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CONTENTS

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THE FERN-FAMILY THELYPTERIDACEAE IN MALAYA

by

R. E. HOLTTUM

Royal Botanic Gardens

Kew

SUMMARY

The genera and species of Thelypteridaceae in Malaya are here arranged as in a monograph of the family prepared for *Flora Malesiana*, Series II (Pteridophyta) Vol. 1, part 5, which is in process of publication simultaneously with the present paper. New names and new combinations will date from Flora Malesiana and not from the present paper, the object of which is to indicate the necessary corrections in Holttum, A Revised Flora of Malaya Vol. 2 (dated 1954 but published early in 1955, second edition 1968) to which reference is made under every species. Apart from changes in generic concepts, the principal new information concerns the species named *Thelypteris vicosa, Cyclosorus stipellatus* and *Cyclosorus ferox* in 1955. New descriptions are only provided where those in the book are defective.

INTRODUCTION

The family Thelypteridaceae comprises about 1000 species, about 8% of all known ferns. About 430 species are now known in Malesia. Early descriptions of species were rarely adequate to identify specimens, and several names were used confusedly in the 19th century. As a basis for the present work, types of almost all species were examined and re-described; all specimens in some major herbaria have also been studied, and many recent unnamed collections. This resulted in the discovery that some species had been wrongly named in the book of 1955; also more critical study and new collections in Malaya indicated that a few species should be subdivided. In 1971 I published a new scheme of genera in the family, to which the Malayan species are here allocated. Subsequently I published a series of monographs of most of the genera, except the largest (*Sphaerostephanos*). Some taxonomists prefer to regard all species in the family as members of the genus *Thelypteris*; the correct name for each species in that genus, if published, is here indicated.

A CONSPECTUS OF THE GENERA

It was evident to me that the system of genera adopted in the book of 1955 was not a natural one; for example, the species there named *Thelypteris immersa* and *Cyclosorus extensus* are closely allied and should not be in different genera; similarly, the species named *Abacopteris lineata* is closely related to *Cyclosorus glandulosus*. Within both *Thelypteris* and *Cyclosorus* is a mixture of species of diverse relationships. Ching established some new genera in 1963, but some of them are wholly or mainly in mainland Asia, and in Malesia there are very numerous additional species which need to be fitted into the picture. My treatment was thus more elaborate than Ching's. The following conspectus shows how I think the genera are related. It is not easy to show this in a way that will also serve as a key by which specimens may be allocated to their correct genera; an artificial key for this purpose (covering Malayan genera only) follows. The inter-relations of the groups are still very uncertain, and need to be considered in the context of the whole family which is world-wide in distribution with the greatest abundance of species in the wet tropics.

1. Group of Phegopteris (Holttum, Gard. Bull. Singap. 29: 145, with key to species. 1977).

Fronds bipinnate or pinnate with deeply lobed pinnae; veins often branching, not reaching margins of leaflets; upper surface of costae prominent, not grooved; indusium present or absent; chromosome numbers 30, 31, 35.

Genera: (*Phegotperis,* not in Malaya), *Pseudophegopteris, Macrothelypteris, Metathelypteris.*

2. Group of Coryphopteris.

Fronds pinnate with deeply lobed pinnae and simple free veins which all reach the margin; sporangia short-stalked, lacking hairs or glands distally; indusia present; small spherical resinous glands usually present on lower surface of pinnae; some acicular hairs in some species consisting of several cells; caudex erect (*Coryphopteris*), or slender and long-creeping (*Parathelypteris*). Chromosome number 31 or 32.

3. Group of Trigonospora.

Caudex erect; fronds pinnate with deeply lobed pinnae and free veins (except one species in Burma); indusia present; sporangia lacking glands or hairs distally; spores trilete with discontinuous perispore of minute papillae; plants of rocky stream-beds; chromosome number 36.

Genera: *Trigonospora* (Asia and W. Malesia), *Menisorus* (Africa).

4. Group of Thelypteris.

Caudex prostrate, short or long; fronds simply pinnate with lobed pinnae; no reduced basal pinnae; veins free or anastomosing, simple except in *Thelypteris,* all reaching the margin; persistent scales, often broad, present on lower surface of costae; sori indusiate or not; sporangia lacking glands or hairs distally but bearing a large spherical red gland at the end of a hair on sporangium-stalk, similar glands sometimes present on lower surface of pinnae; chromosome number 36 (35 in *Thelypteris*).

Genera: *Thelypteris* (not Malayan), *Cyclosorus, Ampelopteris, Mesophlebion.*

5. Group of Chingia.

Caudex massive, erect (sometimes short-creeping in *Plesioneuron*); long narrow scales at base of stipe, often throughout stipe and rachis; fronds pinnate, pinnae variously lobed; no reduced basal pinnae; veins in *Chingia* always oblique, several pairs passing to the sides of a long sinus-membrane which is always prominent on the lower surface; sori close to costules in *Chingia,* often exindusiate; sporangia often bearing small capitate hairs or small spherical glands; chromosome number 36.

Genera: *Chingia Plesioneuron* (in Eastern Malesia and the Pacific).

6. Group of Sphaerostephanos.

Caudex erect or short-creeping (long-creeping in *S. unitus* only); fronds simply pinnate, pinnae deeply lobed to entire; reduced pinnae present, sometimes very small with long aerophores, except *Pronephrium*; veins anastomosing in the less deeply lobed species, sinus membranes usually distinct, short or long; sessile spherical glands or small capitate hairs present on sporangia of many species and often also on surface of pinnae; spores with many separate small thin wings or with a median translucent wing and cross-wings; chromosome number 36.

Genera: *Pneumatopteris, Sphaerostephanos, Pronephrium.*

7. Group of Christella.

Caudex erect or short- to long-creeping; fronds simply pinnate; pinnae deeply to shallowly lobed; lower pinnae in *Christella* gradually reduced but the basal ones never very small; swollen aerophores lacking or rare; glandular hairs on pinnae, if present, ± elongate; sporangia lacking glands or hairs distally, in *Christella* always with an elongate unicellular gland on the stalk; perispore consisting of rather thick tubercles or ridges; chromosome number 36.

Genera: *Christella, Amphineuron.*

KEY TO THE GENERA

1. Upper surface of costae not grooved; veins not reaching margin

  2. Fronds bipinnate

    3. Slender septate acicular hairs present on lower surface of axes of frond .... 1. *Macrothelypteris*

    3. Acicular hairs on axes of frond all uicellular ... 2. *Pseudophegopteris*

  2. Fronds simply pinnate

    4. Sporangia bearing setae .... 2. *Pseudophegopteris*

    4. Sporangia lacking setae .... 3. *Metathelypteris*

1. Upper surface of costae grooved; veins all reaching margin

  5. Much-reduced basal pinnae lacking, or 1–2 pairs inconstantly present or absent

    6. Veins all free

      7. Caudex slender, long-creeping .... 4. *Parathelypteris*

      7. Caudex erect or short-creeping, not slender

        8. Caudex quite erect; basal basiscopic vein of each group arising from costule, not from costa

          9. Fronds commonly more than 100 cm long; copious minute yellow glands on lower surface of veins ... 15. *Amphineuron*

          9. Fronds rarely over 50 cm long; glands on lower surface, if present, otherwise

            10. Plants of mountain ridges; resinous glands usually present on lower surface of pinnae ...... 5. *Coryphopteris*

10. Plants of rocky stream-beds; no glands present .... 6. *Trigonospora*

8. Caudex short-creeping; basal basiscopic vein of each group arising from costa, not from costule .... 7. *Mesophlebion*

6. Veins anastomosing

11. Plants of wet places; caudex long-creeping; flat scales present on lower surface of costae, at least on young fronds

12. Plants of open swamps; fronds not proliferous; indusia present .... 8. *Cyclosorus*

12. Plants of banks of streams or ditches; fronds freely proliferous; indusia lacking .... 9. *Ampelopteris*

11. Plants not growing in wet places; caudex erect or short-creeping; no flat scales on lower surface of costae

13. Caudex erect; stiff narrow scales at base of stipe; sori close to costules; a long prominent sinus-membrane present .... 10. *Chingia*

13. Caudex short-creeping; scales otherwise; sori rarely close to costules; no long sinus-membrane prominent on lower surface

14. Pinnae crenate .... 13. *Pronephrium*

14. Pinnae distinctly lobed

15. In larger pinnae, at least 3 pairs of veins anastomosing or passing to sides of sinus-membrane; a few spherical yellow glands present on lower surface of costules and veins .... 12. *Sphaerostephanos*

15. In larger pinnae, at most 2 pairs of veins thus; glands, if present, otherwise

16. Copious hairs 1 mm long on lower surface; elongate red glands present on lower surface of veins .... 14. *Christella*

16. Most hairs much shorter; glands on veins usually abundant, small and colourless or minute and yellow .... 15. *Amphineuron*

5. Much-reduced basal pinnae present; transition from normal to reduced pinnae abrupt or gradual

17. Spherical yellow glands present, at least on indusia or sporangia, in most species throughout lower surface of pinnae .... 12. *Sphaerostephanos*

17. Spherical yellow glands lacking

18. A few pairs of lower pinnae gradually reduced ... 14. *Christella*

18. An abrupt transition from normal to reduced pinnae at base of frond .... 11. *Pneumatopteris*

1. MACROTHELYPTERIS CHING

1. **Macrothelypteris torresiana** (Gaud.) Ching; Holttum, Gard. Bull. Singap. 29 (1977) 148.

Basionym: *Polystichum torresianum* Gaud. in Freycinet Voy. Bot. (1824) 333.

Name in Holttum 1955: *Thelypteris uliginosa* (Kunze) Ching, p. 241.

Correct name in *Thelypteris*: *T. torresiana* (Gaud.) Alston, Lilloa 30 (1960) 111.

Status in Malaya: as Holttum 1955.

2. PSEUDOPHEGOPTERIS CHING

1. **Pseudophegopteris rectangularis** (Zoll.) Holttum, Blumea 17 (1969) 19; Gard. Bull. Singap. 29 (1977) 149.

Basionym: *Polypodium rectangulare* Zoll., Syst. Verz. (1854) 37, 48.

Name in Holttum 1955: *Thelypteris oppositipinna* (v.A.v.R.) Ching, p. 239.

Correct name in *Thelypteris*: *T. rectangularis* (Zoll.) Nayar & Kaur, Comp. to Beddome (1974) 72.

Status in Malaya: as Holttum 1955.

2. **Pseudophegopteris paludosa** (Bl.) Ching; Holttum, Gard. Bull. Singap. 29 (1977) 149.

Basionym: *Polypodium paludosum* Bl., Fl. Jav. Fil. (1851) 192.

Name in Holttum 1955: *Thelypteris brunnea* (Wall.) Ching; p. 240.

Correct name in *Thelypteris*: *T. paludosum* (Bl.) K. Iwats., Acta Phytotax. Geobot. 19 (1961) 11.

Status in Malaya, with note on synonym: as Holttum 1977, l.c.

3. METATHELYPTERIS CHING

1. **Metathelypteris flaccida** (Bl.) Ching; Holttum, Gard. Bull. Singap. 29 (1977) 147.

Basionym: *Aspidium flaccidum* Bl., Enum., Pl. Jav. (1828) 161.

Name in Holttum 1955: lacking.

Correct name in *Thelypteris*: *T. flaccida* (Bl.) Ching, Bull. Fan Mem. Inst. Biol. Bot. 6 (1936) 336.

Status in Malaya: increasing, on bare earth banks by roadsides in sheltered places at Cameron Highlands, c. 1500 m. See notes on the two forms of this species in Holttum 1977.

Distribution: W. Java, Sumatra (?), Ceylon & S. India, N.E. India to Yunnan.

2. **Metathelypteris gracilescens** (Bl.) Ching, Acta Phytotax. Sinica 8 (1963) 305.

Basionym: *Aspidium gracilescens* Bl., Enum. Pl. Jav. (1828) 155.

Name in Holttum 1955: lacking.

Correct name in *Thelypteris*: *T. gracilescens* (Bl.) Ching, Bull. Fan. Mem. Inst. Biol. Bot. 6 (1936) 327.

Misidentified as *M. decipiens* (Clarke) Ching in Holttum 1977: 147.

Status in Malaya: known only from a single collection from G. Batu Brinchang.

This species occurs in Mainland Asia from the Darjeeeling district in N. Bengal to southern Japan, and has been found in Malesia on mountains at about 1800 m from Sumatra to New Guinea, usually (as on G. Batu Brinchang) on wet rocks near a waterfall. *M. decipiens* (at Darjeeling) differs from Malesian specimens of *M. gracilescens* in having shorter fronds (those of the latter in Malesia commonly 25–30 cm long) with fewer pinnae, the basal pinnae largest, and veins mostly forked. The Malayan specimen (Molesworth Allen 5005) has more forked veins than is usual in Malesian specimens but otherwise does not differ. There are not many places in Malaya where wet rocks by waterfalls occur at 1800 m.

3. **Metathelypteris dayi** (Bedd.) Holttum in Nayar & Kaur, Comp. to Beddome (1974) 205; Holttum, Gard. Bull. Singap. 29 (1977) 148.

Basionym: *Nephrodium dayi* Bedd., Journ. Bot. 25 (1877) 323.

Name in Holttum 1955: *Thelypteris singalanensis* (misidentification), p. 243.

Correct name in *Thelypteris*: *T. dayi* (Bedd.) Nayar & Kaur, Comp. to Beddome (1974) 59.

Status in Malaya: as Holttum 1955.

Distribution: throughout Malesia except E. Java and Lesser Sunda Islands.

4. PARATHELYPTERIS CHING, ACTA PHYTOTAX. SINICA 8 (1963) 300.

The type of this genus is *P. glanduligera* (Kunze) Ching, a species based on a specimen collected near Canton. The lower pinnae of its fronds are not reduced. It appears to be related to *Coryphopteris* but has a long slender creeping rhizome. Ching has also included in this genus two species with lower pinnae gradually much reduced: the Malayan *P. beddomei* and *P. nipponia* (Fr. & Sav.) Ching from China and Japan. There are two species in North America, one like *P. beddomei* in habit, the other like *P. glanduligera.* I think that two genera are here confused; comparative studies of plants from Asia and N. America are needed to resolve this situation.

1. **Parathelypteris beddomei** (Bak.) Ching, Acta Phytotax. Sinica 8 (1963) 302.

Basionym: *Nephrodium beddomei* Bak., Syn. Fil. (1867) 267.

Correct name in *Thelypteris* and name in Holttum 1955, p. 240: *T. beddomei* (Bak.) Ching.

Status in Malaya: now frequent at Cameron Highlands by roadsides which are sheltered by forest, in places where there is a seepage of water.

5. CORYPHOPTERIS HOLTTUM, BLUMEA 19 (1971) 33; 23 (1976) 18–47.

The type of this genus is *C. viscosa* (Bak.) Holttum, of which the type specimen was collected near the top of Mt Ophir by Hugh Cuming in 1839. The genus comprises about 47 species almost all of which occur in Malesia, on mountain ridges where the soil is peaty and very acid. All species have an erect caudex and free veins, the basal pinnae not or little reduced; almost all have red resinous glands on one or both surfaces of pinnae (not easy to see on dried specimens). In 1955 I treated *Thelypteris viscosa* very broadly, mentioning variation among the specimens so named; here they are divided into four species.

KEY TO THE SPECIES IN MALAYA

1\. Base of stipe bearing pale, firmly cylindrical septate hairs

  2\. Stipe and abaxial surface of rachis densely covered with spreading hairs many of which are septate

    3\. Pinnae to 18 x 2.5 cm .... 1. *C. unidentata*

    3\. Pinnae c. 5.5 x 1.2 cm .... 2. *C. tahanensis*

  2\. Stipe above base and abaxial surface of rachis less densely hairy with few septate hairs .... 3. *C. hirtipes*

1\. Base of stipe not bearing such hairs

  4\. Sessile glands present between veins on upper surface of pinnae

    5\. Stipe-scales thin, less than 1 mm wide above base; lower surface of costae bearing many acicular hairs .... 4. *C. viscosa*

    5\. Stipe-scales firm, 1 mm or more wide; lower surface of costae bearing short capitate hairs .... 5. *C. gymnopoda*

      6\. Upper surface of pinnae lacking hairs between veins .... var. *gymnopoda*

      6\. Upper surface of pinnae bearing acicular hairs between veins

        7\. Lower surface between veins, and indusia, lacking acicular hairs .... var. *bintangensis*

        7\. Lower surface between veins bearing copious short erect acicular hairs .... var. *humilis*

  4\. Sessile glands lacking between veins on upper surface of pinnae

    8\. Acicular hairs present on lower surface of costae; glands present, at least on costae

      9\. Septate hairs present on upper surface of rachis and costae

        10\. Septate hairs on upper surface of rachis and costae less than 0.5 mm long; stipe-scales 3 mm long, thin .... 6. *C. arthrotricha*

10. Septate hairs on upper surface of rachis and costae 1 mm or more long; stipe-scales to 7 x 1 mm, rigid, hair-pointed .... 2. *C. tahanensis*

9. Septate hairs absent on upper surface of rachis and costae .... 7. *C. pectiniformis*

11. Hairs on lower surface of costae unicellular, less than 1 mm long .... var. *pectiniformis*

11. Hairs on lower surface of costae septate, to 1.5 mm long .... var. *hirsuta*

8. Acicular hairs lacking or rare on lower surface of costae; no glands present on lower surfaces .... 8. *C. badia*

1. **Coryphopteris unidentata** (Bedd.) Holttum, Blumea 23 (1976) 26.

Basionym: *Lastrea unidentata* Bedd., Handb. Suppl. (1892) 53.

Name in Holttum 1955, p. 251, correct in *Thelypteris*: *T. unidentata* (Bedd.) Holttum.

Status in Malaya: known only from G. Bubu, G. Bintang and G. Inas in Perak (not found at Cameron Highlands, wrongly so reported in Holttum 1955).

2. **Coryphopteris tahanensis** Holttum, Blumea 23 (1976) 33.

Name in Holttum 1955: *Thelypteris viscosa,* in part.

Correct name in *Thelypteris*: none published.

Differs from *C. viscosa*: scales at base of stipe 7–8 x 1 mm, rigid, acuminate; glands lacking on upper surface of pinnae; upper surface of rachis and costae, at least near apex of frond, bearing septate hairs 1 mm long, multicellular hairs 1.5 mm long sometimes also present on lower surface. One specimen from G. Tahan has the lower surface of rachis and costae covered with hairs almost 2 mm long.

Three collections from c. 1800 m on G. Tahan, one from G. Batu Brinchang and one from G. Lari Tembakau.

3. **Coryphopteris hirsutipes** (Clarke) Holttum in Nayar & Kaur, Comp. to Beddome (1974) 203.

Basionym: *Nephrodium gracilescens* var. *hirsutipes* Clarke, Trans. Linn. Soc. II Bot. 1 (1880) 514, t. 67.

Name in Holttum 1955: *Thelypteris herbacea* Holttum, p. 254.

Correct name in *Thelypteris*: *T. hirsutipes* (Clarke) Ching, Bull. Fan Mem. Inst. Biol. Bot. 6 (1936) 314.

Base of stipe bearing spreading septate hairs 1–3 mm long; some septate hairs also present on upper surface of rachis and costae; hairs on lower surface very variable, sometimes all unicellular; glands present on lower surface of Sumatran specimens, not on Malayan ones.

In Malaya, known from three collections: G. Tahan, near Wray's Camp (915 m); G. Padang, Trengganu; G. Hijau at 1370 m, "locally abundant" (Molesworth Allen).

4. **Coryphopteris viscosa** (Bak.) Holttum, Blumea 19 (1971) 33.

Basionym: *Nephrodium viscosum* Bak. Syn. Fil. (1867) 264.

Name in Holttum 1955: *Thelypteris viscosa* (Bak.) Ching, p. 252, in part.

Status in Malaya: only known with certainty from Mt Ophir.

Stipe-scales c. 4 x 0.5 mm, thin; lamina to 30 cm long, tapering gradually distally; pinnae 25 pairs or more, closely placed; basal pinnae to 1.4 cm wide, narrowed towards their bases; largest pinnae 5.5 x 1.2 cm, lobes nearly entire; glands present on both surfaces between veins; acicular hairs present on lower surface of rachis and costae, also very narrow scales; distal sori often ± asymmetric.

There are apparently distinct varieties of this species in Western Sarawak. Some specimens from the Main Range in Malaya which I have named *C. gymnopoda* are perhaphs intermediate between that species and typical *C. viscosa.*

5. **Coryphopteris gymnopoda** (Bak.) Holttum, Blumea 23 (1976) 29.

Basionym: *Nephrodium gymnopodum* Bak., Trans. Linn. Soc. II Bot. 4 (1894) 252.

Name in Holttum 1955: *Thelypteris viscosa,* in part.

Correct name in *Thelypteris*: none published.

Synonyms: *Lastrea ridleyi* Bedd. and *L. robinsonii* Ridl.

Var. **gymnopoda** differs from *C. viscosa* as follows: stipe-scales firm, dark, 1–1.5 mm wide; pinnae 15–18 (rarely to 25) pairs, well spaced; pinna-lobes mostly crenate; lower surface of costae bearing capitate hairs and glands, acicular hairs usually lacking; distal sori rarely asymmetric.

Status in Malaya: found on G. Tahan and at scattered localities on the Main Range, especially in open places. The type came from Mt Kinabalu, where this species is abundant at 1800 m and higher. The types of *Lastrea ridleyi* and *L. robinsonii* are small plants.

Var. **bintangensis** Holttum, Blumea 23 (1976) 30. Upper surface between veins covered with very short acicular hairs in addition to glands.

Status in Malaya: only known from the type collection on G. Bintang.

Var. **humilis** Holttum, Blumea 23 (1976) 30. Fronds small; both upper and lower surfaces between veins covered with short acicular hairs.

Status in Malaya: several collections from exposed places at Cameron Highlands at about 1500 m; their condition is possibly due to exposure; more study is needed.

6. **Coryphopteris arthrotricha** Holttum Blumea 23 (1976) 33.

Name in Holttum 1955: *Thelypteris viscosa*, in part.

Correct name in *Thelypteris*: none published.

Stipe dark at base, paler distally; scales at base of stipe c. 3 mm long, thin; lamina 25–45 cm long; pinnae c. 20 pairs, well spaced, commonly 8 x 1.6 cm; pinnalobes entire to dentate; lower surface of rachis and costae bearing minute acicular and capitate hairs, on costae also red glands and linear scales; few glands between veins; hairs on upper surface of rachis and costae hardly 0.5 mm long but many of them septate (2–4 cells), upper surface between veins glabrous or with a few short hairs, not glands.

Status in Malaya: this is the common species on the Main Range, in ridge forest at 1200–1500 m; known also from Sumatra.

7. **Coryphopteris pectiniformis** (C. Chr.) Holttum Blumea 23 (1976) 34.

Basionym: *Dryopteris pectiniformis* C. Chr. Gard. Bull. Str. Settl. 4 (1929) 379.

Name in Holttum 1955, p. 253, and correct name in *Thelypteris*: *T. pectiniformis* (C. Chr.) Ching.

Status in Malaya: in forest on Taiping Hills at 1250–1400 m; a few records from the Main Range and G. Padang in Trengganu.

Var. **hirsuta** Holttum, Blumea 23 (1976) 34. Differs from the typical form of the species as follows: fronds smaller with pinnae to 6.5 cm long; lower surface of costules and veins bearing acicular hairs 1.5 mm long which are septate; hairs on indusia 0.5 mm long.

Status in Malaya: only known from the ridge connecting Fraser's Hill to Pine Tree Hill.

8. **Coryphopteris badia** (v.A.v.R.) Holttum, Blumea 23 (1976) 44.

Basionym: *Dryopteris badia* v.A.v.R., Bull. Jard. Bot. Btzg II, 16 (1914) 9.

Correct name in *Thelypteris*: *T. badia* (v.A.v.R.) Ching, Bull. Fan Mem. Inst. Biol. Bot. 10 (1941) 250.

Stipe dark, glossy, at base often bearing a tangled mass of slender hairs which are golden brown when dry; lamina of frond variable according to habitat, 10–65 cm long; pinnae thick and rigid when dry, nearly all distinctly stalked, basal acroscopic lobe free or nearly so, lower surface quite glabrous apart from a few hair-like scales on costae, no glands; upper surface of costae bearing rigid dark brown hairs, no other hairs on upper surface and no glands; indusia glabrous.

Status in Malaya: known only from one small plant found on G. Ulu Kali at 1800 m by Mrs A.G. Piggott; other collections from N. Sumatra, Sarawak, Sabah, Sulawesi and New Guinea, at 1400–2500 m, usually growing in moss-cushions, sometimes on branches of trees in moss-forest. The largest known fronds are from an epiphytic plant collected in N. Sumatra.

6. TRIGONOSPORA HOLTTUM, BLUMEA 19 (1971) 29.

Plants of rocky stream-beds; caudex short, erect; basal pinnae not reduced; veins free; sori indusiate; sporangia lacking glands or hairs; spores trilete.

This is a genus of about 10 species, mostly in mainland S.E. Asia and Ceylon.

1. **Trigonospora ciliata** (Benth.) Holttum, Blumea 19 (1971) 29.

Basionym: *Aspidium ciliatum* Benth., Fl. Hongkong. (1861) 455.

Name in Holttum 1955, p. 250, correct in *Thelypteris*: *T. ciliata* (Benth.) Ching.

Correction to Holttum 1955. The type of this species is a specimen from Hong Kong described by Bentham, who adopted a name given by Wallich to a plant from Nepal.

Status in Malaya: on rocks in stream-beds in the flood-zone, at many places on the Main Range, also Taiping Hills and G. Tahan, from low altitudes to 1500 m; formerly abundant above the Parit Falls at Cameron Highlands.

7. MESOPHLEBION HOLTTUM, BLUMEA 19 (1971) 29, EXCL. SUBG. *PLESIONEURON*.

This group of species is described in Holttum 1955 as the group of *Thelypteris crassifolia*. Apart from changes in nomenclature, the only difference in the present treatment is recognition of *M. beccarianum* as a species distinct from *M. chlamydophorum*. This is an interesting genus which would be worth a detailed cytotaxonomic study. As reported in 1955, two Malayan species are tetraploid; a diploid has recently been found in Sarawak (a new species, not known in Malaya).

KEY TO THE SPECIES IN MALAYA

1. Stipe and lower part of rachis bearing many stiff spreading scales .... 1. *M. trichopodum*

1. Upper part of stipe and rachis lacking large scales

  2. Sterile pinnae lobed not more than half-way to costa .... 2. *M. motleyanum*

  2. Sterile pinnae lobed more than half-way to costa

    3. Indusia firm, glabrous, covering the sorus almost to maturity; fertile pinnae lobed to 1–1.5 mm from costa .... 3. *M. beccarianum*

    3. Indusia ± hairy, in most cases not covering the sori to maturity; pinnae lobed less deeply

      4. Fronds rarely dimorphic; pinnae thin, rarely more than 2 cm wide; indusia always conspicuous ...... 4. *M. chlamydophorum*

      4. Fronds usually dimorphic; pinnae rigid, fertile to 3 cm, sterile to 4 cm wide; indusia varied, thin and shrivelled when dried .... 5. *M. crassifolium*

1. **Mesophlebion trichopodum** (C. Chr.) Holttum, Blumea 72 (1975) 226.

Basionym: *Dryopteris trichopoda* C. Chr., Ind. Fil. (1905) 298, new name for *Nephrodium polytrichum* Bak., Journ. Bot. 29 (1891) 107, non Schrad. 1824.

Name in Holttum 1955: *Thelypteris paleata* (Copel.) Holttum, p. 249.

Correct name in *Thelypteris*: none published.

The description of 1955 needes no revision for Malayan plants. These are smaller than the type specimen of *N. trichopodum* from Sarawak but otherwise not different. More collections are needed from Sarawak and Sumatra; possibly distinct varieties exist in Sarawak.

In Malaya known from few places, mostly beside streams in forest: Penang Hill at 650 m (Richmond Pool); Taiping Hills; by the Sungei Tahan at K. Teku, 50 m; by the Sungei Jeriau below Fraser's Hill at 1070 m; on G. Angsi at 600 m.

2. **Mesophlebion motleyanum** (Hook.) Holttum in Nayar & Kaur, Comp. to Beddome (1974) 209.

Basionym: *Nephrodium motleyanum* Hook., Syn. Fil. (1867) 266.

Name in Holttum 1955, correct in *Thelypteris*: *T. motleyanum* (Hook.) Holttum, p. 247.

Status in Malaya: as in Holttum 1955 for lowland plants, but I now think that mountain plants, smaller and firmer in texture than lowland ones (mentioned under *T. crassifolia* in 1955) probably belong to this species; more study is needed.

3. **Mesophlebion beccarianum** (Cesati) Holttum, Blumea 22 (1975) 230.

Basionym: *Nephrodium beccarianum* Cesati, Atti Acad. Napoli 7, no 8 (1876) 23.

Name in Holttum 1955: *Thelypteris chlamydophora,* in part, p. 246.

Correct name in *Thelypteris*: *T. beccariana* (Cesati) Reed, Phytologia 17 (1968) 263.

Fronds firm; lower pinnae with stalks 6–10 mm long; pinnae 12–18 cm long, 1.3–2.5 cm wide (sterile ones largest), lobed to 1–1.5 mm from costa; basal basiscopic vein arising from costa near its costule; lower surface of costae usually hairless but with some scales which are early caduous; sori inframedial; indusia large, firm, glabrous, covering the sori almost to maturity; spores papillose.

Status in Malaya: specimens from Ulu Langat, in hill forest at 750 m, and from G. Angsi, are closely similar to the type and other Bornean specimens; some specimens from Perak and Penang differing in having some short acicular hairs on the lower surface of costae and on indusia may be hybrids. In Sarawak, the species seems to be very uniform.

4. **Mesophlebion chlamydophorum** (C. Chr.) Holttum, Blumea 22 (1975) 321.

Basionym: *Dryopteris chlamydophora* C. Chr., Gard. Bull. Str. Settl. 4 (1929) 384.

Name in Holttum 1955, correct in *Thelypteris*: *T. chlamydophora* (C. Chr.) Ching, p. 246.

Status in Malaya: as in Holttum 1955.

The spores are papillose, as in *M. beccarianum.*

5. **Mesophlebion crassifolium** (Bl.) Holttum, Blumea 22 (1975) 232.

Basionym: *Aspidium crassifolium* Bl., Enum. Pl. Jav. (1828) 158.

Name in Holttum 1955, correct in *Thelypteris*: *T. crassifolia* (Bl.) Ching, p. 246.

In mountain forest in Malaya at 700–1800 m, variable; pinnae of sterile fronds are usually much wider than those of fertile fronds; stalks of lower pinnae very variable in length; indusia thin, with short hairs, sometimes rather large, sometimes small; spores with small wings, as in *M. motleyanum.* There may be hybrids between this and *M. motleyanum* and *M. beccarianum;* one specimen from Fraser's Hill has spores intermediate between winged and papillose, and rather large, thin, short-hairy indusia.

8. CYCLOSORUS LINK, HORT. REG. BOT. BEROL. 2 (1833) 128.

A genus of few species, pantropic, always in open places in freshwater swamps. A characteristic feature is the presence of a large red glandular cell at the end of a hair on the stalks of sporangia; similar glandular cells also occur on the lower surface of pinnae.

1. **Cyclosorus interruptus** (Willd.) H. Ito, Bot. Mag. Tokyo 51 (1937) 714, nomen tantum.

Basionym: *Pteris interrupta* Willd., Phytographia (1794) 13, t. 10, fig. 1.

Name in Holttum 1955: *Cyclosorus gongylodes* (Schkuhr) Link, p. 261.

Correct name in *Thelypteris*: *T. interrupta* (Willd.) K. Iwats., J. Jap. Bot. 38 (1963) 314 nomen tantum.

Status in Malaya: as Holttum 1955.

The type of this species, in the Willdenow Herbarium at Berlin, was collected in Southern India. The species has had many names; see Holttum, Amer. Fern Journ. 63 (1973) 81. Unfortunately Willdenow's type has in recent years been wrongly identified with the species here named *Amphineuron terminans.*

9. AMPELOPTERIS KUNZE, BOT. ZEIT. 6 (1848) 114.

This is a monotypic genus, occurring throughout the wetter parts of the tropics from West Africa to N.E. Australia and New Caledonia.

1. **Ampelopteris prolifera** (Retz.) Copel., Gen. Fil. (1947) 144.

Basionym: *Hemionitis prolifera* Retz., Obs. Bot. 6 (1791) 38.

Name in Holttum 1955: *Ampelopteris prolifera* (Retz.) Copel., p. 298.

Correct name in *Thelypteris*: *T. prolifera* (Retz.) Reed, Phytologia 17 (1968) 306.

Sori exindusiate; between the sporangia are conspicuous red glands which are borne at the ends of hairs on sporangium-stalks, as in *Cyclosorus* and *Mesophlebion;* broad scales present on the lower surface of costae of young fronds, soon lost; forked or branched hairs, often sparse, present on lower surface of costae and rachis; see also description in Holttum 1955.

Status in Malaya: as in Holttum 1955; see also Molesworth Allen, Gard. Bull. Singapore 17 (1959) 261 for reports of this species by the Muda and Kinta rivers. There have been few collections in other parts of Malaya; conditions necessary for establishment of growth of prothalli and sporophytes need to be studied.

10. CHINGIA HOLTTUM, BLUMEA 19 (1971) 31

Caudex erect, usually massive on well-grown plants; stipes covered, at least near base, with long narrow scales; basal pinnae not reduced; pinnae lobed up to half-way to costa; veins all oblique, 1–2 pairs anastomosing and usually several pairs passing to the sinus-membranes which are prominent on the lower surface; sori near costules; indusia small or lacking; sporangia sometimes bearing capitate hairs or small glands; spores black, minutely tuberculate.

A genus confined to Malesia and the Pacific (to Tahiti); 18 species known. Corrections are here made to the description of the previously-known Malayan species, and an additional one is described.

KEY TO THE MALAYAN SPECIES

1. Stipe and at least the lower part of abaxial surface of rachis bearing copious stiff scales or their persistent bases; pinnae thin, bearing variously abundant small sessile glands on their lower surface .... 1. *C. sakayensis*

1. Stipe scaly near base only; pinnae rigid; more or less abundant short capitate hairs present on lower surface .... 2. *C. perrigida*

1. **Chingia sakayensis** (Zeiller) Holttum, Flora Malesiana.

Basionym: *Nephrodium sakayense* Zeiller.

Name in Holttum 1955: *Cyclosorus ferox,* p. 265.

Correct name in *Thelypteris*: *T. sakayensis* (Zeiller) Reed, Phytologia 17 (1968) 311.

The type of this species, at Paris, is the upper part of a frond of a young plant, partly fertile; it was collected near Ipoh. In 1955 I had not seen it, and made no reference to the species. A complete young plant collected by Mrs A. G. Piggott on G. Telapak Burok, Negri Sembilan, along with mature plants, closely matches Zeiller's type. As noted in 1955, Malayan plants named *Cyclosorus ferox* differ in several ways from the type of *Aspidium ferox* Bl. from Java. Important differences are the distinctly flat scales on the rachis, the presence of small indusia and of copious small sessile glands on the lower surface of pinnae between veins.

2. **Chingia perrigida** (v.A.v.R.) Holttum, Kalikasan 3 (1974) 27.

Basionym: *Dryopteris perrigida* v.A.v.R., Bull. Jard. Bot. Btzg II, 10 (1914) 27.

Correct name in *Thelypteris*: none published.

Plants smaller than those of *C. sakayensis,* with rigid fronds having veins prominent on the lower surface; stipe-scales abundant near base only, no scales on rachis; pinnae to 30 x 2.3 cm, lobed 1/3 towards costa or a little more deeply; lower surface of pinnae bearing short capitate hairs on all parts and a variable number of acicular hairs on costules and veins; sori with small indusia.

Status in Malaya: only known from open places by roadsides on G. Ulu Kali (Genting Highlands) at 1500–1700 m, first collected by Mrs A. G. Piggott in 1974. The type of the species was collected on G. Merapi, near Bukit Tinggi, in Sumatra.

11. PNEUMATOPTERIS NAKAI, BOT. MAG. TOKYO 47 (1933) 179.

A genus of about 80 species, confined to the tropics of the Old World apart from one aberrant species in New Zealand; mainly forest plants, a few confined to limestone; differing from *Sphaerostephanos* in lacking spherical yellow glands, in lacking also abundant acicular hairs on lower surfaces; small capitate hairs are present on lower surfaces and/or sporangia of some species; the lower surface of dried specimens, between veins, is ± pustular; aerophores are always somewhat swollen, much elongate in a few species, including the type, *P. callosa.*

KEY TO THE MALAYAN SPECIES

1. Reduced pinnae at base of frond all distinctly leafy

    2. Reduced pinnae 6–10 pairs, the upper ones not auricled .... 1. *P. truncata*

    2. Reduced pinnae 2–3 (–4) pairs, strongly auricled on their acroscopic side .... 2. *P. ecallosa*

1. Reduced pinnae represented by prominent aerophores, each with a very narrow rim at its base .... 3. *P. callosa*

1. **Pneumatopteris truncata** (Poir.) Holttum, Blumea 21 (1973) 314.

Basionym: *Polypodium truncatum* Poir., Encycl. Meth. 5 (1804) 534.

Name in Holttum 1955: *Cyclosorus truncatus* (Poir.) Farwell, p. 266.

Correct name in *Thelypteris*: *T. truncata* (Poir.) K. Iwats., Mem. Coll. Sci. Univ. Kyoto, B, 31 (1964) 33.

Status in Malaya: as Holttum 1955.

The type specimen of this species is labelled Brazil, and I accepted this statement in 1955, but no species of *Pneumatopteris* is known from the New World. The distribution of *P. truncata* is: S. India and Ceylon (where it is tetraploid), Western Malesia and the Philippines. Plants in Northern India are diploid, with smaller fronds, more strongly toothed pinna-lobes and rather large capitate hairs on sporangia.

2. **Pneumatopteris ecallosa** (Holttum) Holttum, Blumea 21 (1973) 310.

Basionym and name in Holttum 1955: *Cyclosorus ecallosus* Holttum, Gard. Bull. Singap. 11 (1947) 269.

Correct name in *Thelypteris*: *T. ecallosa* (Holttum) Reed, Phytologia 17 (1968) 274.

Status in Malaya: now abundant in thickets by small streams at Cameron Highlands; collected also at Genting Highlands at 1500 m.

3. **Pneumatopteris callosa** (Bl.) Nakai, Bot. Mag. Tokyo 47 (1933) 179.

Basionym: *Aspidium callosum* Bl., Enum. Pl. Jav. (1828) 152.

Name in Holttum 1955: *Cyclosorus dicranogramma* (misidentified, p. 267).

Correct name in *Thelypteris*: *T. callosa* (Bl.) K. Iwats., Mem. Coll. Sci. Univ. Kyoto, B, 31 (1964) 34.

Status in Malaya: collected only three times, at Cameron Highlands and at Genting Highlands, at 1500 m, near stream in forest.

Very young fronds are covered with a layer of mucilage through which the aerophores project.

12. SPHAEROSTEPHANOS J. SM. IN HOOK. GEN. FIL. (1839) T. 24.

The type species of this genus is *S. asplenioides* J. Sm. (= *S. polycarpus*), of which John Smith had a defective specimen; he thus made a wrong statement as to the structure of the indusium. Later he corrected this statement and remarked that the species did not differ significantly from others, which he named *Nephrodium*, apart from its elongate sorus. For the same reason I transferred *S. polycarpus* to *Cyclosorus* in 1955. In 1971, when breaking up *Cyclosorus* as defined by Ching and Copeland, I limited *Sphaerostephanos* to a group of species characterized by the presence of spherical yellow sessile glands, which occur usually on the lower surface of pinnae, sometimes confined to costules and veins, or to indusia or sporangia. Similar glands occur in some species of *Pronephrium*, but the latter differ in having almost entire normal pinnae and no reduced pinnae at the base of fronds. One Malayan species, *S. norrisii*, has only 1–2 pairs of very small basal pinnae on its larger fronds, none on smaller ones. *S. peltochlamys* has almost entire pinnae like those of *Pronephrium* but several pairs of reduced basal pinnae; it may be of hybrid origin.

KEY TO THE MALAYAN SPECIES

1. Sori distinctly elongate

    2. Reduced pinnae 6–12 pairs, normal pinnae lobed 1/4 – 1/3 towards costa .... 1. *S. larutensis*

    2. Reduced pinnae many pairs; normal pinnae lobed more than half-way to costa .... 2. *S. polycarpus*

1. Sori not or little elongate

 3. Spherical glands abundant on lower surface of pinnae

  4. Hairs on lower surface of costae and costules appressed or distinctly antrorse

   5. Caudex slender, long-creeping; hairs on lower surface of costae not closely appressed .... 3. *S. unitus*

   5. Caudex erect; hairs on lower surface of costae closely appressed .... 4. *S. porphyricola*

  4. Hairs on lower surface of costae and costules erect or nearly so

   6. Pinnae lobed less than half-way to costa; 2–3 pairs of veins anastomosing .... 5. *S. penniger*

   6. Pinnae lobed at least half-way; only one pair of veins truly anastomosing

    7. Lower surface of costae and rachis glabrous; lowest normal pinnae not or little narrowed at their bases .... 6. *S latebrosus*

    7. Lower surface of rachis and costae bearing short erect hairs; lower normal pinnae much narrowed towards their bases .... 7. *S. heterocarpus*

 3. Spherical yellow glands lacking or rare on lower surface of pinnae

  8. Lower surface of costae and costules covered with slender appressed hairs

   9. Rachis of sterile fronds bearing thick curved brown hairs on both surfaces; basal veins not always anastomosing

    10. Pinnae lobed less than half-way to costa; basal pair of veins often anatomosing .... 8. *S. pterosporus*

    10. Pinnae lobed 3/5 – 2/3 to costa; basal veins rarely anastomosing .... var. *altilobus*

   9. Hairs on rachis pale; basal veins always anastomosing .... 9. *S. hendersonii*

  8. Lower surface of costae and costules not covered with appressed hairs

   11. Normal pinnae entire or crenate .... 10. *S. peltochlamys*

   11. Normal pinnae lobed 2/5 towards costa .... 11. *S. norrisii*

1. **Sphaerostephanos larutensis** (Bedd.) C. Chr., Ind. Fil. Suppl. III (1934) 172.

Basionym: *Nephrodium larutense* Bedd., Handb. Suppl. (1892) 73.

Name in Holttum 1955: *Cyclosorus larutensis* (Bedd.) Ching, p. 284.

Correct name in *Thelypteris*: *T. larutensis* (Bedd.) Reed, Phytologia 17 (1968) 286.

Status in Malaya: as Holttum 1955.

2. **Sphaerostephanos polycarpus** (Bl.) Copel., Univ. Cal. Publ. Bot. 16 (1929) 60.

Basionym: *Aspidium polycarpum* Bl., Enum. Pl. Jav. (1828) 156.

Name in Holttum 1955: *Cyclosorus polycarpus* (Bl.) Holttum, p. 283.

Correct name in *Thelypteris*: *T. polycarpa* (Bl.) K. Iwats., Mem. Coll. Sci. Univ. Kyoto B, 31 (1964) 32.

Status in Malaya: as Holttum 1955.

There is a variety with long hairs on the lower surface of costae, collected on Taiping Hills. Plants at 1500 m on Genting Highlands appear little different from lowland plants.

3. **Sphaerostephanos unitus** (L.) Holttum, Journ. S. Afr. Bot. 40 (1974) 165.

Basionym: *Polypodium unitum* L., Syst. Nat. ed. 10, 2 (1759) 1326 excl. syn.

Name in Holttum 1955: *Cyclosorus unitus* (L.) Ching, p. 260.

Correct name in *Thelypteris*: *T. unita* (L.) Morton, Amer. Fern Journ. 49 (1959) 113.

Status in Malaya: as Holttum 1955.

There are two varieties of this species, one distributed in East Africa, Mascarene Islands, Ceylon and Western Malesia, the other from Borneo and the Philippines eastwards to Fiji.

4. **Sphaerostephanos porphyricola** (Copel.) Holttum, Kalikasan 4 (1975) 59.

Basionym: *Dryopteris porphyricola* Copel., Philip. J. Sci. 7C (1912) 60.

Name in Holttum 1955: *Cyclosorus porphyricola* (Copel.) Ching, p. 271.

Correct name in *Thelypteris*: *T. porphyricola* (Copel.) Ching, Bull. Fan Mem. Inst. Biol. Bot. 6 (1936) 287.

Status in Malaya: as Holttum 1955, but exclude reference to plants from Kinabalu.

The fertile pinnae of this species are up to 14 x 2.5 cm (sterile ones sometimes larger), with abruptly short-acuminate apex.

5. **Sphaerostephanos penniger** (Hook.) Holttum in Nayar & Kaur, Comp. to Beddome (1974) 209.

Basionym: *Nephrodium pennigerum* Hook., Spec. Fil. 4 (1862) 82.

Name in Holttum 1955: *Cyclosorus megaphyllus* (Mett.) Ching, p. 268.

Correct name in *Thelypteris*: *T. megaphylla* (Mett.) K. Iwats., Mem. Coll. Sci. Univ. Kyoto B, 31 (1964) 34.

Status in Malaya: as Holttum 1955; but caudex is never truly erect.

Blume wrongly gave the name *Aspidium pennigerum* (based on *Polypodium pennigerum* Forster; a New Zealand species) to plants of the present species in Java. Hooker copied his description but recognized that Blume has misused Forster's name. In so doing, Hooker in effect created a new name; he retained Forster's name for the New Zaland plant, still in *Polypodium* bcause it had no indusia. The name *Thelypteris pennigera* (Forst.) H. H. Allan applies to the New Zealand fern, so that the later epithet *megaphylla* (given by Mettenius to correct Blume's mistake) has to be used if this species is transferred to the genus *Thelypteris*.

6. **Sphaerostephanos latebrosus** (Mett.) Holttum in Nayar & Kaur, Comp. to Beddome (1974) 209.

Basionym: *Aspidium latebrosum* Mett., Farngatt. IV (1858) 104.

Synonym: *Nephrodium glaucostipes* Bedd., Handb. Suppl. (1892) 80.

Name in Holttum 1955: *Cyclosorus heterocarpus* var. *glaucostipes*, p. 271.

Correct name in *Thelypteris*: *T. latebrosa* (Mett.) Reed, Phytologia 17 (1968) 287.

When writing my book of 1955 I had not seen specimens with the base of fronds intact. Such specimens from the type collection, at Calcutta, show that the basal normal pinnae are hardly narrowed at their bases, and the reduced pinnae are all much larger than in *S. heterocarpus*. This species is still known in Malaya only from two collections in Perak: near Gopeng, and at the foot of G. Idong, both in lowlands. The type of *A. latebrosum* Mett. was from Java.

7. **Sphaerostephanos heterocarpus** (Bl.) Holttum in Nayar & Kaur, Comp. to Beddome (1974) 280.

Basionym: *Aspidium heterocarpon* Bl., Enum. Pl. Jav. (1828) 155.

Name in Holttum 1955: *Cyclosorus heterocarpus* (Bl.) Ching, p. 269.

Correct name in *Thelypteris*: *T. heterocarpa* (Bl.) Morton, Amer. Fern Journ. 49 (1959) 113.

Status in Malaya: as Holttum, except that I think the plants mentioned which had young fronds covered with mucilage belonged to another species, perhaps *S. latebrosus*.

Lowland plants are all small, with pinnae less than 1.5 cm wide, lobed about half-way to the costa; I cannot see a sharp distinction between these and mountain plants which have wider more deeply lobed pinnae; more field study is needed.

8. **Sphaerostephanos pterosporus** (v.A.v.R.) Holttum, Flora Malesiana.

Basionym: *Dryopteris pterospora* v.A.v.R.

Name in Holttum 1955: *Cyclosorus stipellatus,* in part, p. 272.

Correct name in *Thelypteris*: *T. pterospora* (v.A.v.R.) Reed, Phytologia 17 (1968) 307.

In Holttum 1955 this species and *S. hendersonii* were confused with *S. stipellatus* (Bl.) Holttum; all three species lack glands on the lower surface of pinnae, have appressed hairs on lower surface of costae and long thick aerophores at the bases of pinnae. The true *S. stipellatus,* in Java and Sumatra, has less deeply lobed pinnae. *S. pterosporus* is distinguished by thick hairs on both surfaces of the rachis. There are two varieties, as distinguished by the above key.

Var. **pterosporus**: pinnae lobed rather less than half-way to costa; basal veins sometimes meeting to form excurrent veins, sometimes just touching each other at the base of a sinus-membrane. This variety has been found at low altitudes in the southern parts of Malaya: near Malacca (an old collection by Pinwill), near Kajang in Trengganu (Corner) and at low altitudes on G. Pulai and G. Muntahak in Johore. The type came from Sumatra; there are specimens also from G. Matang in Sarawak.

Var. **altilobus** Holttum, Flora Malesiana: pinnae deeply lobed; veins rarely anastomosing. Known only from two collections from Taiping Hills at 750–900 m (Kunstler and Molesworth Allen), the recent one found along the pipe-line path near the Tea Gardens.

9. **Sphaerostephanos hendersonii** Holttum, Flora Malesiana.

Name in Holttum 1955: *Cyclosorus stipellatus,* in part, p. 272.

This species agrees with *S. pterosporus* in most characters but has pale hairs on the rachis and more deeply lobed pinnae. The basal veins are always at a wide angle to the costule and always anastomose to form an excurrent vein to the sinus. Three collections are known from forest at Cameron Highlands at 1500 m; one from North Sumatra appears to be conspecific.

10. **Sphaerostephanos peltochlamys** (C. Chr.) Holttum, Flora Malesiana.

Basionym: *Dryopteris peltochlamys* C. Chr.

Name in Holttum 1955: *Abacopteris peltochlamys* (C. Chr.) Holttum, p. 295.

Correct name in *Thelypteris*: *T. peltochlamys* (C. Chr.) Reed, Phytologia 17 (1968) 303.

Status in Malaya: still known only from one collection from low country in Kelantan.

I have now seen many collections from Sumatra. Glands are often present on sporangia and sometimes on indusia; indusia are always large and usually glabrous but sometimes have a few hairs; small fronds usually lack reduced basal pinnae, but several of these are always present on large fronds. This species is anomalous both in *Sphaerostephanos* and in *Pronephrium* (*Abacopteris*); as above noted, it might be of hybrid origin.

11. **Sphaerostephanos norrisii** (Rosenst.) Holttum, Flora Malesiana.

Basionym: *Dryopteris norrisii* Rosenst. (type from Malaya).

Name in Holttum 1955: *Cyclosorus toppingii*, p. 280 (misidentification).

Synonym: *Nephrodium pennigerum* var.*malayense* Bedd., Handb. Suppl. (1892) 74.

Correct name in *Thelypteris*: none published.

Status in Malaya: as Holttum 1955.

The locality at which the type was collected by Norris is not recorded, but probably it came from the Taiping Hills like the specimens cited by Beddome and two more recent ones, at about 1000 m. The only other collection is my own from Cameron Highlands in forest near the path leading down from Robinson's Falls to the Ringlet valley.

Additional information: glands are usually present on the lower surface of costules and veins in the pinna-lobes, sometimes also on indusia and sporangia; reduced basal pinnae are present only on large fronds.

Distribution outside Malaya: the type of *Dryopteris falcinella* v.A.v.R. from Sumatra is quite identical with that of *D. norrisii;* specimens from Mindanao agree in essentials with those of Malaya and Sumatra but differ in producing fertile fronds of a much smaller size and in the hairs on the upper surface between veins being short and suberect; a few specimens from Borneo are like those from Mindanao. *Dryopteris toppingii* Copel. from Mt Kinabalu differs in a total lack of glands and of reduced pinnae, and in glabrous indusia. A few collections of *D. toppingii* have been made in other parts of Borneo. Copeland gave the name *Sphaerostephanos toppingii* to a quite different species; another name has therefore to be found for the Kinabalu plant which in 1955 I confused with *S. norrisii.*

13. PRONEPHRIUM PRESL, EPIM. BOT. (1851) 258.

Caudex short-creeping; fronds lacking reduced basal pinnae; pinnae subentire or crenate, usually with several pairs of anastomosing veins; lower surface between veins often pustular when dry; spherical glands like those of *Sphaerostephanos* sometimes present on lower surfaces of pinnae or on sporangia; in section *Grypothrix* hairs on the lower surface and on sporangia are hooked and the sori are exindusiate; the species *P. repandum* is intermediate, with exindusiate sori and sporangia bearing many long stiff straight hairs.

This genus, as at present arranged, may be composite; more study of species over a wider area is needed; 57 species are known in Malesia and several more in mainland Asia.

KEY TO THE MALAYAN SPECIES

1. No hooked hairs on any part of the plant

 2. Sori indusiate (indusia in some cases small)

3. Pinnae to 30 cm long, not or little dimorphous; veins 12–15 pairs .... 1. *P. asperum*

3. Pinnae much shorter; fronds dimorphous; veins not over 10 pairs

4. Lower surface of pinnae between veins bearing glands .... 2. *P. glandulosum*

4. Lower surface of pinnae between veins lacking glands

5. Pinnae 4–5 pairs, their bases not or little auricled .... 3. *P. menisciicarpum*

5. Pinnae to 10 pairs, distinctly auricled ...... 4. *P. pletatum*

2. Sori exindusiate .... 5. *P. repandum*

1. Hooked hairs present, at least on caudex

6. Caudex slender, long-creeping

7. Fronds trifoliate .... 6. *P. triphyllum*

7. Pinnae more than one pair, irregular .... 7. *P. X parishii*

6. Caudex thicker, short-creeping with fronds close together

8. Pinnae to 2 cm wide, their bases narrowly cuneate .... 8. *P. salicifolium*

8. Pinnae much wider, their bases broadly cuneate .... 9. *P. rubicundum*

1. **Pronephrium asperum** (Presl) Holttum, Blumea 20 (1972) 112.

Basionym: *Goniopteris aspera* Presl, Tent. Pterid. (1836) 183.

Name in Holttum 1955: *Abacopteris multilineata* var. *malayensis*, p. 297.

Correct name in *Thelypteris*: *T. aspera* (Presl) Reed, Phytologia 17 (1968) 261.

Status in Malaya: as Holttum 1955.

2. **Pronephrium glandulosum** (Bl.) Holttum, Blumea 20 (1972) 118.

Basionym: *Aspidium glandulosum* Bl., Enum. Pl. Jav. (1828) 144.

Name in Holttum 1955: *Cyclosorus glandulosus* (Bl.) Ching, p. 278.

Correct name in *Thelypteris*: *T. malayensis* (C. Chr.) Reed, Phytologia 17 (1968) 291.

Status in Malaya: as Holttum 1955.

The name *Thelypteris glandulosa* belongs to a tropical American species, listed by Christensen as *Dryopteris glandulosa* in his Index Filicum, 1905; he there proposed a new epithet for the Malayan species.

3. **Pronephrium menisciicarpon** (Bl.) Holttum, Blumea 20 (1972) 111.

Basionym: *Aspidium menisciicarpon* Bl., Enum. Pl. Jav. (1828) 142.

Name in Holttum 1955: *Abacopteris menisciicarpa* (Bl.) Holttum, p. 290.

Correct name in *Thelypteris*: *T. menisciicarpa* (Bl.) K. Iwats., Acta Phytotax. Geobot. 21 (1965) 171.

Status in Malaya: as Holttum 1955.

4. **Pronephrium peltatum** (v.A.v.R.) Holttum, Flora Malesiana.

Basionym: *Dryopteris peltata* v.A.v.R.

Name in Holttum 1955: *Abacopteris lineata*, p. 292 (misidentification)

Correct name in *Thelypteris*: *T. peltata* (v.A.v.R.) Reed, Phytologia 17 (1968) 303.

Status in Malaya: as Holttum 1955 but excluding the specimens from Patani, which are *Pronephrium affine* (Bl.) Holttum (a species not found in Malaya). *P. affine* has thinner fronds, crenate pinnae and much larger indusia; it occurs in the lowlands of Java and Sumatra, apparently on rocks by streams.

The type of *P. peltatum* was collected in Sumatra. It differs from Malayan specimens in having distinctly crenate pinnae and small glabrous indusia. In Flora Malesiana the Malayan plants are named var. *peninsulare* Holttum; they are tetraploid. The true *Pronephrium lineatum* (Bl.) Presl does not occur in Malaya.

5. **Pronephrium repandum** (Fée) Holttum, Blumea 20 (1972) 109.

Basionym: *Goniopteris repanda* Fée, Gen. Fil. (1852) 251.

Name in Holttum 1955: *Abacopteris urophylla*, p. 296.

Correct name in *Thelypteris*: none published.

Status in Malaya: as Holttum 1955.

The name *urophylla*, adopted in 1955, is later than *repanda* so a change to the latter is made; the types of both names came from Penang and undoubtedly represent the same species.

6. **Pronephrium triphyllum** (Sw.) Holttum, Blumea 20 (1972) 122.

Basionym: *Meniscium triphyllum* Sw. in Schrad. Journ. Bot. 1800 2 (1801) 16.

Name in Holttum 1955: *Abacopteris triphylla* (Sw.) Ching, p. 287.

Correct name in *Thelypteris*: *T. triphylla* (Sw.) K. Iwats., Mem. Coll. Sci. Univ. Kyoto B, 31 (1965) 190.

Status in Malaya: as Holttum 1955.

7. **Pronephrium X parishii** (Bedd.) Holttum, Blumea 20 (1972) 123.

Basionym: *Meniscium triphyllum* var. *parishii* Bedd., Handb. (1883) 399.

Name in Holttum 1955: *Abacopteris triphylla* var. *parishii*, p. 287.

Name in *Thelypteris*: *T. triphylla* var. *parishii* K. Iwats. l.c., p. 191.

Status in Malaya: on river banks; S. Kerling in Perak, S. Cheka in Pahang.

The specimens are variable in the number, size and spacing of pinnae, and have the appearance of hybrids, one parent being *P. triphyllum*, the second unknown. Similar plants have been found in Peninsular Thailand, southern Burma and southern Vietnam; I have seen none with ripe sporangia. Plants from Pahang cultivated in Singapore retained their variable character.

8. **Pronephrium salicifolium** (Hook.) Holttum, Blumea 20 (1972) 123.

Basionym: *Meniscium salicifolium* Hook., Ic. Pl. 10 (1854) t. 990.

Name in Holttum 1955: *Abacopteris salicifolia* (Hook.) Holttum, p. 288.

Correct name in *Thelypteris*: *T. salicifolia* (Hook.) Reed, Phytologia 17 (1968) 311.

Status in Malaya: as Holttum 1955.

This is certainly related to *P. triphyllum* and *T. rubicundum*, but has hooked hairs only on the caudex and bases of stipes; the fronds are almost glabrous.

9. **Pronephrium rubicundum** (v.R.v.R.) Holttum, Blumea 20 (1972) 123.

Basionym: *Phegopteris rubicunda* v.A.v.R., Bull. Jard. Bot. Btzg III, 2 (1920) 162.

Name in Holttum 1955: *Abacopteris rubicunda* (v.A.v.R.) Holttum, p. 292.

Correct name in *Thelypteris*: *T. rubicunda* (v.A.v.R.) K. Iwats., Mem. Coll. Sci. Univ. Kyoto B, 31 (1965) 195.

Status in Malaya: as Holttum 1955.

14. CHRISTELLA LEV., FL. DE KOUY-TCHEOU (1915) 472; HOLTTUM, TAXON 20 (1971) 533.

Caudex erect or short-creeping; fronds in all species except *C. parasitica* with a few pairs of lower pinnae gradually decrescent, lowest not very small; aerophores not or little evident; pinnae always bearing many acicular hairs (very short in two species) and in some species elongate glandular or short capitate hairs; veins anastomosing in all Malayan species; sori indusiate; sporangia lacking glands or hairs distally but bearing on their stalks elongate yellow or reddish unicellular glandular hairs; perispore consisting of thick tubercles or ridges.

A genus of about 50 species in the warmer parts of the Old World, with a group in the New World and Africa which still needs correlating with the former. A full account of species in the Old World is given in Holttum, Kew Bull. 31 (1976) 293 ff.

KEY TO THE MALAYAN SPECIES

1. Caudex long-creeping; reduced lower pinnae not auricled ...... 1. *C. arida*

1. Caudex not long-creeping; lower pinnae, if reduced, distinctly auricled

   2. Hairs on lower surface of costa and costules all minute, hardly distinguishable with a X 10 lens

      3. Caudex erect; reduced pinnae c. 8 pairs, broad and deeply lobed .... 2. *C. papilio*

      3. Caudex short, suberect; reduced pinnae fewer, not deeply lobed .... 3. *C. subpubescens*

   2. Hairs on lower surface of costae and costules distinct, usually of varied length

      4. Pinnae lobed much more than half-way to costa; hairs on lower surface of costae commonly 1 mm or more long

         5. Basal pinnae not or little reduced; red glands present on lower surface of costules and veins .... 4. *C. parasitica*

         5. Basal pinnae gradually decrescent and more widely spaced; no red glands on lower surface .... 5. *C. hispidula*

      4. Pinnae lobed half-way to costa or a little more deeply; hairs on lower surface of costae rarely 0.5 mm long .... 6. *C. dentata*

1. **Christella arida** (D. Don) Holttum in Nayar & Kaur. Comp. to Beddome (1974) 206.

Basionym: *Aspidium aridum* D. Don, Prodr. Fl. Nepal (1825) 4.

Name in Holttum 1955: *Cyclosorus aridus* (D. Don) Ching, p. 259.

Correct name in *Thelypteris*: *T. arida* (D. Don) Morton, Amer. Fern Journ. 49 (1959) 113.

Status in Malaya: as Holttum 1955.

The most distinctive features of this species are the elongate glands on veins in the pinna-lobes, and the lack of acroscopic basal auricles on the reduced pinnae. This species is reported to be diploid in northern India.

2. **Christella papilio** (Hope) Holttum in Nayar & Kaur, Comp. to Beddome (1974) 208.

Basionym: *Nephrodium papilio* Hope, Journ. Bombay Nat. Hist. Soc. 12 (1899) 625, t. 12.

Name in Holttum 1968: *Cyclosorus papilio* (Hope) Ching, p. 633.

Correct name in *Thelypteris*: *T. papilio* (Hope) K. Iwats., Mem. Coll. Sci. Univ. Kyoto B, 31 (1965) 175.

Status in Malaya: known from Cameron Highlands (below Ringlet), Bukit Hitam and Ginting Simpah, in forest at 300–900 m.

The massive, quite erect, caudex is distinctive. Specimens from Malaya and Thailand all have large ellipsoid red glands on the lower surface of costules and veins; in other respects they agree with the type from northern India.

3. **Christella subpubescens** (Bl.) Holttum, Webbia 30 (1976) 193: Kew Bull. 31 (1976) 323.

Basionym: *Aspidium subpubescens* Bl., Enum. Pl. Jav. (1828) 149.

Names in Holttum 1955: *Cyclosorus sumatranus* (v.A.v.R.) Ching, p. 275; *C. latipinna* (Benth.) Tard., p. 276.

Correct name in *Thelypteris*: *T. subpubescens* (Bl.) K. Iwats., Mem. Coll. Sci. Univ. Kyoto B, 31 (1965) 173.

Status in Malaya: as Holttum 1955, but see note below on union of the two species.

The common Singapore fern described as *Cyclosorus sumatranus* in 1955 agrees with the types of both *Dryopteris sumatrana* v.A.v.R. (1908) and of *Aspidium subpubescens* Bl. (1828), also with specimens named *D. sumatrana* by van Alderwerelt at Bogor. Plants named *Cyclosorus latipinna* in 1955 were from stream-banks in low country in Perak and Pahang; in this situation they are washed away by floods before they attain their full growth. Similar plants away from streams (and cultivated plants taken from stream-banks) are larger, and most of them have fronds stiffer in growth than the Singapore plants; some of them also have elongate red glands on the lower surface of veins (a gland-bearing plant has also been found in Singapore). Bentham's type and other specimens of *latipinna* from Hong Kong lack glands and are closely similar to some stream-bank plants from Perak. A cytotaxonomic study of cultivated plants taken from various sources is needed to clarify the situation. It should be noted that a Singapore plant cultivated at Leeds was found to be tetraploid; it probably had one parent in common with *C. dentata* which is also a tetraploid.

4. **Christella parasitica** (L.) Lev., Fl. de Kouy-tchéou (1915) 475.

Basionym: *Polypodium parasiticum* L., Spec. Plant. (1753) 1090.

Name in Holttum 1955: *Cyclosorus parasiticus* (L.) Farw., p. 281.

Correct name in *Thelypteris*: *T. parasitica* (L.) K. Iwats., Mem. Coll. Sci. Univ. Kyoto B, 31 (1965) 172.

Status in Malaya: as Holttum 1955.

Plants in Ceylon similar to those in Malaya proved to be tetraploid. It is probable that hybrids between this species and *C. dentata* occur in Malaya.

5. **Christella hispidula** (Decne) Holttum, Kew Bull. 31 (1976) 312.

Basionym: *Aspidium hispidulum* Decne, Nouv. Ann. Mus. Hist. Nat. Paris 3 (1834) 346.

Name in Holttum 1955: *Cyclosorus contiguus* (Rosenst.) Ching, p. 282.

Correct name in *Thelypteris*: *T. hispidula* (Decne) Reed, Phytologia 17 (1968) 283.

Status in Malaya: as Holttum 1955, and 1968 p. 633.

Aspidium hispidulum, based on a specimen from Timor at Paris, is the oldest name for this pantropic diploid species, which is somewhat variable in different countries. In Malaya the lower pinnae are distinctly decrescent and more widely spaced. Plants from Ceylon have been hybridized with the tetraploids *C. dentata* and *C. parasitica*.

6. **Christella dentata** (Forsk.) Brownsey & Jermy, Brit. Fern Gaz. 10 (1973) 338.

Basionym: *Polypodium dentatum* Forsk., Fl. Aegypt. — Arab. (1773) 185.

Name in Holttum 1955: *Cyclosorus subpubescens*, p. 273 (misidentification).

Correct name in *Thelypteris*: *T. dentata* (Forsk.) E. St John, Amer. Fern Journ. 26 (1936) 44.

Status in Malaya: rather common everywhere in somewhat exposed places, not in forest.

This is a very variable and widely distributed tetraploid; in Malaya it probably hybridizes with both *C. parasiticus* and *C. subpubescens*.

15. AMPHINEURON HOLTTUM, BLUMEA 19 (1971) 45; 23 (1977) 205.

Lower pinnae always much narrowed towards their bases; reduced pinnae, one or two pairs, inconstantly present at the base of fronds in some species; pinnae lobed; veins in several species (notably in *A. opulentum*) not constantly anastomosing; glandular hairs on lower surfaces pear-shaped, very small and often pale yellow, or larger and colourless; indusia present; sporangia lacking glands or hairs distally, glandular hairs on stalk apparently variable; spores as in *Christella*.

This is a small genus extending from East Africa to the Pacific.

KEY TO THE MALAYAN SPECIES

1. Basal veins often or always anastomosing; caudex not erect
   2. Pinnae lobed less than half-way to costa; basal veins always anastomosing .... 1. *A. terminans*
   2. Pinnae lobed more than half-way; basal veins sometimes free .... 2. *A. opulentum*
1. Basal veins always free; caudex erect .... 3. *A. immersum*

1. **Amphineuron terminans** (Hook.) Holttum, Amer. Fern Journ. 63 (1973) 82.

Basionym: *Nephrodium terminans* Hook., Spec. Fil. 4 (1862) 73.

Name in Holttum 1955: *Cyclosorus interruptus*, p. 262 (misidentification).

Correct name in *Thelypteris*: *T. terminans* (Hook.) Tagawa & K. Iwats., Acta Phytotax. Geobot. 26 (1975) 169.

Status in Malaya: as Holttum 1955.

Colourless glandular hairs are usually present on the lower surface of veins, the distal ones largest; their presence is sometimes the best way of distinguishing old fronds of this species from those of the true *Cyclosorus interruptus*.

2. **Amphineuron opulentum** (Kaulf.) Holttum, Blumea 19 (1971) 45; 23 (1977) 212.

Basionym: *Aspidium opulentum* Kaulf., Enum. Fil. Chamisso (1824) 238.

Name in Holttum 1955: *Cyclosorus extensus* (Bl.) Ching, p. 264.

Correct name in *Thelypteris*: *T. opulenta* (Kaulf.) Fosberg, Smiths. Contr. Bot. 8 (1972) 3.

Status in Malaya: as Holttum 1955.

3. **Amphineuron immersum** (Bl.) Holttum in Nayar & Kaur, Comp. to Beddome (1974) 203.

Basionym: *Aspidium immersum* Bl., Enum. Pl. Jav. (1828) 156.

Name in Holttum 1955 and correct name in *Thelypteris*: *T. immersa* (Bl.) Ching, p. 243.

Status in Malaya: as Holttum 1955.

LIST OF NAMES IN HOLTTUM 1955 AND 1968

WITH EQUIVALENTS IN THE PRESENT PAPER

Abacopteris lineata (Bl.) Ching	=	Pronephrium peltatum (v.A.v.R.) Holttum
Abacopteris menisciicarpa (Bl.) Holttum	=	Pronephrium menisciicarpum (Bl.) Holttum
Abacopteris multilineata (Hook.) Ching var. malayensis Holttum	=	Pronephrium asperum (Presl) Holttum
Abacopteris peltochlamys (C. Chr.) Holttum	=	Sphaerostephanos peltochlamys (C. Chr.) Holttum
Abacopteris rubicunda (v.A.v.R.) Holttum	=	Pronephrium rubicundum (v.A.v.R.) Holttum
Abacopteris salicifolia (Hook.) Holttum	=	Pronephrium salicifolium (Hook.) Holttum
Abacopteris triphylla (Sw.) Ching	=	Pronephrium triphyllum (Sw.) Holttum
Abacopteris urophylla (Hook.) Ching	=	Pronephrium repandum (Fée) Holttum
Ampelopteris prolifera (Retz.) Copel.		unchanged
Cyclosorus aridus (D. Don) Ching	=	Christella arida (D. Don) Holttum

Cyclosorus contiguus (Rosenst.) Copel.	= Christella hispidula (Decne) Holttum
Cyclosorus dicranogramma (v.A.v.R.) Holttum	= Pneumatopteris callosa (Bl.) Nakai
Cyclosorus ecallusus Holttum	= Pneumatopteris ecallosa (Holttum) Holttum
Cyclosorus extensus (Bl.) Ching	= Amphineuron opulentum (Kaulf.) Holttum
Cyclosorus ferox (Bl.) Ching	= Chingia sakayensis (Zeiller) Holttum
Cyclosorus glandulosus (Bl.) Ching	= Pronephrium glandulosum (Bl.) Holttum
Cyclosorus gongylodes (Schkuhr) Link	= Cyclosorus interruptus (Willd.) H. Ito
Cyclosorus heterocarpus (Bl.) Ching	= Sphaerostephanos heterocarpus (Bl.) Holttum
var. glaucostipes (Bedd.)	= Sphaerostephanos latebrosus (Mett.) Holttum
Cyclosorus interruptus (Willd.) Ching	= Amphineuron terminans (Hook.) Holttum
Cyclosorus larutensis (Bedd.) Ching	= Sphaerostephanos larutensis (Bedd.) C. Chr.
Cyclosorus latipinna (Hook.) Tard.	= Christella subpubescens (Bl.) Holttum
Cyclosorus megaphyllus (Mett.) Ching	= Sphaerostephanos penniger (Hook.) Holttum
Cyclosorus papilio (Hope) Ching	= Christella papilio (Hope) Holttum
Cyclosorus parasiticus (L.) Farw.	= Christella parasitica (L.) Lév.
Cyclosorus polycarpus (Bl.) Holttum	= Sphaerostephanos polycarpus (Bl.) Copel.
Cyclosorus porphyricola (Copel.) Ching	= Sphaerostephanos porphyricola (Copel.) Holttum
Cyclosorus stipellatus (Bl.) Ching p.p.	= Sphaerostephanos pterosporus (v.A.v.R.) Holttum
stipellatus p.p.	= Sphaerostephanos hendersonii Holttum
Cyclosorus subpubescens (Bl.) Ching	= Christella dentata (Forsk.) Brownsey & Jermy
Cyclosorus sumatranus (v.A.v.R.) Ching	= Christella subpubescens (Bl.) Holttum

Cyclosorus toppingii (Copel.) Ching	= Sphaerostephanos norrisii (Rosenst.) Holttum
Cyclosorus truncatus (Poir.) Farw.	= Pneumatopteris truncata (Poir.) Holttum
Cyclosorus unitus (L.) Ching	= Sphaerostephanos unitus (L.) Holttum
Thelypteris beddomei (Bak.) Ching	= Parathelypteris beddomei (Bak.) Ching
Thelypteris brunnea (Wall.) Ching	= Pseudophegopteris paludosa (Bl.) Ching
Thelypteris chlamydophora (Rosenst.) Ching	= Mesophlebion chlamydophorum (Rosenst.) Holttum
Thelypteris ciliata (Benth.) Ching	= Trigonospora ciliata (Benth.) Holttum
Thelypteris crassifolia (Bl.) Ching	= Mesophlebion crassifolium (Bl.) Holttum
Thelypteris herbacea Holttum	= Coryphopteris hirsutipes (Clarke Holttum
Thelypteris immersa (Bl.) Ching	= Amphineuron immersum (Bl.) Holttum
Thelypteris motleyana (Hook.) Holttum	= Mesophlebion motleyanum (Hook.) Holttum
Thelypteris oppositipinna (v.A.v.R.) Ching	= Pseudophegopteris rectangularis (Zoll.) Holttum
Thelypteris paleata (Copel.) Holttum	= Mesophlebion trichopodum (C. Chr.) Holttum
Thelypteris pectiniformis (C. Chr.) Ching	= Coryphopteris pectiniformis (C. Chr.) Holttum
var. eglandulosa Holttum	= Coryphopteris pectiniformis
var. hirsuta Holttum	= Coryphopteris pectiniformis var. hirsuta Holttum
Thelypteris singalanensis (Bak.) Ching	= Metathelypteris dayi (Bedd.) Holttum
Thelypteris uliginosa (Kunze) Ching	= Macrothelypteris torresiana (Gaud.) Ching
Thelytperis unidentata (Bedd.) Holttum	= Coryphopteris unidentata (Bedd.) Holttum
Thelypteris viscosa (J. Sm.) Ching p.p.	= Coryphopteris viscosa (J. Sm.) Holttum
viscosa p.p.	= Coryphopteris arthrotricha Holttum
viscosa p.p.	= Coryphopteris gymnopoda (Bak.) Holttum
viscosa p.p.	= Coryphopteris tahanensis Holttum

REVISION OF *MEMECYLON* L. (MELASTOMATACEAE) FROM THE MALAY PENINSULA

by

J. F. Maxwell

Botanic Gardens, Singapore

CONTENTS

ABSTRACT

This revision of *Memecylon* of the Malay Peninsula includes twenty-eight species, three varieties, and three imperfectly known taxa. No new taxa are proposed here. However, twenty-two taxa have been reduced to new synonyms, along with one new combination. Separate keys to flowering and fruiting material, critical taxonomic notes, detailed analyses of various organs of taxonomic importance, and an index to collections are included. Simple line drawings of the floral parts and other salient features of each taxon have been prepared to supplement the descriptions.

ACKNOWLEDGEMENT

In November 1976, when Dr. Hsuan Keng (University of Singapore) suggested that I study *Memecylon*, I eagerly accepted the project since I knew that it would be a challenge. Indeed the work has proved to be very interesting and rewarding.*

I am most grateful to Prof. A.N. Rao and Dr. Hsuan Keng for their assistance, helpful suggestions, and encouragement during my research and preparation of the revision.

Drs. Robert Geesink at Leiden, Netherlands invited me to study from May to July 1977 at the Rijksherbarium, Leiden where a major portion of the research for this paper was completed. Many other botanists there provided inspiration and encouragement for me to continue my work. I would also like to thank the Keeper and staff of the Kew herbarium for their hospitality during my six day visit and for the loan of many specimens. I also borrowed several collections from the British Museum (Natural History) and I would like to express my thanks to the Keeper of that herbarium.

Dr. Chang Kiaw Lan, Curator of the Singapore herbarium, has assisted in numerous ways and I am deeply grateful for her kindness and friendship. I would also like to thank Dr. B. C. Stone, University of Malaya, for editing this paper. I acknowledge gratefully the work of Dr. C. X. Furtado in the Singapore herbarium for he organized and sorted out the specimens of *Memecylon* there saving me weeks of effort and considerable frustration.

Finally, I must express my thanks to Mr. Vijay Kumar Natarajan for drawing, and to Mr. Jumali Kafrawi and Mrs. Lucia Sunderaj Krueger for preparing and arranging the illustrations.

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* M.Sc. thesis, University of Singapore (Feb. 1978).

INTRODUCTION

King, Gamble, and Ridley's "Materials for a Flora of the Malay Peninsula" (1889-1907), followed by Ridley's "Flora of the Malay Peninsula" (1922-1925) are two monumental works which have served several generations of botanists and foresters well, but are now in need of a thorough revision. With the accumulation of numerous collections from throughout the Malay Peninsula since the end of World War II and better knowledge of the floras of neighbouring areas — especially those of Sumatra and Borneo, a revised flora of the Malay Peninsula is urgently needed. Although excellent revisions of many families have appeared in "Flora Malesiana" (edited by Prof. Dr. C.G.G.J. van Steenis) since 1948, the gigantic scope and high standards of the project will take years (generations ?) to complete. The Melastomataceae, a very large and complex family, was inadequately treated in the earlier floras and now needs to be re-studied. *Memecylon*, one of the larger genera of Melastomataceae from the Malay Peninsula, has perplexed botanists for many years and even with several excellent papers to work with, it is still very difficult to be certain about the identities of many taxa. An effort has been made, therefore, to be as careful and critical as possible in this revision of the genus for the Malay Peninsula. It is hoped that this presentation will clear some of the confusion and misunderstanding that has built up through the years concerning *Memecylon* in the region.

REVIEW OF EARLIER WORK ON *MEMECYLON* FROM THE MALAY PENINSULA

The first species of *Memecylon* described from the Malay Peninsula was *M. acuminatum* Sm. in 1813, followed by *M. caeruleum* Jack in 1820. With the publication of the Wallich Catalogue in 1831 and distribution of specimens collected at Penang and Singapore a few years earlier (about 1822), five more distinct taxa, including what are now known as *M. cinereum* King (*M. umbellatum,* 4109 in part), *M. wallichii* Ridl. (*M. depressum* Benth., 4101 in part) *M. megacarpum* Furtado (4102), and *M. edule* Roxb. var. *ovatum* (Sm.) Cl. (*M. grande* Retz., 4103 in part; *M. umbellatum,* 4109B; *M. laxiflorum* Wall. ex Ridl., 4472) were recorded from the Peninsula. Roxburgh added *M. amplexicaule* Roxb. from Penang, in his "Flora Indica" (II, 260) of 1832. Clarke, in Hooker's "Flora of British India" (II, published in 1879), added *M. elegans* Kurz var. *dichotoma* Cl. (=*M. dichotomum* (Cl.) King var. *dichotomum*), *M. maingayi* Cl. (=*M. excelsum* Bl.), *M microstomum* Cl. (=*M. amplexicaule* Roxb.), *M. campanulatum* Cl., *M. pubescens* (Cl.) King, *M. acuminatum* Sm. var. *flavescens* Cl., *M. grande* Retz. var. *horsfieldii* Cl. (=*M. oleifolium* Bl.), and *M. malaccense* (Cl.) Ridl.

The first systematic treatment of *Memecylon* for the Malay Peninsula was published by King in 1900 with 28 species and 4 varieties included. Four of these taxa (3 species and 1 variety) were described by King from specimens from the Andaman and Nicobar Islands and only one of them (*M. kurzii* King =*M. excelsum* Bl.) is found on the Peninsula.

Ridley (1910–1920) published 9 new species of *Memecylon* from the Malay Peninsula, 7 of which were included in his "Flora of the Malay Peninsula" I (1922). Ridley, however, did not include *M. corticosum* Ridl.; and he also reduced *M. eugeniflora* Ridl. to *M. dichotomum* (Cl.) King var. *eugeniflorum* (Ridl.) Ridl., and *M. pulchellum* Ridl. to *M. pauciflorum* Bl. In his treatment, 31 species and 3 varieties of *Memecylon* are included.

Craib described 3 species and 2 varieties of *Memecylon* from lower Thailand in 1930–31 viz. *M. brandisianum* Craib (=*M. oleifolium* Bl.), *M. constrictum* Craib (q.v. *M. minutiflorum* Miq.), *M. dissitum* Craib (= *M. cantleyi* Ridl.), *M. gracilipes* Ridl. var. *rotundatum* Craib. (=*M. dichotomum* (Cl.) King var. *rotundatum* (Craib) Maxw.), and *M. pauciflorum* Bl. var. *brevifolium* Craib. The last taxon is insufficiently known and is probably synonymous with the typical variety.

Bakhuizen van den Brink's exhaustive study of Melastomataceae (1943–45) included a detailed analysis of *Memecylon* from the Malay Archipelago. He included 36 species (14 of which were described as new) and 3 varieties. A total of 25 of these taxa are found in the Malay Peninsula.

The second edition of Corner's "Wayside Trees of Malaya" (1952) includes brief descriptions of 9 taxa with useful field notes, mostly complied from his own observations.

The latest study of *Memecylon* for the Malay Peninsula was by Furtado in 1963. While not an exhaustive or complete study, eight species of *Memecylon* are discussed critically. *M. acuminatissimum* Bl. (=*M. oleifolium* Bl.), *M. hepaticum* Bl., and *M. multiflorum* Bakh. f. (=*M. campanulatum* Cl.) are included as new records from the Malay Peninsula; and *M. megacarpum* Furtado which is a new name for *M. pulchrum* Cogn.

Salient Morphological Characters of *Memecylon.*

HABIT

All taxa of *Memecylon* from the Malay Peninsula are woody. From the field notes for many collections examined it is apparent that there is considerable variation in the habit of many taxa. *M. malaccense* Ridl. and *M. pauciflorum* Bl. var. *brevifolium* Craib, both rather poorly known taxa, have only been recorded as being shrubs; while 18 other taxa have been collected in flowering or fruiting stages as shrubs and treelets up to 4 m tall, or trees up to about 15 m. *M. caeruleum* Jack, *M. cantleyi* Ridl., *M. cinereum* King, *M. fruticosum* King, *M. garcinioides* Bl., *M. globosum* Bakh. f., *M. hullettii* King, and *M. wallichii* Ridl. have bee noted most commonly as shrubs. Some taxa which have often been collected as treelets are *M. dichotomum* (Cl.) King and *M. corticosum* Ridl. Other taxa which have been recorded as small trees more often than as shrubs or treelets include: *M. megacarpum* Furtado, *M. lilacinum* Z. & M., and *M. oligoneurum* Bl. *M. beccarianum* Cogn. has been recorded as a shrub, but most specimens were collected from trees.

Seven species have been recorded only as small to medium sized trees (10–20 m tall) which, as far as I can determine, have never been collected in flower or fruit as shrubs or treelets. These include: *M. acuminatum* Sm., *M. amplexicaule* Roxb., *M. campanulatum* Cl., *M. excelsum* Bl., *M. floridum* Ridl., *M. kunstleri* King, and *M. oleifolium* Bl. The largest species collected (20–30 m tall with a diameter up to 2 m and often buttressed) are: *M. intermedium* Bl., *M. minutiflorum* Miq., *M. paniculatum* Jack, and *M. pubescens* (Cl.) King.

More field studies are required in order to understand the habit of many taxa of *Memecylon* from the Malay Peninsula. Knowledge of the habits, growth forms, and habitats of many taxa of *Memecylon* is inadequate.

BARK AND WOOD

Unfortunately, only a few specimens of *Memecylon* examined have bark or wood samples attached. During the present work eight taxa of *Memecylon* have been seen in the field and with the notes on several collections it seems that most, if not all, taxa of *Memecylon* have similar bark — at least for those collected as trees. The outer bark is typically thin (1–2 mm thick); with shallow, vertical, closely spaced fissures and cracks, sometimes flaking or peeling off, and of a greyish-brown to blackish colour. The slash inner bark is also thin, and is orange to brown. The wood in larger trees is usually white to brown, very dense, and sinks in water. In many taxa the wood is very durable and is used for house posts, lumber, furniture, and fuel.

Figure 31 of the trunk of a mature specimen of *Memecylon lilacinum* Z. & M. illustrates the typical nature of the bark in this genus.

BRANCHLETS

The branchlets of *Memecylon* are often very useful in the identification of many species. Basically there are three different types of branchlets: cylindric, grooved, and angled or winged. These branchlets are smooth and glabrous in all taxa, and ultimately become cylindric.

There are 15 taxa with cylindric branchlets, e.g. *M. amplexicaule* Roxb., *M. megacarpum* Furtado, *M. oleifolium* Bl., etc. Many taxa have cylindric branchlets which are often slightly flattened and shallowly grooved on the two flattened faces immediately below the upper node; the branchlets become cylindric below this short flattened region. Some examples include: *M. acuminatum* Sm., *M. caeruleum* Jack, and *M. garcinioides* Bl. In 10 taxa the branchlets are flattened and grooved on the two compressed faces for the entire length of the upper internode. Older branchlets become cylindric, or nearly so, but there is often a trace of the grooves. Several excellent examples are: *M. campanulatum* Cl., *M. cinereum* King, and *M. minutiflorum* Miq. Vegetative specimens of *M. campanulatum* Cl. and *M. caeruleum* Jack can be distinguished on the basis of a groove in the former and cylindric branchlets in the latter. Each groove is bordered by 2 sharp ridges and in many instances the groove is widened (that is the branchlet is less compressed), thus giving the branchlet a 4-angled appearance. *M. edule* Roxb., *M. pauciflorum* Bl., and *M. lilacinum* Z. & M. frequently show this feature. The upper node in *M. campanulatum* Cl. and *M. edule* Roxb. is often angled and tapers to 2 grooves on the upper internode. The grooved branchlets of *M. floridum* Ridl. is a very good distinguishing feature separating it from *M. acuminatum* Sm. which has cylindric branchlets. Also *M. megacarpum* Furtado, with grooved branchlets, can immediately be distinguished from *M. excelsum* Bl. and *M. beccarianum* Cogn. which have cylindric branchlets. The remaining 6 taxa of *Memecylon* have sharply 4-angled to 4-winged branchlets and upper nodes. *M. dichotomum* (Cl.) King var. *dichotomum* and *M. dichotomum* (Cl.) King var. *rotundatum* (Craib) Maxw. have 4 wings below the upper node which tapers to 4 angles. *M. corticosum* Ridl., *M. wallichii* Ridl., and *M. fruticosum* King have distinctly 4-winged internodes. *M. paniculatum* Jack, because of its 4- angled to 4-winged branchlets, is readily distinguished from *M. kunstleri* King which has cylindric internodes.

INTERPETIOLAR RIDGE OR LINE

At first glance it appears that *Memecylon* has stipular scars, however these interpetiolar ridges or lines, best seen on upper nodes, are merely raised zones of articulation at the base of each petiole which appear separated (by a groove) on the upper node and coalesce on the lower nodes to form a connecting ridge or line which becomes indistinct on older branchlets.

The growing tip of each branchlet is distinct and is flanked on each side at the base by a pair of leaves which are never connected by stipules, lines, or ridges.

LEAVES

The leaves of all taxa of *Memecylon* are opposite, simple, entire, and glabrous. The texture may be chartaceous to thick coriaceous and seems to be constant, and often a diagnositc feature, of each taxon. *Memecylon dichotomum* (Cl.) King var. *dichotomum* and *M. dichotomum* (Cl.) King var. *rotundatum* (Craib)

Maxw. have very thin (chartaceous) blades while all other taxa have thicker blades. Among the 12 taxa with sub-coriaceous blades are: *M. corticosum* Ridl., *M. megacarpum* Furtado, *M. paniculatum* Jack, and *M. pubescens* (Cl.) King. Three species have blades which range in texture from sub-coriaceous to coriaceous *viz. M. cantleyi* Ridl., *M. intermedium* Bl., and *M. oleifolium* Bl. The remaining 14 taxa have coriaceous blades and include, for example: *M. edule* Roxb. var. *edule, M. edule* Roxb. var. *ovatum* (Sm.) Cl., *M. globosum* Bakh. f., *M. lilacinum* Z. & M., *M. pauciflorum* Bl., and *M. wallichii* Ridl. Very often the blades of *M. amplexicaule* Roxb., *M. caeruleum* Jack, and *M. campanulatum* Cl. are thick coriaceous.

The shape of the blades varies from lanceolate (e.g. *M. corticosum* Ridl.) to sub-orbicular (e.g. the limestone form of *M. dichotomum* (Cl.) King). Blade tips vary from broadly rounded (e.g. *M. amplexicaule* Roxb. and *M. caeruleum* Jack) to acuminate-caudate (*M. acuminatum* Sm.). Cordate blade bases are found in several taxa, e.g. *M. amplexicaule* Roxb., *M. caeruleum* Jack, *M. wallichii* Ridl., etc.; while in others it is often broadly rounded, e.g. *M. cinereum* King and *M. fruticosum* King; or decurrent, e.g. *M. floridum* Ridl. and *M. oleifolium* Bl. The blades of all taxa of *Memecylon* from the Malay Peninsula (except *M. oligoneurum* Bl. which is trinerved) have a single main nerve which, in all taxa (including the three main nerves of *M. oligoneurum* Bl.), is sunken on the dorsal surface and raised below where it is thickest near the petiole and tapers to the apex. The secondary veins range in number from about 6 to about 25 pairs which frequently parallel the mid-nerve for a few mm before bending sharply at 45° towards the intramarginal nerve. In most taxa where the venation is visible the distal end of each secondary nerve tends to curve towards the apex of the blade before merging with the intramarginal nerve. The intramarginal nerve parallels the margin (generally at a distance from 1–5 mm) in a nearly straight (e.g. *M. garcinioides* Bl. and *M. pubescens* (Cl.) King) or broadly looping line (e.g. *M. dichotomum* (Cl.) King, *M. excelsum* Bl., and *M. wallichii* Ridl.). The intramarginal nerve is usually of the same thickness and degree of prominence as the secondary veins.

For covenience the venation types are grouped into five general categories in this paper: invisible, invisible to obscure, obscure, distict, and prominent. The veins are typically invisible in 5 taxa — all of which have thick blades viz. *M. amplexicaule* Roxb., *M. caeruleum* Jack, *M. campanulatum* Cl., *M. pauciflorum* Bl. var. *pauciflorum*, and *M. pauciflorum* Bl. var. *brevifolium* Craib. There are 9 taxa which have invisible to obscure venation, e.g. *M. acuminatum* Sm., *M. edule* Roxb. var. *edule, M. edule* Roxb. var. *ovatum* (Sm.) Cl., *M. globosum* Bakh. f., *M. malaccense* (Cl.) Ridl., *M. lilacinum* Z. & M., etc. *M. cantleyi* Ridl., *M. floridum* Ridl., *M. garcinioides* Bl., and *M. intermedium* Bl. have obscure venation; while 5 taxa have distinct (that is, slightly more prominent) venation, e.g. *M. dichotomum* (Cl.) King and *M. hullettii* King. Prominet venation is common in 8 taxa where the secondary veins are often raised below, e.g. *M. corticosum* Ridl., *M. excelsum* Bl.,*M. paniculatum* Jack, and *M. wallichii* Ridl.

The leaves of *Memecylon* have been a source of confusion in many taxa and in numerous instances new species have been distinguished on this basis alone. With detailed analyses of other characteristics of various species it is obvious that many taxa have similar inflorescences, flowers, and fruits; therefore with variable leaf morphologies it has often been difficult to determine some species solely on this characteristic. *Memecylon caeruleum* Jack, *M. dichotomum* (Cl.) King, *M. lilacinum* Z. & M., and *M. oleifolium* Bl. are examples where the leaves are variable and in many instances intermediate specimens can be shown to link some of the new synonyms proposed here to the accepted species. Among the most striking examples include the reduction of *M. floribundum* Bl. to a new synonym of *M. caeruleum* Jack, and the numerous new synonyms under *M. oleifolium* Bl.

The branches and leaves of many species of *Eugenia* L. (Myrtaceae) (e.g. *E. polyantha* Wight and *E. scortechinii* King) often resemble those of several species of *Memecylon*. Aside from obvious differences in the inflorescences, flowers, and fruit, *Eugenia* blades often have closer secondary venation, and dark glandular dots — the latter being absent in *Memecylon* and affording the most reliable distinction in vegetative specimens.

Memecylon oligoneurum Bl., the only species of *Memecylon* from the Malay Peninsula with trinerved blades, is easily confused with *Pternandra* Jack. In addition to well defined floral differences, the secondary veins in *Pternandra* are generally more distinct and reticulate, and the branchlets usually have a darker epidermis which tends to peel off. *Strychnos* L. (Loganiacaae) is in several ways similar vegetatively to *M. oligoneurum* Bl. and *Pternandra;* however its climbing habit immediately distinguishes it from these two genera.

The petioles of *Memecylon* generally range from 2–6 mm in length, 1–3 mm in width, and are usually grooved on the upper surface. *M. edule* Roxb. var. *edule,* with petioles typically shorter than *M. edule* Roxb. var. *ovatum* (Sm.) Cl. is perhaps the only example seen presently where petioles are used to distinguish taxa. Aside from their relative lengths, the petioles have few characteristics which can be used to distinguish Malayan taxa.

INFLORESCENCE

The basic structure of the inflorescence in *Memecylon* is cymose. From this arrangement there are many variations ranging from a panicle of cymes to sessile glomerules. The most complex inflorescences in some species have distinct 3rd and 4th order axes, in addition to the pedicels (e.g. *M. oleifolium* Bl. and *M. paniculatum* Jack). Contraction of the ultimate axes has led to more compact inflorescences where the 4th or 3rd order axes are reduced yielding glomerules on the tips of lower axes (e.g. *M. edule* Roxb. and *M. pubescens* (Cl.) King); or umbels (*M. hulletti* King) due to the flattening of the nodes. Further reduction has resulted in the shortening of the secondary axes so that they appear glomerulate or up to c. 1 mm long on the tips of the primary axes (e.g. *M. intermedium* Bl. and *M. minutiflorum* Miq.). With the shortening of the primary axes the inflorescence becomes very compact (e.g. *M. cinereum* King. *M. oligoneurum* Bl., and *M. lilacinum* Z. & M.). Finally, in several species (e.g. *M. amplexicaule* Roxb. and *M. campanulatum* Cl.) the primary axes are indistinct and the pedicels are clustered on a tubercle.

A pair of bracts, is present at the base of each axis and these are situated at 90° to the axis below them. They are usually of an ovate shape (lanceolate in *M. garcinioides* Bl.), acute at the tip, usually less than 1 mm long, and are either persistent (e.g. *M. caeruleum* Jack and *M. dichotomum* (Cl.) King) or, as in most taxa, fall off before the petals mature. Fallen bracts and bracteoles leave distinct scars at the base of each axis. The bracts and bracteoles have not been very useful taxonomic aids except in those few taxa in which they are persistent.

The nodes of the inflorescence are typically flattened, laterally expanded, and often reflexed at the sides. This feature is most readily seen in taxa with large inflorescences (e.g. *M. oleifolium* Bl. and *M. hullettii* King). Subsequent axes are arranged at right angles to lower axes with the central axis being longer than the lateral ones.

The pedicels are usually in clusters, but sometimes reduced to one on the tip of each ultimate axis. *M. caeruleum* Jack and *M. dichotomum* (Cl.) King are good examples. Many authors have erroneously interpreted this as a pedicel with a pair of bracts near the middle. The primary axis is typically flattened, usually with 2 distinct grooves or 4-angled, and arranged so that the flattened surfaces face the branch and petiole. The axes are glabrous except in *M. beccarianum* Cogn., *M. hullettii* King, and *M. pubescens* (Cl.) King. The inflorescences arise from leafy nodes in most species, however in a few taxa (e.g. *M. edule* Roxb. var. *ovatum* (Sm.) Cl., *M. excelsum* Bl., and *M. corticosum* Ridl., the inflorescence originates from leafless nodes or from older branches. The position, size, and structure of the inflorescence is of paramount importance in the classification and identification of all taxa *Memecylon*.

CALYX

In addition to the anthers, the morphology of the calyx in all taxa of *Memecylon* offers one of the most useful aids in identification. *Memecylon* flowers are all pedicelled and in many taxa there is a distinct constriction above the ovary which flares out to form a funnelform or campanulate calyx tube. *M. amplexicaule* Roxb., *M. intermedium* Bl., and especially *M. minutiflorum* Miq. are some species which have prominent ovaries. Entirely campanulate calyces without a noticeable ovary externally are less frequent within the genus, but are typical for *M. excelsum* Bl. and *M. oleifolium* Bl.

All taxa of *Memecylon* from the Malay Peninsula have glabrous flowers, however 3 taxa (viz. *M. dichotomum* (Cl.) King, *M. dichotomum* (Cl.) King var. *rotundatum* (Craib) Maxw. and *M. minutiflorum* Miq.) have a papillose (or almost muricate) calyx. Sometimes *M. cinereum* King and *M. beccarianum* Cogn. (from Borneo) also have a papillose calyx. The margin of the calyx also provides another feature which serves as a useful aid in identification. It ranges from entirely truncate, with 4 minute cusps or undulations, to distinctly 4-lobed. There are 9 taxa with an entirely truncate calyx margin, e.g. *M. caeruleum* Jack, *M. campanulatum* Cl., *M. excelsum* Bl., *M. dichotomum* (Cl.) King, etc. Generally speaking, the taxa in this group have a thickened calyx tube, while those taxa with cusps or lobes have thinner tubes. In 7 taxa the margin varies from truncate to cuspidate or undulate. Very often the young calyx in several taxa has 4 cusps which become very obscure when the calyx tube matures. Some examples are: *M. edule* Roxb. var. *edule*, *M. edule* Roxb. var. *ovatum* (Sm.) Cl., and *M. pubescens* (Cl.) King (truncate to cuspidate); *M. globosum* Bakh. f. and *M. megacarpum* Furtado (truncate to undulate).

There are 8 taxa which have 4 distinct cusps on the margin of the calyx tube, e.g. *M. garcinioides*, Bl., *M. minutiflorum* Miq., and *M. paniculatum* Jack. Finally, 5 taxa have 4 often acuminate calyx lobes, e.g. *M. cinereum* King, and *M. lilacinum* Z. & M. *M. acuminatum* Sm. var. *acuminatum*, with a 4-lobed calyx margin, is easily separated from *M. acuminatum* Sm. var. *flavescens* Cl. which has a truncate margin.

The internal septa found in all taxa of *Memecylon* are a vestige of the extraovarial chambers which are more highly developed in other genera of Melastomataceae, e.g. the tribe Dissochaeteae (Naud.) Triana. Most taxa have 8 distinct septa and 8 grooves in addition to a thinner line dividing each groove (initially between the anther locules). In several taxa (e.g. *M. cantleyi* Ridl.) the septa dividing the anther locules are almost as prominent as the ones separating the anthers, thus the calyx has 16 septa and 16 grooves. The septa and grooves in all taxa do not extend below the ovary and the manner in which the anthers fit into these structures is most readily seen in mature buds. Aside from *M. oligoneurum* Bl., which has very faint ridges and shallow grooves, the septa and grooves have not proven to be very useful for identification purposes.

PETALS

There are 4 equal, symmetric, and glabrous petals in all taxa of *Memecylon* from the Malay Peninsula. Their shapes range from oblong to sub-orbicular and they are often reflexed at maturity. The tips are broadly rounded to obtuse, or acute; the bases clawed or truncate. Texture ranges from thin to thick coriaceous, and in thicker petals the midrib is often thickened or dorsally keeled There is some variation in petal morphology and colour (white, pink, blue, purple) but these are not always reliable for identification purposes since, in comparison to numerous vegetative and other floral characteristics, they are not as easy to distinguish taxonomically as these other structures. Therefore, the petals have not been referred to very often in the key to flowering material.

STAMENS

The stamens of *Memecylon* are relatively small and simple, and along with those of *Astronia* and *Pternandra* are the least specialised anthers within the family. All species of *Memecylon* have 8 equal, glabrous stamens with flattened filaments and variously shaped, 2-locular, medifixed anthers which open by a vertical slit. The connective, in most species, is well developed and in most taxa there is also a crateriform gland. The anthers are usually described as being dolabriform (axe-shaped), but this term is inadequate for comparative studies. In many species the anthers in bud are not sufficiently developed to provide recognizable distinctions, however in those species which lack a connective gland, plus *M. garcinioides* Bl. and *M. wallichii* Ridl. which have unique shapes, helpful clues can be found. The mature anthers provide the most important structural evidence for the identification of several species, e.g. *M. lilacinum* Z. & M., *M. floridum* Ridl., and *M. pauciflorum* Bl.

The mature anthers of *Memecylon* can be separated into 4 basic groups: "J" or "C" shaped, "U" shaped, uniquely shaped, and glandless anthers. Mature anthers with a "J" or "C" shape are characteristic of 18 taxa. *Memecylon excelsum* Bl. and *M. megacarpum* Furtado have the largest anthers with very thick connectives, but for the other taxa the variation is difficult to describe. Several species (e.g. *M. acuminatum* Sm., *M. caeruleum* Jack, *M. edule* Roxb., etc.) have obviously different anthers and form seems to vary with different stages of maturity. The variability of the curved anthers is not completely known because of the lack of sufficient flowering material and detailed field observations. There is a tendency for the anthers to curve from a nearly linear shape in bud to crescent shape and then to a "C"-shape. In some taxa, (e.g. *M. edule* Roxb. var. *ovatum* (Sm.) Cl.) some anthers are actually "U"-shaped due to more extensive bending. All these anthers have a thickened connective;

a distinct, approximately central gland, and locules which are smaller than the connective.

There are 6 species with "U"-shaped mature anthers viz. *M. cantleyi* Ridl., *M. fruticosum* King, *M. kunstleri* King, *M. paniculatum* Jack, *M. pauciflorum* Bl., and sometimes *M. oleifolium* Bl. *M. lancifolium* Ridl., which is insufficiently known also has (bud) anthers with this shape. In *M. cantleyi* Ridl. and *M. oleifolium* Bl. some anthers show an asymmetric "C" outline. The anthers in bud of these 7 species are usually more curved than those of the "J" or "C"-shaped anthers described above, however the present understanding of this group is also incomplete. Indeed, some anthers of *M. paniculatum* Jack, perhaps due to immaturity, are "C"-shaped and resemble mature anthers of *M. acuminatum* Sm. More observations of anther forms in these two groups are necessary in order to understand both the variation in and the relationships among the various taxa.

Anthers in the following taxa show unique shapes: *M. garcinioides* Bl. and *M. hullettii* King (orbicular) and *M. wallichii* Ridl. (linear). Orbicular anthers have a very reduced connective about as large as the locules with a small, often obscure gland situated on a membranous extension of the connective. *M. hullettii* King is, in addition, distinct from all other species of *Memecylon* by virtue of its broadly rounded, subsessile leaves and compound – umbellate inflorescence. The anthers of *M. garcinioides* Bl. are the most reduced among those studied, and along with *M. hullettii* King are also the smallest in all taxa of *Memecylon* from the Malay Peninsula. *M. intermedium* Bl. often has similar anthers, especially in bud, but the connective in most specimens is less reduced, thus giving the anther a "J" shape. The two species can be easily distinguished by their leaves and calyx margins. The linear shape of the bud and mature anthers of *M. wallichii* Ridl. immediately distinguishes this species from *M. dichotomum* (Cl.) King and *M. corticosum* Ridl. which have "C"-shaped anthers and are similar vegetatively. The locules of *M. wallichii* Ridl. are about the same size as the connective which has a distinct, centrally located gland.

There are 5 species of *Memecylon* from the Malay Peninsula that have glandless anthers, triangular or cuneate in form, which in many respects, resemble those of *Astronia smilacifolia* Triana. These are: *M. cinereum* King, *M. floridum* Ridl., *M. malaccense* (Cl.) Ridl., *M. lilacinum* Z. & M., and *M. oligoneurum* Bl. Apart from *M. oligoneurum* Bl., which is readily distinguished from all other species of *Memecylon* in the region by its 3-nerved blades, the other 4 species in this group are often confused with other species. Both young and mature anthers can be used to distinguish (1) *M. floridum* Ridl. from *M. acuminatum* Sm., (2) *M. lilacinum* Z. & M. from *M. garcinioides* Bl. and *M. pauciflorum* Bl., and (3) *M. malaccense* (Cl.) Ridl. from *M. dichotomum* (Cl.) King and *M. acumiantum* Sm. These species are difficult (except *M. garcinioides* Bl.) to distinguish solely by anther morphology, therefore various other characteristics must be used to correctly identify each.

GYNOECIUM

The stigma is typically minute and is often difficult to distinguish from the slender, glabrous style which is usually not much longer than the stamens and merges with the top of the ovary without any disc or basal swellings. The ovary is unilocular with very short free central (perhaps indistinguishable from basal) placentation with 2–20 ovules attached in a whorl on a flattened, peltate placenta. *Memecylon oligoneurum* Bl., as far as can be determined, has the lowest ovule number (2), while most other taxa have at least 6 ovules in each gynoecium. The number of ovules might ultimately provide a useful means to help distinguish various taxa.

FRUIT

There are two basic fruit shapes in *Memecylon* viz. globose, or nearly so (22 taxa) and oblong to elliptic (7 taxa). The fruits of *M. acuminatum* Sm. var. *flavescens* Cl. and *M. pauciflorum* Bl. var. *brevifolium* Craib have not been studied since fruits have yet to be described or collected from these two varieties. However, it is most likely that they are globose as in their typical varieties. *Memecylon lilacinum* Z. & M. usually has depressed, oblate, globose fruit; but sometimes it is elliptic.

Within each group there are usually sufficient vegetative differences and structural features of the infructescence to distinguish the taxa. In some species, however, (e.g. *M. lilacinum* Z. & M., *M. globosum* Bakh. f., and *M. excelsum* Bl.) the fruit provides the most reliable diagnostic feature. Because flowers and fruits are rarely found together on the same specimen (except in *M. caeruleum* Jack) matching flowering material with fruiting specimens has often been difficult. A good example is with *M. minutiflorum* Miq. and *M. intermedium* Bl. which are easily confused unless collections are available. A similar situation exists between *M. excelsum* Bl. and *M. megacarpum* Furtado, which have oblong and globose fruit, respectively; but frequently have similar vegetative features. There seems to be no correlation between vegetative characteristics, nature of the inflorescence, and morphology of the anthers between species with globose or oblong to elliptic fruit; except that the five species with glandless anthers all have globose fruits.

The exocarp in dry specimens varies from smooth (e.g. *M. cinereum* King and *M. intermedium* Bl., both with globose fruit; or *M. caeruleum* Jack with elliptic fruit) to moderately rough (e.g. *M. dichotomum* (Cl.) King, and *M. edule* Roxb., both with globose fruit, and *M. paniculatum* Jack which often has ovate fruit). Very rugose or pustulate surfaces are typical of *M. lilacinum* Z. & M., and *M. amplexicaule* Roxb., both having globose fruit; and *M. excelsum* Bl. with oblong to elliptic fruit.

The colour of immature fruit is generally green, changing to yellowish, pink or reddish, and finally in many taxa dark purple to blackish when ripe. The dry colour ranges from black (e.g. *M. edule* Roxb. var. *ovatum* (Sm.) Cl. and *M. cinereum* King) to tan-greenish (e.g. *M. lilacinum* Z. & M.), while *M. cantleyi* Ridl. has fruit which dry light brown to tan.

The pericarp varies from very thin (c. 0.25 mm thick, e.g. *M. cinereum* King and *M. intermedium* Bl.), moderately thick (c. 0.5 mm, e.g. *M. edule* Roxb. and *M. oligoneurum* Bl.), to very thick (c. 1 mm or more and gritty in *M. amplexicaule* Roxb., *M. lilacinum* Z. & M. and *M. megacarpum* Furtado). *M. floridum* Ridl. has a fibrous pericarp which immediately distinguishes it from the other species. Generally speaking, species with ovate to elliptic fruits have a thinner pericarp, the thickest being in *M. excelsum* Bl. (c. 0.5 mm thick).

The calyx remnant, which is always present on immature and mature fruit, varies somewhat in size and shape. A distinctly raised, crown-like remnant is found in all taxa except *M. amplexicaule* Roxb. where it is flattened in the plane of the fruit. All fruits have an areolus or space on the top enclosed by the calyx remnant. The internal septa, most obvious in flowers, are also usually distinct in fruits. The style in all taxa falls off with the petals and stamens soon after the fruit begins to develop.

DISTRIBUTION AND RELATIVE ABUNDANCE

Memecylon is found in all the Malaysian States and Singapore. Several taxa are found throughout the region, e.g. *M. amplexicaule* Roxb. and *M. lilacinum* Z. & M., while others, e.g. *M. malaccense* (Cl.) Ridl., *M. kunstleri* King, and *M. globosum* Bakh. f. are comparatively rare and have only been found in a few localities.

Based on the data gathered from herbarium specimens, I have grouped the taxa from the Malay Peninsula in four categories regarding their relative abundance:

A. **Very Common:** *M. amplexicaule* Roxb. *M. caeruleum* Jack, *M. dichotomum* (Cl.) King var. *dichotomum*, *M. edule* Roxb., var. *edule*, *M. edule* Roxb. var. *ovatum* (Sm.) Cl., *M. excelsum* Bl., *M. megacarpum* Furtado, *M. minutiflorum* Miq., *M. lilacinum* Z. & M., and *M. oleifolium* Bl.;

B. **Common:** *M. cantleyi* Ridl., *M. garcinioides* Bl., *M. intermedium* Bl., *M. oligoneurum* Bl., *M. paniculatum* Jack, *M. pauciflorum* Bl. var. *pauciflorum*, *M. pubescens* (Cl.) King, and *M. wallichii* Ridl.

C. **Not Common:** *M. acuminatum* Sm. var. *acuminatum*, *M. campanulatum* Cl., *M. cinereum* King, *M. floridum* Ridl., *M. fruticosum* King, and *M. hullettii* King; and

D. **Rare:** *M. acuminatum* Sm. var. *flavescens* Cl., *M. corticosum* Ridl., *M. dichotomum* (Cl.) King var. *rotundatum* (Craib) Maxw., *M. globosum* Bakh. f., *M. kunstleri* King, and *M. malaccense* (Cl.) Ridl.

MEMECYLON L.

Linnaeus, Sp. Pl. I (1753) 349; Smith in Rees Cyclopedia 23:4 (1813); Jack, Malay Misc. I:5 (1820) 26, II (1822) 62; Wallich Catalogue (1831); De Candolle, Prodr. III (1828) 5; Roxburgh, Fl. Ind. ed. 2, II (1832) 260; Blume, Mus. Bot. Lugd. Bat. I:23 (1851) 353; Naudin, Ann. Sc. Nat. ser. III:18 (1852) 264; Miquel, Fl. Ned. Ind. suppl. I, Sumatra (1860) 323; Triana, Trans. Linn. Soc. 28 (1871) 155; Kurz, For. Fl. Brit. Burma I (1877) 515; Clarke in Hk. f., Fl. Brit. Ind. II (1879) 553; Cogniaux in DC., Monogr. Phanerog. 7 (1891) 1130; King, J. As. Soc. Beng. 69, II:1 (1900) 71 (Mat. Fl. Mal. Pen., 479); Ridley, Fl. Mal. Pen. I (1922) 810; Craib, Fl. Siam. Enum. I:4 (1931) 702; Bakhuizen van den Brink, f., Med. Mus. Bot. Utrecht 91 (1943) 333 and Rec. Trav. Bot. Neerl. 40 (1943-45) 333; Corner, Wayside Tr. Mal. I (1952) 448; Furtado, Gard. Bull. Sing. 20 (1963) 119, Backer & Bakhuizen van den Brink f., Fl. Java I (1963) 371; Maxwell, Mal. Nat. J. 34:1 (1980).

Trees or terrestrial shrubs; branchlets cylindric, flattened and 2-grooved, or 4-angled to 4-winged; smooth, glabrous. Leaves simple, opposite, glabrous; blades chartaceous, subcoriaceous, or thick coriaceous; entire; lanceolate to suborbicular; with 1 main nerve (except in one species 3-nerved), secondary venation pinnate, distinct to invisible, intramarginal nerves similar; petioles c. 1 mm to 15 mm long. Stipules absent, interpetiolar ridge or line distinct on upper nodes, obscure to invisible on older nodes. Inflorescence cymose, arising from leafy or leafless nodes, less frequently terminal; the axes with up to 4 ramifications, or reduced to multiflowered glomerules or umbels; glabrous or less commonly puberulent. Calyx tube campanulate to funnelform, constricted or not above the ovary; margin truncate, with 4 minute cusps, or undulations, to 4-lobed; tube glabrous or papillose outside, with 8 internal ridges or lines, extraovarial chambers absent. Petals 4, thin or thick coriaceous; oblong, obovate, to orbicular; with or without a thickened mid-line, usually reflexed at maturity, frequently colourful. Stamens 8, equal, glabrous; filaments flattened; anthers globose, axe-shaped, or curved in a "J", "C", or "U" shape; connective often thickened, with or without a gland on the connective; 2-locular, each opening by a vertical slit. Stigma minute, style slender; ovary inferior with one locule, with basal to free central placentation; ovules 2–20, whorled on a flattened placenta. Fruit a berry, globose or elliptic to ovoid; 1, rarely 2, seeded; pericarp juicy, fibrous, or gritty; areolus distinct, raised or not; exocarp ripening red to purplish.

The genus *Memecylon* was established by Linnaeus in 1753 with a brief description of *M. capitellatum* L. from Ceylon. Since then over 300 species have been described from tropical Africa, Asia, Australia, and the Pacific Islands. *Memecylon* has been traditionally included in the Melastomataceae by most botanists, however a separate family, Memecylaceae DC. has been accepted by Airy Shaw (Willis Dict. Fl. Pl. & Ferns) which includes four genera: *Memecylon, Axinandra, Mouriri,* and *Votomia* — the former two being found in the Malay Peninsula and neighbouring countries; and the latter two from Central and South America, and the West Indies. Airy Shaw notes that Memecylaceae is more or less intermediate between Myrtaceae and Melastomataceae. In this work accord is made with most other botanists in maintaining *Memecylon* in the Melastomataceae since the internal septae in the calyx tube and the morphology of the stamens (especially the anthers) indicate relationship to *Astronia* and *Pternandra* very closely and not to any genus in the Myrtaceae.

Memecylon, however differs from most other genera of Melastomataceae in having uninerved blades (except *M. oligoneurum* Bl. and a few species from Africa and Ceylon which have 3-nerved Blades); 8 equal, unappendaged anthers with locules opening by slit (instead of pores as in most other genera); a unilocular ovary with free central (almost basal) placentation; fewer ovules (up to 20); and a (usually) single seeded berry. Therefore, the separation of *Memecylon* as a subfamily, Memecyloideae, appears justified.

Key to the species of *Memecylon* from the Malay Peninsula based on flowering material

1. Inflorescence sessile or nearly so; glomerulate with primary axes indistinct or up to 2 mm long; leaf blades with 1 or 3 main nerves

    2. Leaf blades with 1 main nerve; calyx with distinct internal ridges; ovules 6–20; anthers with a gland

3. Branchlets prominently angled or winged, especially below the upper node

4. Blade venation prominently raised on the undersurface; inflorescence from leafy or leafless nodes (often ramiflorous); pedicels c. 3 m long .... *M. corticosum* Ridl.

4. Blade venation obscure, not prominently raised on the undersurface; inflorescence from leaf axils; pedicels 1.5–5 mm long .... *M. fruticosum* King

3. Branchlets cylindric

5. Blades sessile or very shortly (1–3 mm) petioled

6. Inflorescence glomerulate, primary axes absent; blades thick coriaceous, veins obscure to invisible .... *M. amplexicaule* Roxb.

6. Inflorescence cymose, primary axes at least 0.5 mm long; blades subcoriaceous to coriaceous, venation invisible or distinct

7. Flowers 3–5 per inflorescence, bracts persistent; pedicels 1–1.5 mm long; blades cordate at the base, venation invisible .... *M. dichotomum* (Cl.) King var. *dichotomum* (limestone form)

7. Flowers usually more than 5 per inflorescence, bracts caducous, pedicels 2–3 mm long; blades narrowed at the base, venation distinct .... *M. megacarpum* Furtado

5. Petioles over 3 mm long

8. Calyx truncate; anthers with a gland; inflorescence mostly from leafless nodes

9. Blades thick coriaceous, 7–10 cm long, venation invisible .... *M. campanulatum* Cl.

9. Blades coriaceous, 12–26 cm long, venation distinct .... *M. excelsum* Bl.

8. Calyx with 4 broadly triangular lobes; anthers without a gland; inflorescence from leaf axils .... *M. cinereum* King

2. Leaf blades with 3 main nerves; calyx with faint internal ridges; ovules 2; anthers glandless .... *M. oligoneurum* Bl.

1. Inflorescence peduncled, primary axes at least 2.5 mm long; leaf blades with 1 main nerve

10. Inflorescence 4–8 cm long, secondary axes at least 2 mm long, or if not developed then the inflorescence is umbellate

11. Inflorescence umbellate; calyx tube muricate-papillose externally

12. Inflorescence a compound umbel, lowest internode of the primary axes 4–5 cm long, secondary axes 2–15 mm long; venation distinct .... *M. dichotomum* (Cl.) King var. *rotundatum* (Craib) Maxw.

11. Inflorescence an open panicle of cymes or cymose, lower internodes of the inflorescence 1–3 cm long, secondary axes distinct; venation obscure or prominent; pedicels and calyx smooth, not muricate-papillose

13. Veins prominent, raised on the undersurface

14. Branchlets cylindric

15. Inflorescence axes glabrous .... *M. oleifolium* Bl.

15. Inflorescence axes pubescent

16. Leaf blades 8–15 by 4–6 cm; petiole 1.5 mm thick .... *M. pubescens* (Cl.) King

16. Leaf blades 14–30 by 6–8 cm; petiole 3 mm thick .... *M. beccarianum* Cogn.

14. Branchlets 4-angled to 4-winged ... .. *M. paniculatum* Jack

13. Veins obscure, not raised below

17. Blades 6–13 by 2.5–5 cm; petiole 2–3 mm long, 1–1.5 mm thick; inflorescence 2–4.5 cm long with sharply 4-angled axes .... *M. kunstleri* King

17. Blades 10–20 by 5–10 cm; petiole 7–10 mm long, 2–3 mm thick; inflorescence 7–9 cm long with flattened or cylindric axes .... *M. oleifolium* Bl.

10. Inflorescence a contracted cyme or umbel, 0.4–4 (5) cm long, secondary and/or tertiary axes up to 2 mm long, often indistinct

18. Inflorescence axes slender, 1 mm or less thick, or flattened and 1–2 mm wide; blades acute, cuneate, or rounded and usually decurent at the base

19. Inflorescence sub-sessile or up to 1.5 cm long

20. Leaf blades somewhat narrowed, rounded, or shallowly cordate at the base, not or only slightly decurrent at the base

21. Veins conspicuous and often slightly raised below; upper branchlets sharply 4-angled to 4-winged; anthers with a gland

22. Upper internodes 4-winged, oftering tapering to 4-angles; bracts thin, caducous; pedicels clustered on each secondary axis; calyx smooth

23. Anthers "U"-shaped; blades lanceolate or ovate, 5–13 cm long ...... *M. fruticosum* King

23. Anthers slightly curved to almost "C"-shaped; blades lanceolate, 10.5–18 cm long .... *M. corticosum* Ridl.

22. Upper internodes 4-angled tapering to cylindric; bracts thickened, persistent; pedicels solitary on each secondary axis; calyx papillose .... *M. dichotomum* (Cl.) King var. *dichotomum*

21. Veins obscure to invisible; upper branchlets cylindric, often 2-grooved or somewhat 4-angled below the upper node; anthers with or without a gland

24. Calyx thin, 1.5–2 mm long; anthers without a gland .... *M. malaccense* (Cl.) Ridl.

24. Calyx thick, at least 2 mm long; anthers with a distinct gland

25. Branchlets drying brown to blackish; calyx truncate; bracts persistent .... *M. caeruleum* Jack

25. Branchlets drying tan; calyx with 4 broad lobes; bracts caducous .... *M. globosum* Bakh. f.

20. Leaf blades narrowed and often decurrent at the base; venation obscure to invisible, or prominently raised on the undersurface; branchlets not 4-winged (often 4-angled in *M. lilacinum* and *M. excelsum*)

26. Upper branchlets grooved on 2 sides, each flanked by 2 ridges, or sharply 4-angled (becoming obscure on older branches and appearing cylindric)

27. Pedicels, ovary, and calyx minutely papillose, texture roughened; petals obtuse to acute at the tip .... *M. minutiflorum* Miq.

27. Pedicels etc. smooth; petals caudate- acuminate at the tip

28. Anthers without a gland; flowers usually more than 5 per inflorescence

29. Petals lanceolate to oblong .... *M. lilacinum* Zoll. & Mor.

29. Petals broadly ovate

30. Inflorescence 5–7 mm long, pedicels c. 1 mm long, blades drying black .... *M. cinereum* King

30. Inflorescence 10–15 mm long, pedicels c. 4 mm long, blades drying greenish .... *M. floridum* Ridl.

28. Anthers with a distinct gland; flowers c. 5 per inflorescence

31. Blades 3–4 by 1–2.5 cm .... *M. pauciflorum* Bl. var. *pauciflorum*

31. Blades 1.2–1.7 by c. 1 cm .... *M. pauciflorum* Bl. var. *brevifolium* Craib

26. Upper branchlets cylindric, often slightly flattened, shallowly grooved, or somewhat 4-angled below the upper node

32. Calyx lobes reduced to 4 extremely minute points or completely truncate; petals broadly ovate to sub-orbicular, acute or mucronate at the tip

33. Calyx c. 1–1.5 mm long, c. 1.5 mm wide

34. Bud and mature anthers circular in outline, with the gland on a thin extension of the connective; calyx with 4 minute points .... *M. garcinioides* Bl.

34. Bud and mature anthers not circular in outline, gland not as above or absent

35. Bud and mature anthers curved in a "C" shape, gland on the thickened connective; calyx truncate .... *M. acuminatum* Sm. var. *flavescens* Cl.

35. Bud and mature anthers straight, without a gland; calyx with 4 short, triangular cusps ... *M. floridum* Ridl.

33. Calyx 2–3.5 mm long, 3–5 mm wide; bud anthers curved in a "C" or hook shape, gland on the thickened connective distinct

36. Calyx campanulate, not constricted above the ovary

37. Leaf blades thick coriaceous, venation obscure to invisible .... *M. caeruleum* Jack

37. Leaf blades subcoriaceous, venation visible and raised on the undersurface .... *M. excelsum* Bl.

36. Calyx flattened campanulate to funnel-shaped, sharply constricted above the ovary .... *M. constrictum* Craib (q.v. *M. minutiflorum* Miq.)

32. Calyx with 4 distinct cusps, each c. 0.25 mm high, or distinctly 4-lobed, the lobes undulate or 1/3 as long as the calyx tube; petals lanceolate-oblong, or elliptic-oblong, the tips not mucronate

38. Leaf veins invisible; petals lanceolate-oblong and longer than wide, caudate-acuminate at the tip; anthers without a gland .... *M. lilacinum* Zoll. & Mor.

38. Leaf veins prominent; petals broadly elliptic to oblong, wider than long; acute, broadly rounded, or truncate at the tip; anthers with a gland .... *M. excelsum* Bl.

19. Inflorescence 1.5–5 cm long

39. Bud and mature anthers circular in outline with the gland along the entire surface of a thin, flat connective appendage .... *M. garcinioides* Bl.

39. Bud and mature anthers "J", "C", or "U"-shaped; gland centrally located on the thickened connective

40. Calyx with 4 triangular cusps or lobes; venation of blades visible on the undersurface .... *M. acuminatum* Sm. var. *acuminatum*

40. Calyx truncate or with 4 minute cusps or 4 undulate lobes; blade venation very obscure to invisible on the undersurface

41. Inflorescence with 3–10 flowers; petals thin with visible venation .... *M. cantleyi* Ridl.

41. Inflorescence usually with more than 10 flowers; petals coriaceous, with obscure to invisible veins

42. Branchlets cylindric below the upper node

43. Blades 6–9 by 2–3 cm, petiole 3–4 mm long; inflorescence 1.5–2 cm long, secondary axes not developed (glomerulate on the primary axis) or up to 2 mm long; calyx with 4 minute cusps or lobes ... . *M. intermedium* Bl.

43. Blades (6) 9–21 by (2.5) 3–10 cm, petiole 6–9 mm long; inflorescence 1.5–5 cm long, secondary axes 2–12 mm long; calyx truncate .... *M. oleifolium* Bl.

42. Branchlets 2-grooved to 4-angled below the upper node

44. Petiole 4.5–7.5 mm long, 2.5–4 cm wide; inflorescence (0.5) 1.5–2 cm long .... *M. edule* Roxb. var. *edule*

44. Petiole 6–15 mm long; blades 5–12 cm long, 3–6.5 cm wide; inflorescence up to 4 cm long .... *M. edule* Roxb. var. *ovatum* (Sm.) Cl.

18. Inflorescence axes robust, flattened or not, 1.5–2 mm thick; blades broadly rounded to cordate at the base, less frequently with a slightly cordate-auriculate base

45. Veins on leaf blades raised on the undersurface, intramarginal nerve distinct, blades 14–27 cm long; midnerve of petals slightly raised dorsally, margins with a narrow thin portion (less than 1/10 mm wide)

46. Anther locules extending all along one side of the connective and upper part of the other, connective shorter than the locules, gland minute, round; branchlets 4-angled; shrub or tree up to 6 m tall .... *M. wallichii* Ridl.

46. Anther locules on the enlarged tip of the connective, connective longer than the locules, gland elongate, prominent; branchlets cylindric; trees 10–15 m tall ... *M. excelsum* Bl.

45. Veins on leaf blades obscure to invisible on the undersurface, intramarginal nerve invisible; blades 8–14 cm long; mid-nerve of petals prominently keeled dorsally, margins with a prominent thin portion (at least 0.25 mm wide) ...... *M. caeruleum* Jack

Key to the species of *Memecylon* from the Malay Peninsula based on fruiting material

1. Mature fruit subglobose to globose, i.e. about as long as wide

2. Mature fruit 1.2–2 cm diameter

3. Axes of infructescence indistinct, glomerulate; areolus flat, not raised above the plane of the fruit; leaf blades thick coriaceous, veins invisible .... *M. amplexicaule* Roxb.

3. Axes of infructescence at least 3 mm long, cymose; areolus distinctly raised above the plane of the fruit, often flattened; leaf blades subcoriaceous, veins distinct

4. Upper branchlets 4-angled

5. Leaf blades 5–10 cm by 2–5 cm; secondary axes 3, distinct .... *M. dichotomum* (Cl.) King var. *dichotomum*

5. Leaf blades 14–25 by 3.5–10 cm; secondary axes indistinct, clustered at the tips of the primary axes .... *M. wallichii* Ridl.

4. Upper branchlets cylindric

6. Leaf blades 15–20 by 6–7.5 cm, the veins slightly raised on the undersurface; areolus slightly (1 mm) raised .... *M. megacarpum* Furtado

6. Leaf blades 7–10 by 3.5–5 cm, the veins not raised on the undersurface, often invisible; areolus flattened in the plane of the fruit, i.e. not raised .... *M. globosum* Bakh. f.

2. Mature fruit 2–12 mm diameter

7. Upper branchlets cylindric, flattened and grooved on 2 sides, or somewhat 4-angled near the nodes

8. Veins of blades sunken above, raised on the undersurface

9. Fruit smooth when dry; blades 14–30 cm by 6–8.5 cm; petiole c. 3 mm thick .... *M. beccarianum* Cogn.

9. Fruit rough when dry; blades 8–12 by 4–5.5 cm; petiole 1.5 mm thick .... *M. pubescens* (Cl.) King

8. Veins of blades obscure to invisible on both surfaces

10. Upper branchlets somewhat flattened with a vertical groove flanked by two ridges on opposite sides of the petioles, or 4-angled throughout

11. Fruit flattened at the poles; pericarp 1–2 mm thick and gritty, often grooved near the base

12. Blades drying black above, brown on the undersurface; fruit drying black; infructescence glomerulate, up to 10 mm long .... *M. lilacinum* Zoll. & Mor.

12. Blades drying brown above; green, tan, to yellowish on the undersurface; fruit drying tan to grey-greenish; infructescence cymose, the axes 10–15 mm long .... *M. minutiflorum* Miq.

11. Fruit globose throughout, usually not flattened at the poles; pericarp up to 0.5 mm thick, not gritty or grooved

13. Primary axes of the infructescence less than 1.5 mm long

14. Exocarp rough when dry; blade undersurface and fruit drying tan, yellowish, to grey-greenish .... *M. minutiflorum* Miq.

14. Exocarp smooth when dry; blade undersurface and fruit drying brown

15. Infructescence from the axils of older leaves or from leafless nodes; primary axes 6–19 mm long, secondary axes 4–5 mm long ...... *M. edule* Roxb. var. *edule*

15. Infructescence from the axils of upper leaves; primary axes 1.5–2 mm long, secondary axes indistinct and reduced to a tubercle c. 0.5 mm long

16. Leaf blades 3–6 by 1–3 cm .... *M. pauciflorum* Bl. var. *pauciflorum*

16. Leaf blades 1.2–1.7 by up to 1 cm .... *M. pauciflorum* Bl. var. *brevifolium* Craib

13. Primary axes of the infructescence less than 1.5 mm long

17. Leaf blades and fruit drying black .... *M. cinereum* King

17. Leaf blades drying browish above, greenish on the undersurface; fruit drying greenish-brown .... *M. edule* Roxb. var. *edule*

10. Upper branchlets cylindric, somewhat 4-angled, or flattened with a shallow groove on 2 sides, below the upper node

18. Blades with 3 main nerves from the base; exocarp with a grey-mealy texture when dry .... *M. oligoneurum* Bl.

18. Blades with 1 main nerve (midvein) from the base; exocarp not with a grey-mealy texture when dry

19. Infructescence an open, compound umbel; primary axes 4–5 cm long; blades broadly rounded to cordate at the base, petiole 1–2 mm long .... *M. hullettii* King

19. Infructescence cymose, often very compact to glomerulate; primary axes shorter; blades acute and decurrent at the base; petiole more than 2 mm long (except *M. constrictum*)

20. Infructescence axes up to 5 mm long

21. Blade venation invisible; infructescence from behind the leaves; primary axes up to 1.5 cm long

22. Infructescence glomerulate, of 10 or more pedicels, from behind the leaves; blades thick coriaceous, petiole 5–12 mm long .... *M. campanulatum* Cl.

22. Infructescence cymose, of 3–5 pedicels, from leaf axils; blades coriaceous; petiole c. 2 mm long .... *M. dichotomum* (Cl.) King var. *dichotomum* (limestone form)

21. Blade venation visible on the undersurface (often obscure); infructescence in leaf axils; primary axes at least 3 mm long

23. Petiole 2–4 by 1–1.5 mm .... *M. garcinioides* Bl.

23. Petiole c. 2 by 2–2.5 mm .... *M. constrictum* Craib (q.v. *M. minutiflorum* Miq.)

20. Infructescence axes at least 7 mm long

24. Petiole 7–15 mm long; blades (5) 8–12.5 by 3–6.5 cm

25. Fruit drying tan-brown, exocarp smooth, pericarp c. 0.2 mm thick .... *M. cantleyi* Ridl.

25. Fruit drying black or greenish, exocarp rugose, pericarp 0.5–1 mm thick, gritty .... *M. edule* Roxb. var. *ovatum* (Sm.) Cl.

24. Petiole less than 7 mm long; blades 4–9 by 2–4.5 cm

26. Blades coriaceous, veins invisible

27. Infructescence mostly from behind the leaves; blades drying greenish to brown, obtuse to acute at the tip .... *M. edule* Roxb var. *edule*

27. Infructescence mostly from leaf axils; blades drying dark brown to black, acuminate at the tip .... *M. intermedium* Bl.

26. Blades chartaceous to sub-coriaceous, veins visible

28. Blades acute at the base; petiole 3–6 mm long

29. Fruit 6–7 mm diameter, pericarp c. 1/3 mm thick; blades broadly ovate to elliptic ....
M. acuminatum Sm. var. *acuminatum*

29. Fruit 10–12 mm diameter, pericarp fibrous, 1–2 mm thick, blades lanceolate-elliptic ....
.... *M. floridum* Ridl.

28. Blades broadly rounded to shallowly cordate at the base, petiole 1–2 mm long

30. Primary axes of the infructescence up to 6 mm long, 1 mm thick ....
M. dichotomum (Cl.) King var. *dichotomum*

30. Primary axes of the infructescence 15–20 mm long, 1/3 mm thick ....
M. dichotomum (Cl.) King var. *rotundatum* (Craib) Maxw.

7. Upper branchlets generally 4-winged or at least distinctly 4-angled along the entire length of the internodes

31. Petiole 2 mm thick; blades 11–26 by 3.5–14 cm, broadly rounded to cordate at the base

32. Infructescence axes (total length) 3–4 cm, from behind the leaves; trees 10–20 m tall .... *M. paniculatum* Jack

32. Infructescence axes 1–1.5 cm long, generally from leaf axils; shrubs or trees up to 6 m tall ...... *M. wallichii* Ridl.

31. Petiole 1–1.5 mm thick; blades 5–13 by 2–6 cm, rounded to narrowed at the base

33. Blades thin coriaceous, veins usually visible (often obscure); branchlets 4-winged to 4-angled

34. Primary axes up to 6 mm long, c. 1 mm thick

35. Upper branchlets 4-angled, tapering to cylindric; bracts persistent; secondary axes not glomerulate, up to 3 mm long ....
...... *M. dichotomum* (Cl.) King var. *dichotomum*

35. Upper branchlets 4-winged, tapering to 4-angled; bracts not present in fruit; secondary axes glomerulate or up to 1 mm long .... *M. fruticosum* King

34. Primary axes 15–20 mm long, c. 1/3 mm thick .... *M. dichotomum* (Cl.) King var. *rotundatum* (Craib) Maxw.

33. Blades coriaceous, veins invisible; branchlets 2-grooved to 4-angled .... *M. malaccense* (Cl.) Ridl.

1. Mature fruit ovate to elliptic, i.e. longer than wide

36. Infructescence axes up to 2 cm long, 3d and 4th axes usually not developed

37. Mature fruit grooved near the base, often flattened at both ends, areolus c. 1.5 mm wide .... *M. lilacinum* Zoll. & Mor.

37. Mature fruit not grooved or flattened; areolus at least 2 mm wide

38. Fruit 8–10 mm long, areolus c. 2 mm wide

39. Blades coriaceous; ovate, acute, and often decurrent at the base

40. Infructescence axes 6–10 mm long ... *M. excelsum* Bl.

40. Infructescence axes at least 15 mm long .... *M. oleifolium* Bl.

39. Blades subcoriaceous, lanceolate to narrowly ovate, rounded to shallowly cordate at the base

41. Branchlets cylindric .... *M. kunstleri* King

41. Branchlets 4-winged

42. Blades ovate, 8–13 cm long .... *M. fruticosum* King

42. Blades lanceolate, 10.5–18 cm long .... *M. corticosum* Ridl.

38. Fruit 10–20 mm long, areolus 3–5 mm wide

43. Fruiting bracts persistent; exocarp smooth; blades coriaceous, veins mostly invisible .... *M. caeruleum* Jack

43. Fruiting bracts caducous; exocarp rugose-pustulate; blades subcoriaceous, veins distinct .... *M. excelsum* Bl.

36. Infructescence axes 2–8 cm long, 3d and 4th axes usually developed

44. Secondary veins sunken above, prominently raised on the undersurface; branchlets drying brown, upper internodes usually 4-angled or 4-winged .... *M. paniculatum* Jack

44. Secondary veins faint or invisible, not sunken above, invisible to slightly raised on the undersurface; branchlets drying greyish to khaki, upper internodes cylindric .... *M. oleifolium* Bl.

fruit unknown: *M. acuminatum* Sm. var. *flavescens* Cl.
M. pauciflorum Bl. var. *brevifolium* Craib

1. *Memecylon acuminatum* Sm., Rees Cyclop. 23 (1813) var. *acuminatum*

Tree up to 15 m tall with a diameter of 15 cm; branchlets slender and often hanging; upper internodes cylindric, often flattened and grooved below the nodes, smooth, drying brown; blades subcoriaceous, broadly elliptic to ovate, acuminate to caudate (up to 12 mm) at the tip, narrowed and decurrent at the base, midnerve sunken above, raised below, secondary venation very obscure or invisible on both surfaces; 5–7 cm long, 1.5–3.5 cm wide, dark glossy green drying brownish to olive-green above, dull green below when dry, entirely glabrous; petiole 5–7 mm long, c. 1 mm wide, glabrous; inflorescence from leaf axils, loosely cymose with many branches, (1) 2–3 cm long, with (10) 20–30 flowers, glabrous, axes flattened, bracts and bracteoles not seen, falling off before the petals mature; primary axes solitary, 10–20 mm long with 1 or 2 nodes, c. 1 mm wide at the base, secondary axes c. 5 from each primary node, 2–3 mm long with 2–3 nodes, tertiary axes c. 2 mm long, 4th axes not developed or up to 0.5 mm long, pedicels 1–2 mm long; calyx campanulate, wider and becoming flattened above the ovary, glabrous, c. 1 mm long, 1–1.5 mm wide, margin with 4 well developed triangular lobes, each c. 0.25 mm long; petals broadly ovate to sub-orbicular, acute at the tip, truncate at the base, thickened with thinner margins, c. 2–2.5 mm long and of similar width; anthers c. 1 mm long, crescent shaped, with a prominent gland centrally located on the connective; stigma minute, style c. 3.5 mm long, glabrous; fruit globose, often depressed, 6–7 mm diameter, calyx remnant distinct, flat, areolus c. 4 mm wide; exocarp pale green when immature, drying straw yellow with a slightly roughened texture, c. 0.3 mm thick

Figure 1: a. calyx and corolla bud, b. petals, c. bud stamen, d. mature stamen

This species is sometimes confused with *M. floridum* Ridl. (q.v.) which has glandless anthers, a shorter inflorescence, larger fruit, and angled branchlets.

M. intermedium Bl. (q.v.) has a shorter inflorescence with reduced, often glomerulate, secondary axes. Even in specimens of *M. acuminatum* with very reduced axes, e.g. Ridley 3297, 6413, 7309; and Foxworthy 1194, the nodes of the secondary and tertiary axes are visible. The blades in *M. intermedium* tend to dry black above, and brown below.

Kedah — Pulau Dayang Bunting: Corner sn, 13 Nov. 1941

Perak — Larut: King's collector 3458, 6754

Kelantan — G. Stong: Symington 37731

Selangor — Bukit Kutu: Ridley 7309; Sempang Mines: Ridley 15591, 15618

Pahang — Ulu Rembau: Nur 11778

Malacca — Batu Tiga: Derry 1041; Gunong Ledang: Ridley 3297; Pokoh Magas: Alvins 765; sine loc.: Griffith 2325/1

Johore — G. Belumut: Holttum 10779; Kluai Yong Estate: Corner 36295; Gunong Pulai: Mat 3741; Peuyabong: Foxworthy 1194; Tana Runto: Ridley 4656; Tanjong Bunga: Ridley 6412, 6413, Sungai Bau: Ridley s.n. in 1894

Singapore — Ridley 4574, 6411

1a. *Memecylon acuminatum* Sm. var. *flavescens* Cl. in Hk. f., Fl. Brit. Ind. II (1879) 562.

This variety differs from the typical variety by the completely truncate calyx. The differences, according to Clarke, are that var. *flavescens* has more rigid blades, which dry yellowish; and shorter (c. 1 cm long) cymes. The anthers appear to be quite similar to those of typical *M. acuminatum*. The blades, especially with their rostrate tips, also compare well.

King (J. As. Soc. Beng. 69, II : I (1900) 81 and Mat. Fl. Mal. Pen. III, 489) and Craib (Fl. Siam. Enum. 1:4 (1931) 709) both considered var. *flavescens* as a synonym of *M. minutiflorum* Miq. Their opinions are not accepted here since the structure of the inflorescence, smooth calyx, and anthers all differ significantly. The upper internodes of var. *flavescens* are cylindric and not 4-angled or 2-grooved as with *M. minutiflorum*. The affinities of var. *flavescens* lie with M. *acuminatum* and not *M. minutiflorum*; however since only 4 collections of var. *flavescens* were studied during this research I cannot be certain of any variations or to which other species of *Memecylon* it may be related. Fruiting material of var. *flavescens* has not been seen or described.

Figure 1a: a. calyx, b. petal, c. mature stamen

Penang

I.H. Burkill 2655: Curtis 815, 816

Malacca

Griffith 2325/2 (type K, L)

2. *Memecylon amplexicaule* Roxb., Fl. Ind. II (1832) 260 (*M. amplexicaulis*); *M. microstomum* Cl. in Hk. f., Fl. Brit. Ind. II (1879) 557; King, J. As. Soc. Beng. 69, II : I (1900) 79 (Mat. Fl. Mal. Pen. III, 487), syn. by Ridley, Fl. Mal. Pen. I (1922) 815; Craib, Fl. Siam. Enum. I : 4 (1931) 703..

Tree 6–18 m tall, diameter 15–75 cm; bark smooth, grey-brown, thin, shallowly fissured and cracked; slash inner bark thin, brown or orange; slash wood brown or orange; bole straight, crown spreading; branches cylindric, smooth, c. 2 mm thick, drying light brown, nodes thickened; blades coriaceous, ovate or elliptic, obtuse or with an obtuse acumen c. 5 mm long, base rounded or more often (especially in more mature or larger blades) cordate and clasping the branch; 7–15 cm long, 3–8 cm wide; veins generally invisible above, invisible or very obscure below, intramarginal nerve invisible; midnerve distinct and sunken above, prominently elevated below, thickened near the petiole and tapering towards the leaf tip; dark glossy green above, light yellowish-green below, drying brown to greenish (often with a mottled pattern), greenish to lighter brown below; petiole 0.5–2, less frequently up to 3 mm long, c. 2 mm wide; leaf scars prominent, becoming elevated on older branches; inflorescence sessile, glomerulate, in leaf axils, glabrous, composed of every reduced cymes united in compact and globose fascicles; bracts and bracteoles lanceolate-ovate, acute, c. 0.5 mm long, persistent; primary and secondary axes not apparent, united axes 5–8 (rarely 10) mm diameter, entire inflorescence 1.5–2.5 cm wide; pedicles numerous, 15–25 per axil, 2–3 mm long, white to pinkish; calyx campanulate, c. 1.5–2 mm long, 1.5–2 mm wide, margin shallowly undulate or with 4 distinct, broadly triangular, acute lobes; glabrous and smooth outside, prominently ridged inside, white to pinkish; petals broadly ovate to suborbicular, acute at the tip, truncate at the base, 1.5–2 mm long, 2 mm wide, thin with the venation visible and a prominent and thickened dorsal midnerve, margins thinner, ventrally cocave at maturity, white to cream coloured; filaments 2.5–3 mm long, glabrous, white; anthers curved in a ")" shape, connective white, gland tan, distinct; style slender c. 4 mm long, white; ovules 5–12, erect, reniform, and flattened; ovary slightly wider than the pedicel, much narrower than the calyx, c. 1 mm wide; fruit globose, slightly flattened at the apex, glabrous, 1.2–2 cm diameter, pedicels 2–3 mm, calyx remnant sunken at the top without any tissue projecting above the plane of the fruit, c. 2 mm wide, internal ridges generally obscure, style scar distinct; pericarp c. 2 mm thick, pulpy, exocarp smooth, greyish-green to dark green and hard, turning red, purplish and soft when ripe, drying tan to light brown with a roughened texture, seed globose, 6–8 mm diameter, testa blackish, smooth.

Figure 2: a. calyx, b. petal, c. stamen

vernacular: nipis kulit, pantai ulat, kelat, daun pekan, dalak

properties: leaves boiled together with onions form a liquid which, when used as a poultice and applied to the head, cures headaches

uses: charcoal

habitat: primary forest, swamp forest, 600–1200 m elevation

The glomerulate inflorescence and the thick blades are similar to *M. multiflorum* which differs in having longer petioles, blades with acute bases, and a truncate calyx. The anthers appear to be the same. *M. caeruleum* Jack (q.v.) differs, among other traits, in having distinct primary axes, larger flowers, and elliptic fruit.

Kedah — Bukit Enggang: Everett 13747; Bukit Perak For. Res: Chan 13128, 13133, Everett 13684; Koh Mai For. Res.: Kiah 35182; Ulu Muda For. Res.: Bray 11511; Kedah, Haniff & Sallah 10475

Penang — Curtis 766, 3592, s.n.

Perak — Kampong Tera: Ismail 95021; Padang Batang: Shing 17388; Ulu Bubong: King's coll. 10588; Ulu Kenderong: Hamid 11615

Kelantan — G. Rabong: Shah 2484; Kampong Gobek: Shah & Kadim 484; Sungei Galas: Cockburn 7477; Sungei Merkeh; Shah & Shukor 3178

Trengganu — Jambu Bongkok For. Res.: T. & P. 12, 439 (3030); Sekayu For. Res.: Shing 13538; Ulu Bendong: Corner 30003, 30188

Pahang — Aur For. Res.: Whitmore 3683; Bukit Blakang: Haniff 21047; Bukit Tersit; Shah & Shukor 2628, Soepadmo 837; Fraser's Hill: Henderson 11515, Henderson & Nur 11212; Gunong Benom: Ismail 97802; Gunong Berembun: Ismail 104897; Kuala Teku: Kiah 31740; Baloh For. Res.: Mahamud 0820; Labis For. Res.: Ahmad & Shukor 522

Negri Sembilan — Gunong Angsi: Loh 17310; Jelebu: Everett 104909A

Malacca — Kedah Peak: Maingay 821 (1565) (*type M. microstomum* Cl.); Nyalas: coll. ? 797; Sungei Udang: Alvins 24

Johore — Gunong Besar, Labis For. Res.: Everett 13994, 14098; Gunong Blumut: Whitmore 8829; Kota Tinggi: Corner 30781; Kluai: Corner 29953; Labis For. Res.: Suppiah 104957; Ma'okil For. Res.: Shah 3666, Shing 6861; Panti For. Res.: Everett 13812

Singapore — Cantley sn; Henderson 36357; Ngadiman 37009; Ridley 2023, 9182, 15622

Further Distribution — peninsular Thailand: Surat (*fide* Craib, 703).

3. *Memecylon beccarianum* Cogn. in DC., Monogr. Phanero. 7 (1891) 1143.

Tree, 10–18 m; bark smooth, thin, reddish, brittle; branches cylindric, smooth, c. 2 mm thick; blades sub-coriaceous, broadly lanceolate to elliptic, acuminate at the tip, narrowed and slightly decurrent to somewhat rounded and shallowly cordate at the base; venation pinnate, 15–20 pairs of nerves, sunken above, prominently raised below; intramarginal nerve similar, 1.5–3 mm from the margin, looping; midnerve sunken above, raised and tapering to the tip below. 14–30 cm long, 6–8.5 cm wide; drying olive-green to brown above, greenish to light brown below; entirely glabrous; petiole 6–9 mm long, 2–3 mm thick, glabrous; inforescence a panicle of cymes, many flowered, from leafy or upper leafless nodes; 3–10 cm long, axes 4-angled, often flattened and grooved, minutely muricate-furfuraceus, becoming glabrous; bracts and bracteoles lanceolate, acute 0.25–0.5 mm long, caducous; primary axes usually solitary, 6.5–9 cm long, with up to 4 nodes, secondary axes up to 2.5 cm long with 1 node, terminated by 15–20 pedicles, 1.5–2 mm long, clustered at the tip; calyx campanulate, often constricted above the ovary, truncate with 4 minute cusps, at first minutely muricate-papillose, becoming smooth, ridged internally, 1.5 mm high, 2 mm wide; petals thickened, broadly ovate to suborbicular, acute at the tip, truncate at the base, margins thinner, midvein slightly raised dorsally; 2 mm long, 2.5 mm wide, light blue; filaments c. 2 mm long, anthers "C"-shaped, gland distinct; style c. 4 mm long; ovules c. 16; fruit globose, 7–8 mm wide, capped by the raised calyx remnant, areolus c. 2 mm wide; exocarp thin, smooth, drying tan to black; pericarp c. 0.2 mm thick.

Figure 3: a. calyx and style, b. petal, c. stamen. Figure 32

Memecylon beccarianum Cogn. is very close to *M. paniculatum* Jack (q.v.) and can be distinguished by the cylindric internodes in the former and 4-angled to 4-winged branches in the latter. The structure of the inflorescence, calyx, petals, and anthers are virtually the same. *M. paniculatum* is a rather variable species and several other species have been reduced to synonyms of it. It is quite possible that *M. beccarianum* Cogn. is also the same since the relative nature of the branches is not a good feature meriting maintenance of a separate taxon. As sufficient authentic material of *M. beccarianum* has not been seen (types Beccari 1311, 1518, from Matang, Borneo) it is difficult to determine its exact affinities with *M. paniculatum* merely from the orginal description and a few specimens. Therefore, pending a detailed study of the two species, *M. beccarianum* is maintained as a distinct species in this paper. As far as can be determined *M. beccarianum* has only been collected in Borneo. The inforescence, especially the pubsecence, of *M. pubescens* (Cl.) King (q.v.) is also similar, however the leaves of that species are smaller, more acute at the base, and there are differences with the calyx and petals.

Memecylon oleifolium Bl. (q.v.) can be separated from *M. beccarianum* by the cylindric inflorescence axes which are thicker, less branched, and the elliptic-ovate fruit.

4. *Memecylon caeruleum* Jack, Mal. Misc. 1:5 (1820) 26; *M. floribundum* Bl., Mus. Bot. Lugd.-Bat. 1:23 (1851) 361!; *M. caeruleum* Jack var. *floribundum* (Bl.) Kurz, For. Fl. Brit. Burma I (1877) 511; *M. cordatum* Wall. Cat. 4100E.

Shrub up to 4 m or less commonly a tree up to 12 m tall; bark thin, finely fissued, grey-brown to blackish; branchlets cylindric, often flattened and shallowly grooved on 2 faces below the upper node, smooth, 1.5–2.5 mm thick, drying brown to blackish; blades coriaceous, ovate to elliptic, acute to obtuse at the tip, often with a very minute cusp; broadly rounded, cordate, or acute at the base; 8–16 cm long, 3.5–7 cm wide; venation very obscure to invisible on both surfaces, midnerve sunken above, prominently raised and tapering below; dark green above, green below, drying dark brown or blackish above, lighter brown, less commonly greenish below; margin often inrolled below; glabrous; petiole 1–3 mm long, c. 2 mm thick in broadly rounded to cordate blades; 5–7 mm long in acute blades and usually not as thick; glabrous; inflorescence cymose, appearing glomerulate, 1–1.5 cm long, glabrous, many flowered, primary axes 2–3 from foliate nodes, 2–4 mm long, slightly flattened, c. 2 mm thick; secondary axes 2–3 mm long, generally with one pedicel at the tip of each; pedicels 1–2 mm long; bracts ovate, acute, keeled on the back, up to 0.5 mm long, persistent; calyx campanulate, often somewhat funnelform, smooth, glabrous; margin truncate, thick, often cracking in 4 places (opposite the petals) after flowering; 2–4 mm long, 2.5–3.5 mm wide; pink to purple; petals coriaceous, broadly ovate to orbicular, acute or tipped with a minute mucro, truncate to emarginate at the base, c. 2.5–3 mm long, 3–3.5 mm wide at the middle; midnerve thickened and often keeled, margins thinner, reflexed at maturity, dark purple, or deep blue, margins often whitish; filaments 2.5 mm long, deep blue; anther curved in a ")" or "C" shape, c. 1 mm long, deep blue, locules white, gland distinct, reddish or orange-brown; style 4–6 mm long, blue; ovules c. 10; infructescence axes thicker, secondary axes often elongating 1–2 mm, total length up to 2.5 cm; fruit ellipsoid, smooth, glabrous, 10–15 mm long, 6–9 mm wide, crowned by the persistent calyx remnant, areolus 3–4 mm wide; exocarp thin, pink to red, turning light blue, deep purple to black with deep purple juice when ripe; pericarp pulpy and gritty, c. 2 mm thick, white.

Figure 4: a. inflorescence, b. petal, c. stamen, d. fruit and seed

There is considerable variation in the leaves of this species. Specimens with broadly rounded to cordate blades with petioles 1–3 mm long and 2 mm thick confer with Jack's description of *M. caeruleum*. In *M. floribundum* Bl. the blades are generally narrowed at the base, however broadly rounded, but not cordate, blades are often found associated with these narrowed blades (Noor & Samsuri 10, is a good example). The petioles in *M. floribundum*, regardless of the base of the blades, are always 5–7 mm long. The blades and leaves of *M. caeruleum* Jack, specifically those described by Blume as *M. floribundum*, are similar to those of *M. campanulatum* Cl. (q.v.) and *M. edule* Roxb. var. *ovatum* (Sm.) Cl. (q.v.), however the former has a glomerulate inflorescence (axes not distinct) and the latter has an elongate (1–4 cm) one; both differ in having globose fruit. *M. amplexcaule* is easily distinguished from *M. caeruleum* s.s., by its clasping leaf bases, smaller flowers, and globose fruit.

M. caeruleum s.s. is apparently restricted in distribution to southern Thailand, the Malay Peninsula, and parts of Indo-China. *M. floribundum* s.s. ranges from central Thailand to the Malay Archipelago. While the blades differ significantly and there seem to be no intermediate shapes linking the two types; the inflorescences, flowers, and fruits are identical. There is, therefore, no reason in keeping the species separate, therefore *M. florubundum* Bl. has been reduced in this paper to a synonym of *M. caeruleum* Jack on the basis of publication priority.

Kadim and Noor 660, from Pulau Tulai, Pahang; is an exceptional specimen in that the infructescence is up to 2.2 cm long. The primary axes are solitary and are up to 17 mm long with 1 or 2 nodes, the secondary axes are about 2 mm long and the pedicels are slightly shorter.

Thailand

Singora: Annandale 1662; Teratau Is.: Haniff & Nur 7479; Mohea, Trang: Hamid 2959

Malay Peninsula

Perlis — Besih Hangat: Henderson 22881; Kaki Bukit: Kiah 35280

Kedah — Alor Star: Ridley 15057; Kedah Peak: Rao, Keng, Wee 77; Pulau Langkawi: Bolinan 6787, Chew 138, Kerr 21762, Robinson 6328, Turnau 741, Whitmore 12984; Pulau Rawei: Ridley 15777; Pulau Selang: Corner sn, 22 Nov. 1941; Pulau Timun: Henderson 29125; Tau: Ridley sn, June 1893; Yan: Ridley sn, June 1893.

Wellesley — Bukit Jura: Ridley sn. Dec. 1895

Penang — Ahmad 1015: Curtis 54, Oct. 1884; Curtis 54, Aug. 1889; Curtis 54 (= 1507), 1507; King's coll. 1687; Selvaraj 99660; Sinclair 39045; Wallich 4100E (*type M. cordatum* Wall.)

Perak — Pulau Jarajah: King's Coll. 4972; Pulau Lanang: Seimund sn; Pulau Pangkor: H.M. Burkill & Shah 253; Corner 31654; Foxworthy 1736; Ridley sn; Yeob 1097; sine loc.: Scortechini 641, 1027

Trengganu — Pulau Kapas: Holttum 15216

Selangor — Kuala Selangor: Watson 16410

Pahang — Pulau Sepoi: Corner 25764, 29846; Pulau Tioman: Corner sn, 17 Aug. 1935: I.H. Burkill sn, June 1915; Henderson 18538; Pulau Tulai: Kadim & Noor 660; S. Kampong Aur: Ahmad & Shukor 484

Negri Sembilan — Port Dickson: Strugnell 10988

Malacca — Bukit China: Goodenough 1522; Bukit Panan: Alvins 280; Gambaga Batu: Hervey 2020; G. Kalan: Alvins sn, 19 Dec. 1885; Lanjong Kling: Ridley 218; Pang Kalan Miniak: Alvins sn, 19 Dec. 1885; sine loc.: Cuming 2322, Griffith 2322, Maingay 809 (1423)

Johore — Hulu Sedil: Lake & Kelsall 4074, Pulau Pemanggil: Noor & Samsuri 10

Singapore — Chew 1463; Furtado 34854; Kassim 1489; Pangi sn; Walker sn.

Further Distribution — Indo-China, Burma, Thailand, Sumatra, Java (and islands to north),, Anambas Islands, New Guinea (*fide* Craib and Bakh. f.).

5. *Memecylon campanulatum* Cl. in Hk. f., Fl. Brit. Ind. II (1879) 563; *M. multiflorum* Bakh. f., Med. Mus. Bot. Utrecht 91 (1943) 343 and Rec. Trav. Bot. Neerl. 40 (1943-45) 343; Furtado, Gard. Bull. Sing. 20 (1963) 121 *syn. nov.*

Tree up to 20 m tall with a diameter of up to 60 cm, shortly buttressed; bark closely fissured, soft, c. 2.5 mm thick, brown to grey; inner bark pink; slash wood yellow; branches 2-grooved to slightly 4-angled below the upper node, becoming cylindric, 2–2.5 mm thick, drying grey to light brown; blades coriaceous, glabrous, elliptic to ovate, less frequently lanceolate, obtuse at the tip, acute and decurrent at the base; venation invisible on both surfaces, intra-marginal nerve very obscure to invisible, c. 2 mm from the margin, mid-vein sunken above, raised and tapering below; drying tan to dark olive-brown above, lighter brown below; 7–12.5 (15.5) cm long, 4–7 cm wide; petiole 5–8 mm long, 2 mm thick, glabrous; inflorescence glomerulate, up to 10 mm long, 5–10 mm wide, glabrous, many flowered, on tubercles from older branches behind the leaves; bracts and bracteoles lanceolate-ovate, acute, up to 0.5 mm long; primary axes 0.5–2 mm long, secondary axes glomerulate or up to 1 mm long; pedicels 10 or more, c. 3 mm long, calyx narrowly campanulate, thickened, 1.5–2 mm long, 1.5 mm wide, constricted above the ovary, margin truncate, flattening after flowering, glabrous, smooth, yellow, drying dark brown to black; petals ovate, acute at the tip, narrowed to the truncate base, c. 3 mm long, 1.5 mm wide, thickened with thinner margins, midnerve dorsally raised; filaments 4–4.5 mm long, anthers "C"-shaped, c. 1.5 mm long, gland prominent; style 2.5–3 mm long; ovules 10–12; fruit subglobose, 7–8 mm diameter, on pedicles c. 2.5 mm long, calyx remnant small, areolus c. 2 mm wide; exocarp green turning pink, roughened and blackish when dry; pericarp c. 1 mm thick and gritty.

Figure 5: a. inflorescence axes, calyx and style; b. petal, c. stamen

In general appearance *M. campanulatum* very closely resembles *M. edule* Roxb. var. *ovatum* (Sm.) Cl. (q.v.) which has longer inflorescences (primary axes at least 5 mm long), shallowly lobed to apiculate calyx, and petals that are more acute at the tip. The anthers and fruit appear to be the same. There seems to be a clear distinction between the lengths of the primary axes in these two species, those of *M. campanulatum* are not more than 2.5 mm long and in var.

ovatum they are at least 5 mm (generally 1–3 cm) long. It is tempting to consider *M. campanulatum* as a synonym of var. *ovatum*, but there are differences which do not, as far as can be determined, merge to form a clear gradation of variation between the two species. *M. campanulatum*, therefore, is maintained as a distinct species in this paper with a strong suggestion that it may be the same as var. *ovatum.* Kloss s.n., from Rawong, Selangor; is identical to the holotypes of *M. campanulatum* and *M. multiflorum* except that the calyx has a 4-apiculate margin. The petals and anthers of this specimen appear to be the same as the two type collections. The type collection of *M. multiflorum* Bakh. f. (Achmad 1191, from Sumatra) is identical to the holotype of *M. campanulatum* at Kew. Both type collections are in flower and fruits from other specimens collected in Sumatra and the Malay Peninsula match. *M. campanulatum* is apparently uncommon in both areas since there are only a few collections of this species available.

The congested, glomerulate inflorescence and the thick leaves of *M. campanulatum* are similar to those of *M. amplexicaule* Roxb. (q.v.) which differs in having a lobed calyx, nearly sessile and clasping leaves, and larger fruit.

Trengganu — Bukit Bauk: Hou 765; Jerangau For. Res.: Kochummen 2114

Selangor — Rawong For. Res.: Kloss sn

Pahang — Ulu Singei Anak, Endau: Cockburn 8105

Malacca — Ayer Panas: Derry 1184, Ridley 1184; sine loc.: Griffith 2325 (*type*)

Johore — Kluang For. Res.: Ng 98023; Ma'okil For. Res.: Sinclair 38992

Singapore — Ngadiman 36139

Further Distribution — Sumatra, Simeuloee Is. (*fide* Bakh. f.).

6. *Memecylon cantleyi* Ridl., J. Str. Br. Roy, As. Soc. 79 (1918) 72; *M. dissitum* Craib, Kew Bull. 1930, 325 *syn. nov.; M. steenisii* Bakh. f., Med. Mus. Bot. Utrecht 91 (1943) 355 and Rec, Trav. Bot. Neerl. 40 (1943-45) 355 *syn. nov.*

Shrub up to 3 m or a tree up to 15 m with a diameter up to 25 cm; bark thin, smooth, finely fissured and flaking, brown to greyish, inner bark yellow to brown; branchlets cylindric, often with two shallow grooves, sometimes with four faint lines or four distinct angles, very smooth, c. 1.5 mm thick, light tan to greyish when dry; blades coriaceous, less often subcoriaceous, lanceolate to ovate, acuminate at the tip (acumen up to 1 cm long), acute at the base and decurrent on the petiole for 2–3 mm, venation pinnate, 8–10 pair of nerves, very obscure to invisible above, very obscure below, more distinct in thinner blades, intramarginal nerve c. 2 mm from the margin, obscure to invisible, mid-vein sunken above, raised and tapering below, texture smooth in thin blades, rough in thicker ones when dry, 8–19.5 cm long, 3–7.5 cm wide; dark green above, slightly yellowish-green below; drying brown-greenish above, greenish below; petiole (5) 7–9 mm long, 1..25–1.5 mm wide; inflorescence 1.5–2.5 cm long, cymose from leafy or leafless nodes, each with 3–10 flowers; primary axes 1 or 2 from each axil, 5–11 mm long, flattened, secondary axes not developed or up to 6 mm long, pedicels clustered at the tips of the main axes, 3–5 mm long; calyx campanulate, c. 2.5–3 mm high 3–4 mm wide, flattening after flowering, smooth and glabrous outside, faintly ridged inside, margin truncate to somewhat undulate with 4 minute (often indistinguishable) cusps, purplish-pink; corolla buds apiculate, tips twisted; mature petals broadly ovate, 3–4 mm long, 3–4 mm wide, acute at the tip and often provided with a mucro, shortly clawed at the base, thickened with thinner margins, mid-nerve visible, lateral venation frequently visible, anthers bent in an overturned "U" shape, gland distinct in immature anthers, rather obscure and elongating in mature ones, anthers and filaments deep red-violet; ovary distinctly narrower than the base of the calyx, ovules 6–8, infructescence axes thickening and elongating 1–2 mm; mature fruit subglobose, c. 10 mm long, 8 mm wide, calyx remnant very prominent in immature fruits, less so when mature; areolus c. 4 mm wide, internal ridges very faint; pinkish-white or sulphur yellow, turning dark purple when mature, drying blackish when immature, light brown to tan when mature, smooth with a thin (c. 0.25 mm) exocarp.

Figure 6: a. inflorescence, b. flower, c. petal, d. stamen

The relatively large flowers that are on short inflorescences plus the large, subglobose fruit; and the flattened calyx in old flowers tend to characterise this species.

Memecylon dissitum Craib is, in this paper, considered as being the same as *M. cantleyi* Ridl. The types of *M. dissitum* (Kerr 15408, from peninsular Thailand) are in poor condition, nevertheless the holotype from Kew does have a few small buds and the isotypes from BM and BK both have fruit. The immature flowers, especially the anthers, match the buds of Sidek 380 — which is *M. cantleyi.* The fruit on both isotypes are the same as on Chelliah 104387 and Sinclair & Kiah 39964 — both clearly being *M. cantleyi.* The leaves on the type specimens of *M. dissitum* match those on the specimens of *M. cantleyi* (including the holotype) examined. Craib (l.c. 325) notes that *M. dissitum* is close to *M. garcinioides* Bl. (q.v.), however the structure of the inflorescence, size of the flowers, fruit, and especially the anthers differ. The anthers of *M. garcinioides* are quite unusual and those of *M. dissitum* are not at all similar.

Memecylon cantleyi Ridl. is most closely related to *M. oleifolium* B. (q.v.) since the branches, especially the grey-tan colour when dry; leaves, and inflorescence structure are very similar. The flowers are also similar, however those of *M. oleifolium* are much smaller and the fruit of *M. cantleyi* is smooth and not roughened as with *M. oleifolium.*

Memecylon steenisii Bakh. f., from Sumatra, has also been reduced to a new synonym of *M. cantleyi* Ridl. and is more remotely related to *M. oleifolium* Bl. than Bakh. f. suggests. The holotype of *M. steenisii* (van Steenis 3373) and the paratype (Achmad 1387) at Leiden both have inflorescences c. 1 cm long each with 3–7 flowers. The size of the calyx (all buds) and the shape of the petals, especially the texture, strongly resemble *M. cantleyi.* The bud anthers resemble both *M. cantleyi* and *M. oleifolium.* These two specimens of *M. steenisii* also have blades which have dried greenish to yellow-greenish as in *M. cantleyi* — in contrast to *M. oleifolium* which dries brown.

The holotype of *M. steenisii* matches Yusoff 99141 and Suppiah 104811 (from Pahang and Kelantan, respectively) and is essentially identical to Chelliah 104387 (from Pahang) which has definite *M. cantleyi* fruit. The flowering and fruiting axes of all of these specimens are up to 1 cm long and are structurally the same. *M. oleifolium* has longer axes which are typically over 1 cm long. The holotype of *M. dissitum* Craib compares very closely in all vegetative and flowering features to the two types of *M. steenisii.* All these specimens are in bud and the size and shape of the inflorescences and buds are essentially identical.

Since the fruit of *M. steenisii* Bakh. f. has not been seen it is impossible to be absolutely certain that it is a synonym of *M. cantleyi*. However, from the evidence described above it is reasonably certain that this reduction is justified.

Thailand

Kanchanaburi, Kwae Noi Basin: Kostermans 940; Nakorn Sri Tammarat, Kao Luang: Kerr 15408 (*type M. dissitum* Craib)

Malay Peninsula

Kedah — Bukit Enggang For. Res.: Sidek 380; sine loc.: Saaid 20661

Penang — Nauen sn, May 1940

Perak — Larut: King's coll. 7635

Kelantan — Ulu Sat For. Res.: Suppiah 104811

Trengganu — Ulu Brang: Moysey & Kiah 33641; Sinclair & Kiah 39964

Selangor — Bukit Bauk For. Res.: Kochummen 2384

Pahang — Belingoo, Temerloh: Awang-Lela 4578; Bentong: Ahmad 5099; Gunong Benom, Ulu Krau: Chelliah 104387, Yusoff 9914; Jambu Bongkok: T. & P. 8 (2608); Jenderak Halt: Kadim & Mahmood 50; Jerantut: Holttum 24751; Raub: I.H. Burkill & Haniff 16219; Sungei Krau, Temerloh: Strugnell 22472, 22475; Tembeling: Henderson 24515; Titi Bungkor, Temerloh: Henderson 10671; Ulu Checka, Benom Forest: J.C. (Carrick) 1639 (2569); Ulu Chineas, Kuala Lipis: I.H. Burkill & Haniff 17091

Negri Sembilan — Seremban: Alvins sn, 21 April 1886

Malacca — Ayer Panas: Derry 1240; sine loc.: Maingay 817 (1688)

Johore — Sungai Kayu: Kiah 32170; Sungai Sedili: Corner 36980

Singapore — Ahmad 1221, Cantley 148, Ridley 13012 (type), Shah 1733.

Further Distribution — Sumatra, Simeuloee Is. (*fide* Bakh. f.)

7. *Memecylon cinereum* King, J. As. Soc. Bengal 69, II: 1 (1900) 82 (Mat. Fl. Mal. Pen. III, 490); *M. umbellatum* Wall. Cat. 4109, in part.

Shrub 1–2 m or a tree up to 4 m tall; upper branches grooved and ridged on 2 sides, or somewhat 4-angled with wider grooves, c. 1 mm thick; older branches cylindric, smooth, thicker, younger branches drying dark brown to blackish, older ones tan; blades subcoriaceous, ovate to lanceolate, long acuminate to almost caudate at the tip (acumen up to 1 cm long), acute to cuneate and often decurrent on the petiole; midnerve sunken above, raised and tapering below, other venation generally invisible on both surfaces; 5.5–12 cm long, 2.5–5 cm wide, drying dark brown to blackish above, dark brown below, very smooth on both sides, entirely glabrous; petiole c. 5 mm long, 1 mm thick; inflorescence cymose, appearing glomerulate, 5–7 mm long, from leafy nodes, glabrous; primary axes flattened, up to 1.5 mm long with 1 node, secondary axes fused and indistinct or c. 1 mm long, pedicels c. 1 mm long, flowers numerous in each inflorescence; calyx campanulate and widened above the ovary, 1.5–3 mm long, 2.5–3.5 mm wide, smooth or minutely papillose outside, ridged internally; lobes distinct, broadly triangular, 0.25–1 mm long; pinkish or blue; petals broadly ovate, acuminate to aristate at the tip, narrowed and truncate at the base, mid-vein thickened but not keeled, 1.5–3.5 mm long, 1–1.5 mm wide, whitish or purple; filaments c. 3 mm long; anthers triangular-cuneate, without a gland or in bud anthers sometimes visible as a very minute bump, c. 1.5 mm long; ovules 6–10; fruit globose, 7–8 mm diameter, calyx remnant slightly raised, with a square limb which is often flattened in the plane of the fruit, easily falling off; areolus 1.5–2 mm wide, internal ridges distinct; exocarp generally smooth or with a few minute warts, c. 0.2 mm thick, black when dry; testa glossy, brown-tan when dry.

Figure 7: a. calyx and style, b. calyx, c. bud petal, d. mature petal, e. stamen

M. cinereum King is very closely related to *M. lilacinum* with the inflorescence, calyx, and especially the glandless anthers. The blades and fruit differ. *M. malaccense* (Cl.) Ridl. is probably even more closely related, and the only major difference is with its rounded and shallowly cordate (c. 0.5 mm) blades and shorter calyx lobes. Those of *M. cinereum* are acute and decurrent at the base. The inflorescence, in basic structure, is similar, although less glomerulate with *M. malaccense*. The petals, anthers, and fruit are the same.

Memecylon floridum Ridl. (q.v.) has slightly larger axes, but otherwise the flowers are the same. The blades and especially the larger fruit with a fibrous pericarp are major differences.

Two specimens of Wallich Catalogue 4109 at Kew, inserted in a type folder of *M. edule* Roxb. var. *ovatum* (Sm.) Cl., are clearly *M. cinereum*. According to Cogniaux (l.c. 1155, 1156) other parts of the collection belong to *M. edule* var. *ramiflora* Triana, and *M. edule* var. *ovatum*.

Perak — Salama: King's coll. 3143 (*lectotype*); Silma: Scortechini 2035 (*syntype*); Ulu Kal: King's coll. 10758 (*syntype*); sine loc.: Scortechini 394 (*syntype*)

Trengganu — Gunong Padang: Moysey & Kiah 3390

Selangor — Ginting Simpah: Hume 9011; Pahang Track: Ridley 8615; Semangkok Pass: I.H. Burkill 8888, Ridley 15570; Sungei Bulok: Goodenough 10602; Trig. Station: Suilliee 8888; Weld's Hill: Cubitt 5109, Hamid 9908

Pahang — Bentong: Best 13852; Temerloh: Henderson 10514, 10704

Singapore — Wallich Cat. 4109 (type *M. umbellatum* Wall., in part)

8. *Memecylon corticosum* Ridl., J. Fed. Mal. States Mus. 10 (1920) 92.

Shrub 2–3 m tall or treelet up to 3 m tall; branches distinctly 4-winged throughout the upper internodes, nodes with wider wings (appearing auricled); branches becoming cylindric with age, 2–3 mm thick, drying grey to tan; blades sub-coriaceous, lanceolate to elliptic, acuminate at the tip (acumen 1–2 cm long); rounded, and in larger blades slightly (c. 1 mm) cordate, less frequently narrowed, at the base, venation pinnate, c. 15–20 pairs of nerves, sunken and obscure to distinct above, raised, often prominently, below, intramarginal nerve similar, 4–6 mm from the margin, broadly looping, midnerve sunken above, prominently raised and tapering below; 10–23 cm long, 3–9 cm wide; medium glossy green above, dull green below, drying light greenish-brown above, light brown or greenish below; petiole 2–3 mm long, 2–3 mm thick; inflorescence cymose, often appearing glomerulate, from behind the leaves, often ramiflorus on thickened (c. 1 cm) branches with tubercles 2–4 mm thick; c. 5 mm long; bracts and bracteoles ovate, acute, thickened, c. 0–5 mm long, persisting; primary axes several per axil, with 1 or 2 nodes, flattened, 1–4 mm long; secondary axes almost indistinguishable and appearing fused or up to 0.5 mm long; pedicels 5–10, 2.5–3 mm long; calyx campanulate, often appearing funnelform with a constriction above the ovary, margin truncate with 4 broad and short lobes; thickened, smooth, glabrous, ridged internally, sometimes flattening after flowering, 1–1.5 mm long, 2–2.5 mm wide; pink, drying black; bud petals thick, broadly ovate, obtuse at the tip, truncate at the base, margins thinner, 3–4 mm long, 4 mm wide, dark crimson, white; anthers slightly curved to almost "C"-shaped, purple with a prominent gland; ovules 4–6; fruiting pedicels c. 5 mm long; fruit pyriform to obovate, capped by the slightly raised calyx remnant, areolus c. 3 mm wide; 9–11 mm long, 8–9 mm wide (at the widest point), exocarp pale greenish-white, flushed purplish-violet when nearly ripe, drying smooth or with a somewhat roughened texture; pericarp c. 0.5 mm thick.

Figure 8: a. upper node and internode, b. leaf, c. flower bud, d. calyx, e. petal, f. stamen

The holotype of *M. corticosum* Ridl. (Kloss 7027, from peninsular Thailand) has bud anthers which differ completely from *M. wallichii* and *M. longifolium*, thus it is certain, even though the blades and branches of *M. corticosum* often appear similar, that *M. corticosum* is distinct from these other two. The blades on the holotype of *M. corticosum* have distinct venation, however in most other specimens the venation is more prominently raised below. One specimen (Shah & Noor 1838) has a few very immature buds on a small tubercle in a leaf axil, however all the other specimens studied have the inflorescence behind the leaves or on thickend branches.

The winged branches and general shape of the leaves suggest close affinities with *M. fruticosum* King (q.v.) (including synonyms *M. epiphyticum* King and *M. tenuifolium* Ridl.). All of these taxa are poorly known, thus their exact relationships are difficult to determine. *M. kunstleri* King (q.v.), which is also incompletely known, has elliptic fruit and similar bud stamens, but cylindric branches.

Vegetative specimens are easily confused with *M. wallichii* Ridl. (q.v.) and in several collections, e.g. Henderson 19581, Moysey & Kiah 33738, 33856; the distinction is not clear due to lack of flowers or fruit. The inflorescences in these three collections are ramiflorus, thus they have been inserted under *M. corticosum*. Henderson s.n., from Batu Papan, Kelantan is vegetative and could also be referable to *M. wallichii*.

Thailand

Bangtapan, Ratchaburi: Keith 492; Tasau, Chumpawn: Kloss 7027 (*type*)

Malay Peninsula

Kelantan — Bukit Batu Papan: Henderson sn, 8 July 1935; Gua Minik: Henderson 19581; Gua Panjang: UNESCO 609

Trengganu — Kuala Trengganu-Besut Road: Sinclair & Kiah 4058; Ulu Brang: Moysey & Kiah 33738, 33856; Ulu Telemong For. Res.: Suppiah 11408

Pahang — Ulu Sungei Sat: Shah & Noor 1838

Johore — Sungei Juasseh, Labis: Ahmad 283

9. *Memecylon dichotomum* (Cl.) King in J. As. Soc. Beng. 69, II:I (1900) 75 (Mat. Fl. Mal. Pen. III, 483). *M. elegans* Kurz var. *dichotoma* Cl. in Hk. f., Fl. Brit. Ind. II (1879) 554; Cogniaux in DC., Monogr. Phan. 7 (1891) 1138; *M. ridleyi* Cogn. ex Ridl., J. Str. Br. Roy. As. Soc. 30 (1897) 85 *nomen nudum; M. eugeniiflora* Ridl. (*"eugeniflora"*), J. Str. Br. Roy. As. Soc. 57 (1910) 48 *syn. nov.; M. dichotomum* (Cl.) King var. *eugeniiflorum* (Ridl.) Ridl., Fl. Mal. Pen. I (1922) 812 syn. *nov.*

var. *dichotomum*

Tree 6–12 m tall with a diameter up to 30 cm, less commonly a treelet or a shrub up to 3 m tall; bole irregular with many knots; bark thin, slightly fissured and scaly, light brown; upper nodes slightly flattened, often somewhat 4-winged or 4-auricled; internodes usually sharply 4-angled and usually tapering to cylindric, older branches cylindric; 1–2 mm thick; blades chartaceous to subcoriaceous, lanceolate or ovate, acuminate at the tip, rounded or shallowly cordate at the base; venation pinnate, c. 8–15 (20) pairs of nerves, obscure above, distinct and often slightly raised below; intramarginal nerve obscure to distinct, 3–4 mm from the margin, broadly looping; mid-vein sunken above, raised and tapering below; 5–10 cm long, 2–5 cm wide; glossy greeen above, duller green below; drying dark brown to greenish above, greenish to olive-green or brown below; entirely glabrous; petiole 1–2 mm long, 1–1.5 mm thick (cordate based blades appearing sessile), glabrous; inflorescence cymose, 5–7 mm long, glabrous, few (often 3) flowered; primary axes 1 — several from leaf axils, 0.5–3 (exceptionally 5) mm long, with 1 or 2 nodes, flattened and 4-angled; secondary axes 3–5, up to 3 mm long, less commonly not developed; pedicels papillose, solitary on the tip of each secondary axis, 0.5–1 mm long; bracts thick, lanceolate to ovate, acute, c. 1 mm long, persistent; bracteoles similar, both usually minutely papillose; calyx campanulate, often constricted above the ovary, becoming funnelform after flowering, slightly thickened, truncate and often splitting irregularly at the margin, usually minutely papillose outside, 3 mm long, 4 mm wide, pink to red; petals thick coriaceous with thinner margins, broadly ovate to suborbicular, broadly rounded to almost truncate at the tip, often with a minute mucro; narrowed and somewhat clawed or entirely truncate at the base; midnerve not apparent, 3–3.5 mm long, 3.5–5 mm wide, whitish to pink, reflexed at maturity; filaments white, 3–4 mm long; anthers lilac, crescent shapped to "C"-shaped, 1–1.5 mm long; gland centrally located, prominent, red-brown; stigma minute, style 3–4 mm long; ovules c. 8; fruit globose, 12–16 mm diameter, calyx remnant distinctly raised (c. 1 mm) and thickened, areolus 4–5 mm wide; exocarp green when immature, turning yellow flushed with rose-red, becoming blackish when ripe, edible, sweet, smooth and thin in smaller and immature fruits, becoming minutely muricate-papillose and black when dry; pericarp c. 1 mm thick, gritty.

Figure 9: a. branch, leaf, and internode;
b. bracts, calyx, and style; c. petal, d. stamen

A variable species with several forms which are not well understood. The papillose pedicels and calyx recall *M. minutiflorum* Miq. (q. v.), but that species has a very sharp constriction above the ovary, different branches, leaves, and fruit.

The two syntypes of *M. eugeniiflora* Ridl. have narrower and thicker blades than the type collection of *M. dichotomum*, however both taxa have identical branches, inflorescences, and flowers. Several collections clearly show that both narrow and wide blades occur on the same plant, e.g. Ridley 13423 and others with both distinct (*dichotomum*) and indistinct to invisible (*eugeniiflora*) venation, e.g. Selvaraj 11189. There is no reason, therefore, to maintain Ridley's taxon as distinct from *M. dichotomum*. The papillose calyx and distinct bracts of Ridley 14695 (syntype of *M. eugeniiflora*) match those of the type collection of *M. dichotomum*.

Another species, *M. ridleyi* Cogn. ex Ridl., only differs from *M. dichotomum* in the former having more rounded leaf bases and perhaps fainter venation on the leaf undersurfaces. Two specimens (Ridley 2241, 2609) from Tahan River and Kuala Tahan (respectively), Pahang) were collected within days of each other and have "*M. ridleyi* Cogn." written in Ridley's writing on their original labels. These are the only two specimens of *M. ridleyi* seen in the Singapore collection. King (l.c. 75) lists Ridley 2609 under *M. dichotomum*, and Furtado annotated this specimen as *M. dichotomum* also. Ridley 2241 was annotated as *M. perakense* by Furtado. There is no doubt that both of these specimens are *M. dichotomum*. *M. ridleyi* is listed by Ridley in his compilation of Malay plant names as "delima burong". Apparently Ridley never published a description of this species, therefore it is a *nomen nudum*. Thus, not only are the differences of this species artificial, but the name itself cannot be used due to nomenclatural rules.

A form of *M. dichotomum* with cylindric or obscurely 4-angled branches, coriaceous blades with shallowly (1–2 mm) cordate bases with invisible venation, and a smooth calyx with a broadly 4-lobed margin each tipped with a minute cusp is known from two collections on limestone from Kelantan. More material of this form is desired for a better understanding of its exact taxonomic status (UNESCO 520, Whitmore 4039).

uses: the liquid from boiled roots is drunk after childbirth, boiled roots used for rheumatism, used for house posts which last for 5 or 6 years when exposed; the fruit is stupefying, and the very heavy (sinks in water), durable wood is used for making spring bows (belantek).

Kedah — Bukit Enggang For. Res.: Kochummen 2011; Gunong Baling: Corner sn, 25 Nov. 1941; Gunong Jerai: Ridley 5752

Perak — Bujong Malacca: Ridley 9638; Gunong Tempurong: Allen & Kadim 494; Larut: King's coll. 3239, 5036, 5297; Maxwell's Hill: Ridley 2938, sn in June 189?; Wray 2989; Temengo: Ridley 14695 and 14696 (*types M. eugeniiflora* Ridl.); Ulu Kal: King's coll. 10783

Kelantan — Gua Batu Goh: Whitmore 4039; Gua Musang: UNESCO 241; Gua Panjang: UNESCO 520, Henderson 19595; Gunong Rabong: Shah 2486; Kampong Gobeh For. Res.: Shah & Kadim 489; Sungai Ketchil, Batu Papan: Nur & Foxworthy 12073; Sungai Lebir: Cockburn 7103; Temanga For. Res.: Brown 52920

Selangor — Bukit Enggang: Symington 24199; Chadangan For. Res.: Chelliah 98204; Dusun Tua: Ridley 7331; Gading For. Res: Loh 13369; Klang Gates: Ridley 13423; Kuala Lumpur: Curtis 2338; Sempang Mines: Ridley 15693; Sungei Bulok: Jaamat 13908; Sungei Lalang Kajang: Symington 24075; Ulu Klang Ampang: Gadoh 1661; Ulu Langat: Gadoh 959, Suppiah 11262

Trengganu — Bukit Kajang: Corner 30312, 30327; Gunong Tebu, Besut: Selvaraj 11189

Pahang — Bentong: Shah 194; Bukit Cheras: Henderson 25064; Cameron Highlands: Nur 32862; Fraser's Hill: I.H. Burkill & Holttum 8697, Cubitt 6522, Henderson & Nur 11142, Kalong 22411, Kochummen 98156; Gali near Raub: I.H. Burkill & Haniff 16249; Genting Highlands: Kochummen 16678; Whitmore 0925, 4629; Gunong Serudom, Kuantan: Shah, Sidek, Samsuri 3777; Jenderah Halt: Kadim & Mahmood 27, Kadim & Nur 27; Kota Glanggi: Henderson 22403; Krau Game Res.: Whitmore 3231; Kuala Tahan: Ridley 2241 (*syntype M. ridleyi* Cogn. ex Ridl.); Kwala Tembeling: Ridley sn (= 2241), Aug. 1891; sn in 1891; Holttum 20535, Henderson 21772; Lesong For. Res.: Ahmad & Shukor 421; Raub: Strugnell 22259; Sungai Nerling, Temerloh: Henderson 10565; Tahan River: Ridley 2609 (*syntype M. ridleyi* Cogn. ex Ridl.); Sungai Tahan: Kiah 31902, Mat sn in 1893; Taman Negara: van Balgooy 2479; Telom Valley: Kiah & Strugnell 24023; Temerloh: Burn-Murdoch 164; Ulu Keniayam: Shah 1535; Ulu Sungei Sat: Shah & Noor 1777

Negri Sembilan — Gemas: I.H. Burkill 6387; Gunong Angsi: Nur 11572, Osman 23669; Bukit Tangga: Ridley sn on 17, 22, 27 Dec. 1920; Gunong Tampin: Holttum 9574; Sungei Ujong: Alvins 1925, 2217, sn

Malacca — Mt. Ophir: Maingay 820 (2598); sine loc.: Alvins 119, Griffith 2324 (*type*), Maingay 818 (1424)

Johore — Gunong Belumut: Whitmore 8748; Khiang: Holttum 9279; Labis For. Res.: Jumali 6711 (4257), Maxwell 77–372; Sungei Endau: Shah, Shukor, Ahmad 2624; Sungei Juasseh, Labis: Ahmad 273

Further Distribution — peninsular Thailand: Pattani (*fide* Craib).

9a. *Memecylon dichotomum* (Cl.) King var. *rotundatum* (Craib) Maxw. *comb. nov.; **M. gracilipes*** Ridl. var. *rotundatum* Craib, Fl. Siam. Enum. I:4 (1931) 708; ***M. gracilipes*** Ridl., J. Str. Br. Roy. As. Soc. 79 (1918) 72 not C. B. Robinson, Phil. J. Sci. Bot. 6 (1911) 353; ***M.** curtisii* Burk. & Hend., Gard. Bull. Str. Settl. III (1925) 377 *syn. nov.; **M.** perakense* Merr., Gard. Bull. Str. Settl. 8 (1935) 132 *nom. illeg.*

Tree up to 6 m tall or a shrub 1–3 m high; branchlets 4-angled and almost winged below the upper nodes, often becoming cylindric in the lower parts of the internode, cylindric in older branches, c. 1 mm thick; blades subcoriaceous, ovate, acuminate at the tip (acumen 1–2 cm long); shallowly (1–2 mm) cordate or less commonly broadly rounded at the base; venation pinnate, 6–12 pairs of nerves, sunken above, faintly to distinctly raised below, intramarginal nerve 2–3 mm from the margin, looping, midnerve sunken above, raised and tapering below; 5.5–10 cm long, 2.5–4.5 cm wide; drying dark brown to blackish above, brown below; petiole c. 1 mm long, shorter than the cordate sinus at the base of the blade; inflorescence a simple umbel composed of 3 flowers, solitary from leaf axils, 20–33 mm long; primary axes 15–20 mm long, c. 0.3 mm thick, glabrous; secondary axes subtended by a pair of lanceolate-ovate, acute bracts, c. 0.75 mm long, 1 or 3 per inflorescence, 1–4 mm long; each, when developed, with 1 pedicel; pedicels 2–4 mm long, subtended by 2 lanceolate, acute bracteoles, 0.5–0.75 mm long; calyx campanulate, lobes broadly triangular, acute, sinuses wide, lobes less distinct as the flowers mature and often appear almost truncate, minutely papillose-muricate outside, ridged internally, c. 2 mm long, 2.5 mm wide; petals ovate, acute, 1–1.5 mm long (ex description); anthers (only seen in bud) crescent shaped, c. 2 mm long, gland obscure, not cupular, in many instances it is merely a thickened area on the connective, probably even more obscure in mature anthers; fruit globose, 15–20 mm diameter at maturity (*ex* description), calyx remnant distinctly raised, areolus 1.5–2 mm wide; exocarp smooth, becoming minutely muricate with maturity drying black; pericarp thin when immature, thickening with maturity; testa glossy brown.

Figure 9a: a. inflorescence and calyx, b. bud stamens.

This variety is very closely related to *M. fruticosum* King (q.v.) and even closer to the typical variety. A reduction of var. *rotundatum* to the typical variety has not been made since there is variation in the inflorescences of the two taxa, thus the two can always be easily distinguished on this basis. This is not true with the leaves of both since they are variable.

There are two specimens in the Singapore collection (Haniff 14969, and Henderson 23798) which fit Ridley's description of *M. gracilipes* Ridl. viz. the nearly sessile blades with round, often cordate bases; and the three flowered, slender, long-peduncled umbel. Furtado annotated both of these as *M. perakense* Merr. *M. gracilipes* Ridl. is a later homonym of *M. gracilipes* C. B. Rob. — an entirely different species from the Philippines. *M. gracilipes* Ridl. was incorrectly renamed as *M. curtisii* by Burkill and Henderson. At varietal status *M. gracilipes* Ridl. var. *rotundatum* Craib is the oldest and only existing epithet for this taxon and must be used as the correct name here. Merrill's epithet cannot be used since it was not only published after Craib's var. *rotundatum*, but also has no priority outside its species rank.

Curtis 1295, the type collection of *M. gracilipes*, matches Kerr 15766 which is the type collection of var. *rotundatum*.

Thailand

Trang: Kerr 15766 (*type M. gracilipes* Ridl. var. *rotundatum* Craib), 19172

Malay Peninsula

Perak — Gunong Pondoh: Henderson 23798; Padang Rengas Reservoir: Haniff 14969; Waterloo Estate: Curtis 1295 (type *M. gracilipes* Ridl.)

10. *Memecylon edule* Roxb., Corom. Pl. I:4 (1798) tab. 82, and Fl. Ind. ed. 2, (1832) 260; *M. globiferum* Wall. Cat. 4108.

var. *edule*

Tree up to 12 m tall with a diameter up to 15 cm, less frequently a shrub up to 3 m tall; bark finely fissured, not flakikng, grey-brown; inner bark thin, ochre; branchlets somewhat flattened and grooved on 2 sides, grooves often widened, thus appearing 4-ridged or 4-angled, becoming cylindric with age, 1–1.5 mm thick; blades coriaceous, ovate, obtuse to acute at the tip, acute and decurrent at the base; venation pinnate, invisible or infrequently extremely obscure on both surfaces; mid-nerve sunken above, raised and tapering below, 4.5–7.5 cm long, 2.5–4 cm wide; dark green above, light green below; drying dark brown above, brown below; petiole 4–6 mm long, 1–1.5 mm thick; inflorescence from the axils of older leaves, sometimes from defoliate nodes, cymose, often contracted and appearing glomerulate, glabrous, (0.5) 1.5–2 cm long, many flowered;

primary axis 1 or 2 from each axil, flattened and grooved or angled (1) 6–10 mm long; often with 2 or 3 nodes; secondary axes usually 5, less frequently glomerulate, 4–5 mm long; tertiary axes 0–2 mm long; pedicels 2–3 mm long; calyx campanulate, truncate with or without 4 minute cusps or 4 undulate lobes smooth outside, ridged internally, 1–1.5 mm long, 2–2.5 mm wide, pinkish; corolla buds conical, tips acute to shortly acuminate, twisted; petals coriaceous, broadly ovate to oblong, acuminate at the tip, truncate at the base with a very short, broad claw, dorsally keeled, margins with a wide thin zone, 1.5–2.5 mm long, c. 1.5 mm wide, white, often with a pink hue; filaments c. 2 mm long, blue; anthers crescent shaped, whitish to lilac, gland centrally located; stigma minute, style c. 3 mm long, blue; ovules 8–14; fruit globose, often somewhat flattened, thus slightly wider than long 5–9 mm wide, calyx remnant raised, areolus c. 1 mm wide, exocarp green to yellow/green, turning pinkish, finally dark purple to blackish when ripe, drying greenish-brown, often somewhat mottled, with a slightly rugose texture; pericarp 0.5–1 mm thick, not gritty.

Figure 10: a. calyx and corolla bud, b. calyx and style, c. petal, d. & e. stamens

habitat: open places, frequently found near the seashore

In many respects *M. edule* resembles *M. lilacinum* Z & M. (q.v.) but that species has 4 distinctly apiculate calyx points, narrower and long acuminate petals, no anther gland, and a grooved, flattened fruit with a very thick, gritty pericarp. *M. pauciflorum* Bl. (q.v.) is similar in flower structure to *M. lilacinum,* but has a distinct anther gland similar to that of *M. edule.*

Thailand

La Tang Si: Annandale 1696

Malay Peninsula

Kedah — Pulau Langgun: van Balgooy 2349; Pulau Langkawai: Curtis 2627, 3691, sn in Feb. 1899; Haniff & Nur 7072; Keng et al. 126; Ridley 15804; Robinson 6321; Telok Udang: Haniff 1027

Perak — Pangkor: Corner 31653

Kelantan — Gunong Brong: Shah & Ali 2891; Kota Baru: Ridley sn; Tumpat: Corner sn on 22 April 1936

Trengganu — Kuala Dugun: T. & P. 349 (2949); Kuala Trengganu: Holttum 15158, Brelkerta sn on 1 Nov. 1939, Sinclair 40726; Mesang: Poore 6133

Selangor — Merchang: Poore & Merton 1133

Pahang — Badok For. Res.: Hou 763; Fraser's Hill: Nur 11318, I.H. Burkill & Holttum 8937; Gunong Tahan: Wray & Robinson 5352; Pulau Duchong: Corner sn on 22 Aug. 1935; Praman Pekan: Ridley = 1027, sn on 26 Aug. 1889; Rompin: Bidin 15442; sine loc.: Ridley 1027

Negri Sembilan — Cape Rachado: Mahmud bin Sider 13212, Kochummen 2484

Malacca — Gadek: I.H. Burkill 4477; Pulau Rumbia: Seimund sn; Sungai Hudang: Derry 1028; Tanjong Bidara: Wong 2566; sine loc.: Alvins sn: Griffith 2326, 2327; Maingay 812

Johore — Mersing: H.M. Burkill & Shah 2508; Pulau Batu off Mersing: H.M. Burkill & Shah 2526; Pulau Setindan: Corner 29760; Tg. Penawar: Cockburn 7646

Singapore — Henderson 35783, Hullett sn; Ridley 6054, 6531, 9564, sn in 1890, sn in 1894, sn in 1906; Sinclair 39004, Maxwell 80-180

Further Distribution — India, Ceylon, Andaman Islands, Burma, Tonkin, Banka Is., Borneo (*fide* Cogniaux).

10a. *Memecylon edule* Roxb. var. *ovatum* (Sm.) Cl. in Hk. f., Fl. Brit. Ind. II (1879) 564. *M. ovatum* Smith, Rees Cyclop. 23 (1813). *M. laxiflorum* Wall. ex Ridl., J. Str. Br. Roy. As. Soc. 79 (1918) 74 *syn. nov. M. rhodophyllum* Bakh. f., Med. Mus. Bot. Utrecht 91 (1943) 357 and Rec. Trav. Bot. Neerl. 40 (1943-45) 357 *syn. nov.*

Tree up to 18 m tall, with a diameter up to 20 cm, or a shrub up to 5 m tall, bark thin, finely fissured and flaking off in thin, broadly oblong pieces, brownish; inner bark pale ochre, branchlets cylindric, often flattened and shallowly grooved on 2 sides below the upper node, 1–2 mm thick, drying greyish to tan; blades coriaceous, ovate, less commonly broadly elliptic or suborbicular, obtusely acute to obtusely acuminate at the tip, broadly rounded to acute and slightly decurrent at the base; venation pinnate, c. 15 pairs of nerves, very obscure to invisible above, distinct, but rather faint below; intramarginal nerve obscure to invisible below, c. 1 mm from the margin; midnerve sunken above, raised and tapering below; dark, glossy green above, yellow/green below, drying dark brown to blackish above, lighter brown below; 5–12 cm long, 3–6.5 cm wide; petiole 6–15 mm long, 1–2 mm thick; inflorescence from the axils of lower leaves and more commonly from leafless nodes just behind the leaves; cymose, densely flowered, often appearing glomerulate when the axes are short, 1–3 (exceptionally 4) cm long; primary axes 1–3 from each axil, vertically arranged, flattened and 4-angled or 2-grooved on 2 sides, 1–2 mm wide, glabrous, 5–15 (rarely 30) mm long; secondary axes 5–8 (10) mm long, tertiary axes 0–2 (5) mm long, pedicels 3–4 mm long; calyx campanulate, widened above the ovary, margin with 4 shallow undulations, or with 4 broadly rounded to acute lobes, sometimes truncate with 4 minute cusps; smooth outside, ridged internally, c. 1.5 mm long, 2 mm wide, pink; corolla buds conical, apiculate, tips twisted; petals thin, venation visible, broadly ovate to orbicular, broadly rounded and acute at the tip, truncate and sometimes distinctly clawed at the base, midline and claw with a thicker texture; 2.5 mm long, 2.5 mm wide, pale to brilliant blue, often purplish; filaments 2.5 mm long, pale blue; anthers "J" to "U"-shaped, c. 1 mm long; gland centrally located, reddish black; stigma minute, style c. 3 mm long; ovules c. 8; fruit globose, 8–10 mm diameter, calyx remnant raised, thin, areolus c. 2 mm wide; exocarp green, turning yellow, red, pink, then purple-black when ripe, smooth to slightly rugose and black when dry; often associated with keringga (red) ants, pericarp at first thin, when ripe 0.5–1 mm thick, gritty.

Figure 10: a. calyx and style, b. petal, c. stamen. Figure 33.

habitat: open lowlands, commonly near the sea, recorded on limestone.

In general the blades of var. *ovatum* are larger and have longer petioles than var. *edule*. The calyx in var. *ovatum* is usually broadly and shallowly 4-lobed while those of the typical variety are truncate and sometimes have 4 minute cusps. The bark of var. *edule* is narrowly fissured and does not flake off while that of var. *ovatum* has wide fissures and flakes off. The blade venation of var. *edule* is generally invisible, while those of var *ovatum* are faint, but visible in most specimens, var. *edule* also has a shorter petiole and smaller inflorescences which most frequently come from leaf axils. The petals of var. *edule* are coriaceous, with a short claw, and white.

Memecylon campanulatum Cl. (q.v.) is very closely allied and differs in having a nearly sessile inflorescence, truncate calyx, and blunt petals. As I have not seen any intermediate forms linking the two taxa, I have maintained the two as separate entities (q.v. discussion under *M. campanulatum*). The holotype of *M. laxiflorum* Wall. ex Ridl. (Wallich 4472, from Singapore) is a fruiting specimen which matches many similar specimens from throughout the peninsula. Considering the variation in the size of the leaves and inflorescence, Wallich 4472 is in no way variant and should be considered a synonym of *M. edule* Roxb. var. *ovatum* (Sm.) Cl. This specimen was cited by Clarke and Cogniaux under *M. grande* Retz., however King did not agree with this treatment and included it under doubtful species. *M. rhodophyllum* Bakh. f., described from 5 sheets collected by de Vriese (s.n.) from the Moluccas, only differs from *M. laxiflorum* Wall. ex Ridl. in having slightly shorter (2–4 cm) infructescences on thinner axes. All the isotypes are in fruit, however all of them are identical to var. *ovatum.* The fruit of these specimens of *M. rhodophyllum* are smaller and have a more prominent calyx remnant, but aside from this and the axes, significant differences between this species and var. *ovatum* have not been found. There are specimens at Singapore and Leiden which have smaller fruit and thinner axes and these all fall well within the range of variation for var. *ovatum*, therefore *M. rhodophyllum* has been reduced.

Thailand

Bang Son: Haniff & Nur 4245

Malay Peninsula

Perlis — Bukit Lapi: Henderson 22803; Kaki Bukit: Kiah 35283

Kedah — Bukit Hantu: Chew 207; Gunong Kerriang, Alor Star: Kiah 35412; Pulau Langkawi: van Balgooy 2319; Stone 6906, 6967; Chan 6800; Pulau Jerkam: Corner sn on 7 Nov. 1941; Pulau Selang: Corner sn on 22 Nov. 1941; Pulau Rawei: Ridley 15779; Pulau Tuba: Chen 41016

Penang — Pulau Jerjak: Ahmad 1004, 1012; Penang: Curtis 723 in Oct. 1885 (*syntype M. laxiflorum* Wall. ex Ridl.), Muka Head: Curtis 723 in March 1886 (*syntype M. laxiflorum*), Curtis 723 in May 1893 (*syntype M. laxiflorum*), Curtis 723 in 1893 (*syntype M. laxiflorum*); Gov.'t. Hill: Curtis 723 in May 1894; Batu Ferengy: Curtis sn, May 1901; sine loc.: Forest Guard sn, Guard sn

Perak — Larut: King's coll. 4175; Pangkor Island: Foxworthy 237, Corner 31656, Whitmore 3006

Trengganu — Pulau Kapas: Holttum 15215

Selangor — Ginting Simpah: Whitmore 4620; Gua Batu: Ridley 8279; Pulau Angsa: H.M. Burkill & Shah 970; Pulau Selatan: H.M. Burkill & Shah 933

Pahang — Gunong Tahan: Ridley 16279; Kluang Terbang: Barnes sn; Kuantan: I.H. Burkill & Haniff 17513; Pulau Chibeh: Corner sn on 19 Aug. 1935; Pulau Sepoi: Corner 29846

Malacca — Malacca Pindah: Alvins sn

Johore — Kilat Estate: Ridley 15396 (*syntype M. laxflorum* Wall. ex Ridl.); Minyak Buku: Ridley 11092 (*syntype M. laxiflorum*)

Singapore — Pulau Merambong: Corner sn on 29 Sept. 1935; Singapore: Ridley 9565, 9591; Wallich 4103B, 4109B, 4472 (*lectotype M. laxiflorum*).

Further Distribution — India, Ceylon, Andaman Islands, Burma, Tonkin; Banka, Karimata, Billington Islands; Borneo (Indonesian part), Karimoen Djawa Islands, Sumatra, Java (*fide* Cogniaux and Bakh. f.).

11. *Memecylon excelsum* Bl., Bijdr. Fl. Ned. Ind. 17 (1826) 1094; *M. heteropleurum* Bl., Mus. Bot. Lugd.-Bat. I:23 (1851) 362 *syn. nov., M. heteropleurum* Bl. var. *olivaceum* King ("*olivacea*"), J. As. Soc. Bengal 69, II:1 (1900) 78 (Mat. Fl. Mal. Pen. III, 486), *syn.* in part by Furtado, Gard. Bull. Sing. 20 (1963) 120, *non M. heteropleurum* Bl. *sensu* King l.c. 78; *M. subtrinervium* Miq., Fl. Ned. Ind. Suppl. I, Sumatra (1860) 322 *syn. nov.; M. maingayi* Cl. in Hk. f., Fl. Brit. Ind. II (1879) 567 *syn. nov.; M. kurzii* King l.c. 77 *syn. nov.; M. elmeri* Merr., Univ. Calif. Publ. Bot. 15 (1929) 230 *syn. nov.*

Tree up to 18 m tall with a diameter up to 60 cm, bole straight, crown spreading, branches long and deflexed, bark thin, finely fissured and flaking, brownish-grey or greenish-brown; inner bark thin, pale brown, wood hard, brownish; branches cylindric, often flattened and shallowly grooved on 2 sides or sometimes slightly 4-lined or 4-angled below the upper node; 2–2.5 mm thick, glabrous; blades coriaceous, elliptic to ovate, acute to obtuse at the tip, acute at the base and not or only slightly decurrent on the petiole; venation pinnate, 15–22 pairs of veins, sunken above, slightly raised below, lower veins running parallel to the midrib for 1–2 mm, then diverging directly towards the margin; tertiary venation generally visible below; intramarginal nerve c. 2–4 mm from the margin, nearly straight or looping, midnerve sunken above, raised and tapering below; 12–26 cm long, 4–12 cm wide, glabrous; dark glossy green above, duller green below, usually drying greenish-brown to dark brown above, olive-green to brown below; petiole 3–4 mm long, 2–3 mm thick, glabrous; inflorescence of clustered cymes, appearing glomerulate, 6–10 mm long, sometimes among the leaves, but usually just behind them, glabrous; primary axes several from each leaf axil, usually on a tubercle, 1–4 mm long, flattened, c. 1 mm thick, secondary axes not developed (glomerulate) or up to 3 mm long; tertiary axes, when developed, up to 1 mm long; pedicels 1–3 mm long; bracts and bracteoles ovate, acute, c. 0.5 mm long; calyx campanulate, thickened, truncate, smooth outside, ridged internally, 3.5–5 mm wide when mature, pink; petals coriaceous, broadly elliptic to oblong, broadly rounded or truncate at the tip, truncate at the base, 3–4 mm long, 3.5–5 mm wide, midnerve often raised on the dorsal surface margins thinner, pale lilac to pink on the dorsal surface, white to cream ventrally; filaments white, c. 2 mm long; bud anthers "J"-shaped c. 2 mm long, blue, with a narrow and elongated gland; style c. 4 mm long; ovules 6–8; fruit oblong-elliptic, 8–20 mm long, 10–12 mm wide when ripe, calyx remnant raised, aerolus c. 4 mm wide; exocarp green when immature, purple when ripe, drying greenish to black with a rugose and often pustulate texture; pericarp 0.5–1 mm thick; seed purple, containing a liquid.

Figure 11: a. inflorescence, b. calyx, c. petal, d. stamen, e. fruit, f. areolus. Figure 34 a — e

The leaves are similar to *M. oleifolium* Bl. (q.v.) (including *M. ambiguum* Bl and *M. acuminatissum* Bl.), but this species has a paniculate inflorescence at least 4 cm long. *M. paniculatum* Jack (q.v.) has nearly sessile leaves, a paniculate inflorescence, smaller fruit, and winged branches.

The holotype of *M. excelsum* Bl. (Blume 208, from Java) at Leiden is in poor condition and is without inflorescences and flowers. A specimen collected by Bakh. Sr. (3092), also from Java, has identical branches and leaves as the holotype. This specimen has a few loose buds which are identical in structure to those on the isotype of *M. heteropleurum* Bl. (Korthals sn. from Sumatra). The only distinction is that the blade venation of *M. heteropleurum* is more prominent. Blume's descriptions of these two species differ only with the blade venation. Fruiting collections of *M. heteropleurum*, e.g. Bakh. Sr. 1777 (Sumatra), and Achmad 779 (P. Simeuloee); match those of Blume s.n. from Java which has blades identical to those on the holotype of *M. excelsum* Bl. The majority of specimens in the Leiden collection of *M. excelsum* have the *M. heteropleurum* - type blade venation, however since all other features between these two species are the same it is necessary, due to priority, to reduce the latter to a synonym of the former.

The holotype of *M. subtrinervium* Miq. (Teysmann 835, from Sumatra) at Utrecht is without any axes, flowers, or fruit. Miquel (l.c. 322) did note that the species has few flowered inflorescences with a peduncle c. 7 mm long. The young berries are said to be oviod, constricted at the top; and have a persistent, 4-lobed calyx limb. The branches on the holotype are cylindric and the blades have a distinct intramarginal nerve; both of these features match the two types of *M. heteropleureum* at Leiden — especially the smallest leaf on the isotype. The larger leaves on this isotype resemble *M. excelsum* s.s Since it is virtually impossible to determine the structure of the inflorescence, and what the leaves and fruit of *M. subtrinervium* looked like, it appears from the specimens available that it is the same as *M. excelsum*. It is obvious that many botanists have been confused over *M. subtrinervium* and have, as an alternative, referred most of their specimens to *M. heteropleurum* and *M. excelsum*. The isotypes of *M. elmeri* Merr. (Elmer 21646, from Sabah) at Singapore and Leiden are identical to the holotype of *M. heteropleurum* Bl. Both sheets are in bud, however the leaves and flowers (especially the immature anthers) match the buds on the holotype of *M. heteropleurum*. They are both, therefore, synonyms of *M. excelsum* Bl. Furtado reduced *M. elmeri* to a synonym of *M. maingayi* Cl. *M. Kurzii* King (l.c. 77), originally described as *M. subtrinervium* Miq. var. *grandiflorum* Kurz ("*grandiflora*") (J. As. Soc. Beng. (1876) 131), is recorded by King from the Nicobar Islands. The specimens of King's coll. 509, cited by King under this species are in poor condition, and the specimen from BM is without inflorescences and flowers. The specimen from Kew is somewhat better in that the axes are intact and there are a few loose post-flowering specimens. The branches and blades of these two sheets are very similar to those of *M. excelsum* Bl., however the inflorescence is larger (up to 1 cm long) and the calyx is described as being undulate with 4 broad teeth. This feature is not apparent with the post flowering material. In any case, the calyx remnant on these immature fruit is irregularly cracked and it is suspected that King misinterpreted these as lobes. The size and shape of these pieces are very similar to those of *M. maingayi*.

Memecylon maingayi Cl. is unqestionably the same as *M. excelsum* and *M. heteropleurum*. The holotype of *M. maingayi* (Maingay 814 (1422) has larger buds than the holotype of *M. heteropleurum*, but this is merely a developmental factor; the structure of the inflorescences, and flowers — especially the bud anthers — of the two specimens are the same. There is variation in the prominence of the blade venation and texture, but with numerous collections of *M. excelsum* and its synonyms available the general vein pattern is the same.

Nicobar Island — King's collector 509 (*type M. kurzii* King)

Malay Peninsula

Kedah — Bukit Perak For. Res.: Chan 13120

Perak — Larut: King's collector 4726; Lumut: Ridley 9474; Pondok Tanjong: Sallih 9710; Tapa: Wray 1310 (*lectotype M. heteropleurum* Bl. var. *olivaceum* King); sine loc.: Scortechini 89, Yong 94670

Kelantan — Gunong Sitong: Nur & Foxworthy 12257; Kuala Krai: Ismail 104273

Trengganu — Bukit Kajang: Corner sn, 30 Oct. 1935; Gunong Tebu For. Res.: Kochummen 2507; Sekayu For. Res.: Suppiah 11846, 11865; Gunong Padang: Whitmore 12543, Belara: Wood 76072

Pahang — Aur For. Res.: Whitmore 3631; Pulau Tioman: Kadim & Noor 580; Kemasul For. Res.: Temerloh: Kochummen 98586; Whitmore 0078: Kota Glanggi: Henderson 22482; Lepar For. Res.: Suppiah 108998; Lesong For. Res.: Ahmad & Shukor 450; Tahan River: Ridley 2240

Negri Sembilan — Seremban: Ismail 109424

Malacca — Selangor: Alvins 245, 430: sine loc.: Maingay 814 (1422) (*type M. maingayi* Cl.)

Johore — Anbong, Endau: Kadim & Noor 416; Bekok For. Res.: Jumali 4100; Bukit Tinjar Laut: Ngadiman 36931; Gunong Besar: Everett 14076; Kluang Reserve: Kochummen 2824, Ng 97953; Kota Tinggi: Corner 28702; Maokil For. Res.: Shing 68877; Mersing: Wyatt-Smith 76278; Sarom: Ridley sn in 1900; Sungei Kayu: Corner 29245, 32246, 32504, 32759, Kiah 31981, 32311; Ulu Sungei Segamat: Jumali 4496 (973), Samsuri & Shukor 727.

Further Distribution — Sumatra, Simeuloee Is., Mentawai Islands, Java, Borneo (Sabah, Kalimantan) (*fide* Bakh. f.).

12. *Memecylon floridum* Ridl., J. Str. Br. Roy. As. Soc. 79 (1918) 73.

Tree 10–17 m tall with a diameter of up to 15 cm; bark brown-grey, finely fissured, thin; slash inner bark thin, brown; slash wood yellow-orange, hard; upper nodes thickened, 4-angled to 4-auriculate; upper internodes sharply 4-angled or somewhat compressed and appearing 2-grooved, glabrous, c. 1.5 mm thick, drying greyish to tan; older branches mostly cylindric with widened nodes, drying greyish; blades subcoriaceous, lanceolate to elliptic, acuminate-rostrate at the tip (acumen 1–2 cm long), sharply narrowed and decurrent at the base; midnerve sunken above, raised and tapering below; secondary venation pinnate, faint; 6.5–8.5 cm long, 2.5–3 cm wide; drying greenish, often with a brown hue above, greenish below; petiole 5–6 mm long, c. 1.5 mm wide; inflorescence cymose, from leafy and upper leafless nodes, 10–20 mm long, many flowered, glabrous; bracts and bracteoles lanceolate, acute, c. 0.5 mm long, falling off early; primary axes 1 or 2 per axil, flattened, 5–9 mm long with 1, less commonly 2, nodes; secondary axes not developed, glomerulate at the tips of the primary axes, pedicels c. 4 mm long; calyx campanulate, widened above the ovary, 1.5 mm long, 2 mm wide, margin truncate to undulate with 4 broadly triangular lobes, each c. 0.25 mm long, smooth outside, ridged internally, yellow-green; petals broadly ovate, acute at the tip, truncate at the base, slightly thickened with thinner margins, 3 mm long, 2.5 mm wide, white; filaments c. 2.5 mm long, anthers axe-shaped, without a gland, purple; stigma minute, style slender, c. 4 mm long, immature fruit pryiform, becoming globose when mature, 10–13 mm diameter, calyx remnant slightly raised, flattened, areolus c. 3 mm wide; exocarp smooth, green turning yellow then pinkish, drying blackish; pericarp fibrous, c. 2 mm thick.

Figure 12: a. calyx, b. petal, c. stamen

vernacular: nipis kulit (Perak, Kelantan)

This species is very closely related to *M. cinereum* King (q.v.) in having similar inflorescences and nearly identical flowers. The axes are slightly shorter in *M. cinereum* and its blades are less acute at the base, have invisible venation, and dry black. A major difference lies in the fruit viz. those of *M. cinereum* are smaller and have a very thin, non-fibrous pericarp.

Memecylon malaccense (Cl.) Ridl. (q.v.) and *M. lilacinum* Z. & M. (q.v.) also have similar inflorescences, flowers (especially the glandless anthers), but have different leaves and fruit. *M. acuminatum* Sm. (q.v.) is readily distinguished by having an anther gland, smaller fruit, larger and more complex inflorescence, and cylindric branches.

Perak — Gunong Bubu: Everett 13922; Larut: King's collector 3551 (*type*), 3870

Kelantan — Kuala Mersing: Ng 5460; Relai For. Res.: Cockburn 7414

Trengganu — Sekayu For. Res.: Suppiah 11867; Ulu Bendong, Kajang: Corner 30190; Ulu Besut: Cockburn 8288

Pahang — Raub: Renggol 20341; Tasek Bera: Chen & Noor 249

Negri Sembilan — Tampin For. Res.: Shing 17093

Singapore — Liew 37742, Ngadiman 36360, Ridley 6219

13. *Memecylon fruticosum* King, J. As. Soc. Bengal 69, II: 1 (1900) 74 (Mat. Fl. Mal. Pen. III, 482): *M. epiphyticum* King l.c. 74 (l.c. 482), *syn. nov.; M. tenuifolium* Ridl., Fl. Mal. Pen. I (1922) 812, *syn. nov.; M. depokkense* Bakh. f., Med. Mus. Bot. Utrecht 91 (1943) 339 and Rec. Trav. Bot. Neerl. 40 (1943-45) 339, *syn. nov.*

Shrub 1.5–2.5 m tall, often epiphytic, or a treelet up to 3 m tall; branches sharply 4-angled to 4-winged, generally prominently so below the nodes giving an auricled appearance, c. 1.5 mm thick, glabrous; blades subcoriaceous, glabrous, lanceolate to ovate, acuminate at the tip (acumen up to 1 cm long), rounded at the base, 5–13 (16) cm long, 1.5–6 cm wide; venation pinnate, 10–12 pairs of nerves, sunken and obscure above, slightly raised or obscure below; intra-marginal nerve distinct or obscure, 1–4 mm from the margin, broadly looping; mid-nerve sunken above, raised and tapering below; light green when young, turning yellowish/greenish, drying dark brown with a roughened texture above, brown to greenish-brown below; petiole 2–3 mm long, 1–1.5 mm thick, glabrous; inflorescence cymose, often in pairs from leaf axils, sometimes from leafless nodes, 1–1.5 cm long; primary axes flattened, 0.5–1 mm wide, 1–6 mm long with 1 or extended for 1 mm with a second node, secondary axes glomerulate or up to 1 mm long, pedicels 1.5–5 mm long, clustered; bracts and bracteoles ovate, acute, thin, up to 0.75 mm long, caducous; calyx funnelform, c. 1 mm long, 3 mm wide, smooth outside, ridged internally, truncate, or with 4 undulations, or 4 broadly triangular, acute lobes, sinuses wide; petals oblong to broadly ovate, tipped with a mucro, truncate at the base, 2 mm long, 1.25–1.5 mm wide, margins thinner, mid-line thickened and slightly raised dorsally; filaments 2–2.5 mm long; anthers "U"-shaped with a distinct gland, c. 1 mm long; style cylindric, c. 3 mm long, ovules 9–12; immature fruit oblong-pyriform, 8–10 mm long, 6–7 mm wide, becoming globose, 8–10 mm diameter, when mature; calyx remnant distinctly raised (c. 1 mm), areolus c. 4 mm wide; exocarp smooth, green turning light red when ripe; pericarp c. 0.5 mm thick.

Figure 13: a. branch, leaf, and inflorescence, b. calyx, c. petal, d. anthers

King notes that *M. fruticosum* and *M. epiphyticum* approach *M. dichotomum* (Cl.) King (q.v.), but the latter has several major differences viz. 4-angled to cylindric branches which are not winged, more prominent leaf venation; a much shorter inflorescence with larger, thicker, and persistent bracts; papillose calyx tube; and larger fruit with a thick pericarp. The anthers of the 3 species have a similar "U" shape. Unfortunately, all three syntypes and other collections of *M. fruticosum* seen lack petals and mature fruit, however from its entirely different inflorescence *M. fruticosum* is a distinct, albeit poorly known, species.

Memecylon epiphyticum King merely differs from *M. fruticosum* in having a shorter (more reduced) inflorescence, fewer flowers, and smaller leaves. The two syntypes (King's coll. 5184, and Wray 2727) were collected after flowering and the specimens are in immature fruit. These parts are identical to King's coll. 2971 which is the lectotype of *M. fruticosum.*

Memecylon tenuifolium Ridl. hardly differs from *M. fruticosum* and *M. epiphyticum* except that its leaves are narrower and the inflorescence is shorter (c. 5 mm). The holotype of *M. tenuifolium* (Kassim 0748) at Kew has 3 loose fruit which are depressed globose, c. 10 mm diameter, and are without a raised areolus. Since Ridley did not describe the fruit of this species, plus the fact that these fruit differ from those of *M. fruticosum,* it is strongly suspected that they have been attached to the sheet by mistake. It is not common to find both flowers and mature fruit on the same specimen of *Memecylon.*

Memecylon depokkense Bakh. f., from Java, is another variant of *M. fruticosum* which has shorter inflorescences (7–8 mm long), and differs from *M. tenuifolium* in having more flowers and wider blades. Both species, in all other respects, are identical to *M. fruticosum.*

Memecylon corticosum Ridl. (q.v.) is similar to *M. fruticosum* in the angled-winged branches, and structure of the inflorescence; and it is possible that the mature stamens are also "U"-shaped. *M. corticosum* differs in having larger, lanceolate blades with prominent venation. As collections of either species that have any transitional features have not been seen, the two species are maintained as separate taxa in this paper.

Penang — Government Hill: Ridley sn, Mar. 1896; West Hill: Curtis 1773

Perak — Larut: King's collector 2971 (*lectotype*), 3265 (*syntype*), 3425 (*syntype*), 5184 (*syntype M. epiphyticum* King); Kunstler 3265; Sungei Larut: Wray 2727 (*lectotype M. epiphyticum* King)

Trengganu — Bukit Kajang: Corner 30329

Selangor — Bukit Payong Kajang: Symington 24235

Pahang — Telok Mungkuang, Temerloh: Kassim 0748 (type *M. tenuifolium* Ridl.)

Negri Sembilan — Gunong Angsi: Sow 23712

Singapore — Ridley 5753

Further Distribution — Natoena Islands (west of Sarawak), Java (*fide* Bakh. f.).

14. *Memecylon garcinioides* Bl., Mus. Bot. Lugd.-Bat. I:23 (1851) 358.

Shrub up to 5 m tall or a tree 6–15 m high; upper internodes cylindric, sometimes slightly flattened and shallowly grooved immediately below the upper node, c. 1 mm thick, drying greyish, older branchlets drying khaki-tan; blades subcoriaceous, elliptic to ovate, acuminate at the tip (acumen 8–10 mm long), narrowed and slightly decurrent at the base, midnerve sunken above, raised and tapering below, secondary venation very obscure to invisible on both surfaces; 5.5–10 (13.5) cm long, 2–6 cm wide; drying dark brown to blackish or sometimes greenish above, brown often mottled with a greenish hue below; petiole 2–4 mm long, 1–1.5 mm thick; inflorescence from leaf axils, cymose, 1–3.5 cm long, many flowered, axes flattened, glabrous; bracts and bracteoles lanceolate, acute, c. 0.5 mm long, falling off before the petals mature; primary axes 1–3 per axil, 0.4–1.3 (2) cm long with 1 or 2 nodes; secondary axes not developed or up to 4 mm long; pedicels 2–4 mm long; calyx campanulate, slightly constricted above the ovary, c. 2 mm long, and slightly wider, margin truncate with 4 minute, triangular cusps, internal ridges prominent, drying with a slightly rugose-papillose texture; bud petals dome shaped, acute; mature petals broadly ovate to suborbicular, acute at the tip, truncate at the base, thickened with a keeled mid-rib, 1.5–2 mm long, 1.5–2 mm wide; anthers suborbicular, 0.75–1 mm long, with a thin, flat, connective extension with a long shallow gland along its entire surface; filaments c. 2 mm long; stigma minute, style slender, 3–3.5 mm long; fruit globose, 6–7 mm diameter, areolus 2–3 mm wide internal ridges distinct, calyx remnant slightly raised very thin; exocarp drying black or greyish-green, with a slightly roughened texture, c. 0.25 mm thick.

Figure 14: a. calyx, b. petal, c. stamen

The truncate calyx with 4 minute points and suborbicular anthers with a tail-like extension (actually a remnant) of the connective distinguish this species. The holotype of *M. garcinioides* Bl. var. *elongatum* Bl. (l.c. 358), which was considered to be identical to *M. intermedium* by King (l.c. 86) and a synonym of *M. garcinioides* by Bakh. f. (l.c. 363), has blades up to 13 cm long and 4.5 cm wide with infloresecnes 10–12 mm long. It is obvious, therefore, that the lengths of the blades and inflorescences of all these taxa and specimens studied at Lieden and Singapore do not correlate.

Furtado (Gard. Bull. Sing. 20 (1963) 119) annotated a set of specimens in the Singapore collection as *M. hepaticum* Bl., which are actually *M. garcinioides*. The type specimen of *M. hepaticum* (Blume s.n., from Sumatra) at Leiden is without inflorescences, flowers, and mature fruit; therefore it is not certain what this species really is since the description is inadequate for a critical study. The specimens from Johore and Malacca all have lanceolate leaves, but the inflorescences and flowers (especially the globose anthers) strongly resemble *M. garcinioides*. For this reason this set of specimens has been cited under *M. garcinioides*. No specimens from the Malay Peninsula have been seen with the same kind of leaves as the type collection of *M. hepaticum*. The anthers of *M. intermedium* Bl. (q.v.), especially in bud, often resemble those of *M. garcinioides*. Good distinguishing features of *M. intermedium* include its smaller and narrower leaves, and calyx with 4 triangular lobes.

Perak — Gunong Boobo: King's collector 7394; Gunong Malacca: King's collector 7152, Kunstler 7123; Jor Batang Padang: Henderson 10886; Larut: King's collector 1984, 2938; Maxwell's Hill: Wray 2961, 3203; Sungai Seluang: Shah & Shukor 3451; Ulu Bubong: King's collector 10034

Kelantan — Sungai Renong: Nur & Foxworthy 12159

Selangor — Bukit Kulu: Goodenough 10812; Gunong Bunga Bua: Ng 1160; Kuala Lumpur: Mohamet 2024; Raweang: Ridley 7333; Sungei Bulok: Hamid 1600, Symington 21077; Ulu Gombak: Strugnell 12738

Pahang — Gunong Senyum: Evans 13190; Taman Negara: van Balgooy 2584; Tasek Bera; Stone 9472a, 9474

Negri Sembilan — Gunong Angsi, Loh 17304

Malacca — sine loc.: Alvins 1212; Mt. Ophir: Keng et al. 6312

Johore — Endau: Kadim & Noor. 314; Gunong Panti: Everett 13837, H.M. Burkill 3189; Joh: Ridley 14167; Kota Tinggi: Corner 32491; Mawai: Corner 30882; Mawai — Jemaluang Road: Corner sn, on 9 Feb. 1935; Mawai — Kota Tinggi Road: Corner 30976; Sungei Kayu: Corner 29251, 32476, Kiah 31961; Sungei Kayu Ara: Corner 29481; Ulu Langat For. Res.: Whitmore & Wong 115654

Singapore — Ngadiman 34975, Rao sn; Ridley 4805,, 8118, 14171

Further Distribution — peninsular Thailand, Sumatra, Java, Borneo (Kalimantan), Karimata Is. (*fide* Craib and Bakh. f.).

15. ***Memecylon globosum*** Bakh. f., Med. Mus. Bot. Utrecht 91 (1943) 355 and Rec. Trav. Bot. Neerl. 40 (1943-45) 355.

Shrub up to 2 m tall or a tree up 5 mm tall; branchlets cylindric, often grooved immediately below the upper node on 2 sides, smooth, glabrous, 1.5–2 mm thick, drying tan; blades coriaceous; oblong, elliptic, or ovate; acuminate at the tip (acumen up to 12 mm long), narrowed and shortly (1–3 mm) decurrent at the base, midnerve distinct, intramarginal and secondary nerves obscure to invisible above, more distinct below; 7–20 (23) cm long, 3–11.5 cm wide; drying brownish above, lighter brown below; petiole flattened, dorsally grooved, 5–8 mm long, 1.5–3.5 mm thick; inflorescence cymose, 1–1.5 cm long, from leaf axils, sometimes terminal, few to many flowered, glabrous; bracts ovate, acute, c. 1.5 mm long, caducous; primary axes generally several per axil, flattened, 2.5–5 mm long, with one node, lateral axes shorter; pedicels 3–4 mm long; calyx campanulate, thickened, widened above the ovary, c. 3 mm long, 4 mm wide; margin with 4 short, broadly rounded lobes, sinuses splitting in mature flowers, glabrous; petals thick, (sub) orbicular, c. 4 mm long, 4 mm wide, obtuse at the tip, truncate at the base, reflexed at maturity; filaments c. 2.5 mm long; anthers "J" shaped, c. 2 mm long, connective thick with a prominent gland; 14–16 mm diameter, areolus flattened, c. 4 mm wide; exocarp greenish (immature), drying brownish-tan with a slightly roughened texture; pericarp fibrous, c. 1 mm thick.

Figure 15: a. inflorescence and leaf, b. calyx, c. petal, d. stamen

The branches and leaves closely resemble those of *M. oleifolium* Bl. (q.v.) which has, among other major differences, longer and more complex inflorescences, and elliptic-ovate, pustulate fruit. *M. globosum* is easily distinguished from other species of *Memecylon* by its short inflorescence, relatively large flowers, 4 broad calyx lobes, and large, globose fruit.

The type collection of *M. globosum* (van Steenis 1265, from the Natoena Islands west of Sarawak) consists of buds, and the mature flowers and fruit were not previously described. Several other collections from Borneo, Johore, and Singapore compare closely with this type collection, thus enabling a complete description of this species. There is considerable variation in the size and shape of the leaves, however the inflorescence, flowers, and fruit seem to be constant. The species is apparently rare and ranges from southern Johore, Singapore, to Borneo.

Johore — Gunong Blumut, Kluang: Shah & Sanusi 2173

Singapore — Bukit Timah: Ridley 6768

Further Distribution — Natoena Islands, Borneo (*fide* Bakh. f.).

16. *Memecylon hullettii* King, J. As. Soc. Beng. 69, II: 1 (1900) 76 (Mat. Fl. Mal. Pen. III, 484).

Shrub or treelet up to 3 m tall; branchlets cylindric, often flattened and shallowly grooved below the upper node, 1.5–2 mm thick; blades coriaceous, lanceolate, ovate, to oblong; acuminate at the tip (acumen up to 2 cm long), broadly rounded and usually cordate at the base; venation pinnate, 15–20 pairs of nerves, very obscure but visible on both surfaces; intramarginal nerve 1–2 mm from the margin; 12–27 cm long, 3.5–8 cm wide; drying dark brown above, lighter brown below; petiole 1–2 mm long, shorter than the basal lobes of the blades, thus appearing sessile, 1.5–2 mm thick; inflorescence a compound umbel, 6–8 cm long, often reflexed, many flowered; axes muricate-papillose; primary axes solitary from leafy nodes, 4–5 cm to the first node of the inflorescence, often extending beyond the first node for 0.5–1.5 cm; secondary axes 5–7, ranging in length from 2 mm (peripheral ones) to 1.5 cm (central one); pedicels 4–5 mm long, papillose, in terminal clusters ranging from 3–5 flowers (peripheral axes) to c. 25 on the terminal axis; bracts ovate, acute, c. 0.75 mm long, appearing clustered, caducous; calyx campanulate, flattening somewhat after maturity, truncate with 4 minute cusps, widened abruptly above the ovary, papillose outside, ridged internally, 1.5 mm long, 3 mm wide; petals coriaceous, broadly ovate, broadly round and apiculate at the tip, rounded and shortly clawed at the base, slightly keeled in the upper $\frac{1}{2}$ dorsally, margins thinner, 3 mm long, 4 mm wide, white, filaments c. 2.5 mm long, anthers blue, c. 1 mm long, suborbicular in outline, connective shortened and reduced to about the same size as the locules, gland distinct, situated on the curved tip of the connective; stigma minute, style slender c. 5 mm long; ovules c. 6; fruit globose, 7–9 mm diameter, capped by the persistent calyx remnant, c. 0.5 mm high, with a thickened, undulate margin, areolus c. 2–3 mm wide, internal ridges generally indistinct; exocarp smooth, c. 0.2 mm thick, white, then pinkish, finally blueish when ripe, drying blackish.

Figure 16: a. branch, leaf, and inflorescence, b. calyx and corolla bud, c. petal, d. stamen

The broadly rounded or cordate, nearly sessile leaves; long primary axis, and compound umbellate inflorescence distinguish this species from all others in the region. The leaves of *M. dichotomum* (Cl.) King (q.v.) are often similar, but its angled branchlets and glabrous inflorescence axes immediately distinguish it from *M. hullettii*. The anthers of *M. garcinioides* Bl. (q.v.) appear similar, but all other vegetative and floral characteristics of the two species differ considerably.

Johore — Gunong Belumut: Holttum 10854; Gunong Muntajak: Nur 19976; Gunong Pulai: King & Hullett 253 (*lectotype*), Mat 3739, Sinclair 39549; Khiang: Holttum 9436; Kluang For. Res.: Alphonso, Sanusi, Sidek 210; Shah & Sanusi 2133; Kota Tinggi: Shah 454; Pelepah Kiri: Corner sn on 19 Oct. 1936; Sedenah: Ridley 13501; Sungai Batu Pahat: Lake & Kelsall 4073 (*syntype*); Sungai Buloh Kasap: Corner 29984; Sungai Kayu Ara: Corner 29234; Sungei Pelepoh Kiri: Corner sn, on 26 June 1938; Virgin Jungle Res.: Ahmad 390

17. *Memecylon intermedium* Bl., Mus. Bot. Lugd.-Bat. I:23 (1851) 358.

Tree up to 25 m tall, with a diameter up to 1 m, buttressed in larger trees, bark grey-brown, smooth, rugose, finely fissured and flaking off, inner bark brownish; branches cylindric, often with a shallow groove on 2 faces which usually disappears before the next node, 1–1.5 mm thick, drying tan to brown; blades subcoriaceous to coriaceous, glabrous, lanceolate to ovate, acuminate at the tip (acumen up to 1 cm long), narrowed and decurrent at the base, midnerve sunken above, raised below, secondary venation extremely obscure or invisible; 6–9 cm long, 2–3 cm wide, drying dark brown to blackish above, brown below, with a roughened texture; petiole flattened, 3–4 mm long, 1.5–2 mm thick; inflorescene from leaf axils, cymose, 1.5–2 cm long, many flowered, glabrous; bracts and bracteoles lanceolate, c. 0.5 mm long, caducous; primary axes usually solitary, flattened, 7–12 mm long usually with 1 node, seondary axes glomerulate or up to 2 mm long, pedicels 1–2 mm long; calyx campanulate, 1.5–2 mm long, 2–3 mm wide, widened above the ovary, smooth and glabrous, flattening after flowering, margin truncate with 4 cusps or short lobes, internal ridges prominent;

petals broadly ovate to sub-orbicular, 2.5–3 mm long, c. 3 mm wide, acute at the tip, truncate at the base, thickened with a slightly raised midrib, margins thinner, pinkish; filaments c. 2 mm long, pale blue; anthers "J"-shaped, c. 2 mm long, gland distinct; stigma minute, style cylindric c. 3 mm long; fruit globose. 6–8 mm wide, calyx remnant nearly flat or slightly raised, areolus c. 2 mm wide, exocarp smooth, green ripening blue, drying black, pericarp c. 0.2 mm thick.

Figure 17: a. branch, leaves, and inflorescence;
b. calyx, c. petal, d. anthers

In terms of the inflorescence and flowers this species closely resembles *M. acuminatum* Sm. (q.v.), however that species has larger fruit with a thicker, more rugose pericarp, and thinner blades. The leaves and fruit of *M. glomeratum* Bl. (known from Sumatra and Borneo) are very similar to those of *M. intermedium,* however the former has much shorter (apparently nearly sessile) inflorescences.

Authentic inflorescences and flowers of *M. glomeratum* have not been seen, thus further comparisons cannot be made here. Blume notes that *M. intermedium* is close to *M. garcinioides* Bl. (q.v.), however I feel that its affinities lie with *M. edule* Roxb. (q.v.). *M. garcinioides* has sub-orbicular anthers with a curious appendage which can be used to immediately distinguish the species.

The anthers of *M. intermedium* Bl., especially in bud, are closest to those of *M. garcinioides* Bl. (q.v.) which differs in having larger leaves and a minutely apiculate calyx. The anthers of *M. garcinioides* have, in general, a more reduced connective, thus giving the anther an orbicular rather than "J" shape. Several collections from Java known as *M. intermedium* Bl. var. *longipes* Bl. (l.c. 359), and reduced to the typical variety by Bakh. f. (l.c. 363) have inflorescences up to 6 cm long. Sepcimens of this species from the Malay Peninsula have inflorescences 1.5–2 cm long.

The typical variety of *M. edule* Roxb. (q.v.) is also close to *M. intermedium* and can be distinguished by having inflorescences behind the leaves, blades which dry greenish or brownish — never black, and 4-angled or 2 grooved branches.

Kedah — Gunong Jerai: Chelliah 9801, Evans & Gorden 95; Hou 798, 814; Stone 8635; Stone & Mahmud 8505

Trengganu — Gunong Padang: Whitmore 12690

Penang — Penara Bukit: Curtis sn in June 1890

Perak — Slim Hills For. Res: Whitmore 0812

Kelantan — Bukit Brangkat: Shah & Ali 2880; Gunong Stong: Whitmore 12453

Selangor — Gunong Bunga Bua: Ng 1153, Whitmore 0345; Semangko For. Res.: Whitmore 12556; Ulu Langat For. Res.: Whitmore 12175; sine loc.: Kepong no. 85084

Pahang — Balok Game Res.: Kochummen 2095; Fraser's Hill: Nur 11259; Gunong Benom: Whitmore 3194; Gunong Lesong, Rompin: Shah & Shukor 3130; Kuala Kelepah: Shah & Noor 1767; Kuala Teku: Whitmore 4803; Merapoh: Shing 17265

Malacca — Gunong Ledang: Ridley 3296

Johore — Bukit Chongkrak: Shah & Samsuri 3635; Kuala Palong For. Res: Everett 14263; Rengam For. Res.: Suppiah 17770

Further Distribution — Sumatra, Java (*fide* Bakh. f.).

18. *Memecylon kunstleri* King, J. As. Soc. Beng. 69, II: 1 (1900) 76 (Mat. Fl. Mal. Pen. III, 484).

Tree up to 20 m tall, diameter up to 45 cm; branches cylindric, striate, often with two very shallow grooves below the upper node, becoming cylindric, c. 1 mm thick, drying tan; blades subcoriaceous, glabrous, lanceolate-ovate, shortly acuminate (c. 5 mm) at the tip, rounded and often shallowly cordate at the base, venation pinnate, 10–12 pairs of nerves, obscure on both surfaces in smaller blades, distinct on larger ones, sunken above, slightly elevate below; intramarginal nerve obscure or distinct, 2–2.5 mm from the margin; 6–13 cm long, 2.5–5 cm wide; deep glossy green drying dull dark brown above, brown below; with a roughened texture; petiole 2–3 mm long, 1–1.5 mm thick; inflorescence cymose, 2–4.5 cm long, glabrous, from leaf axils, many flowered, axes sharply 4-angled; primary axes 1 or 2 per axil, 10–35 mm long with 1 or 2 nodes, secondary axes 3–15 mm long, pedicels 2–3 mm long; calyx campanulate, flattening after flowering, truncate or undulate at the margin, with 4 minute cusps, smooth outside, prominently ridged inside, 1.25–1.5 mm long, 2 mm wide; petals thickened with thinner margins, oblong to broadly ovate, rounded and apiculate at the tip, truncate at the base, 1.5–2 mm long, 2–2.5 mm wide, waxy white; filaments c. 2.5 mm long, bud anthers "J"-shaped, "U"-shaped when mature, c. 1 mm long, gland distinct; dark brown; style c. 3 mm long, ovules 12–15; immature fruit ovoid, 7–9 mm long, 4–5 mm wide, crowned with the obscurely 4-toothed calyx remnant, areolus c. 3 mm wide, waxy pale green, drying grey-greenish, pericarp c. 0.2 mm thick.

Figure 18: a. branch, leaves, and inflorescence;
b. calyx and style, c. petal, d. stamen, e. areolus

The cylindric branches and glabrous inflorescence axes distinguish this species from *M. paniculatum* Jack (q.v.), *M. fruticosum* King (q.v.), and *M. corticosum* Ridl. (q.v.). The leaves of *M. kunstleri* closely resemble those of the type collections of *M. appendiculatum* Bl. and *M. nudum* Bl. — both of which were reduced to synonyms of *M. costatum* Miq. by Bakh. f. (l.c. 345), and now synonymous with *M. paniculatum.* These species have similar inflorescences, but differ in having 4-angled branches and pubescent inflorescence axes.

The dry blades and "U" shaped anthers of *M. kunstleri* and *M. fruticosum* are similar, however the winged branches and shorter inflorescences of the latter are obvious differences.

Kedah — Sungai Terap, Selma: Henderson 35447

Penang — Penang Hill: Nauen sn, in April 1940

Perak — Changkat, Serdang: Wray 744; Gunong Dipang: King's collector 8195 (*syntype*); Ulu Bubong: King's collector 10419 (*lectotype*)

Selangor — Labu: Ridley 7334

19. *Memecylon lilacinum* Zoll. & Mor., Syst. Verzeich. (1845-46) 9; *M. myrsinoides* Bl. var. *lilacinum* (Zoll. & Mor.) King, J. As. Soc. Bengal 69, II: 1 (1900) 81 (Mat. Fl. Mal. Pen. III, 489); *M. myrsinoides* Bl., Mus. Bot. Lugd.-Bat. I: 23 (1851) 356 *syn. nov.; M. laevigatum* Bl., l.c. 358 *syn. nov.; M. laevigatum* Bl. var. *sulcicarpum* Furtado *in scheda,* Herb. Singapore; *M. pseudo-nigrescens* Bl., l.c. 357 *syn. nov.; M. pseudo-nigrescens* Bl. var. *acuminatum* Bl. *in scheda,* Leiden; *M. confine* Bl., l.c. 357 (syn. by Bakh. f., Med. Mus. Bot. Utrecht 91 (1943) 361 and Rec. Trav. Bot. Neerl. 40 (1943-45) 361).

Tree up to 25 m tall, diameter up to 40 cm, bole shortly fluted; less frequently a shrub up to 3 m tall; bark pale grey-brown, thin, finely fissured and flaking; slash inner bark thin, brown; slash wood dark yellow to white, wood dense and sinks in water; upper nodes flattened, prominent after leaf fall, black when dry; upper internodes often shortened (8–12 mm) or 2–3 cm long, 1–1.5 mm thick, flattened and grooved on 2 sides, often somewhat 4-angled, becoming cylindric, drying greyish to khaki-tan; blades coriaceous, glabrous, lanceolate to ovate, acuminate at the tip (acumen 5–15 mm long), acute and decurrent at the base, 2.5–8.5 cm long, (1) 1.5–4 cm wide, mid-nerve sunken above, raised below, other venation invisible; dark glossy green drying dark brown to blackish above, dull green drying brown to dark brown below; petiole 4–8 mm long, 1–1.5 mm thick, glabrous; inflorescence from the axils of lower leaves or upper leafless nodes, cymose and appearing glomerulate, many flowered, 5–8 mm long, glabrous; bracts and bracteoles subulate, c. 0.25 mm long, falling off before the petals mature; primary axes flattened, with 1 node, 1–1.5 mm long, secondary axes 3–5, glomerulate or c. 1 mm long each with 3 pedicels c. 1 mm long; calyx campanulate, glabrous, smooth, 1.5 mm long, 1.25–1.5 mm wide, tan, margin truncate with 4 distinct triangular cusps each c. 0.25 mm high; corolla buds dome shaped, acute, tips twisted; petals lanceolate-oblong, sharply acuminate at the tip, truncate at the base, 1.5–2 mm long, c. 1 mm wide, slightly thickened with a keeled dorsal mid-nerve, margins thinner; white, lilac, or blue; filaments c. 1.5 mm long, lilac; anthers c. 1.5 mm long without a gland, whitish; style slender, 3–5 mm long, lilac; ovules c. 8; fruit globose, 8–12 mm diameter, flattened at both poles, calyx remnant minute, flattened in the plane of the fruit; areolus c. 1.5 mm wide not sunken; generally with 4–8 shallow (often indistinct) vertical grooves, especially near the pedicel; exocarp smooth when immature, often becoming somewhat rugose in mature dry specimens, infrequently with minute whitish pustules, green when immature, turning yellow to pale orange, finally black when ripe, grey-green or black when dry; pericarp 1–2 mm thick, gritty.

Figure 19: a. inflorescence, b. calyx and corolla bud, c. petal, d. stamen

Figure 31: bark

vernacular: delik (Selangor), nipis kulit (Kedah, Johore), tengading (Temuan)

The very compact cymes, calyx with 4 cusps, narrow and acuminate petals, glandless anthers, and the depressed, grooved, globose fruit distinguish this species. *Memecylon edule* Roxb. (q.v.) can be confused here, but it has no or extremely minute calyx points, wider and blunter petals, an anther gland, and a smooth, globose fruit with a thin pericarp and no grooves.

Some specimens may be confused with *M. garcinioides* Bl. (qv.) wh.ch has cylindric branches without grooves, thinner blades, and different flowers (especially the anthers) and fruit. The fruit on some specimens, e.g. Chan 6764, have dried black and the exocarp has scattered, minute pustules. Everett 13821 has fruit with a similar colour and texture, but the shape is more pyriform with a narrowed tip, unequal base, and lacks grooves. The type specimens in Leiden of *M. myrsinoides* (Blume 1374 from Java) all have relatively small blades, 3–4.5 cm long and 1.5–2.5 cm wide on branches with short (8–12 mm) upper internodes.

The inflorescences on the specimen designated as the holotype are about 5 mm long with numerous flowers. These specimens, at first glance, appear to differ from the type specimens at Leiden of *M. laevigatum* Bl. collected by Blume (s.n.) from Borneo. The blades are generally larger, 5.5–8.5 cm long, 2.5–4 cm wide, and the upper internodes are all over 2 cm long. The inflorescences are essentially the same except that the secondary axes are slightly less obscure.

The two type specimens of *M. myrsinoides* Bl. var. *lilacinum* (Zoll. & Mor.) King in the Leiden collection (Zollinger 187) are intermediate between the two species discussed above. The blades are 5–6.5 cm long and 2.5–3.25 cm wide and the inflorescences are structurally the same, but with more flowers and longer (c. 5 mm) styles. The upper nodes are from 1.5–2 cm long, that is intermediate between the other two species. All three taxa have identical flowers which are typified by the truncate margin with 4 distinct cusps; thin, oblong, acuminate petals, and the uniquely shaped anthers without a gland. Fruit of the large leaved *M. laevigatum* and the smaller leaved *M. myrsinoides* and various intermediate specimens from several sheets at Singapore and Leiden are the same.

A specimen collected by van Steenis (12657) from Java has branches and leaves which match the type specimens of *M. myrsinoides* and the inflorescences, being very dense and having long styles, are the same as those on Zollinger's collections of var. *lilacinum*. Paie 13320, from Sarawak, has short internodes characteristic of *M. myrsinoides* and larger blades which range in size for those of var. *lilacinum* and *M. laevigatum*. Dilmy et al. 11, from east Java, has both small and medium sized blades, relatively long upper internodes, and inflorescences similar to those of *M. myrsinoides* and *M. laevigatum*. Even on the type specimens of *M. myrsinoides* and *M. laevigatum* the range of blade size overlaps, and with all taxa the upper internodes are shallowly grooved on 2 sides and dry a khaki-tan colour.

Unfortunately, variation in the length of the upper internodes and size of the blades has caused some taxonomic confusion. Cogniaux (l.c. 1159, 1160) separated the species mainly on the size of the inflorescences and considered *M. lilacinum* as a synonym of *M. myrsinoides*. Bakh. f. (l.c. 335) maintained both species and var. *lilacinum* as distinct taxa. Since all three taxa are structurally idental and have intermediate traits which link all of them togetther, they are considered as representing one species and in this paper have been lumped under the oldest name viz. *M. lilacinum* Zoll. & Mor.

Memecylon cinereum King, *M. floridum* Ridl., and *M. malaccense* (Cl.) Ridl. have very similar inflorescences, calyx lobes, and identical glandless anthers. The blades, petals, and fruits differ (q.v. discussions under these species). The holotype of *M. peudo-nigrescens* (Blume s.n. from Sumatra) in the Leiden collection has branches, blades; and most important, immature fruit which is depressed globose, grooved, and with a thick, rugose pericarp. It is, undoubtedly, the same as *M. myrsinoides* Bl. et al. Other specimens in the Leiden and Singapore collections confirm this fact. The blades in most specimens of *M. pseudo-nigrescens* are ovate and fall within the upper size range of *M. myrsinoides* and match the smaller ones of *M. laevigatum*. There are no flowers on the holotype of *M. pseudo-nigrescens*, however, Lörzing 10163 from Sumatra has inflorescences and flowers, especially the glandless anthers, similar to the holotype of *M. myrsinoides*. Lörzing's specimen has the calyx margin distinctly undulate with 4 triangular cusps. This feature differs slightly from the truncate calyx in the holotype of *M. myrsinoides* Bl.

There is no reason to maintain *M. pseudo-nigrescens* Bl. as a distinct taxon and since it cannot be adequately distinguished from *M. myrsinoides* et al. it should be combined with *M. lilacinum* Zoll. & Mor.

A specimen collected by Korthals (s.n.) from Sakoembang, Borneo has *M. pseudo-nigrescens* Bl. var. *acuminatum* written on the original label. This specimen is identical to the holotype of *M. pseudo-nigrescens* Bl. Bakh. f. (l.c. 362) placed this specimen in his list of species under *M. pseudo-nigrescens*. I agree with Bakh. f. (l.c. 361) in reducing *M. confine* Bl. (l.c. 357) to a synonym of *M. pseudo-nigrescens*. Cogniaux (l.c. 1160) combined *M. pseudo-nigrescens* and *M. confine* under *M. glomeratum* Bl. (l.c. 356), however the fruit of the holotype of *M. glomeratum* Bl. at Leiden is globose with a smooth, thin pericarp which dried black. The branches and leaves of *M. glomeratum* do, however, match those of *M. myrsinoides*, *M. pseudo-nigrescens*, et. al. Flowers of *M. glomeratum* have not been described and all the material of this species at Leiden lacks flowers. It is not certain, therefore, what *M. glomeratum* really is, but at least from the immature fruit is not the same as *M. lilacinum* Z. & M. *M. oligoneurum* Bl. (q.v.) has similarly shaped, glandless anthers; but differs greatly in the 3-nerved blades, different calyx and petals, 2 ovules, and globose fruit. *M. minutiflorum* Miq. (q.v.) has similarly shaped fruit, but differs in having larger fruiting axes, a raised areolus, and blades which dry with lighter colours.

The fruit in some specimens, e.g. Goh 15701 and Chew 726 is obovate to oblong, often with grooves; thus differing from the typically depressed globose shape of most fruiting material. Furtado annotated Goh's specimen as *M. laevigatum* Bl. var. *sulcicarpum* Furtado *var. nov.* (*in scheda* Herb. Sing.). This variety is not accepted here.

Perlis — Ginting Kabok: Ridley 15058; Kaki Bukit: Kiah 35281

Kedah — Bukit Enggang: Everett 13768; Bukit Perak For. Res.: Chan 13118; Bukit Selambau: Meh 8977; Gunong Inan For. Res.: Whitmore 4678; 48th mile Jeninag Road: Kiah 36152; Pulau Adang: Ridley 15778; Pulau Langkawi: Batten-Pooll sn, Keng et al. 30, Stone 6934; Ulu Muda For. Res.: Chan 6764

Penang — Waterfall: I.H. Burkill 6893; Garden: Curtis 100 in Dec. 1884, Curtis 100 at Government Hill in 1885; Curtis = 100 at the waterfall in March 1893, 1503, 2219, 3596, sn at the waterfall in June 1893 and June 1901, sn; King's collector 1457; Ridley 7962, sn at the waterfall in June 1893 and March 1915

Perak — Larut: King's collector 3517, 3768, 5923; Wray 2258; Ulu Bubong: King's collector 10442; Ulu Kerling: King's collector 8828; sine loc. Scortechini 87

Kelantan — Kulal Badong: Henderson 10395

Trengganu — Sungei Pelong: Suppiah 14877

Selangor — Sungei Buloh: H.M. Burkill sn on 24 Nov. 1956; H.M. Burkill & Shah 1048; Kochummen 2568; Sungei Lalang Kejang: Symington 24224; Ulu Langat: Gadoh 1137, 1295; Weld's Hill: Ahmad 2477; CF 2477, 6419; Kochummen 99517; Pawanchee 12902; coll. ? 6410

Pahang — Lesong For. Res.: Ahmad & Shukor 450A; Rompin: Goh (Soh) 15701; Gunong Benom, Ulu Krau: Yusoff 99102; Temerloh: Hamid 10678

Negri Sembilan — Gunong Angsi: Shing 17338; Gunong Tampin: Holttum 9570

Malacca — Bukit Senanau: Holttum 9669; Julutong: Goodenough 1767; Poloh Diak: Alvins 163; Poloh Dulle: Alvins 2296; Pulau Rumbia: Seimund sn; sine loc.: Alvins 69, Griffith 2328

Johore — Gunong Panti: Chew 726; Labis For. Res.: Ahmad & Shukor 523; Pulau Tuiggi: I.H. Burkill 903; Sedili Ketchil: Corner 28562; Sungei Sedili: Corner 25896, sn on 28 March 1932; Tana Runto: Ridley 2026; Tebrau River: Ridley 13502 (aff.)

Singapore — Corner sn on 7 May 1937, Hullett 390, Jumali 943; Maxwell 76-790, 77-84, 78-56; Ridley 1815, 3848, 4804, 6218, sn in 1892 and 1893; Walker 176; Ahmad 1416, 1475

Further Distribution — Indo-China, Burma, Thailand, Sumatra, Java, Banka Island, Borneo (Kalimantan), Karimata Is., Celebes (*fide* Craib and Bakh. f.).

20. *Memecylon malaccense* (Cl.) Ridl., J. Str. Br. Roy. As. Soc. 79 (1918) 73; *M. amabile* Bedd. var. *malaccensis* Cl. in Hk. f., Fl. Brit. Ind. II (1879) 555.

Shrub 1–4 m tall, branches widely 2-grooved and appearing 4-angled, slightly winged below the upper nodes, becoming cylindric below, c. 1 mm thick; blades coriaceous, broadly ovate to broadly lanceolate, acuminate at the tip, broadly rounded and usually shallowly (c. 0.5 mm) cordate at the base, venation extremely obscure to invisible on both surfaces, midnerve sunken above, raised and tapering below, 4–7 cm long, 2.5–4 cm wide, drying brown above, lighter brown below; petiole 0.5–1 mm long, 1 mm wide, basal lobes of cordate blades longer than the petiole and appearing sessile; inflorescence cymose, 8–10 mm long, from leaf axils, glabrous; bracts and bracteoles lanceolate-ovate, acute, c. 0.75 mm long, falling off early; primary axes 1 or 2 per axil, cylindric, 1.5–3 mm long, secondary axes glomerulate or c. 0.25 mm long, pedicels clustered at the tips, c. 1 mm long, 4–8 per inflorescence; calyx campanulate, truncate with 4 broadly rounded and minutely mucronate lobes, smooth outside, ridged internally, 1.5–2 mm long, 2–3 mm wide; petals thick with thinner margins, broadly ovate, acute at the tip, clawed at the base, c. 3 mm long, 2.5 mm wide; anthers without a gland; ovules c. 6; fruit globose, capped by the raised calyx remnant which often has 4 distinct points, areolus c. 2 mm wide, exocarp smooth, drying black, pericarp c. 0.25 mm thick.

Figure 20: a. calyx and style, b. petal, c. stamen

M. malaccense Ridl. appears to be very closely related to *M. lilacinum* Z. & M. (q.v.). The branches, inflorescence, calyx, and mainly the anthers are very similar. The petals of *M. malaccense* are more ovate and shortly clawed at the base. The blades of *M. malaccense* differ in having rounded and very shallowly (c. 0.5 mm) cordate bases. The fruit also differs in being globose with a smooth, thin exocarp without grooves.

I do not think that *M. malaccense* (Cl.) Ridl. should be united with *M. lilacinum* Z. & M. (q.v.) since there are some important differences: mainly the fruit and the leaves. Specimens of *M. lilacinum* with shallowly cordate blades or smooth fruit have not been seen. More material of *M. malaccense* is needed in order to properly understand its relation with *M. lilacinum.*

M. malaccense and *M. cinereum* King (q.v.) are essentially the same, except that *M. cinereum* has larger blades which are acute and decurrent on a longer and thicker petiole; and a shorter, i.e. more glomerulate, inflorescence. The petals of *M. lilacinum* are generally narrower, the calyx lobes usually better developed, and the fruit is much different.

M. floridum Ridl. (q.v.) has nearly identical flower morphology. however the blades and fruit, namely the fibrous pericarp, differ significantly.

Malacca — Maingay 819 (2528) (*syntype*), 819 (2531) (*lectotype*).

21. *Memecylon megacarpum* Furtado, Gard. Bull. Sing. 20 (1963) 121; *M. pulchrum* Cogn. in DC., Monogr. Phan. 7 (1891) 1141, *nom. illeg.* not Kurz, For. Fl. Brit. Burma I (1877) 510 (= *M. caeruleum* Jack var. *pulchrum* (Kurz) Cl. in. Hk. f., Fl. Brit. India II (1879) 559); *M. heteropleurum* Bl. *sensu* King, J. As. Soc. Bengal 69, II: 1 (1900) 78 (Mat. Fl. Mal. Pen. III, 486).

Tree up to 15 m tall with a diameter up to 30 cm, or a shrub up to 3 m tall; bark smooth, dark grey to brown, thinly fissured and flaking; inner bark brownish, yellow; slash wood pale brown; youngest branches slightly flattened with a groove on 2 sides, becoming cylindric, c. 2 mm wide, drying tan to brown; blades subcoriaceous, elliptic to ovate, acuminate at the tip (acumen up to 1.5 cm long), gradually narrowed and somewhat rounded at the base; glabrous; mid-nerve sunken above, raised and tapering below; secondary venation pinnate with 20–30 pairs of nerves, straight, sunken above, slightly raised below; intramarginal nerve 2–3 mm from the margin, straight; finer venation very obscure to invisible; 15–20 cm long, 6–7.5 cm wide; drying greenish to dark brown above, greenish to brown below; petiole 1–3 mm long, 2–2.5 mm thick; inflorescence of clustered cymes, from behind the leaves, 9–12 mm long, many flowered, glabrous; axes flattened; bracts and bracteoles lanceolate, acute, 1–2 mm long, falling off before the petals mature; primary axes clustered, often on raised tubercles, 1–2 mm long, 1.5 mm wide at the base, usually with 1 node; secondary axes indistinct or up to 2 mm long; pedicels 2–3 mm long; calyx campanulate, widened above the ovary, thick, margin truncate with 4 very shallow (best seen in bud) undulations, each with a minute cusp, indistinguishable in mature flowers where there are 4 minute thickenings below the rim, minutely papillose outside, prominently ridged inside, c. 5 mm long, c. 5 mm wide, pink; petals broadly ovate to sub-orbicular, glabrous, broadly and often irregularly rounded at the tip, narrowed to a broad claw at the base, c. 5 mm long, 6 mm wide, very thick with thinner margins, reflexed at maturity; filaments c. 2.5 mm long; anthers "C" or "J"-shaped, c. 2 mm long, gland very prominent; style c. 4 mm long, ovules c. 10; fruit globose, 16–18 mm diameter, aerolus slightly (1 mm) raised, c. 3 mm wide, exocarp green, drying olive to brown, with a roughened texture; pericarp c. 3 mm thick; seed with a liquid inside.

Figure 21: a. calyx and style, b. petal, c. stamen, d. fruit (lateral view), e. fruit (dorsal view) with areolus

Memecylon megacarpum Furtado is mostly closely related to *M. dichotomum* (Cl.) King (q.v.), the latter having angled branches, smaller leaves, and fewer flowers per inflorescence. Both species have large, globose fruit which are similar to those of *M. amplexicaule* Roxb. (q.v.) which has thick, coriaceous, cordate blades.

King misidentified several collections of *M. megacarpum* (e.g. Maingay 816 and Curtis 814) as *M. heteropleurum* Bl., which has been reduced to a synonym of *M. excelsum* Bl. (q.v.) in this revision.

Memecylon excelsum has the calyx widened above the ovary, different blade venation, and oblong to elliptic fruit. These distinctions are not obvious, except in fruit, unless the type collections are examined.

While it is certain that the species described above is distinct from *M. dichotomum* and *M. excelsum*, it is not certain that *M. megacarpum* is the correct name. Cogniaux described *M. pulchrum* as having much larger leaves (30–35 cm long, 9–11 cm wide) and longer pedicels (3–5 mm), which have basal bracts. By this it is assumed in this paper that the species lacks secondary axes. The type collections of *M. pulchrum* (Beccari 585 and 1833, from Sarawak) were not seen during this research. The epithet *M. pulchrum* Cogn. cannot be used since it is a later homonym of *M. pulchrum* Kurz which was reduced to *M. caeruleum* Jack. var.*pulchrum* (Kurz) Cl. by Clarke which is an entirely different species from the Andamans.

Kedah — Bongsu For. Res.: Everett 14169; Bukit Enggang For. Res.: Whitmore 0405; Gunong Bintang: Haniff 21048; 33rd mile Jeniang Road: Kiah 35959; Koh Mai For. Res.: Kiah 35153

Penang — West Hill: Curtis 814; sine loc.: Wallich 4102A

Perak — Gunong Batu Patch: Wray 1066, 1148; Gunong Bubu For. Res.: Hou 662; Larut: King's collector 6621; Pangkor Island: Whitmore 3081; Slim Hills For. Res.: Whitmore 0817; Sungai Ryah: King's collector 1110; Ulu Kerling: King's collector 8589, 8689; Upper Perak: Wray 3425; Waterfall, Taiping: Burn-Murdoch 162

Kelantan — Gunong Stong: Whitmore 12415; Ulu Sungei Lebir Ketchil: Cockburn 7115

Trengganu — Bukit Lanjut For. Res.: Loh 13459; Gunong Bubu Trong: Suppiah 11746; Gunong Tebu, Jabi; Shah, Shukor, Awang 3303; Ulu Telemong For. Res: Loh 13445

Selangor — Bukit Lagong, Kepong: Suppiah 108881, Kuchummen 79112; Bukit Tanggah: Everett 13781; Fraser's Hill: I.H. Burkill & Holttum 7869; Gading For. Res.: Chan 11239; Kuala Lumpur: Ridley 2053, Mat 2053; Ulu Gombak For. Res.: Kochummen 2353, T. & P. 43 (2643), Yong 99002; Weld's Hill: Hamid 965, Jaamat 10266

Pahang — Batu Balain: I.H. Burkill & Haniff 15829; Bukit Beserah For. Res.: I.H. Burkill & Haniff 16135, Whitmore 3751; Kadouchong, Pulau Tawar: Ridley 2242; Tahan River: Ridley 2340; Kemasul For. Res.: Ismail 98912; Kuala Lumpat, Krau: Soepadmo 759; Lesong For. Res.: Suppiah 14891; Robinson's

Falls, Cameron Highlands: Henderson sn; Raub: Sohadi 14661, Strugnell 20464, Syed-Alli 23365; Sungei Lemoi: Jaamat 28188; Sungai Teku: Kiah sn, on 29 July 1936; Taman Negara: Everett 14458; Ulu Sungai: Shah & Noor 1743, 1843

Negri Sembilan — Bukit Tangga: Ridley sn, in Dec. 1920; Gunong Angsi For. Res.: Nur 11699, Sohadi 14612

Malacca — Sungei Udang: Derry 582

Johore — Bunong Ma'okil Maur: Samsuri & Shukor 957; Gunong Panti: Corner 36290; Mawai-Jemalang Road: Corner 28683, 29016; Sedenah: Ridley 13507

Singapore — Henderson 35916: Maingay 815 (2746), 816 (3112); Ridley 3614a, 5092, 5928, 6215, 9210; Ahmad 1474

Further Distribution — Sumatra, Borneo (Sarawak) (*fide* Cogniaux and King).

22. *Memecylon minutiflorum* Miq., Fl. Ned. Ind. Suppl. I, Sumatra (1860) 323, King, J. As. Soc. Beng. 69, II:1 (1900) 80 (Mat. Fl. Mal. Pen. III, 488).

Tree up to 25 m tall with a diameter up to 60 cm; bole straight, buttressed in larger individuals; bark red-brown to brown-tan or blackish, finely fissured, flaking, thin; slash inner bark pink to red, cambium whitish-purple; slash wood orange-yellow or cream; youngest branches usually somewhat flattened with a vertical groove between internodes on 2 opposite sides, often with 2 raised ridges flanking each groove or 4-angled; older branches cylindric with little or no trace of the grooves or ridges, smooth, tan, c. 1 mm thick; blades subcoriaceous, glabrous, lanceolate, elliptic to broadly ovate, caudate-acuminate (acumen 1–1.5 cm long) at the tip, cuneate at the base and shortly decurrent on the petiole (c. about half its length); venation pinnate, 8–10 pairs of nerves, invisible to very obscure on both surfaces; intramarginal nerve invisible to very obscure, c. 1 mm from the margin; mid-nerve distinct, sunken above, raised and tapering below; 5–10 cm long, 2–5.5 cm wide; dark green, drying light to dark brown above, light brown or olive-greenish to yellowish below; petiole 3–6 mm long, 1–1.5 mm thick, glabrous; inflorescence cymose from leaf axils, or less commonly just behind the leaves, 7–15 (17) mm long, many flowered; axes flattened, grooved on 2 sides, glabrous; bracts and bracteoles lanceolate, acute, up to 1.5 mm long, caducous; primary axes usually solitary, 2–13 mm long, secondary axes glomerulate or up to 4 mm long; pedicels clustered, 1–1.5 mm long, minutely papillose; calyx tube funnelform, constricted above the globose ovary, truncate with 4 cusps, minutely papillose outside, tube 1–2 mm long, c. 2 mm wide, ovary 1 mm diameter; petals broadly ovate to suborbicular, obtuse to acute at the tip, truncate at the base, thin, midline slightly thickened, not keeled, c. 2–2.5 mm long, 1.5–2 mm wide, reflexed at maturity, pink; style c. 4 mm long; ovules 10–12; fruit globose, often flattened at both poles, sometimes with 4 shallow longitudinal grooves, or somewhat gibbous, 7–10 mm diameter, calyx remnant slightly (0.75 mm) raised, areolus c. 2 mm wide; exocarp green, drying yellow-green or grey-green, with a roughened, almost mealy, texture, pericarp 1–2 mm thick, gritty or not gritty.

Figure 22: a. branch and infloresœne, b. calyx and style, c. petal, d. stamen

vernacular: kemuning tikus (Temuan)

This species is easily recognized by the papillose pedicels and calyx; bulbous ovary abruptly widened into the funnelform, 4-cusped calyx; globose fruit with a rugose-mealy texture, and blades which dry concolorous. The holotype of *M. minutiflorum* at Utrecht (Diepenhorst 2337, from Sumatra) lacks inflorescences, flowers, and fruit. The branches and blades, however, compare well with many other specimens which have flowers and fruit that match King's description, e.g. Corner 30336, Mahmud 819, Haniff 15528, King's coll. 6265). Reconstructing an idea of what the holotype is has been done with the literature and other specimens, therefore it is reasonably certain that the description above fits the species.

It should be noted that the type collection of *M. grande* Retz. var. *khasiana* Cl. (Griffith 2333, from the Khasia Mountains in East Bengal), which King (l.c. 83) reduced to a synonym of *M. celastrinum* Kurz, has branches and leaves identical to the holotype of *M. minutiflorum.* The fruit of Griffith's collection is smooth and has a larger calyx remnant.

Memecylon acuminatum Sm. (q.v.) is, in many respects, similar to *M. minutiflorum,* but has cylindric branches, smooth calyx, and smooth fruit with a wider and flat areolus. *M. acuminatum* Sm. var. *flavescens* Cl. (q.v.) is also closely related but differs from both species by having a truncate calyx. The exact relationship of var. *flavescens* to these two species is uncertain, and in this paper King's reduction of var. *flavescens* to a synonym of *M. minutiflorum* Miq. is not accepted.

Memecylon minutiflorum has fruit which closely resembles those of *M. lilacinum* Z. & M. (q.v.). The two species can be easily distinguished by the very short (appearing glomerulate) infructescence, flat areolus, and blades which generally dry dark brown to blackish of the latter.

Memecylon constrictum Craib (Kew Bull. 1930, 324, only known from the type collection of Haniff & Nur (2732), from peninsular Thailand) has a short cymose inflorescence and a distinct constriction above the globose ovary which is similar to that of *M. minutiflorum. M. constrictum*, however, has a smooth, truncate calyx, and larger, thicker leaves. The type collection at Kew has a few very immature buds and from the stamens and petals the species could be related to *M. minutiflorum.* The species is poorly known and there is insufficient material available to study the matter any further (Figure 29, a. — c.).

Thailand

Huey Mut: Kiah 24400; Puket: Haniff & Nur 2732 (*type M. constrictum* Craib)

Malay Peninsula

Kedah — Bukit Perak: Everett 13681; Gunong Baysu: Meh 17954; Gunong Jerai: Stone & Mahmud 8540, Everett 13674; Jeniang Road: Kiah 35978; Sawa For. Res.: Langkawi: Chelliah 6945; N. Pulau Dayang, Langkawi: Whitmore 15043; Machinchang For. Res.: Langkawi: Whitmore 11216, 15030; Langkawi: Wilkinson 20776; Pulau Timon: Whitmore 15105; Sungei Batu Asap, Langkawi: Haniff 15528; Sungai Lugong: Kiah 35086

Penang — West Hill Res.: Burn-Murdoch 28: Reservoir Line, West Hill: Curtis 816

Perak — Larut: King's collector 5027, 6105, 6265; Maxwell's Hill: Ridley 9312, sn in June 1893, Wray 3240

Trengganu — Bukit Kajang: Corner 30336, 30479; Sri Bangun: Sinclair & Kiah 39870; Ulu Sungei Trengganu: Cockburn 10509

Selangor — Bukit Peringkot: Kochummen 1502, Gadoh 1502, Gading For. Res.: Shing 13357, Ginting Bidai: Ridley 7312; Ulu Gombak: Mahmud 819; Ulu Selangor: Goodenough 10601; Weld's Hill: Cubit 867

Pahang — Shah 172; Cameron Highlands: Everett 13664; Endau, Rompin: Mahamud 15519; Gunong Seuyum: Henderson 22211; Jerantut: I.H. Burkill & Haniff 16102; Kota Tongkat: Evans 13187; Kuala Tekam: Evans 13188; Lesong For. Res.: Ahmad & Shukor 447, Samsuri & Shukor 447; Taman Negara: Everett 14462

Negri Sembilan — Gemas: I.H. Burkill 4970; Gunong Sungei For. Res.: Osman 23759; Jelebu For. Res.: Suppiah 11285; Tebong For. Res.: Holttum 9641

Malacca — Bukit Panchor: I.H. Burkill 3046; Bukit Sidenau: Derry 127; Sungei Udang: Alvins 21; sine loc.: Alvins 129, 2302, sn; Maingay 810 (2551)

Johore — Bukit Badok: Hassan & Kadim 92; Gunong Ma'okil: Samsuri & Shukor 958; Gunong Panti West: Samsuri & Shukor 768; Kluang: Whitmore 8691; Kuala Telung Tinggi: Ridley 11078; Maokil For. Res.: Shing 6865, 6873; Mawai-Jemulang Road: Corner 29021, 29044, 29450; Sungei Kayu: Kiah 32057; Sungei Kayu Ara: Corner 28733, sn on 10 Feb. 1935; Sungei Sedili: Corner: 31942

Singapore — Kassim 261

Further Distribution — peninsular Thailand, Sumatra (*fide* Craib).

23. *Memecylon oleifolium* Bl. ("*oleaefolium*"), Mus. Bot. Lugd.-Bat. I:23 (1851) 359 (no. 877); *M. ambiguum* Bl., l.c. 359 (no. 879) *syn. nov.; M. micranthum* Bl., l.c. 360; *M. acuminatissimum* Bl., l.c. 360 *syn. nov.; M. horsfieldii* Miq., Fl. Ned. Ind. I (1855) 572; *M. grande* Retz. var. *horsfieldii* (Miq.) Cl. in Hk. f., Fl. Brit. Ind. II (1879) 558; *M. lampongum* Miq., Fl. Ned. Ind. Suppl. I, Sumatra (1860) 321; *M. brandisianum* Craib, Kew Bull. 1930, 323 *syn. nov.*

Tree up to 12 m tall with a diameter up to 45 cm; bark thin, smooth, fissured to slightly scaly, greyish to whitish; inner bark yellow; sap wood white to brown; branches cylindric, 1–2 mm thick, drying greyish to khaki; blades subcoriaceous to coriaceous, glabrous, elliptic to ovate (often broadly so), acuminate at the tip (acumen up to 17 mm long), acute and decurrent at the base; venation invisible to distinct above; invisible, obscure, or prominent below; mid-nerve sunken above, raised and tapering to the tip below; dark glossy green above, pale green below; drying dark brown above, brown below; (6) 9–21 cm long, (2.5) 3–10 cm wide; petiole (4) 6–9 mm long, 1.5–2.5 mm wide, glabrous; inflorescence from leafy or upper leafless nodes, cymose, 1.5–5 cm long, glabrous, axes 2-grooved to 4-angled; bracts and bracteoles lanceolate, acute at the tip, 0.5 mm long; primary axes 0.8–4 cm long, secondary 2–12 mm, tertiary axes generally not developed or sometimes up to 2 mm long, pedicels 2.5–7 mm long; calyx campanulate, truncate, 1.5–3 mm long, 2–4 mm wide, glabrous, cream coloured with a purple hue; petals thickened, broadly ovate, acute and mucronate at the tip, truncate at the base, 2–2.5 mm long, 2.5 mm wide, mid-nerve thickened and slightly raised dorsally, margins thinner, blue to purple; filaments c. 2 mm long, anthers "C" or "J"-shaped, purple, gland prominent; style 3–4 mm long; ovules

9–12; fruit elliptic-ovate, 8–10 mm long, 6–8 mm wide, pedicels 3–8 mm long, calyx remnant raised, c. 1 mm high, areolus c. 2 mm wide; exocarp green turning light yellow, black and smooth or with minute pustules when dry; pericarp c. 0.5 mm thick.

Figure 23: a. calyx and corolla bud, b. petal, c. bud stamen, d. mature stamens, e. fruit

At first glance, the holotypes of *M. oleifolium* Bl. and *M. acuminatissimum* Bl. appear to be very different; the former has smaller blades with indistinct or invisible venation and the latter has larger blades with conspicuous venation. The holotype of *M. acuminatissimum* (Korthals s.n., from Sumatra) lacks inflorescences and has only a few loose flowers buds. Comparison of this specimen with other collections plus the original description has helped in reconstructing an idea of what the species is. Cockburn 10839 and Whitmore 8773 are flowering and fruiting specimens, respectively, which have branches and leaves similar to the holotype of *M. acuminatissimum*. The inflorescences on Cockburn's specimen range from 2–5 cm long, with distinct secondary (infrequently with tertiary) axes, pedicels 4–5 mm long, and a calyx 3 mm long and 4 mm wide. Whitmore's fruit are elliptic, c. 14 mm long, and 8 mm wide.

Distinguishing *M. acuminatissimum* from *M. oleifolium*, especially with numerous collections of specimens which have been referred to either one, is difficult. Some distinguishing features of *M. acuminatissimum* include the larger: leaves, inflorescences, and calyx. Similar features include the structure of the inflorescence, flowers (especially the anthers), and the fruit. There are several specimens which have blades with faint venation resembling those of *M. oleifolium*, e.g. Cockburn 10839 and Chew 728, but both of these have the inflorescences and calyx similar to *M. acuminatissimum*. Ng 97986 has leaves approaching the size of *M. acuminatissimum*, but the venation is invisible. The inflorescence is more similar to that of *M. acuminatissimum*. There are other specimens which combine features of these two species, e.g. Whitmore 12320 (flowers) and Kochummen 2618 (fruit) in which the inflorescence and fruiting axes are like *M. acuminatissimum* and the leaves resembling both species. In at least two other specimens, Jumali & Heaslett 3056, and Cockburn 10839, the larger leaves resemble *M. acuminatissimum* and the smaller ones *M. oleifolium*. Since there are no structural differences that can be used to separate these two species, plus the fact that the leaves have intermediate forms, I feel that it is necessary to lump *M. acuminatissimum* with *M. oleifolium*, thereby expanding the range of variation of the latter even further.

Memecylon laurinum Bl. (l.c. 359, no. 878), which Bakh. f. (l.c. 357) reduced to *M. oleifolium* Bl. var. *laurinum* (Bl.) Bakh. f. is only known from three collection which include the two types (Korthals s.n., from Sumatra, and Korthals s.n. from Borneo) and another specimen (without collector or number) from Sumatra. Only the two specimens from Sumatra can be studied in detail since the other type is without flowers or fruit.

The buds of var. *laurinum* differ from those of the typical variety in that the calyx is quite large (c. 4 mm long) and apiculate, and the inflorescence is shorter and more compact. The bud petals and anthers are of identical size and shape to those of *M. oleifolium*. The branches and leaves are also the same. The mature of the calyx differs from *M. oleifolium* and since there is little similarity between the two taxa I do not feel confident in reducing the variety to a synonym of the typical variety since its mature flowers and fruit are still unknown.

Blume (l.c. 359) notes under *M. ambiguum* Bl. that the inflorescence is more dense, the blade venation is more prominent, and the base of the blades is more rounded that with *M. oleifolium*. The type specimens of both species at Leiden have been examined and while the vegetative features are somewhat different, the structures of the inflorescence and the morphology of the flowers are the same for both species.

Another species, *M. micranthum* Bl. (l.c. 360) was reduced to a synonym of *M. oleïfolium* Bl. by Cogniaux (l.c. 1150). The type specimen of *M. micranthum* Bl. at Leiden is exactly the same as the type specimen of *M. ambiguum* Bl. in all respects. Bakh. f. (l.c. 353) combined *M. micranthum* with *M. ambiguum*, but maintained *M.. oleifolium* as a distinct species. Cogniaux (l.c. 1143), however, considered *M. ambiguum* as a good species and included it in his monograph in a different section from *M. oleïfolium*. It is not understood how Cogniaux could have done this since the leaves of *M. ambiguum* and *M. micranthum* are exactly the same. This is not true with the leaves of *M. oleifolium*.

In any case, the structure of the inflorescences and the flowers are the same for all three species. This, therefore, is very good evidence for combining all of them under one species viz. *M. oleifolium* which was published above the other two. More evidence for this involves King's coll. 4420 from Larut, Perak. This specimen, cited by King (l.c. 83) as *M. oleïfolium* combines features of this species and *M. ambiguum*. The relatively small leaves and their texture resemble *M. ambiguum*, however the acute base and the obscure venation are like *M. oleifolium*. The inflorescence has many flowers on thicker axes which is a *M. ambiguum* feature. The flower morphology matches both species. Bakh. f. annotated this specimen as *Memecylon* spec. and it is easily understood why since it is an apparent intermediate form between the two species.

In comparison to all the more typical specimens of *M. oleïfolium* examined, King's coll. 4420 is very unusual. The specimens of *M. ambiguum* and *M. micranthum* at Leiden, at first glance, appear to be distinct from *M. oleifolium*. Similarly, most of the specimens of *M. oleifolium* match its type specimen. Unfortunately, there are only a few specimens of *M. ambiguum* and *M. micranthum* at Leiden, thus I am not certain of any other variation within this group.

Koorders 24271, from Java, is the only specimen of *M. ambiguum* (including *M. micranthum*) at Leiden that has fruit, and these match those of several collections of *M. oleifolium*.

From observations during this research and from the opinions of those botanists mentioned above, it seems that these three species are the same. I have little doubt that *M. micranthum* is the same as *M. ambiguum* and confidence is maintained in combining both of them with *M. oleifolium* Bl.

The holotype of *M. lampongum* Miq. (Teysmann 4281, from Sumatra) at Utrecht is in very immature calyx bud, but from the branches, leaves, and structure of the inflorescence this specimen matches Maingay 811 and to a lesser extent, due to its having more mature flowers, Blume's type collections of *M. oleifolium*.

Bakh. f. suggests that *M. lampongum* may be related to *M. ambiguum*, which it certainly is, but the striking similarities with Maingay 811 and Blume's material is more obvious. I agree with King in reducing *M. lampongum* Miq. to a synonym of *M. oleifolium* Bl. Agreement is also made with King (l.c. 83) in reducing *M. grande* Retz. var. *horsfieldii* (Miq.) Cl. to *M. oleifolium*. A specimen at Leiden (Maingayi 811) matches the types of the latter collected by Korthals (s.n.) from Sumatra. This variety, with less prominent nerves, more acute buds, and shorter inflorescences, lacks any structural differences from *M. oleifolium*. It cannot, therefore, be considered distinct from *M. oleifolium*.

Memecylon pubescens (Cl.) King (q.v.) has flowers similar to those of *M. oleifolium*, but the inflorescence of the former has many more flowers which are congested in glomerules on the tips of the secondary axes. Also these axes are pubescent and the venation of the blades, especially below, is much more prominent. Transitional forms linking the two species have not been seen, therefore it is better to maintain both of them as separate species.

The type specimens of *M. brandisianum* Craib (Kerr 14169 from peninsular Thailand) match the type specimens of *M. oleifolium* Bl. at Leiden. The holotype from Kew and the isotypes from BM and BK of *M. brandisianum* are in bud, however the calyx, petals, and stamens match a bud specimen collected by Blume (s.n.) from Sumatra. The leaves of Kerr's specimens have dried with a green colour on both surfaces in contrast to the typical brown colour of dried *M. oleifolium* blades.

Craib, in his original description, notes that *M. brandisianum* is related to *M. garcinioides* Bl. (q.v.), however it is obvious from the anthers of Kerr's specimens that the relation is only superficial. The stamens of *M. garcinioides* are very unusual and quite distinct, and in no way, even in bud, resemble those of *M. brandisianum* or *M. oleifolium*.

Thailand

Terutao: Kerr 14169 (*type M. brandisianum* Craib)

Malay Peninsula

Kedah — Miujol: Meh 17879

Perak — King's collector 4420, 4439, 8198; Ulu Kerling: King's collector 8571; sine loc.: Scortechini 2069; Grik: Yong 94662

Kelantan — Bukit Yong: Shah & Shukor 3232; Ulu Sat For. Res.: Suppiah 104585

Trengganu — 34th mile Jerengau Road: Sinclair & Kiah 40939; Sungei Nipa: Corner sn on 20 Nov. 1935; Ulu Brang: Moysey & Kiah 33632; Ulu Bendong: Corner 30017; Ulu S. Loh: Cockburn 10839

Selangor — Gunong Simpah: Hume 8481, 8910, 9159; Sungei Lalang Kajang: Symington 22644; Ulu Gombak: Kochummen 2718; Ulu Langat: Gadoh 1781; sine loc.: Alvins 659

Pahang — Bukit Berelah, Kuantan: Shah, Sidek, Samsuri 3722; Kampong Aur: Samsuri & Shukor 484; Kemasul For. Res.: Temerloh: Kochummen 98582, Whitmore 0079; Lepar For. Res.: Suppiah 108952; Lompat Krau: Whitmore 3583; Pulau Tioman: Henderson 21651; Sabi Estate, near Bentong: Shah 223; Ulu Kuantan: Craddock sn in 1903; Ulu Sungei Sat: Shah & Noor 1842

Negri Sembilan — Bukit Tangga: Ridley sn in Dec. 1920; Gunong Angsi: Nur 11679; Kuala Pilak: Tassin 4498

Malacca — Ayer Panas: Derry 1199; Bukit Besar: Ridley sn; Bukit Sutu, Sungei Ujong: Alvins 1970; Bukit Tumiang: Alvins 2035; Sungei Ujong: Alvins sn; sine loc.: Maingay 811 (1228)

Johore — Gua Riman, Kluang: Jumali & Heaslett 3056; Gunong Blumut: Whitmore 8773; Gunong Ledang: Whitmore 12320, 12341; Gunong Panti: Ridley sn in 1892, Holttum 18095, Corner sn on 20 Jan. 1936; Chew 728; Gunong Pulai: Ridley 12179; Kluang For. Res.: Ng 97986; Labis For. Res.: Ahmad & Shukor 521, Kochummen 2618; Segamat: Shing 17155; Sungai Kayu Ara: Kiah 31994, 32079; Corner sn on 8 and 10 Feb. 1935; Virgin Jungle Reserve, Mersing: Ahmad 376

Singapore — Ridley 6414A, 6416

Further Distribution — Sumatra, Java, Soemba Is. (*fide* Bakh. f.).

24. *Memecylon oligoneurum* Bl. Mus. Bot. Lugd.-Bat. I: 23 (1851) 353.

Shrub up to 3 m tall, more commonly a tree 5–15 m tall with a diameter of 15–30 cm; bark thin, finely fissured and flaking, light brown or grey; inner bark thin, dull greyish-brown, sapwood hard, brownish-yellow; branches cylindric, often a bit flattened and shallowly grooved on two faces below the upper node, sometimes 4-angled on lower internodes, drying brown; blades coriaceous, elliptic, often broadly so, acute to bluntly acuminate at the tip; narrowed and decurrent at the base; main veins 3, from the base to the tip, depressed above, raised (often prominently) below; secondary venation pinnate, very obscure to invisible on both surfaces; intramarginal nerve obscure to invisible, 1–2 mm from the margin, arching smoothly towards the tip, (5) 7–12 cm long, (2) 3.5–6.5 cm wide, drying dark brown to blackish above, brown below; petiole 5–7 mm long, 1 mm thick; inflorescence glomerulate, 3–5 mm long, glabrous; primary axes 0–1.5 (exceptionally 2.5) mm long, flattened, usually several in the leaf axils, flowers numerous; pedicels 1–2 mm long, crowded along the fused secondary axes; bracts and bracteoles ovate, acute, 0.75 mm long; calyx campanulate, slightly to sharply constricted above the ovary, often flattened when mature, c. 1 mm high, 1.5 mm wide, glabrous, truncate with 4 obscure, broad, short, apiculate lobes, faintly ridged inside, cream to whitish; petals thin, oblong to sub-orbicular, ventral surface often concave at maturity, broadly rounded at the tip, narrowed or rounded to a claw at the base, margins slightly thinner, mid-nerve slightly raised near the tip of the dorsal surface; 1–1.5 mm long, 1–1.25 mm wide, white, filaments 1.5–2 mm long; anthers rounded - cuneate to globose, 0.5–0.75 mm long, connective several times to as long as the locules, without a gland, light yellow; stigma capitate, minute; style slender c. 3 mm long; ovules 2; fruit globose, 5–7 mm diameter, pedicels 3–4 mm long, calyx remnant raised and lobed, areolus c. 1.25 mm wide; often appearing didymous with 2 shallow, vertical grooves near the pedicel extending half way up, two seeds have developed in this situation; exocarp green when immature, turning blue and finally black when ripe; drying grey to blackish, often mealy in texture; pericarp c. 0.5 mm thick.

Figure 24: a. leaf, b. inflorescence, c. calyx and style, d. petal, e. stamen

The 3 basal veins, calyx with faint internal ridges, and glandless anthers immediately distinguish this species from all others in the region. *M. oligoneurum* Bl. is often confused with various species of *Pternandra,* especially *P. galeata* (Korth.) Ridl., and *P. coerulescens* Jack. *Pternandra* in general, has thicker blades with invisible secondary venation which dry black or very dark brown, larger flowers, and many seeded fruit. The inflorescence of *P. coerulescens,* even when it is very short, always has distinct primary axes, which are not on tubercles, and sometimes secondary axes, fewer flowers, and a much larger, campanulate-cyathiform, truncate calyx with an external tessellate pattern.

The epidermis on the branchlets of *Pternandra coerulescens* Jack is usually blackish and in most instances peels off. This feature and that of the secondary venation afford good distinguishing features with vegetative material. Confusion is also possible with various species of *Strychnos* L. (Loganiaceae), however a distinction can immediately be made by its climbing habit.

M. oligoneurum Bl. has, as far as can be determined, the fewest number of ovules of all the species of *Memecylon* from the Malay Peninsula. The glandless anthers are similar to those of *M. lilacinum* Z. & M. (q.v.), but that species has, among other major differences, uninerved blades, and narrow petals.

Kedah — Gunong Bougan: Bosewell 18022

Penang — Curtis 1065, 1146, 2220, sn in March 189?; Forest Guard 2220

Perak — Larut: King's collector 2513; Taiping: Shah & Sidek 1158; Tapah: Ridley 14060; Ulu Bubong: King's collector 10280, 10920; sine loc.: Burn-Murdoch 191, Scortechini 1309

Kelantan — Sungai Lebir: Cockburn 115981; Ulu Sungei Aring: Whitmore 4490;

Selangor — Ginting Simpah: Hume 9309, 9687; Gombak For. Res.: van Balgooy 2125; Sepang: Corner sn on 27 Nov. 1941; Sungai Buloh: Nur 11881; Ulu Gombak: Hume 9381

Pahang — Jengka For. Res.: Whitmore 0059; Kuala Lipis: Mat 4038; Pulau Tioman: I.H. Burkill 1103; Rompin: Mahamud 17164; Taman Negara: Lim sn; sine loc.: Nong 4038

Negri Sembilan — Gunong Angsi: Nur 11654

Malacca — Ayer Keroh: Ridley 10752; Bukit Buiang: Alvins 40

Johore — Labis For. Res.: Ogata 110396

Singapore — Kiah 34670

Further Distribution — Banka Is., Sumatra, Java, Philippines, Borneo (Kalimantan) (*fide* Bakh. f.).

25. *Memecylon paniculatum* Jack, Mal. Misc. II (1822) 62; *M. costatum* Miq., Verh. Kon. Ned. Inst. (1850) 29; *M. appenduculatum* Bl., Mus. Bot. Lugd.-Bat. I:23 (1851) 361; *M. nudum* Bl., l.c. 361; *M. caloneuron* Miq., Fl. Ned. Ind. Suppl. I, Sumatra (1860) 321 (synonyms in Bakh. f., Med. Mus. Bot. Utrecht 91 (1943) 345 and Rec. Trav. Bot. Neerl. 40 (1943-45) 345); Merrill, J. Arn. Arbor. 33 (1952) 235; Furtado, Gard. Bull. Sing. 20 (1963) 121); *M. venosum* Merr., Phil. J. Sci. 3 (1908) Bot. 154 *syn. nov.; M. gigantifolium* Elm., Leaf. Phil. Bot. 8 (1915) 2762 *syn. nov.*

Tree 10–30 m tall ,diameter up to 90 cm; bark thin, finely fissured and flaking, brownish-grey, greyish-white; branchlets distinctly 4-winged or 4-angled, less commonly 4-angled near the nodes and cylindric below, 3–4 mm thick, glabrous and smooth, drying dark brown, epidermis peeling off leaving a smooth, cylindric, light brown surface; blades subcoriaceous, glabrous, lanceolate, ovate, obtuse or shortly and obtusely acuminate (acumen up to 1 cm long) at the tip, broadly rounded or more frequently distinctly cordate (indentation 2–3 mm) at the base; (8) 11–26 cm long, (3.5) 45–14 cm wide, venation pinnate, (8) 10–14 opposite to subopposite pairs, sunken and clearly visible above, prominently raised below, arising at 45° from the mid-vein, straight or arching, intramarginal nerve similar in appearance to the veins on both surfaces, 5–8 mm from the margin, looping; mid-vein sunken above, prominently raised and tapering below; drying dark brown above, lighter brown below, very brittle; petiole 2–3 mm long, 1–2 mm thick, glabrous; inflorescence cymose, c. 4 cm long, axes generally 4-angled, minutely furfuraceus, becoming glabrous; primary axes 1–3, usually from leaf axils, 2–3 cm long, 1–2 mm thick; secondary axes 4–10 cm long, tertiary axes generally glomerulate or up to 3 mm long, 4th axes glomerulate and rarely distinguishable; pedicels c. 2 mm long, green; calyx funnelform-campanulate, truncate, often with 4 minute cuspus, 1–2 mm long, c. 3 mm wide, glabrous and smooth outside, prominently ridged inside, green; petals slightly thickened, broadly ovate to sub-orbicular, acute at the tip, truncate at the base, margins thinner, c. 2 mm long, 2 mm wide, white; anthers "J" shaped, c. 1 mm long, gland distinct, centrally located; stigma minute, style c. 3 mm long; ovules c. 12; infructescence axes generally not elongating, but becoming thicker, prominently angled to somewhat 4-winged, primary axes 3–4 mm thick, tertiary axes generally glomerulate, often irregularly so due to the unequal lengths of the tertiary axes, up to 3 mm thick, with numerous distinctly raised bract scars forming a rim about the pedicel scars; pedicels c. 3 mm long; fruit globose, 6–8 mm diameter, capped by the persistent calyx remnant; exocarp thin, whitish turning purple when ripe; or ovate, nipple-like and crowned by the persistent calyx remnant at the tip; 10–13 mm long, 7–9 mm wide; yellow/green when immature, drying tan to blackish.

Figure 25: a. calyx, b. petal, c. & d. stamens

Memecylon beccarianum Cogn. (q.v.) is very close to, if not the same as, *M. paniculatum* Jack. *M. beccarianum* differs from *M. paniculatum* in having cylindric branchlets. As far as can be determined from the original description and type specimens of *M. beccarianum* (from Borneo), this is the only major difference. Unfortunately, Jack, in his original description, did not indicate whether the branchlets are cylindric or angled to winged, however those specimens at Singapore and Leiden which are considered in this paper as being *M. paniculatum* all have angled to winged branchlets which become cylindric with age. *Memecylon beccarianum* has been retained as a distinct species in this paper since it is not certain that it is the same as *M. paniculatum* or one of its numerous synonyms.

Elmer 13548, from Mindanao, Philippines, which is the type material of *M. gigantifolium* Elm., has the same leaves, inflorescences, and flowers as *M. paniculatum* Jack and synonyms. Elmer's isotype at Leiden has a lower branch which is cylindric and with rather large leaves. In some specimens of *M. paniculatum* seen the leaves are of this size and nearly sessile, however all other features are distinctly those of *M. paniculatum* — including older branches which are cylindric. *M. gigantifolium* does not differ from *M. paniculatum sensu lat.* and should be reduced to a synonym of the latter.

Memecylon venosum Merr., according to Merrill, merely differs from *M. paniculatum* in having smaller, more acuminate blades with prominent reticulations on the undersurface; and a shorter inflorescence. A syntype of this specimen at Leiden (Clemens, s.n., from Camp Keithley, Mindanao, in September 1906) closely matches specimens annotated by Bakh. f. as *M. costatum*. There are no structural details in the inflorescences, flowers, or fruit which distinguish *M. venosum* from *M. costatum,* which has been reduced to a synonym of *M. paniculatum.* Two other collections identified as *M. venosum* Merr. at Leiden (Elmer 13666, 11752; both from Mindanao) match its syntype and confirm my belief that *M. venosum* is the same as *M. paniculatum.*

Kedah — Gunong Raya, Langkawi: Haniff 15526; Koh Mai For. Res.: Kiah 35198

Penang — Penang Hill: Ng 1112

Perak — Chior For. Res.: Ng 5799; Dindings: Burn-Murdoch 255; Larut: King's collector 6945, 8305; Wray 3235; Sungai Seluang, Telok Anson: Shah & Shukor 3450

Kelantan — Gua Nunik: Henderson 19711; Gunong Stong: Whitmore 12438; Kuala Sepia: Whitmore 4318; Sungei Lebir: Cockburn 7029

Trengganu — Ulu Brang: Moysey & Kiah 33635

Pahang — Tahan River: Ridley 2237

Malacca — sine loc.: Maingay 813 (1567)

Johore — Kangka Sedili Ketchil: Corner 28603; Mawai: Ngadiman 34734; Panau Sungei Sedili: Corner 37050; Panti River: Ridley 15399; Sungai Kayu: Kiah 32188

Singapore — Corner sn on 10 Sept. 1934; Sinclair 39658, 40234.

Further Distribution — Thailand (SE), Sumatra, Simeuloee Is., Java, Karimata Is., Borneo (Kalimantan), Philippines, Celebes, Talaud & Soela Islands, Moluccas (*fide* Craib and Bakh. f.).

26. ***Memecylon pauciflorum*** Bl., Mus. Bot. Lugd.-Bat. I:23 (1851) 356; *M. pulchellum* Ridl., J. Str. Br. Roy. As. Soc. 61 (1912) 52, syn. in Ridl., Fl. Mal. Pen. I (1922) 816; *M. pauciflorum* Bl. var. *obovatum* Furtado *in scheda* Herb. Sing.

var. *pauciflorum*

Shrub 2–3 m or a tree up to 8 m tall; bark thin, brown, longitudinally ridged; branches somewhat flattened and deeply grooved on 2 sides, each groove bordered by 2 sharp ridges, or sharply 4-angled, often with the grooves widened and appearing winged near the upper nodes, 1 mm thick, glabrous; blades coriaceous, ovate, bluntly acuminate at the tip, narrowed and not or only slightly decurrent on the petiole, venation extremely obscure or more commonly invisible on both surfaces, mid-nerve sunken above, raised and tapering below, 3–6 cm long, 1–3 cm wide, grey-green or glossy dull green above, yellow-green or olive-green below, drying blackish or very dark brown above, brown below; petiole 1–3 mm long, 1 mm thick, glabrous; inflorescence from leaf axils, 5–7 mm long, umbellate or a very contracted cyme which appears umbellate, primary axes 1 or 2 from each axil, 4-angled, 1.5–4 mm long, often extended beyond the first node for up to 1 mm; secondary axes indistinct and reduced to tubercles c. 0.5 mm long; pedicels 2–2.5 mm long; flowers few (c. 5); bracts and bracteoles lanceolate, acuminate at the tip, c. 0.25 mm long, cauducous; calyx campanulate, constricted above the ovary, truncate with 4 distinct cusps, smooth outside, ridged internally, white; corolla buds dome shaped, tips acuminate and twisted; petals thin, broadly ovate, caudate-acuminate at the tip, truncate to shortly clawed at the base, midvein slightly thickened, but not raised, c. 2 mm long, 1.5–2 mm wide, blue to purplish; filaments blueish, anthers yellowish with a blue spur, gland distinct; fruit globose, 5–8 mm diameter, calyx remnant raised, areolus c. 1–1.5 mm wide, exocarp smooth and sometimes minutely warty, c. 1/5 mm thick, green turning pale yellowish and tinged with pink, drying black or greenish.

Figure 26: a. calyx and corolla bud, b. petal, c. stamens

In many respects this species closely resembles *M. lilacinum* Z. & M. (q.v.), however that species has a greater variation in leaf size, more flowers in each inflorescence, and anthers without a gland. The fruit of *M. lilacinum* also is larger, depressed globose, and has a thick, gritty pericarp. The anthers and fruit provide the most reliable distinguishing features for the two species.

M. edule Roxb. var. *edule* (q.v.) very closely resembles *M. pauciflorum*, however the former has a truncate calyx with or without 4 very small bumps and a generally more complex inflorescence.

M. pulchellum Ridl. has more ovate blades, slightly larger and narrower calyx lobes, and shortly clawed petals. These features fall well within the range of variation for *M. pauciflorum*, and, therefore, agreement is made with Ridley in reducing *M. pulchellum* to a synonym of *M. pauciflorum*.

Memecylon pauciflorum Bl. var. *obovatum* Furtado, as noted on several sheets in the Singapore collection (Henderson sn, from Selat Panchor, Langkawi on 22 Nov. 1934; Corner sn, from Pulau Dayang Bunting, Langkawi on 13 Nov. 1941, etc.) differs from the typical variety in having obovate blades. Some blades on these collections are identical to those of typical *M. pauciflorum*, thus Furtado's unpublished variety is not worthy of further attention.

Kedah — Pulau Butong: Ridley 15828 (*lectotype M. pulchellum* Ridl.); Pulau Dayang Bunting: Alphonso & Samsuri 179; Corner 37853, sn on 13 Nov. 1941; Pulau Jerkam: Corner sn on 17 Nov. 1941; Pulau Langkawi: Haniff & Nur 7547, Holttum 17431; Sulau Sarang: Ridley 15829 (*syntype M. pulchellum* Ridl.); Selat Panchor. Langkawi: Henderson 29090, sn on 22 Nov. 1934; Telok Udang: Haniff 1071

Penang — Curtis 3434, King's collector 1684, Nauen sn on Penang Hill in April 1940

Kelantan — Gua Musang: UNESCO 326; Gua Teja: Henderson 29680; Gunong Brong Bertam: Shah & Ali 2886

Trengganu — S. Banum, Kemaman: Corner 25829

Selangor — Bukit Takun: Nur 34371; Gua Batu: Ridley sn in July 1897

Perak — Gunong Ginting: Ahmad & Sidek 579

Johore — Gunung Belumut: Holttum 16779; Kanga Sedili Ketchil: Corner 28565

Singapore — Lobb 296, Ridley 14178

Further Distribution — Burma, Laos, Thailand, Timor (type), New Guinea (*fide* Craib and Bakh. f.).

26a. *Memecylon pauciflorum* Bl. var. *brevifolium* Craib, Fl. Siam. Enum. I:4 (1931) 712.

Shrub 50–100 cm tall, branchlets flattened, deeply grooved on two sides, each groove flanked by two sharp ridges; grooves often wider, thus the branchlets appear somewhat 4-angled; older branches becoming cylindric, c. 1 mm thick; blades coriaceous, ovate, obtuse at the tip, sometimes shallowly emarginate; acute and shortly decurrent at the base; venation invisible on both surfaces, midvein sunken above, slightly raised near the base and tapering to the tip below, 1.2–1.7 cm long, 6–8 (ex descr. 10) mm wide, drying dark brown above, brown below; petiole 2 mm long, c. 0.5 mm thick; inflorescence, flowers, and fruit unknown.

Figure 35: isotype.

Craib notes that there is only one known collection of this taxon, and that the specimen he examined was in fruit. The two specimens at Singapore are vegetative and apparently only differ from the typical variety by the very small leaves.

Thailand

Puket: small islands near Pulau Panji: Haniff & Nur 4070 (*type*).

27. *Memecylon pubescens* (Cl.) King, J. As. Soc. Bengal 69, II:1 (1900) 74 (Mat. Fl. Mal. Pen. III, 482); *M. grande* Retz. var. *pubescens* Cl. in Hk. f., Fl. Brit. Ind. II (1879) 558.

Tree up to 30 m tall, diameter up to 75 (exceptionally 2 m) cm; trunk massive, twisted or straight, fluted to about 3 m high; crown with massive, spreading limbs; bark slightly fissured, in thin, brittle, and elongate scales, dull brown to grey-green; inner bark black-brown; sap wood yellow; branchlets slightly flattened and grooved below the upper node, otherwise cylindric; 1.5 mm diameter, smooth and glabrous, blades coriaceous, elliptic, acute or shortly acuminate at the tip, acute and decurrent at the base; venation pinnate, 8–12 pairs of nerves, sunken above; raised below; intramarginal nerve c. 3 mm from the margin, looping; midnerve sunken above, prominently raised and tapering below; 8–15 cm long, 4–6.5 cm wide; dark, glossy green above, dull green below; drying dark and often glossy brown above, dull brown below, entirely glabrous; petiole 8–10 mm long, 1.5–2 mm thick, glabrous; inflorescence from leaf axils or just behind the leaves from leafless nodes, composed of an open panicle of cymes or umbellate, 2.5–7 cm long; axes flattened, grooved on 2 faces and frequently angled; minutely rufus hispid throughout; primary axes 1.5–5 cm long, usually solitary, less frequently paired, with 1 or 2 nodes, 1.5–2 mm wide; secondary axes 3–20 mm (exceptionally 25–35 mm) long, tertiary axes not developed or up to 2 mm long, pedicels glomerulate, glabrous, c. 1 mm long; flowers numerous; calyx campanulate, truncate, often with 4 minute points, widened above the ovary, smooth outside, ridged inside, 1.25–1.5 mm long, 1.5 mm wide, petals thickened, oblong to broadly ovate, obtuse with a mucro at the tip, truncate at the base; mid-nerve slightly raised, but not keeled, dorsally, margins thinner, c. 1.25 mm long, c. 1–1.5 mm wide; anthers "J" to "C"-shaped, gland prominent, centrally located, connective thickened, c. 1 mm long; stigma minute, style c. 2 mm long; ovules 10–12; infructescence axes often glabrescent, pedicels 2 mm long, fruit globose, 10–12 mm diameter, calyx remnant slightly raised, areolus c. 2 mm wide; exocarp minutely muricate, pericarp c. 1 mm thick, gritty, green when immature, purple to dark blue when ripe; drying black.

Figure 27: a. branch and inflorescence, b. calyx, c. petal, d. stamen, e. fruit

The axes in *M. hullettii* King are muricate-papillose and the inflorescence is a compound umbel. *M. beccarianum* Cogn. has pubescent axes, however the leaves in that species are larger, more rounded at the base, and the calyx has 4 minute points. Purseglove 5505 and Everett 13882, both from Johore, differ from most other specimens of *M. pubescens* in having thicker blades. The secondary veins are impressed above and are very faint to invisible below. The finer venation is invisible. The inflorescence, flowers, and fruit of these collections appear to be the same as more typical specimens of *M. pubescens.*

Kedah — Koh Mai Res.: Kiah 35188; Ulu Muda For. Res.: Chan 6693, 6791, 6802

Perak — King's collector 6089; Kinta Hills For. Res.: Zainuddin 99778; Slim Hills For. Res.: Whitmore 0746

Trengganu — Ulu Brang: Whitmore 12539

Selangor — Semangko For. Res.: Whitmore 12554; Sungei Bulok For. Res.: Kiai 8295, Sow & Tachon 16858

Pahang — Kemasul For. Res.: Hamid 10619; Pekan: I.H. Burkill & Haniff 17248, 17250; Temerloh: Pawanchee 13760

Negri Sembilan — Jelebu For. Res.: Suppiah 11353

Malacca — sine. loc.: Griffith 2336 (*type*)

Johore — Gunong Pulai: Purseglove 5505; Ulu Sungei Sedili Besar: Everett 13882

Singapore — Henderson 35911, 36437, Ridley 10390

Further Distribution — peninsular Thailand (*fide* Craib).

28. *Memecylon wallichii* Ridl., J. Str. Br. Roy. As. Soc. 79 (1918) 74; *M. heteropleurum* Bl. var. *olivaceum* King ("*olivacea*"), J. As. Soc. Bengal 69, II: 1 (1900) 78 (Mat. Fl. Mal. Pen. III, 486), in part; *M. longifolium* Ridl., l.c. 72 *nom. illeg. non* Cogn.; *M. depressum* Benth. ex Triana, Trans. Linn. Soc. 28 (1871) 158; *M. amplexicaule* Roxb. *sensu* Clarke in Hk. f., Fl. Brit. Ind. II (1879) 559.

Shrub up to 4 m tall or a tree up to 5 mm with a diameter of 15 cm; bark greyish, finely fissured, thin; branchlets 4-angled, less commonly 4-winged, especially near the upper nodes, becoming cylindric with age, smooth, glabrous, light brown-tan when dry, c. 2 mm thick; blades coriaceous, glabrous, lanceolate, elliptic, to ovate; caudate-acuminate (acumen up to 2.5 cm long) at the tip; broadly rounded to cordate at the base; venation pinnate, 14–18 pairs of nerves, lower veins running parallel to the midvein for 1–2 mm, then diverging at 45° towards the margin, straight or slightly arching, sunken and rather faint above, prominently or less commonly slightly raised below; intramarginal nerve of similar appearance, 6–9 mm from the margin, broadly looping; midvein sunken above, prominently raised and tapering below; (12) 14–25 cm long, 3.5–10 cm wide; drying olive-brown to dark brown above, brown or greenish below; petiole 1–2 mm long, 1.5–2.5 mm thick, glabrous; inflorescence cymose, 1–1.5 cm long, glabrous, usually with about 10 flowers; primary axes 2 or 3 from leaf (often terminal) axils, 2–8 mm long, 1–2 mm thick, 4-angled; secondary axes 1–2 mm long, often clustered; tertiary axes generally glomerulate, less frequently up to 0.75 mm long; pedicels 2–2.5 mm long; bracts ovate, acute, thickened, c. 0.5–0.75 mm long, fimbriate at the base inside; calyx campanulate, truncate, cracking irregularly about the margin; smooth outside, ridged internally, glabrous, 3–4 mm long, 3–4 mm wide, red; petals orbicular in outline, acute at the tip, truncate at the base, thickened with thinner margins, 2.5–3 mm long, 3–4 mm wide; keel slightly developed dorsally, white; filaments c. 2 mm long; anthers linear, locules extending all along one side of the anther and curving around the distal tip, connective smaller, with a distinct gland near the filament, 1.5–2 mm long, white; stigma minute, style c. 4 mm long; ovules c. 8; fruit globose, 10–15 mm diameter, smooth, capped by the raised calyx remnant, areolus c. 4 mm wide; pericarp c. 0.5 mm thick, pink to bright red when immature, dark purplish-red, then blackish when ripe.

Figure 28: a. bracts and calyx, b. bud petal, c. stamens

The 4-angled to 4-winged branchlets and leaves are similar to *M. paniculatum* Jack (q.v.), but that species has longer primary and secondary axes (total length up to 4 cm), entirely different anthers, and smaller (globose or ovate) fruit. *M. excelsum* Bl. is also similar, but the inflorescence is behind the leaves, has different anthers, and ovate fruit. *M. corticosum* Ridl. is nearly the same as *M. wallichii* vegetatively, however that species has narrower blades, ramiflorus inflorescences, and different anthers. The anthers of *M. wallichii* are unique and are probably the most reliable structural feature that can be used to distinguish it from all related species.

Agreement is made with Furtado (Gard. Bull. Sing. 20 (1963) 122) in his reduction of *M. longifolium* Ridl. to a synonym of *M. wallichii* Ridl. The blades, inflorescence, and flowers (especially the anthers) of the holotype of *M. longifolium* (Ridley 9475, from Perak) match those of Curtis 1294 — which is a syntype of *M. wallichii*.

Memecylon longifolium Ridl. is a later homonym of a completely different species described by Cogniaux (Monogr. Phan. 7 (1891) 1150) from New Guinea and Sarawak. Ridley's epithet, even though it has publication priority over *M. wallichii,* cannot be used since it violates a nomenclatural rule.

The syntypes of *M. heteropleurum* Bl. var. *olivaceum* King include specimens which Furtado reduced to *M. maingayi* Cl. (Wray 1310) (now a synonym of *M. excelsum* Bl.) and *M. wallichii* (King's coll. 500). His observations are correct, however I have not seen the other syntype of var. *olivaceum* (King's coll. 10872) to determine its proper identity.

Penang — I.H. Burkill 1532, 2685, 3337, 6146, 6579; Curtis 457 (*syntype*); 965 from Experimental Nursery (*syntype*), 965 from Penang Hill, = 965 at Paya Trobong in Aug. 1892, sn from Paya Trobury in Aug. 1892; Ridley sn in Mar. 1915; Wallich 4101, 4101C (*lectotype*)

Perak — Goping: King's collector 500 (*lectotype M. heteropleurum* Bl. var. *olivaceum* King); Gunong Bujang Melaka: Shah & Shukor 3406; Gunong Keledang: Ridley 9628; Kali, Kuala Kangsar: Haniff 14949; Grik: Chelliah 98616; Larut: King's collector 2778 (*syntype M. heteropleurum* Bl. var. *olivaceum* King); 3058 (*syntype*); Lumut: Curtis sn in Dec. 1902; Ridley 9475 (*type M. longifolium* Ridl.); Piah For. Res.: Jaamat 39247; Taiping: Ridley 14687; Tapak: Ridley 14102; Waterfall: Wray 1964, 2326, 3278; Waterloo: Curtis 1294 (*syntype*); sine loc.: Scortechini 231 (*syntype*), sn

Kelantan — Bertam: UNESCO 95

Malacca — Bujoing: Ridley 9526

Insufficiently Known Taxa

1. *M. constrictum* Craib, Kew Bull. 1930, 324. (q.v. *M. minutiflorum* Miq.).

Figure 29: a. calyx and corolla bud, b. petal, c. stamen.

2. *M. lancifolium* Ridl. Ml. Malay Pen. V suppl. (1925) 311.

Small tree, glabrous; blades coriaceous, lanceolate, acuminate at the tip (acumen c. 1 cm long), narrowed and slightly decurrent at the base, midrib sunken above, raised below; secondary venation pinnate with c. 15 pairs of nerves, obscure to invisible on both surfaces; 15 cm long, 4 cm wide; drying olive-greenish above, brown below; petiole c. 1 cm long, 2 mm thick; inflorescence cymose, in pairs from leaf axils, axes slightly 4-angled to flattened, drying black; primary axes c. 7 mm long, secondary axes 3, 7–8 mm long; tertiary up to 4 mm. 4th not developed or up to 1.25 mm long, pedicels c. 2 mm long; bracts and bracteoles ovate, acute, c. 0.5 mm long; calyx campanulate, widened above the ovary, smooth and glabrous outside, c. 2 mm long, c. 3 mm wide, margin with 4 broadly undulate lobes; petals broadly ovate, acute at the tip, truncate at the base, very thick with thinner margins, in bud c. 1.5 mm long, 2 mm wide, blue; anthers in bud "C"-shaped, c. 1.25 mm long, gland distinct, centrally located; fruit unknown.

Type: Ridley 3840, Sungei Morai, Singapore

The holotype of this species at Kew consists of one detached leaf and a pile of broken inflorescences and flowers. Branchlets are not on the sheet. There is not much to see and from the description I have been unable to study this species in further detail. It is noted on this specimen that there is a duplicate in the Singapore collection, however I could not find it there. The leaf does not look like that of any species of *Memecylon* that I am familar with. Therefore, since this species cannot be adequately reconstructed it has been included in the section for inadequately known taxa.

Figure 30: a. calyx, b. petal, c. stamen

3. *M. pauciflorum* Bl. var. *brevifolium* Craib, Fl. Siam. Enum. I:4 (1931) 712; q.v. discussion under *M. pauciflorum* Bl. (26a.) Figure 35.

GENERAL CONCLUSIONS

In this treatment of *Memecylon* from the Malay Peninsula twenty eight species and three variations (not including three imperfectly known taxa) are discussed and twenty two taxa have been reduced to new synonyms. No new taxa are described here, although there are several collections which I have not been able to identify and these may be undescribed taxa. These specimens will have to remain undetermined until more material is studied. *Memecylon dichotomum* (Cl.) King var. *rotundatum* (Craib) Maxw. is the only new combination included in this paper. Although specimens of *M. beccarianum* Cogn. from the Malay Peninsula have not been seen, this Bornean species is presently included in this treatment since it is likely that it occurs in the region.

While examining a large number of collections from the Malay Peninsula and the Malay Islands at Singapore, Leiden, and Kew it became apparent that several widely distributed species and varieties show a broad range of variation. As a result a number of new synonyms which were formerly described as distinct taxa from the Malay Islands are included here. The reduction of three and five species to synonyms of *M. oleifolium* Bl. and *M. excelsum* Bl., respectively; appears, for this reason, to be justified.

Among King's five new species and two new varieties of *Memecylon* from the Malay Peninsula, one species and two varities have been reduced to synonyms of other species. Among the remaining taxa which King included in his paper, fourteen species and one variety have been accepted in this revision without nomenclatural changes. In the meantime the present revision includes four reduction made by other authors on King's work, plus two misinterpretations have been found: *M. heteropleurum* Bl. and *M. amplexicaule* Roxb. — the former being *M. megacarpum* Furtado, and the latter a mixture of *M. amplexicaule* Roxb. and *M. wallichii* Ridl.

Among the thirty one species and three varieties of *Memecylon* from the Malay Peninsula discussed by Ridley twenty species and one variety are included as distinct taxa in this revision. The other thirteen taxa; including *M. tenuifolium* Ridl., which was described as a new species; as synonyms of other species. In general, Ridley followed King's treatment quite closely, but did make some changes which I have accepted: reducing *M. microstomum* Cl. to *M. amplexicaule* Roxb., and considering *M. amabile* Bedd. var. *malaccensis* Cl. as *M. malaccense* (Cl.) Ridl. (King regarded this variety as a doubtful taxon). Ridley also followed

King in considering *M. acuminatum* Sm. var. *flavescens* Cl. as a synonym of *M. minutiflorum* Miq. In this present work var. *flavescens* has been maintained as a distinct, but poorly known taxon. The type collection of *M. laxiflorum* Ridl., described in vol. V of his flora, is incomplete and I have been unable to decide on its exact taxonomic status.

Craib's three new species and two new varieties of *Memecylon* from peninsular Thailand have been reconsidered in this revision and now includes only one new species and one new variety — both of which are incompletely known and perhaps synonyms of other taxa.

Bakhuizen van den Brink's extensive work on *Memecylon* from the Malay Archipelago includes twenty five taxa which are also found in the Malay Peninsula, twelve of which are recognized in the present revision as distinct taxa and the other thirteen as synonyms. At least four of his new species of *Memecylon* are, in this paper, considered identical to previously described taxa which have been recorded from the Malay Peninsula viz. *M. depokkense* Bakh. f. (= *M. fruticosum* King), *M. multiflorum* Bakh. f. (= *M. campanulatum* Cl.), *M. steenisii* Bakh. f. (= *M. cantleyi* Ridl.), and *M. rhodophyllum* Bakh. f. (= *M. edule* Roxb. var. *ovatum* (Sm.) Cl. *M. globosum* Bakh. f. is the only new record of *Memecylon* for the Malay Peninsula. His paper contains a tremendous amount of information which also clarifies many taxonomic problems and has greatly improved our knowledge of the family.

In regards to Corner's treatment of *Memecylon* my conclusions differ from his in that *M. heteropleurum* Bl. is replaced with *M. excelsum* Bl., and *M. ovatum* Sm. is reduced to *M. edule* Roxb. var. *ovatum* (Sm.) Cl.

Furtado's paper has been thoroughly reviewed. The specimens listed under *M. campanulatum* Cl. are all *M. minutiflorum* Miq. Furtado also discusses *M. hepaticum* Bl. and cites several specimens from Johore as examples. The type specimen of *M. hepaticum* Bl. (Blume s.n., from Sumatra) lacks inflorescences, flowers, and mature fruit; and the original description is inadequate for detailed analysis. The specimen (at Leiden) does not resemble the collections Furtado cites, and furthermore these specimens all have inflorescences and flowers (especially the anthers) identical to those of *M. garcinioides* Bl. The leaves, however, are longer and narrower than most collections of *M. garcinioides* Bl. from the Malay Peninsula and Malay Islands. Therefore, *M. hepaticum* Bl. is now considered to be an imperfectly known species which does not seem to occur in the Malay Peninsula.

Furtado correctly recognized the syntypes of *M. heteropleurum* Bl. var. *olivaceum* King as belonging to two other taxa: *M. maingayi* Cl. and *M. wallichii* Ridl., however he did not reduce *M. maingayi* Cl. to *M. excelsum* Bl. as Blume's holotype (at Leiden) was not available to him. *M. longifolium* Ridl. was also correctly reduced to a synonym of *M. wallichii* Ridl. A review of the salient morphological characteristics of each taxon is outlined in Table 1. These features, in several instances, can be used to distinguish individual taxa, while in others several closely related taxa can be separated — their individual identities requiring more detailed analyses.

TABLE 1. REVIEW OF SALIENT MORPHOLOGICAL CHARACTERS

Taxon	Branchlets	Calyx	Anther Shape	Fruit Shape	Distinguishing Features
M. acuminatum var. *acuminatum*	cylindric	4-lobed	C	globose	acuminate blades, long primary axis
acuminatum var. *flavescens*	cylindric	truncate	C	globose	poorly known
amplexicaule	cylindric	truncate-undulate	C	globose	sessile, thick blades; glomerulate inflorescence
beccarianum	cylindric	truncate-apiculate	C	globose	Bornean species
caeruleum	cylindric	truncate	C	ovoid	thick blades, fruit
campanulatum	flattened-grooved	truncate	C	globose	tall tree, thick blades, short inflorescence
cantleyi	grooved-angled	truncate	U	ovoid	flattened calyx, fruit
cinereum	flattened-grooved	lobed	triangular-cuneate	globose	acuminate petals, glandless anthers, short inflorescence
corticosum	winged	truncate-apiculate	C	ovoid	winged branchlets; ramiflorus inflorescence
dichotomum var. *dichotomum*	angled-winged	truncate	C	globose	bracts, inflorescence
dichotomum var. *rotundatum*	angled-winged	truncate	C	globose	longer inflorescence

Taxon	Branchlets	Calyx	Anther Shape	Fruit Shape	Distinguishing Features
edule var. *edule*	grooved-angled	truncate-apiculate	C	globose	smaller leaves, branchlets
edule var. *ovatum*	cyindric	truncate-apiculate	C	globose	larger leaves, branchlets
excelsum	cyindric	truncate	C	ovoid	large, thick calyx; ramiflorus
floridum	grooved-angled	lobed	truncate-cuneate	globose	glandless anthers, pericarp
fruticosum	angled-winged	truncate-undulate	U	globose	branchlets, inflorescence
garcinioides	cylindric-grooved	cusped	orbicular	globose	globose anthers with very reduced connective
globosum	cylindric	truncate-undulate	C	globose	large fruit (15–20 mm diam.)
hullettii	cylindric	undulate-apiculate	orbicular	globose	long, umbellate, papillose inflorescence
intermedium	cylindric	truncate-apiculate	C	globose	small: inflorescence, fruit
kunstleri	cylindric	truncate-apiculate	U	globose	poorly known
lilacinum	grooved-angled	lobed	triangular-cuneate	globose	acuminate petals; rugose, grooved fruit
malaccense	cylindric	truncate-apiculate	triangular-cuneate	globose	glandless anthers, not well known
megacarpum	cylindric-grooved	truncate-undulate	C	globose	large, rugose fruit

Taxon	Branchlets	Calyx	Anther Shape	Fruit Shape	Distinguishing Features
minutiflorum	flattened-grooved	cusped	C	globose	papillose calyx constricted above the ovary
oleifolium	cylindric	truncate	C to U	ovoid	complex inflorescence, branchlets drying tan, fruit
oligoneurum	flattened-grooved	truncate-apiculate	triangular-cuneate	globose	tri-nerved blades
paniculatum	angled-winged	cusped	U	globose, ovoid	blade venation, large inflorescence
pauciflorum	grooved-angled	truncate-apiculate	U	globose	small: leaves, inflorescence
pubescens	cylindric-grooved	truncate-cusped	C	globose	blade venation; complex and pubescent inflorescence
wallichii	angled-winged	truncate	linear	globose	axillary inflorescence and unique anthers

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M. brandisianum Craib, Kew Bull. 1930, 323 = *M. oleifolium* Bl.

M. dissitum Craib, Kew Bull. 1930, 325 = *M. cantleyi* Ridl.

M. epiphyticum King, J. As. Soc. Beng. 69, II:1 (1900) 74 (Mat. Fl. Mal. Pen. III, 482) = *M. fruticosum* King

M. eugeniiflora Ridl., J. Str. Br. Roy. As. Soc. 57 (1910) 48, and *M. dichotomum* (Cl.) King var. *eugeniiflorum* (Ridl.) Ridl., Fl. Mal. Pen. I (1922) 812 = *M. dichotomum* (Cl.) King

M. gracilipes Ridl., J. Str. Br. Roy. As. Soc. 79 (1918) 72, and *M. gracilipes* Ridl. var. *rotundatum* Craib, Fl. Siam. Enum. 1:4 (1931) 708 = *M. dichotomum* (Cl.) King var. *rotundatum* (Craib) Maxw.

M. heteropleurum Bl. var. *olivaceum* King, J. As. Soc. Beng. 69, II:1 (1900) 78 (Mat. Fl. Mal. Pen. III, 486) = *M. excelsum* Bl. and *M. wallichii* Ridl.

M. laxiflorum Wall. ex Ridl., J. Str. Br. Roy. As. Soc. 79 (1918) 74 = *M. edule* Roxb. var. *ovatum* (Sm.) Cl.

M. longifolium Ridl., J. Str. Br. Roy. As. Soc. 79 (1918) 72 = *M. wallichii* Ridl.

M. maingayi Cl. in Hk. f., Fl. Brit. Ind. II (1879) 557 = *M. excelsum* Bl.

M. microstomum Cl. in Hk. f., Fl. Brit. Ind. II (1879) 557 = *M. amplexicaule* Roxb.

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M. pulchellum Ridl., J. Str. Br. Roy. As. Soc. 61 (1912) 52 = *M. pauciflorum* Bl.

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M. tenuifolium Ridl., Fl. Mal. Pen. I (1922) 812 = *M. fruticosum* King

M. umbellatum Wall. Cat. 4109, in part = *M. cinereum* King

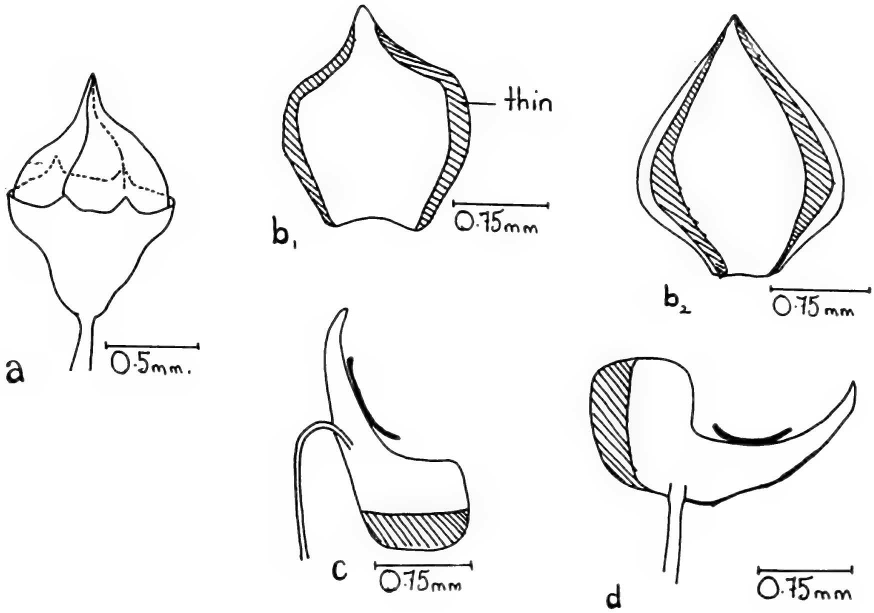


Fig. 1. *Memecylon acuminatum* Sm. var. *acuminatum* a. calyx and corolla bud b. (1) immature petal, (2) mature petal c. stamen in bud d. mature stamen a.-d. Griffith 2325/1

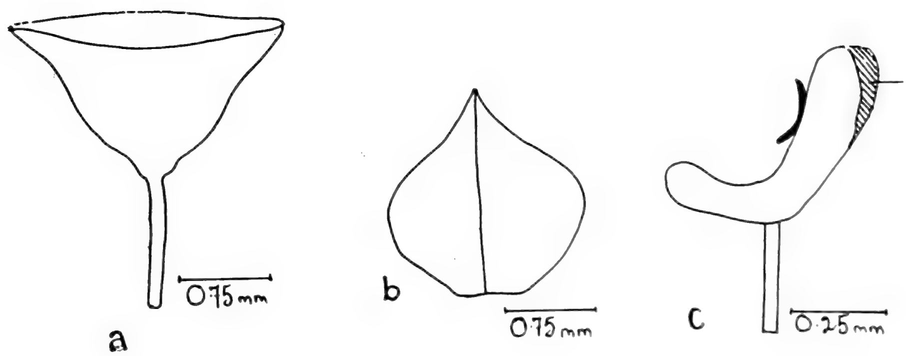
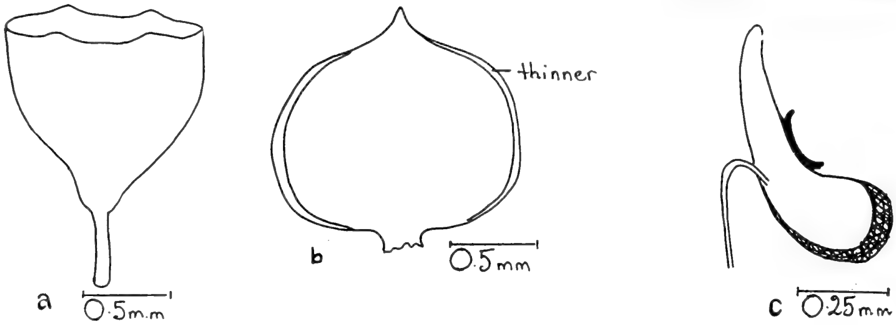


Fig. 1a. *Memecylon acuminatum* Sm. var. *flavescens* Cl. a. calyx b. petal c. mature stamen a. & c. Curtis 816, b. Griffith 2325/2 (isotype)



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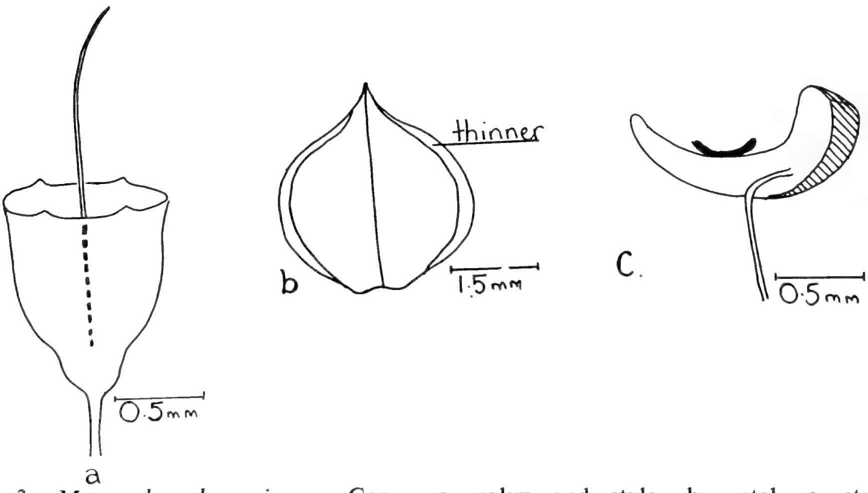
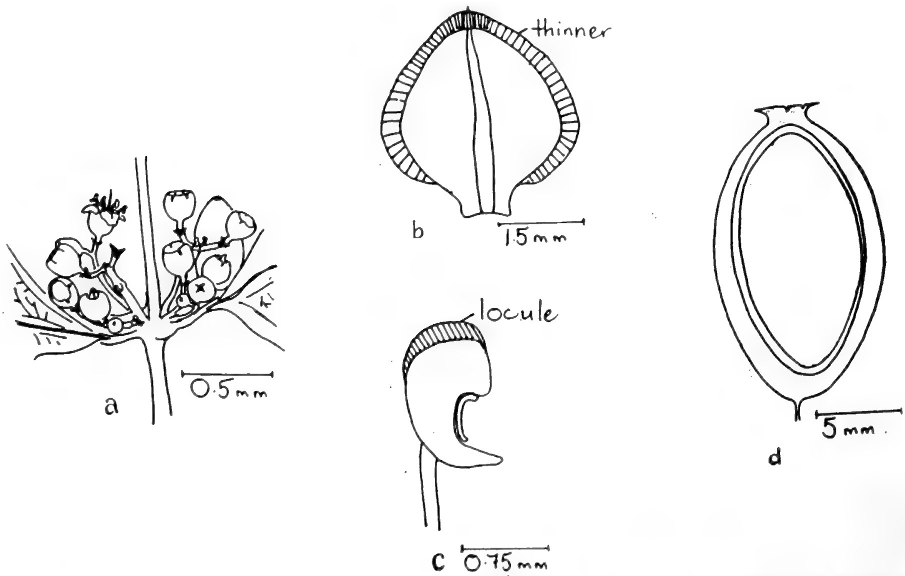


Fig. 3. *Memecylon beccarianum* Cogn. a. calyx and style b. petal c. stamen a.-c. Beccari 1518 (syntype)



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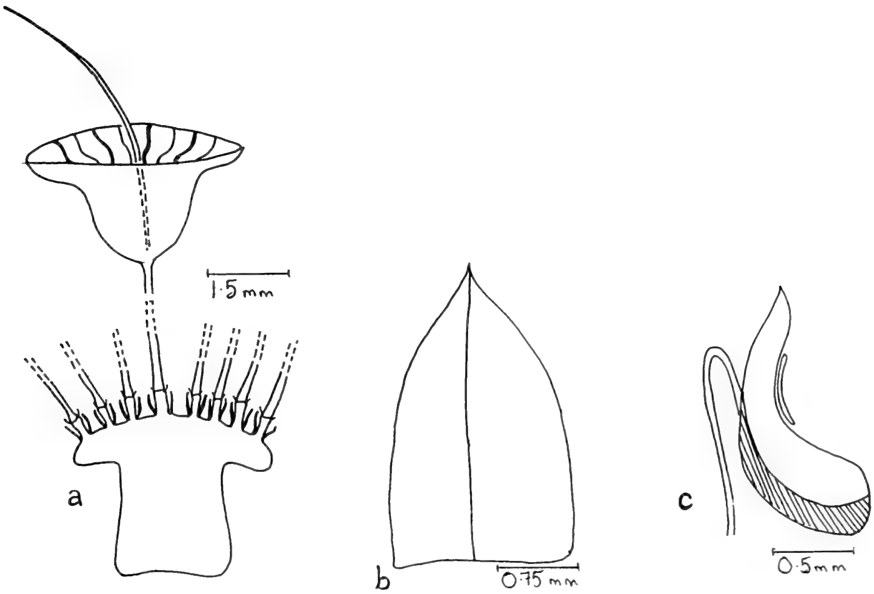

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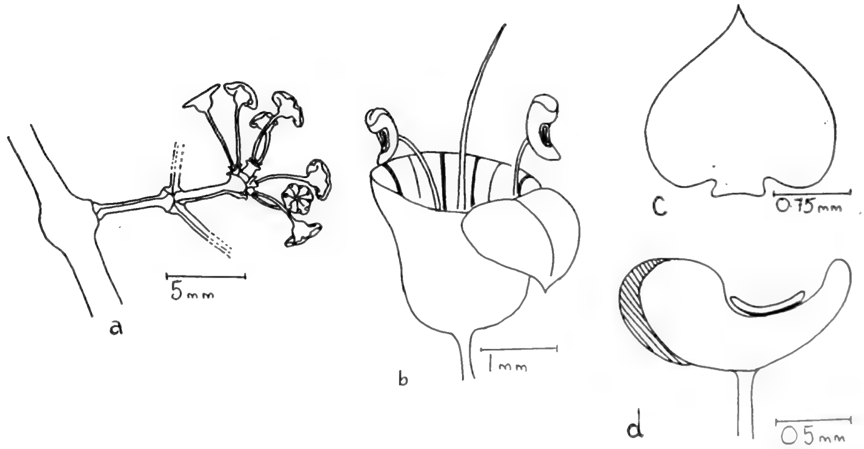

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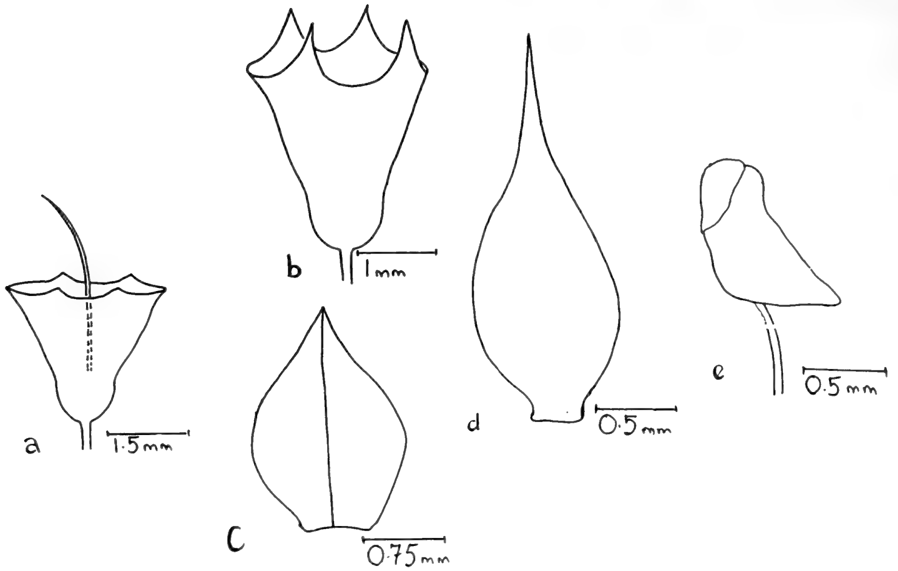

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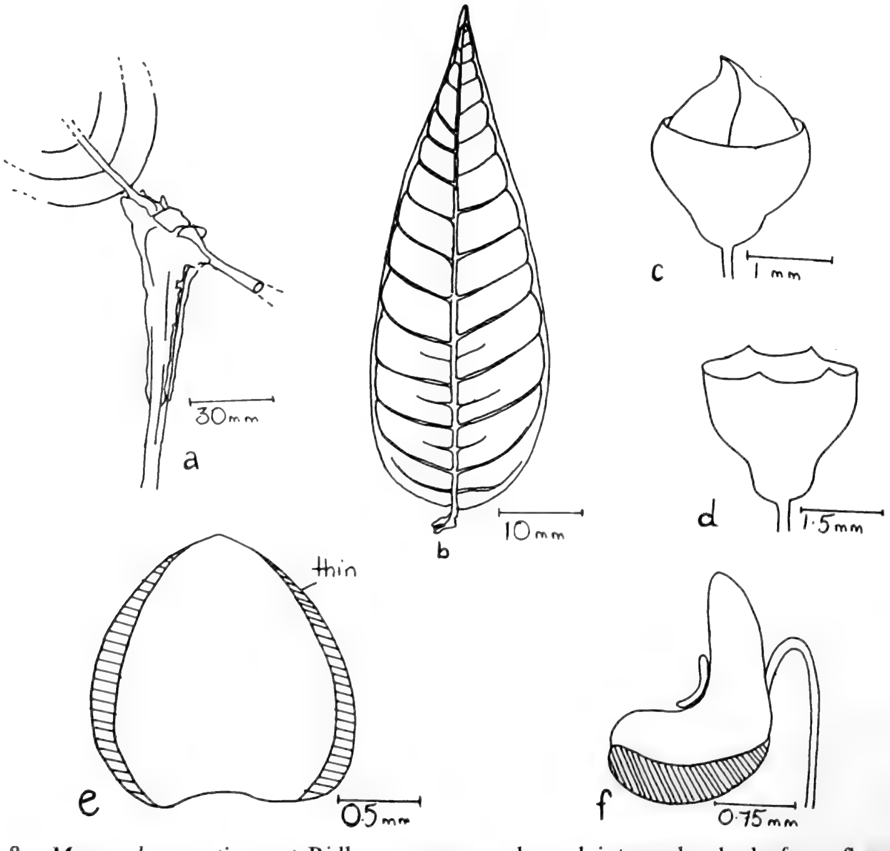

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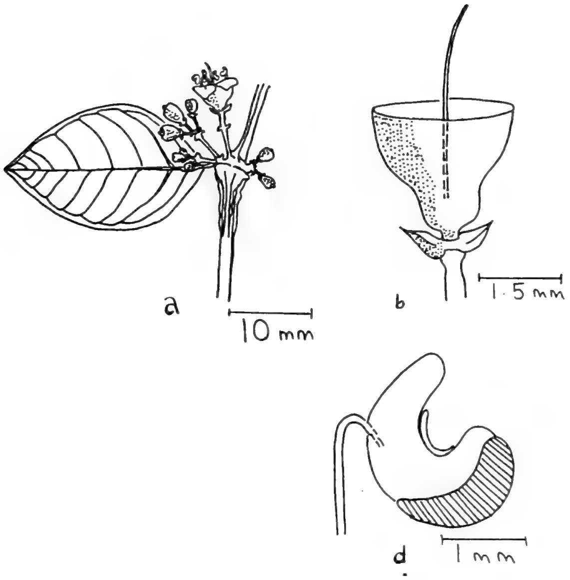

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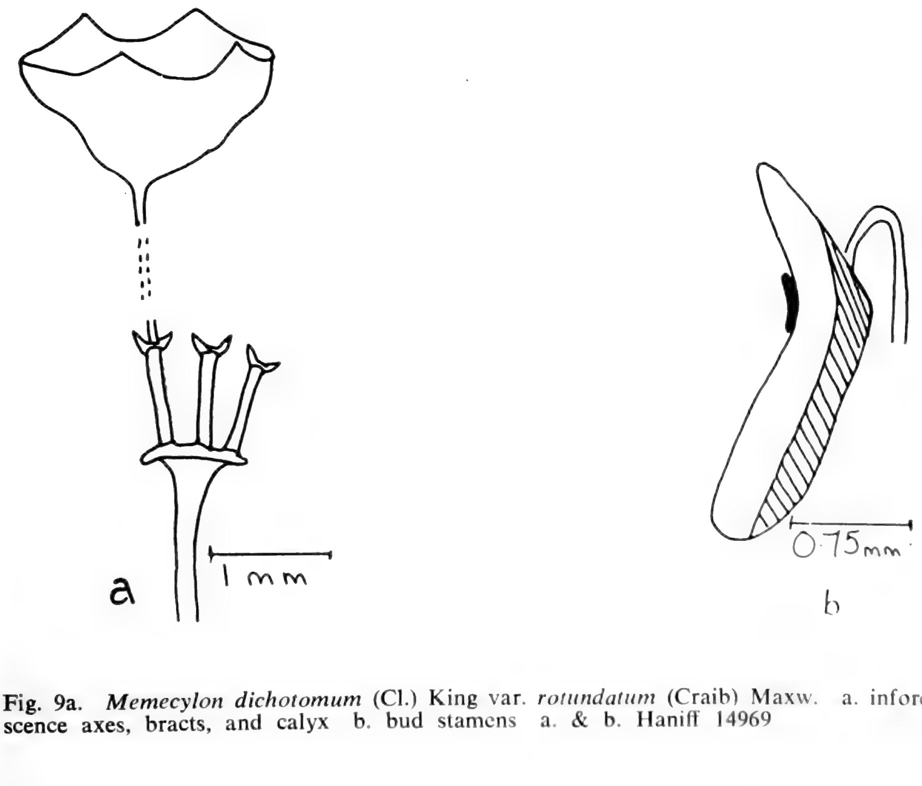

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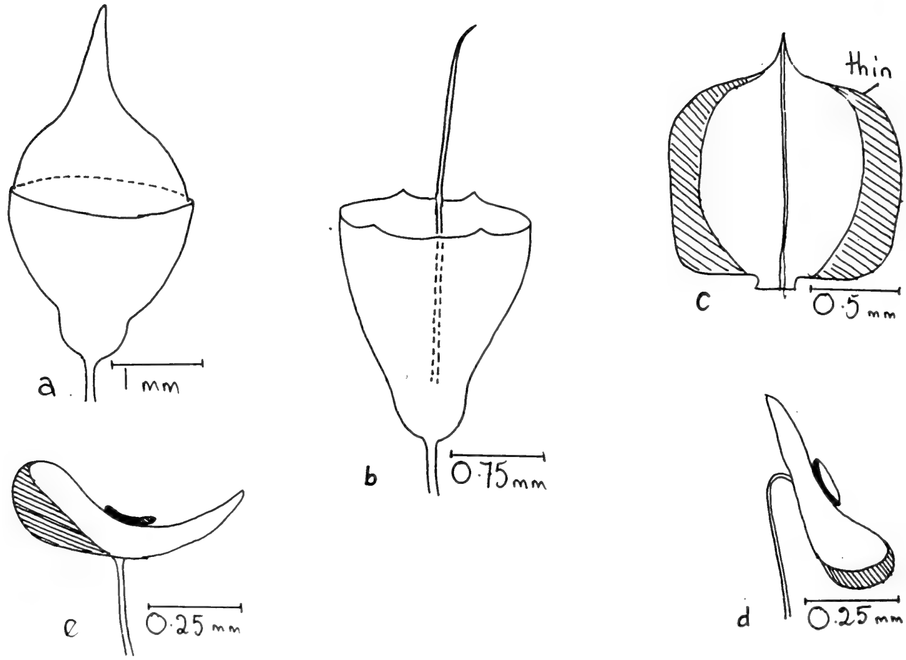
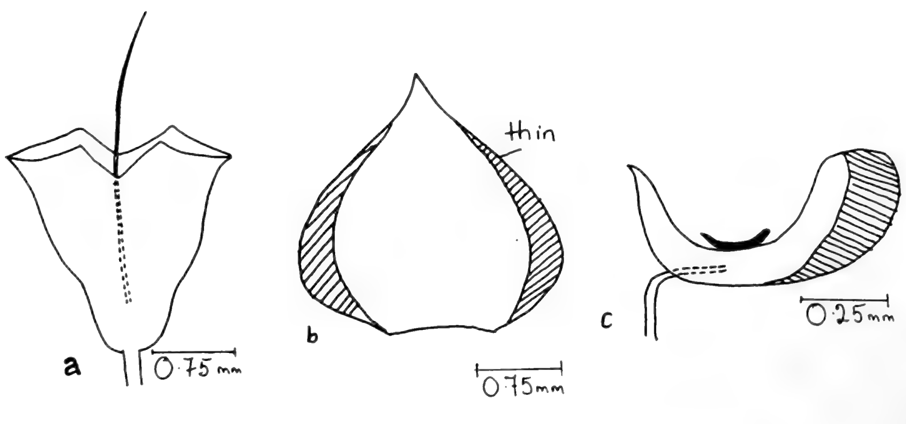


Fig. 10. *Memecylon edule* Roxb. var. *edule* a. calyx and corolla bud b. mature calyx and style c. petal d. & e. stamens a. & d. H.M. Burkill 2526; b. Hou 763; c. & e. Brelkerta sn, from Kuala Trengganu on 1 Nov. 1939



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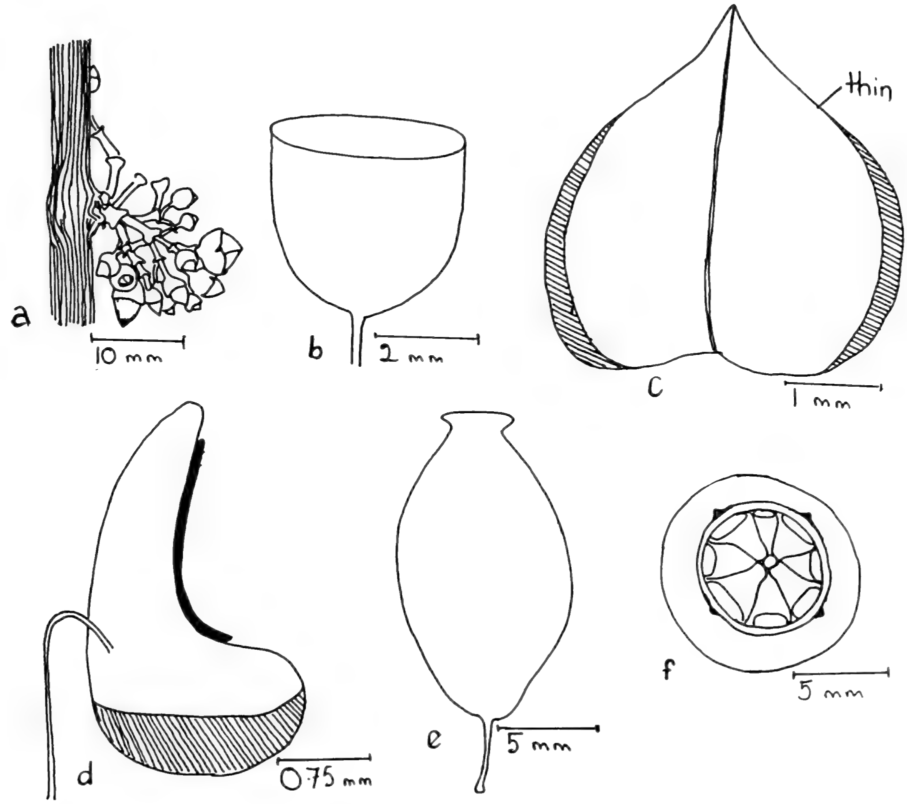

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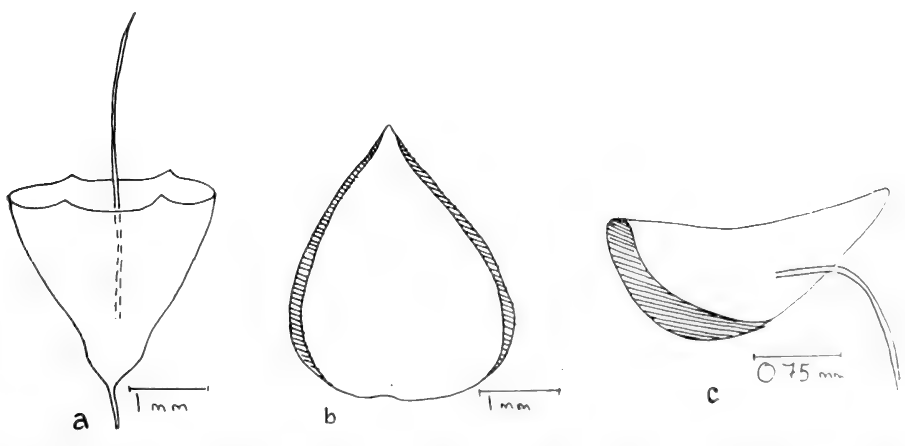

Fig. 12. *Memecylon floridum* Ridl. a. calyx and style b. petal c. stamen a.-c. King's coll. 3551 (holotype)

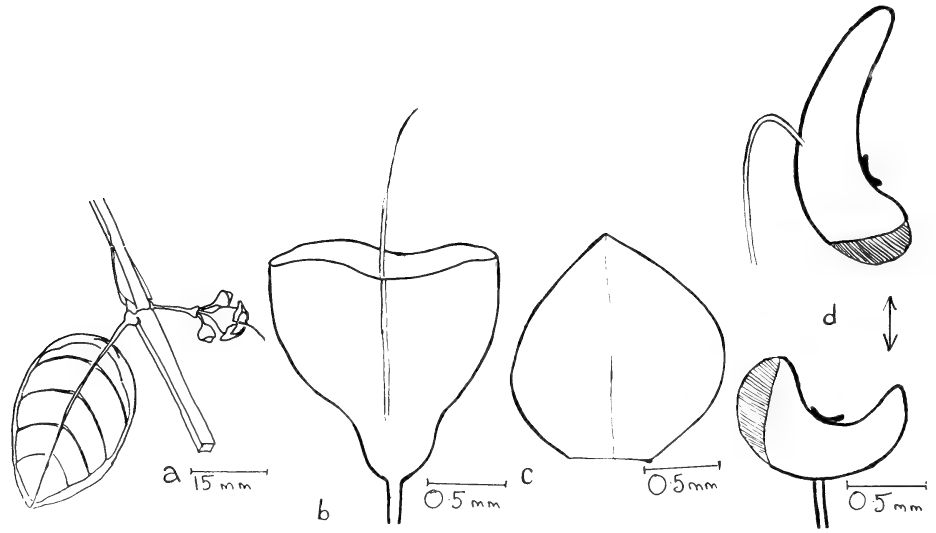

Fig. 13. *Memecylon fruticosum* King a. branch, leaf, and inflorescence b. calyx c. petal d. anthers a.-d. Kunstler 3265 (syntype)

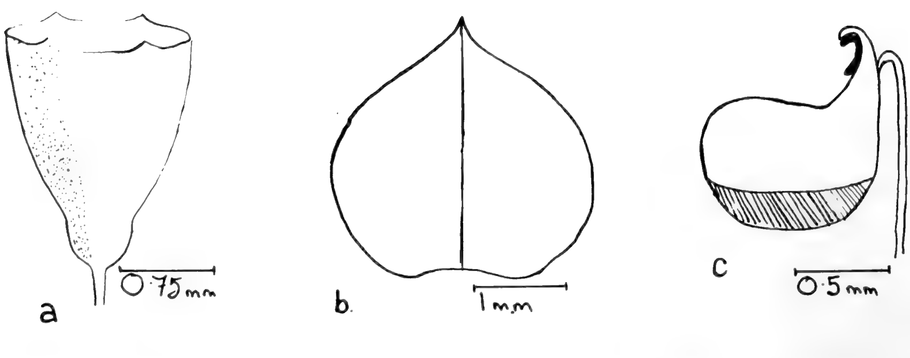

Fig. 14. *Memecylon garcinioides* Bl. a. calyx b. petal c. stamen a.-c. Korthals sn (Sumatra) (holotype)

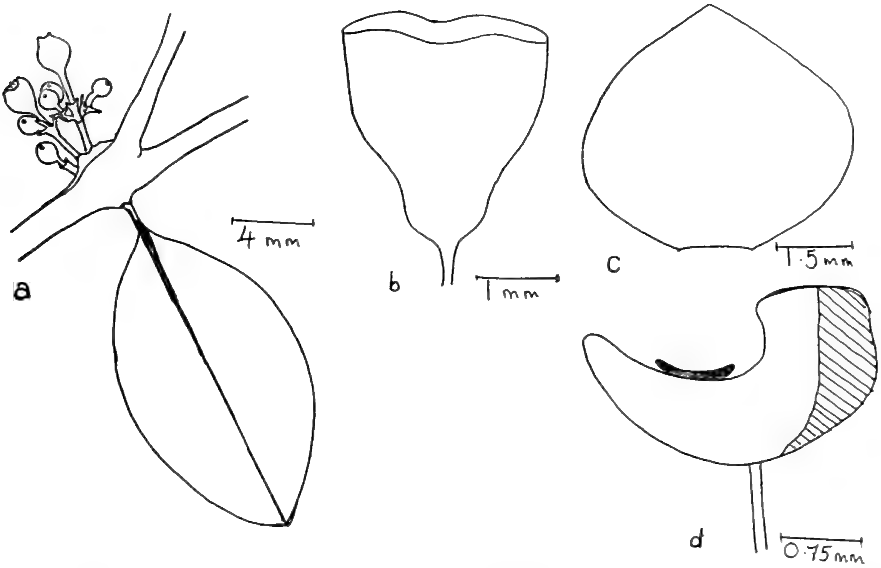

Fig. 15. *Memecylon globosum* Bakh. f. a. inflorescence and leaf b. calyx c. petal d. stamen a.-d. van Steenis 1265 (isotype)

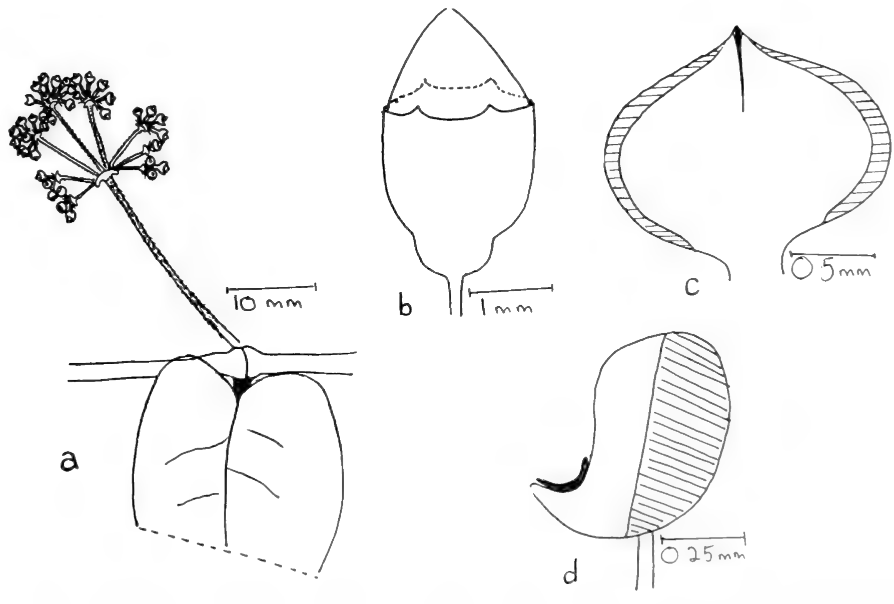

Fig. 16. *Memecylon hullettii* King a. branch, leaf, and inflorescence b. calyx and corolla bud c. petal d. stamen a.-d. Sinclair 39549

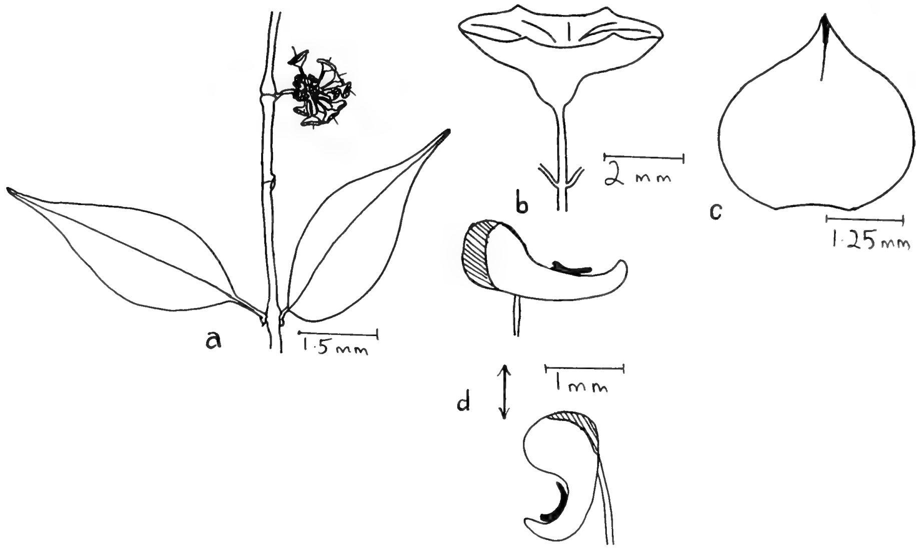

Fig. 17. *Memecylon intermedium* Bl. a. branch, leaves, and inflorescence b. calyx c. petal d. anthers a. Ng 1153, b.-d. Paie 27695

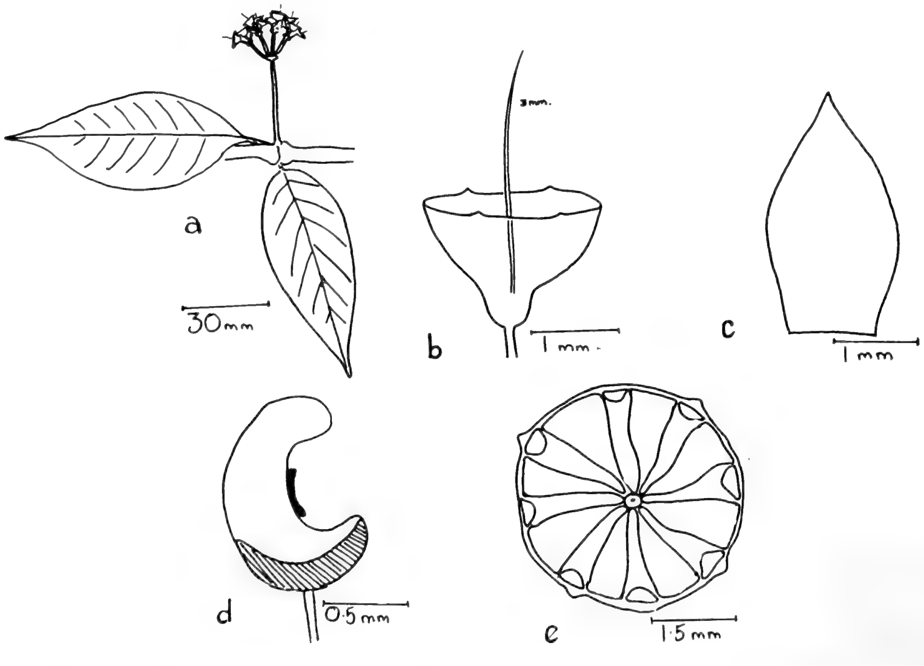

Fig. 18. *Memecylon kunstleri* King a. branch, leaves, and inflorescence b. calyx and style c. petal d. stamen e. areolus a.-e. King's coll. 10419 (lectotype)

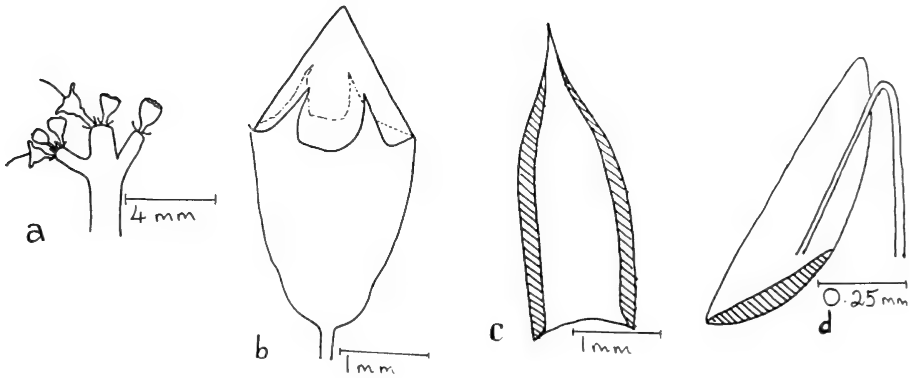

Fig. 19. *Memecylon lilacinum* Z. & M. a. inflorescence b. calyx and corolla bud c. petal d. stamen a.-d. Blume sn (Java) (holotype)

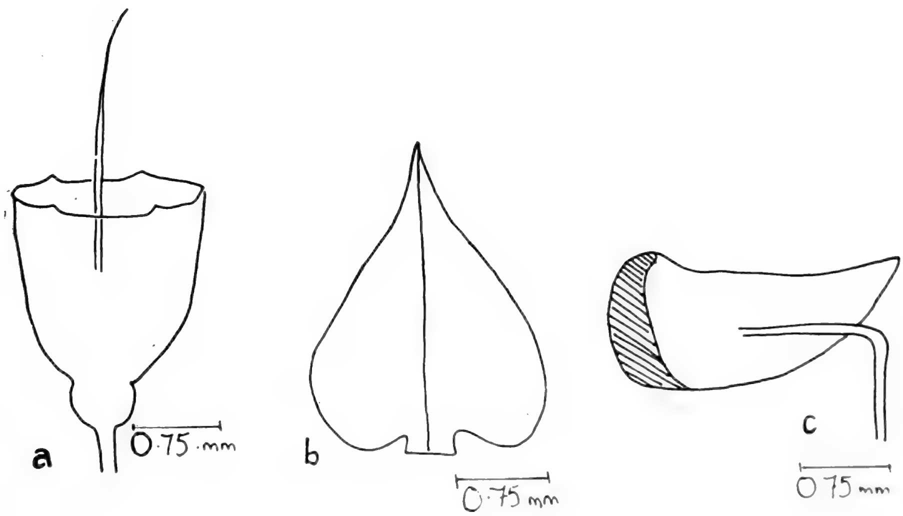

Fig. 20. *Memecylon malaccense* (Cl.) Ridl. a. calyx and style b. petal c. stamen a.-c. Maingay 2531 (819) (syntype)

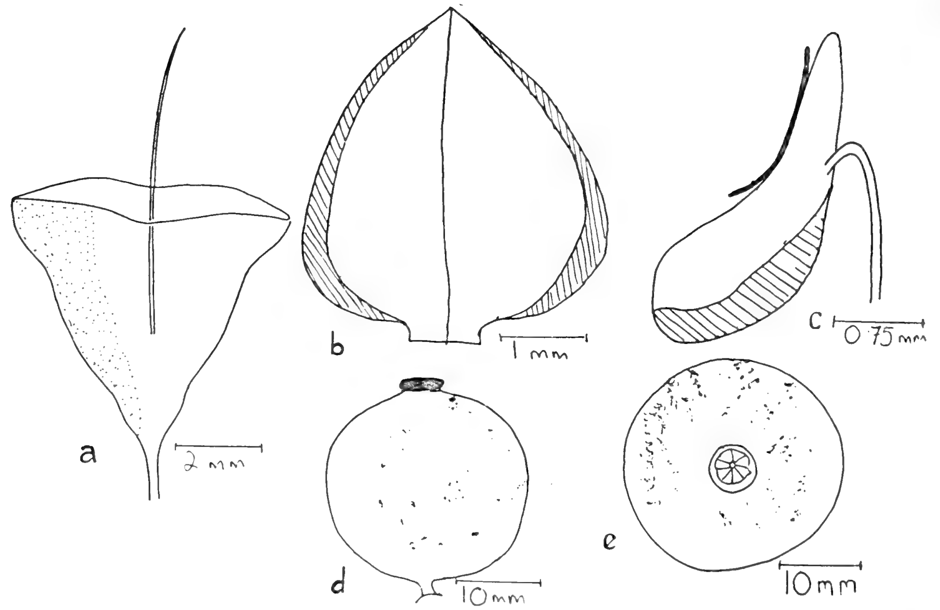

Fig. 21. *Memecylon megacarpum* Furtado a. calyx and style b. petal c. stamen d. fruit (lateral view) e. fruit (dorsal view) a.-c. Curtis 814, d. & e. Burn-Murdoch 162

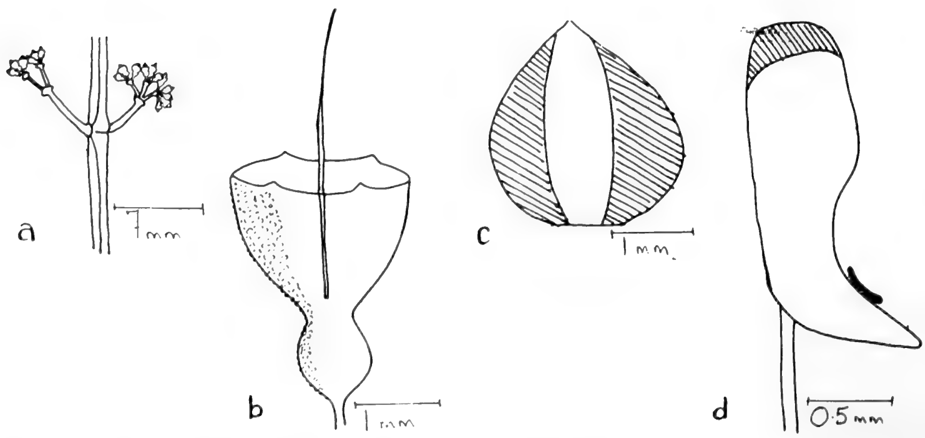

Fig. 22. *Memecylon minutiflorum* Miq. a. branch and inflorescence b. calyx and style c. petal d. stamen a. Cubitt 867, b.-d. Maingay 810 (2251)

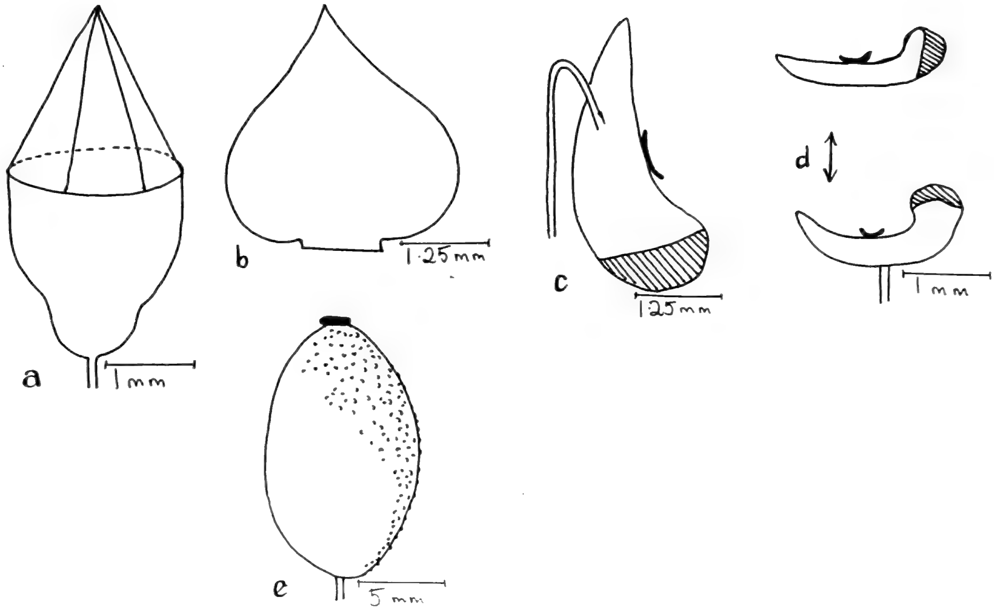

Fig. 23. ***Memecylon oleifolium*** **Bl. a. calyx and corolla bud b. petal c. bud stamen d. mature stamen e. fruit a.-d. Blume sn (Sumatra) (isotype), e. Whitmore 0079**

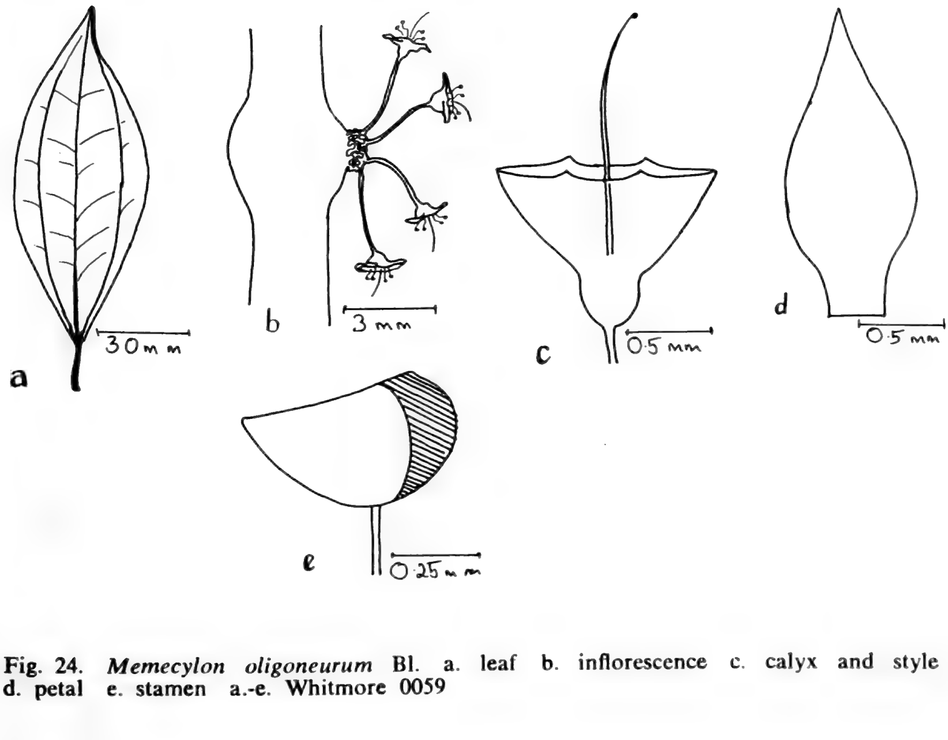

Fig. 24. ***Memecylon oligoneurum*** **Bl. a. leaf b. inflorescence c. calyx and style d. petal e. stamen a.-e. Whitmore 0059**

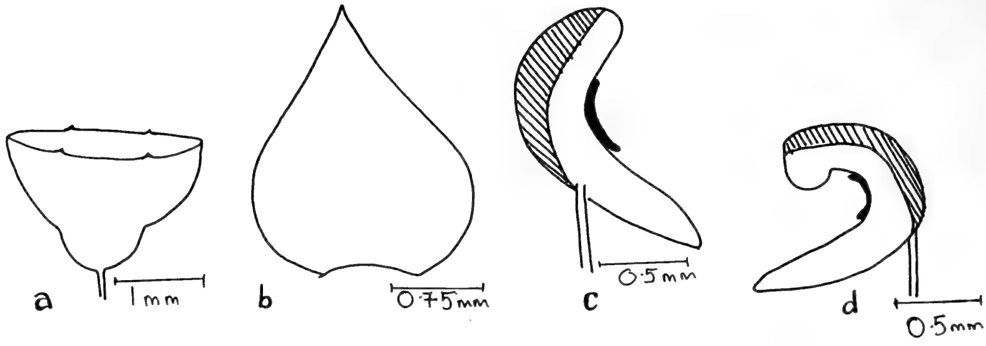

Fig. 25. *Memecylon paniculatum* Jack a. calyx b. petal c. & d. stamens a.-c. Corner 37050, d. Moysey & Kiah 33635

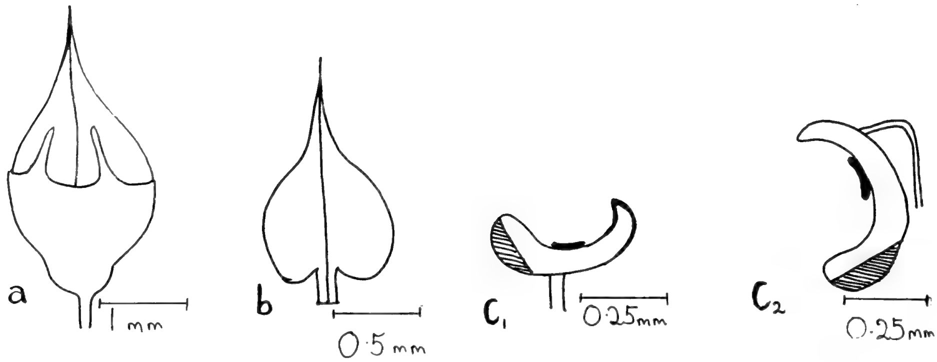

Fig. 26. *Memecylon pauciflorum* Bl. var. *pauciflorum* a. calyx and corolla bud b. petal c. stamens a.-c. Corner 28565

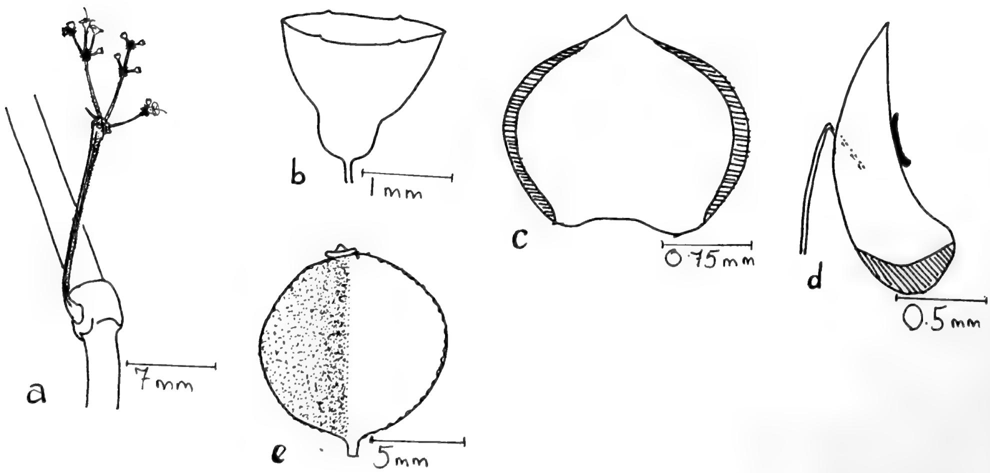

Fig. 27. *Memecylon pubescens* (Cl.) King a. branch and inflorescence b. calyx c. petal d. stamen e. fruit a.-d. Kiah 35188, e. Everett 13882

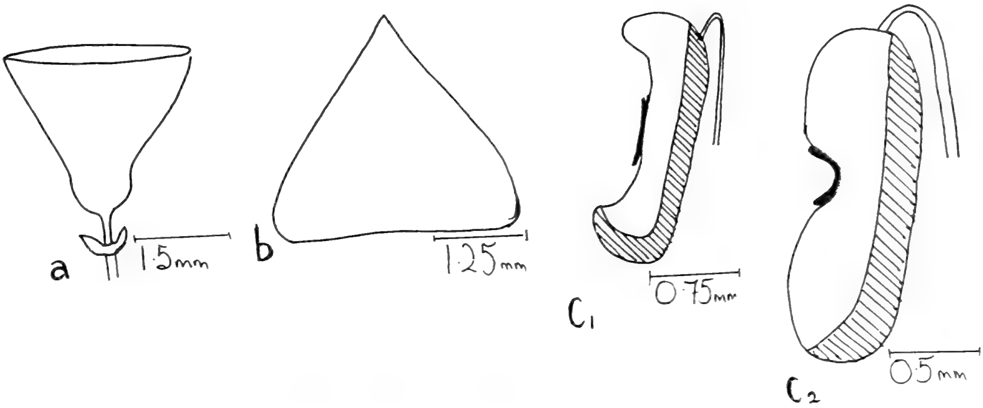

Fig. 28. ***Memecylon wallichii*** **Ridl. a bracts and calyx b. bud petal c. stamens a.-c. Curtis 1294 (syntype)**

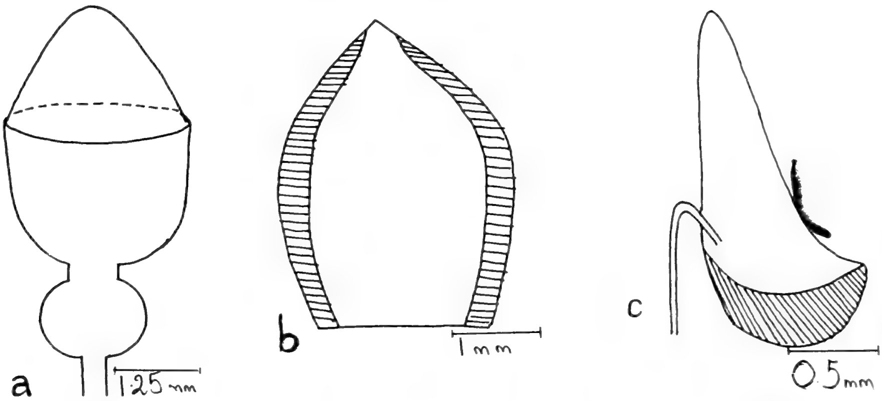

Fig. 29. ***Memecylon constrictum*** **Craib a. calyx and corolla bud b. petal c. stamen a.-c. Haniff & Nur 2732 (holotype)**

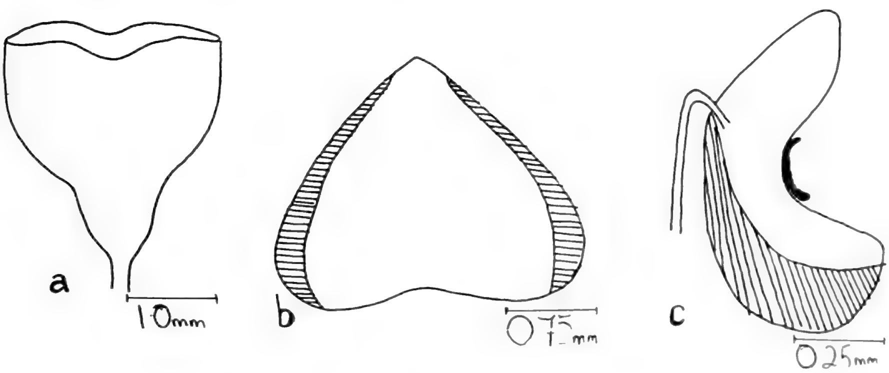

Fig. 30. ***Memecylon lancifolium*** **Ridl. a. calyx b. petal c. stamen a.-c. Ridley 3840 (holotype)**

Fig. 31. Bark of *Memecylon lilacinum* Z. & M., mature tree at MacRitchie Reservoir, Singapore; 18 Dec. 1976. Specimen: Maxwell 76-790. Photo by Mr. Douglas Teo.

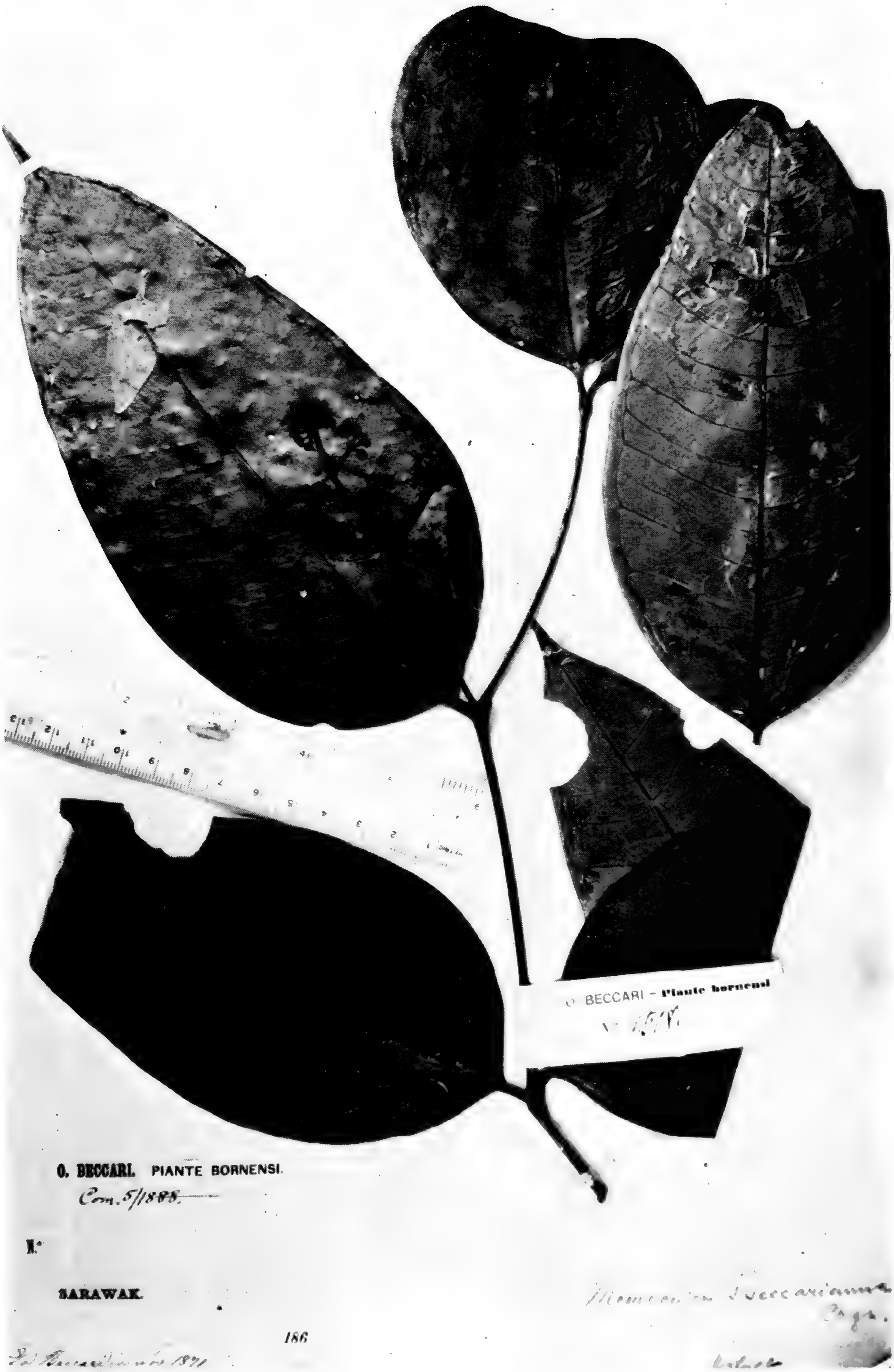

Fig. 32. Syntype of *Memecylon beccarianum* Cogn. at Kew.

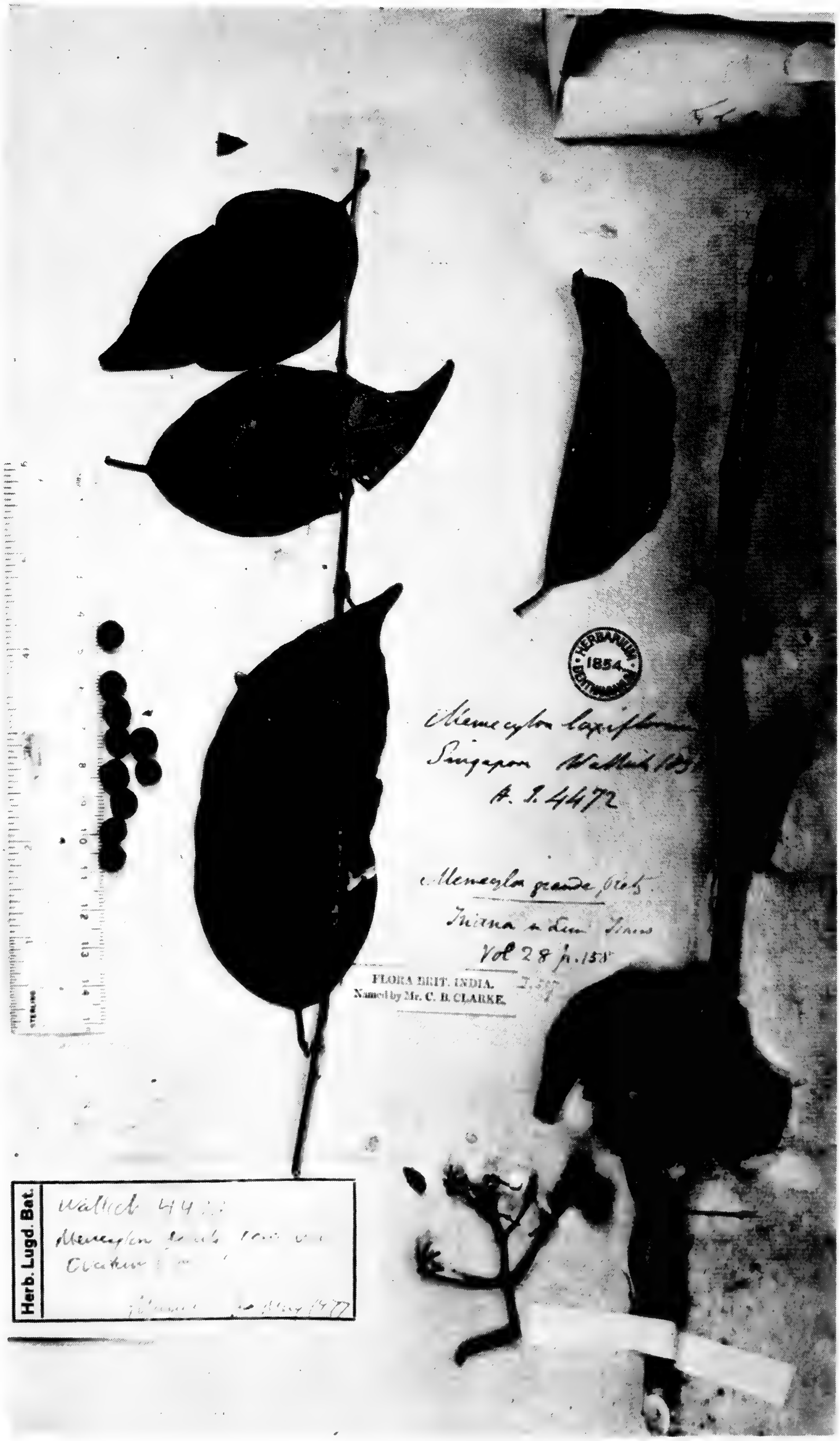

Fig. 33. *Memecylon edule* Roxb. var. *ovatum* (Sm.) Cl. from the Wallich collection at Kew. One of the oldest (1831) specimens of *Memecylon* collected in Singapore. Originally distributed as *M. laxiflorum* by Wallich, later included under *M. grande* Retz. by Triana (1871) and other botanists, described in 1918 by Ridley as *M. laxiflorum* Wall. ex Ridl., and now a synonym of *M. edule* var. *ovatum*.

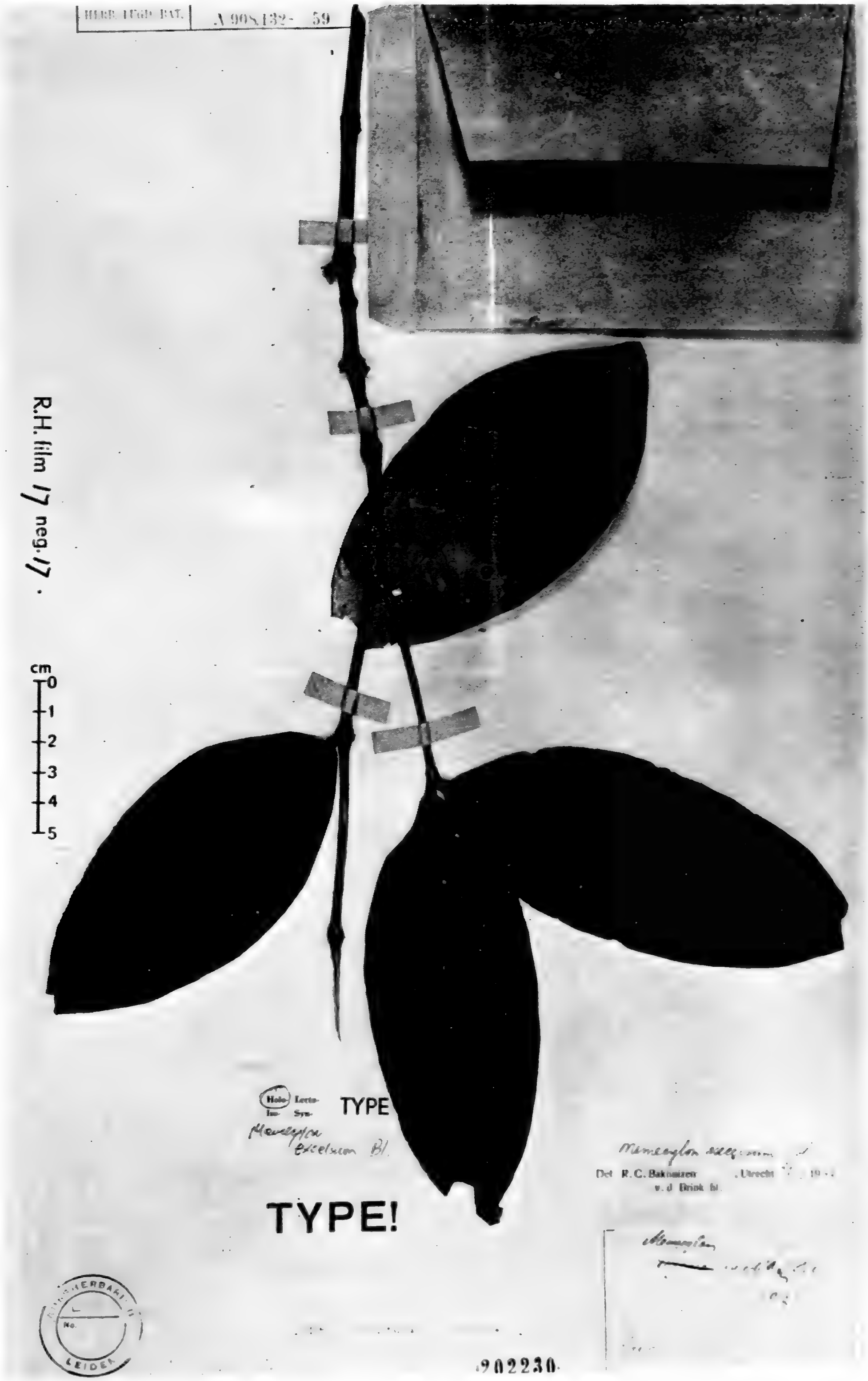

Fig. 34. (a) a. *Memecylon excelsum* Bl. (holotype) with four species included in this revision as new synonyms; b. *M. heteropleurum* Bl. (holotype); c. *M. subtrinervium* Miq. (holotype); d. *M. maingayi* Cl. (holotype); and e. *M. kurzii* King (isotype). Photos a.-e. Rijksherbarium, Leiden

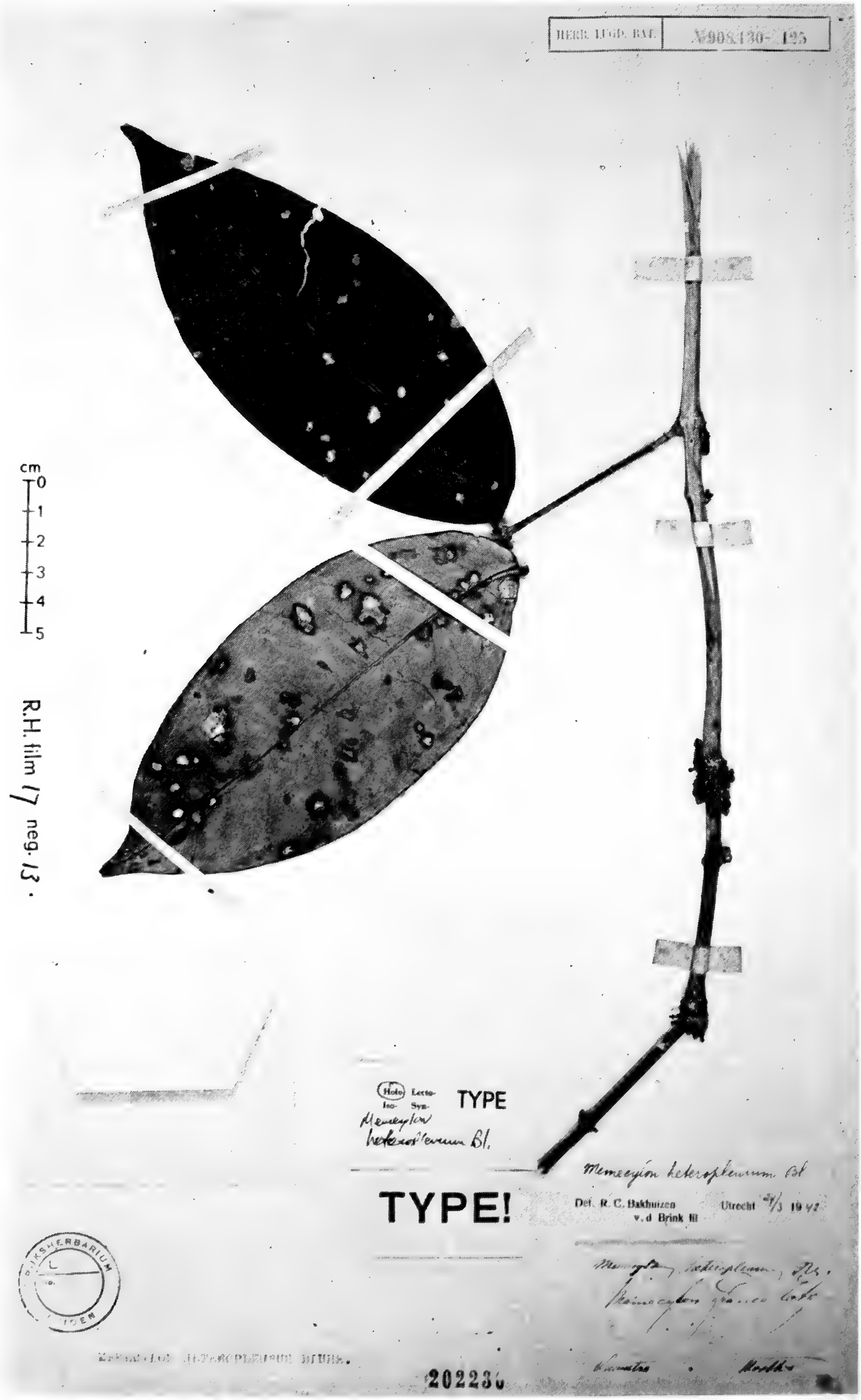
HERB. LUGD. BAT.
No 908.130-125
cm 0 1 2 3 4 5
R.H. film 17 neg. 13.
TYPE
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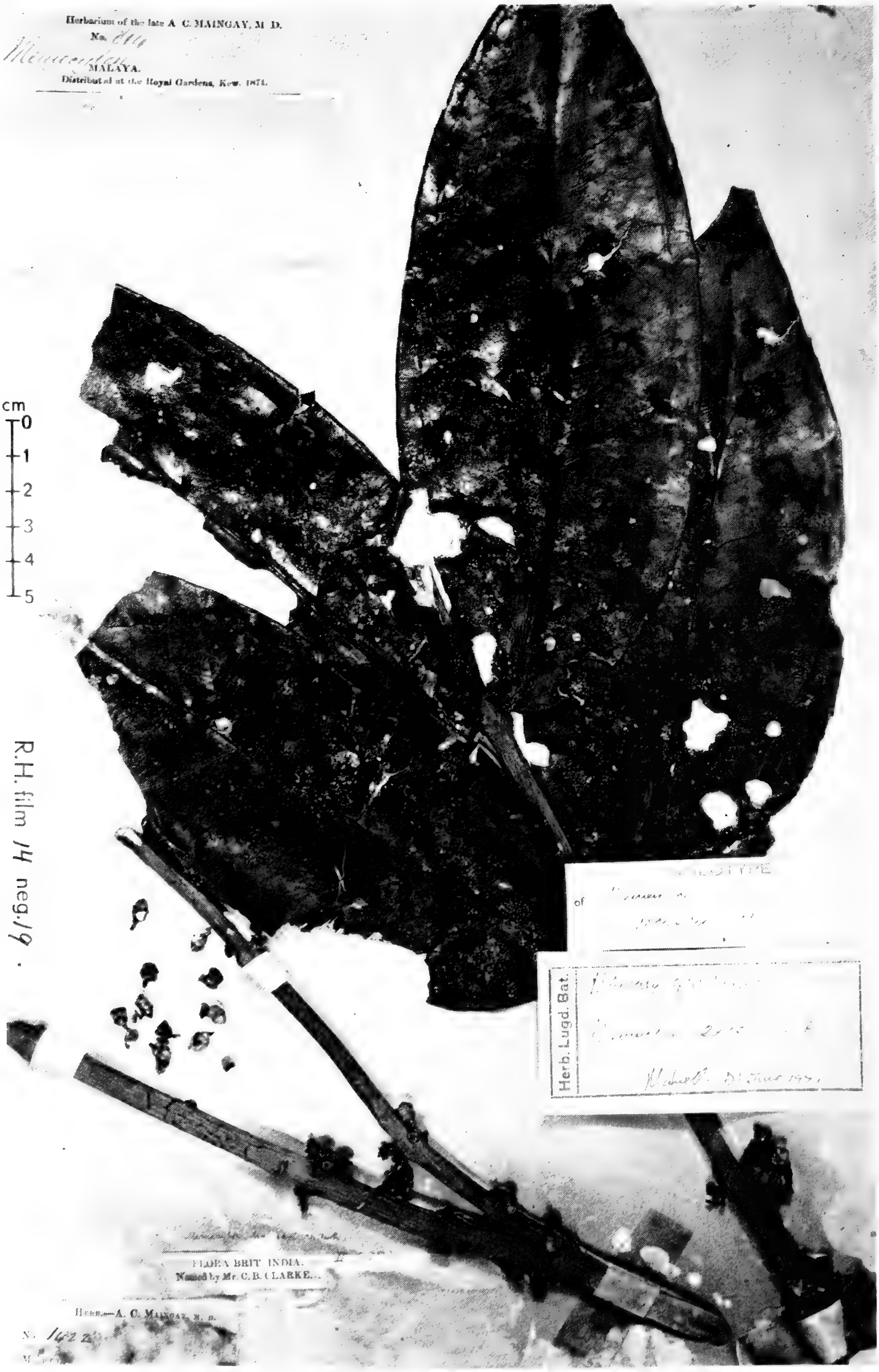
Fig. 34. (b)

Fig. 34. (c)


Herbarium of the late A. C. MAINGAY, M. D.
MALAYA.
Distributed at the Royal Gardens, Kew. 1871.
cm
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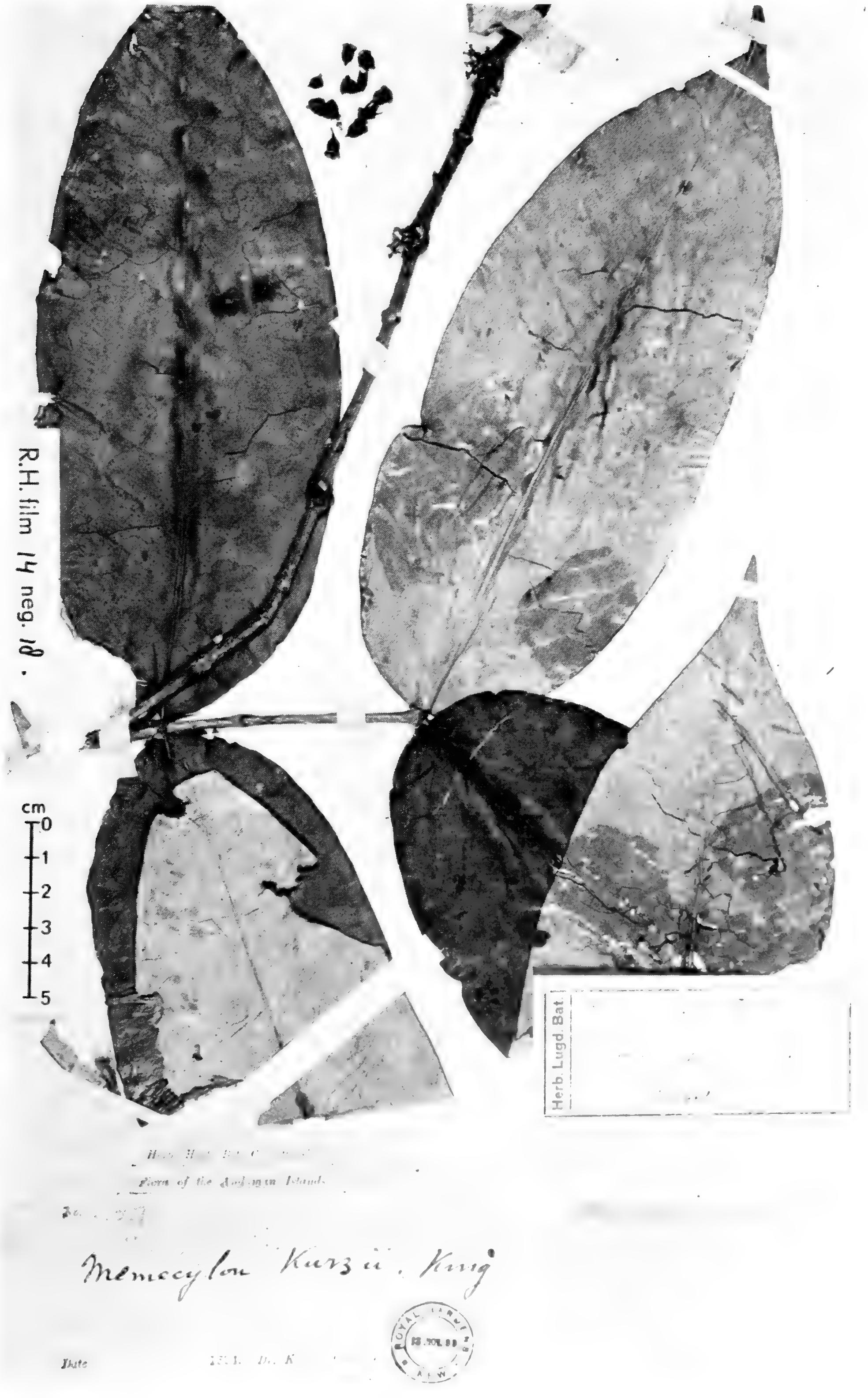
R.H. film 14 neg./9.
Herb. Lugd. Bat.
FLORA BRIT. INDIA.
Named by Mr. C. B. CLARKE.

Fig. 34. (d)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Herb. Lugd. Bat.
Memecylon Kurzii, King

Fig. 34. (e)

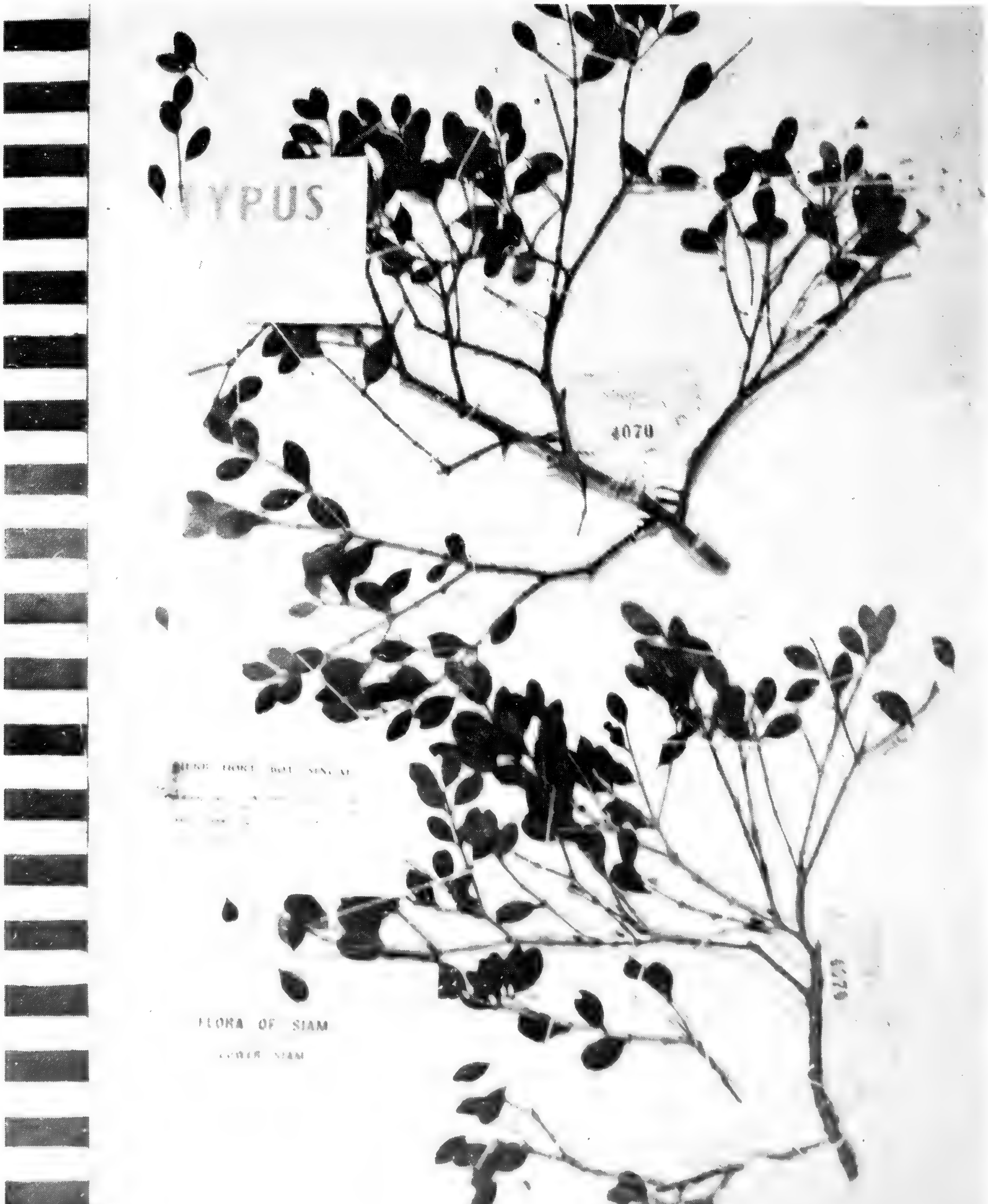

Fig. 35. *Memecylon pauciflorium* Bl. var. *brevifolium* Craib (isotype)
Photo by Dr. Ming Anthony

CERCOSPORA AND ALLIED GENERA OF SINGAPORE AND THE MALAY PENINSULA

by

J. M. YEN[1] & G. LIM[2]

INTRODUCTION

The genus *Cercospora* and allied genera are represented by a great number of species which cause leaf spot disease on a wide range of host plants. They are responsible for much damage to economic plants such as cereals, grasses, vegetables, forest trees and ornamentals and are important plant pathogens.

The diseased spots on the leaves vary in shape and size and are generally coloured pale brown to brown. Under humid conditions, abundant conidia are formed on the necrotic spots. Conidiophores appear as tufts or fascicles, arising from the lesion surface or through the stomata in the diseased areas. The perfect stage has not been encountered so far in the collections examined and described here.

Since the genus *Cercospora* was established by Fresenius in 1863, numerous species have been recorded and described by mycologists and phytopathologists. The monograph by Chupp (1954) is a valuable reference source, and Deighton's many studies (1967, 1971, 1973) have added considerably to the elucidation of this interesting group of fungi. More recently, Deighton (1976) has redescribed a number of *Cercospora*-like species and estimated that some 2000 species names have been published to date in the genus *Cercospora,* which is a heterogenous genus and one of the largest of the Hyphomycetes.

The number of species described here totalled 98, of which 72 species have been described and published previously by the authors as new *Cercospora* species. This publication brings together their reports published in various journals, which are now translated from French into English here. The recent studies by Deighton (1976) make it necessary for certain revisions and changes to the generic names of some species previously published as *Cercospora* species. This communication updates the authors' previous reports and facilitates access to information on the prevalent leaf spot diseases affecting host plants in this region caused by this group of fungal pathogens.

1 Research Associate in Botany, Museum of Natural History, Los Angeles, California, USA.

2 Botany Department, University of Singapore.

1. *Cercoseptoria balsaminicola* (Yen & Lim) Yen, comb. nov. (Fig. 1, A, B & E)

   = *Cercospora balsaminicola* Yen & Lim, Cahiers du Pacifique 14:90, 1970a.

Leaf spots amphigenous, distinct, circular, pale brown to brown, dispersive or confluent, 1–7mm in diam. Fruiting amphigenous, visible as minute black pustules on both sides of the spots. Stromata well developed, black brown, globose or subglobose, 20–60μm in diam. Fascicles present, dense to very dense, emerging through the stomata. Conidiophores olivaceous brown, erect or slightly flexuous, continuous or l-septate, not geniculate, tip irregularly rounded, conidial scars indistinct, 10–27.5 x 2.5–3.5μm. Conidia very thin, acicular or filiform, hyaline, usually curved, 1–8 septate, tip acute, base cylindrically truncate, 45–132 x 2–2.5μm.

Habitat: On leaves of *Impatiens balsamina* (Balsaminaceae), Bukit Timah, Singapore, leg. G. Lim, Mar. 12, 1969.

Note: This fungus differs from others (*Cercospora fukushiana* (Mats.) Yamam. and *C. balsaminiana* Yen & Lim) by its very thin filiform conidia.

2. *Cercoseptoria ixoriana* (Yen & Lim) Yen, comb. nov. (Fig. 2)

   = *Cercospora ixoriana* Yen & Lim, Bull. Soc. Mycol. Fr. 85:469, 1969.

Leaf spots amphigenous, circular, whitish gray, surrounded by brown border, scattered, 5–16mm in diam., sometimes confluent. Fruiting strictly hypophyllous, appearing as black minute pustules under the hand lens. Stromata globose, brown to black brown, 30–48μm in diam. Fascicles dense to very dense. External hyphae strictly hypophyllous, emerging through the stomata, pale olivaceous brown, septate, branched, 2.5–3.5μm in width. Conidiophores either from fascicles or arising from external hyphae, erect or flexuous, simple or sometimes branched, olivaceous brown, 0–2(–3) septate, 0–2 geniculate, tip irregularly rounded, conidial scars indistinct, 16–40(–48) x 3–3.5μm. Conidia strictly filiform, pale olivaceous brown, straight or slightly curved, 3 septate, apex rounded, base cylindrically truncate, 36–109 x 2.5–3.5μm.

Habitat: On leaves of *Ixora chinensis* (Rubiaceae), Singapore, leg. G. Lim, Aug. 2, 1969.

Note: *Pseudocercospora ixoricola* (Yen) Yen differs from this fungus by its angular and strictly vein-limited leaf spots and its obclavate conidia; furthermore it has no external hyphae and developed stromata.

3. *Cercoseptoria polygonigena* (Yen) Yen, comb. nov. (Fig. 3)

   = *Cercospora polygonigena* Yen, Revue de Mycol. 42:143, 1978.

Leaf spots distinct, soil-brown with an indefinite yellowish border, irregularly circular, scattered. 2–7mm in diam., sometimes up to 20mm in length. Fruiting amphiphyllous, but more abundant on the lower side of the leaf. Fascicles poor to meagre (2–10 stalks), emerging through the stomata. Conidiophores amphigenous, simple, rarely branched, straight or slightly tortuous, pale olivaceous brown, 0–2 septate, 0–1 geniculate, tip slightly attenuate and truncate, conidial scars inconspicuous, 10–65 x 3–3.5μm. Conidia very thin, filiform, pale olivaceous brown, straight or slightly curved, 3–7 septate, tip conic, base cylindrically truncate, 30–90 x 2–3μm.

Habitat: On leaves of *Polygonum* sp. (Polygonaceae), Bukit Timah (Hwa Chung College), Singapore, leg. Chuan-ling Yen, Apr. 15, 1973.

Note: *Cercospora avicularis* Winter and *Cercospora polygonicola* Kar & Manal are different from this species by their obclavate conidia.

4. *Cercoseptoria rhododendricola* (Yen) Deighton (Fig. 4)

= *Cercospora rhododendricola* Yen, Revue de Mycol. 31:137, 1966.

Leaf spots angular or irregular, vein-limited, with an indefinite border, dark brown on upper side, yellowish brown on under side, 1.5–3mm in diam., frequently confluent and forming large patches. Fruiting strictly epiphyllous, appearing as minute black pustules under the hand lens. Stromata black brown, globular or irregularly globular, 30–60μm in diam. Fascicles dense to very dense, filling the stomatal opening. Conidiophores epigenous, simple, straight or slightly flexuous, 0–1 geniculate, generally continuous, rarely 1–2 septate, tip irregularly rounded or laterally shouldered, conidial scars inconspicuous, 18–26 x 2.4–3μm. Conidia filiform or acicular, pale olivaceous brown, generally slightly curved, 3–6 septate, tip obtuse, base slightly attenuate and truncate, 54–96 x 2–2.5μm.

Habitat: On leaves of *Rhododendron* sp. (Ericaceae), Botanic Gardens, Singapore, leg. Mrs. Shu-hsien Yen (No. 112), Apr. 13, 1965.

Note: *Cercospora handelii* Bubak is distinct from this species by its bigger and not vein-limited leaf spots (2–10mm in diam.) and its amphigenous fruiting.

5. *Cercoseptoria tecomae-heterophyllae* (Yen) Yen, comb. nov. (Fig. 5)

= *Cerospora tecomae-heterophyllae* Yen, Revue de Mycol. 31:143, 1966.

Leaf spots very small, circular, whitish and surrounded by a brown margin, scattered or coalescing to form large patches, 0.2–1mm in diam. Fruiting amphigenous, more abundant on the upper side, appearing as minute black pustules under the hand lens. Stromata generally epigenous, black brown, globose or irregularly globose, 36–90μm in diam. Fascicles dense to very dense, emerging through rupture of the epidermis. External hyphae generally hypogenous, emerging through the stomata, pale olivaceous brown, septate, branched, 1.5–3μm in width. Conidiophores showing two types: A, conidiophores coming from fascicles, pale olivaceous brown, straight or flexuous, simple (never branched), 0–3 geniculate, 0–3 septate, unthickened small condial scars at the attenuate and truncate tip, 25–48 x 3–4.5μm; B, condiophores arising from external hyphae, pale olivaceous brown, single, straight or slightly tortuous, 1–2 geniculate, 0–2 septate, tip attenuate and truncate 12–45 x 3–4μm. Conidia filiform or acicular, very pale olivaceous brown, or subhyaline, slightly curved, 2–6 septate, tip obtuse or rounded-obtuse, base slightly truncate and cylindrical, 36–72 x 1.5–2.5μm.

Habitat: On leaves of *Tecoma heterophylla* (Bignoniaceae), Botanic Gardens, Singapore, leg. Mrs. Shu-hsien Yen (No. 115), Apr. 13, 1965.

Note: This fungus is distinct from others (*Cercospora tecomae* Chupp & Viegas and *C. stenolobiicola* Chupp) by its thin conidia.

6. *Cercoseptoria tecomicola* (Yen) Yen, comb. nov. (Fig. 6)

= *Cercoseptoria tecomicola* Yen, Revue de Mycol. 32:196, 1967a.

Leaf spots distinct, angular or irregularly angular, strictly vein-limited, brown to dark brown, scattered, 0.5–4mm in diam. Fruiting amphigenous, visible as minute black pustules on the upper surface of the leaf, appearing as gray velvet on the lower side of the leaf spots. Stromata epigenous, at times lacking, dark brown to black brown, globose, 30–55μm in diam. Fascicles medium to dense or very dense. External hyphae hypophyllous, emerging through the stomata, pale brown, septate, branched, 2–3μm in width. Conidiophores showing two types: A, conidiophores coming from fascicles, pale brown, paler towards the apex, erect or flexuous, simple or branched, 0–3 septate, 0–3 geniculate, tip rounded or laterally shouldered, 21.5–49 x 3–4.8μm; B, conidiophores arising from the external hyphae, pale olivaceous brown, single, 0–1 septate, 0–1 geniculate, tip rounded or laterally shouldered, 6–19.5 x 2.5–4.5μm. Conidia cylindrical or acicular, pale olivaceous brown, slightly curved, 1–9 septate, tip subrounded, base cylindrical and truncate, 18–79 x 2.5–3μm.

Habitat: On leaves of *Tecoma stans* (*Stenolobium stans*) (Bignoniaceae), Katong, Singapore, leg. Jo-min Yen (No. M.S. 771), Jan. 5, 1966.

Note: *Cercospora stenolobiicola* Chupp differs from this species by its hyaline conidia and *Cercoseptoria tecomae-heterophyllae* (Yen) Yen is distinct from this fungus by its very small (0.2–1mm in diam.) and not vein-limited leaf spots.

7. *Cercospora abacopteridis* Yen & Lim (Fig. 7, C-E)

Cahiers du Pacifique 17:96, 1973.

Leaf spots amphigenous, brown with an indefinite border, at first vein-limited, then confluent. Fruiting hypophyllous, invisible. Stromata lacking, fascicles poor to midly dense (2–18 stalks), emerging through the stomata. Conidiophores dark brown, paler towards the apex, always simple, erect or slightly flexuous, 1–5 septate, with 0–2 small geniculations, a large black brown conidial scar at the rounded tip, 15–118 x 4–5μm. Conidia acicular or filiform, hyaline, straight or slightly curved, 1–35 septate, tip acute, base cylindrical-truncate with a black brown scar at its end, 62–400 x 2–4μm.

Habitat: On leaves of *Abacopteris urophylla* (Pteridophyte), Singapore, leg. G. Lim (No. 71), Mar. 3, 1972.

8. *Cercospora acori* Yen (Fig. 8)

Revue de Mycol. 29:209, 1964.

Leaf spots indistinct, sometimes appearing as gray darkish specks. Fruiting amphigenous, effuse, dark brown, Stromata lacking. External hyphae brown or yellowish brown, branched, septate, 2.5–4.8μm in width. Conidiophores as single branches from procumbent threads, never fasciculate, brown or dark brown, cylindrical, not geniculate, 2–6(–8) septate, tip rounded to conic, several small brown scars on the upper part, 21–190 x 4–4.8μm. Conidia pale olivaceous brown, obclavate or obclavatoacicular, 4–9(–12) septate, tip acute, base obconically truncate, 40–120 x 2.3μm.

Habitat: On leaves of *Acorus calambus (Araceae)*, Botanic Gardens, Singapore, leg. Mrs. Shu-hsien Yen (No. 7), Jan. 26, 1964.

Note: This fungus is parasitic on the uredospores of *Uromyces aparganii* Clint. & Peck which is parasitic on the same host plant at the same time.

9. *Cercospora apii* Fres.

Beitr. Myk. 3:91, 1863.

Syn. *Cercospora penicillata* var. *apii* Fuckel, Hedwigia 2:132, 1863.

Leaf spots subcircular to irregular, brownish to ashy gray, surrounded by an indistinct greenish border, 1–5mm in diam., often confluent. Fruiting amphigenous, invisible. Stromata lacking or very small. Fascicles very poor. Conidiophores olivaceous brown, simple, straight or slightly flexuous, 2–6 septate, not geniculate, a large black brown scar at the rounded tip, 50–220 (–300) x 4–6μm. Conidia filiform, acicular, hyaline, straight or curved, multiseptate, tip acute to subacute, base truncate, 35–210 (–300) x 2–3.5μm.

Habitat: On leaves of *Apium graveolans* (Umbelliferae), Bukit Timah, Singapore, leg. G. Lim, Apr. 25, 1969.

Distribution: N. America, Europe, India, Korea, Japan, Manuchuria and Singapore.

10. *Cercospora asystasiana* Yen (Fig.9)

Revue de Mycol. 32:180, 1967a.

Leaf spots orbicular, brown with an indefinite border, scattered, 2–5mm in diam., sometimes confluent. Fruiting strictly hypophyllous, invisible. Stromata absent, sometimes present but very rudimentary. Fascicles very poor (2–5 stalks), emerging through the stomata. Conidiophores hypogenous, simple, straight or tortuous, dark brown, with 0–5 small geniculations, 0–5 septate, a large black brown conidial scar at the rounded tip, several small scars on the upper part, 30–132 x 3–3.5μm. Conidia hyaline, acicular or obclavato-cylindrical, mildly curved, 5–20 septate, tip acute to obtuse, base subtruncate and with a black brown scar at the end, 48–185 x 2.5–5μm.

Habitat: On leaves of *Asystasia chelonoides (Acanthaceae)*, Botanic Gardens, Singapore, leg. Jo-min Yen (No. M.S. 769), Jan. 5, 1966.

Note: This fungus is different from *Pseudocercospora asystasiae* (Yen) Yen by its hypophyllous fruiting and hyaline conidia.

11. *Cercospora balsaminiana* Yen & Lim (Fig. 1, C & D)

Cahiers du Pacifique 14:91, 1970a.

Leaf spots none or indistinct. Fruiting epigenous, invisible. Stromata absent or very rudimentary, consisting of few brown cells. Fascicles very poor (2–7 stalks), emerging through the stomata. Conidiophores pale brown, always simple, cylindrical, erect, usually continuous, sometimes 1 septate, a large dark brown conidial scar at the rounded tip, 15–40 x 4.5–6μm. Conidia acicular, hyaline, straight or slightly curved, 5–17 septate, tip acute, base truncate and with a black brown scar at the end, 66–307 x 2.5–4.5μm.

Habitat: On leaves of *Impatiens balsamina* (Balsaminaceae), Bukit Timah, Singapore, leg. G. Lim, Mar. 12, 1969.

Note: *Cercospora fukushiana* (Mats.) Yamam. differs from this fungus by its amphiphyllous fruiting and its 1–4 septate conidiophores.

12. *Cercospora barleriae* Yen & Lim (Fig. 10)

Cahiers du Pacifique 17:100, 1973.

Leaf spots amphigenous, angular, vein-limited, black on the upper side and dark brown on the under side, usually confluent and forming large black brown patch, sometimes extending over a great part of the leaf surface. Fruiting strictly hypophyllous, effuse, visible as dark brown velvet on the under side of spots. Stromata absent. Fascicles poor to mildly dense (2–18 stalks), emerging through the stomata. Conidiophores olivaceous brown, paler towards the tip, simple, rarely branched, flexuous, 1–7 septate, with 0–3 small geniculations, apex slightly attenuate and truncate, with brown conidial scar at the end, 25–130 x 5–6μm. Conidia pale olivaceous brown, obclavate or obclavato-cylindrical, straight or slightly curved, 1–8 septate, tip rounded or subobtuse, base slightly attenuate and truncate, 13–80 x 4–5μm.

Habitat: On leaves of *Barleria cristata* (Acanthaceae), Singapore, leg. G. Lim (No. S.U. 73), Jan. 5, 1971..

Note: *Cercospora barlericola* Payak and *C. barleriae-cristatae* Gov. & Thir. are different from this fungus by their amphiphyllous fruiting and hyaline conidia.

13. *Cercospora canavaliiana* Yen & Lim (Fig. 11, A-F)

Cahiers du Pacifique 14:94, 1970a.

Leaf spots distinct, medium brown on the upper side, grayish brown on the lower side, irregularly orbicular, 3–25 mm in diam. Fruiting amphigenous, but chiefly hypophyllous. Stromata absent or very rudimentary. Fascicles poor to medium (2–12 stalks), emerging through the stomata. Conidiophores olivaceous brown, simple, cylindrical, always erect, not geniculate, continuous (rarely 1 septate), a large black brown conidial scar at the rounded and paler tip, 36–80 x 5–6μm. Conidia cylindrical or filamentous, hyaline, slightly curved, 3–10 septate, apex rounded, base truncate with a black brown scar at the end, 60–200 x 2.5–4.8μm.

Habitat: On leaves of *Canavalia gladiata* (Leguminosae), Bukit Timah, Singapore, leg. G. Lim, Apr. 5, 1969.

Note: This species differs from others (*Cercospora canavaliae* Syd. and *C. canavaliicola* Saw. & Kats.) by its amphiphyllous fruiting and filiform conidia.

14. *Cercospora canescens* Ell. & Mart.

Amer. Nat. 16:1003, 1882.

Syn. *Cercospora vignicaulis* Tehon, Mycologia 29:436, 1937.

Cercosporiopsis canescens (Ell. & Mart.) M. Miura, South Manch. Railway Co. Agr. Rept. 27:529, 1928.

Leaf spots amphigenous, suborbicular to irregular, reddish brown with an indefinite border, at times vein-limited, 1.5–15mm in diam., sometimes confluent. Fruiting amphigenous, more abundant on lower side, invisible. Stromata very poor. Fascicles poor to dense (2–25 stlks), emerging through the stomata. Conidiophores may be divided into two kinds: A, conidiophores from fascicles simple, erect or slightly flexuous, olivaceous brown, 0–7 septate, 0–3 geniculate, a large black brown conidial scar at the rounded tip or somewhat laterally displaced, 28.8–174 x 4–5μm: B, conidiophores arising from external hyphae, simple, erect, olivaceous brown, continuous, a small conidial scar at the rounded tip, 2.4–12 x 3.6–5μm. Conidia hyaline, acicular, straight or curved, 3–18 septate, tip acute, base truncate and a black brown scar at the end, 75–190 x 2.5–3.5μm.

Habitat: On leaves of *Phaseolus vulgaris* (Leguminosae), Jurong, Singapore, leg. Shu-ling Lin, Dec. 10, 1968.

Distribution: N. & S. America, Africa, India, China, Manchuria, Japan and Singapore.

15. *Cercospora capsici* Heald & Wolf

Mycologia 3:15, 1911.

Leaf spots suborbicular, 1–5 up to 10mm in diam., at first brown, then becoming grayish brown, raised on the upper surface, surrounded by a raised dark brown border. Fruiting amphigenous, invisible. Stromata lacking or small, brown 15–30μm in diam. Fascicles poor to mildly dense (2–18 stalks), emerging through the stomata. Conidiophores straight to slightly curved, simple, 1–3 abruptly geniculate, 1–2 septate, medium brown, paler towards the apex, a dark brown conidial scar at the truncate tip, 30–60 x 4.5–5.5μm. Conidia hyaline, acicular, straight or slightly curved, 1–5 septate, tip subobtuse, base truncate, 30–125 x 3.5–4μm.

Habitat: On leaves of *Capsicum annum* (Solanaceae), Bukit Timah, Singapore, leg. G. Lim, Apr. 6, 1969.

Distribution: N. & S. America, China, Japan and Singapore.

16. *Cercospora cassiae-nodosae* Yen (Fig. 12)

Revue de Mycol. 43:97, 1979..

Leaf spots amphigenous, distinct, black, circular or subcircular, scattered, 1–2mm in diam., rarely 2–3 confluent. Fruiting strictly hypophyllous, visible as minute black pustules on the under surface of the spots. Stromata globose to irregularly globose, black brown, 25–40μm in diam. Fascicles dense to very dense, emerging through the stomata. Conidiophores hypophyllous, always simple, erect or slightly tortuous, olivaceous brown, 2–5 septate, 0–2 geniculate, a dark brown conidial scar at the rounded tip, 60–145 x 3–4μm. Conidia obclavate, olivaceous brown, curved, 3–7 (generally 5–6) septate, tip conic, base obconically substruncate, with a dark brown scar at the end, 25–65 x 3–5μm.

Habitat: On leaves of *Cassia nodosa* (Leguminosae), Kuala Lumpur (For. Res. Inst.), Malaysia, leg. Jo-min Yen (No. 71339), Sept. 28, 1971.

Note: This fungus is distinct from others by its black leaf spots, developed stromata, coloured conidia and long conidiophores (60–145μm).

17. *Cercospora cassiae-occidentalis* Yen (Fig. 13)

Revue de Mycol. 29:212, 1964.

Leaf spots indistinct, sometimes with many small gray reddish points on both sides of the leaf. Fruiting amphigenous, invisible. Stromata lacking. Fascicles very poor (2–6 stalks), filling stomatal opening. Conidiophores simple, not branched, olivaceous brown, 2–6 septate, 1–5 geniculate, straight or tortuous, paler and more narrow towards the tip, bulbiform at the base, a brown small conidial scar at the attenuate tip, 60–128.5 x 4–5μm. Conidia pale olivaceous brown, obclavato-cylindrical or cylindrical for the short ones, straight or slightly curved, 3–6 septate, tip rounded or subrounded, base obconically truncate, 62.4–98.5 x 3.6–4.8μm.

Habitat: On leaves of *Cassia occidentalis* (Leguminosae), Katong, Singapore, leg. Mrs. Shu-hsien Yen (No. 30) Apr. 25, 1964.

Note: The amphigenous fruiting and the unbranched conidiophores separate this species from *Pseudocercospora nigricans* (Cooke) Deighton.

18. *Cercospora citrullina* Cooke

Grevillea 12:31, 1883.

Syn.: *Cercospora cucurbitae* Ell. & Ev., J. Mycol. 4:3, 1888.

Cercospora sechii Stevenson, P. Rico Ins. Exp. Sta. Dept. Agr. Ann. Rept. (1917), 18:137, 1919.

Cercospora chardoniana Chupp, Monogr. Univ. R. Rico. B. 2:245, 1934.

Cercospora momordicae Mendoza, Philipp. J. Sci. 75:173, 1941.

Cercospora momordicae Sawada, Descr. Cat. Formosan Fungi. 9:173, 1943.

Leaf spots subcircular or angular to irregular, 2–5mm up to 10mm in diam., brownish with a dark brown to purplish raised border, centre becoming grayish. Fruiting amphigenous but chiefly epiphyllous, invisible. Stromata lacking or consisting of few brown cells. Fascicles poor to medium (2–10 stalks), emerging through the stomata. Conidiophores simple, erect or slightly flexuous, usually geniculate at the upper part, 2–8 septate, 1–6 geniculate, olivaceous brown, but paler towards the apex, a large black brown conidial scar at the rounded tip, 40–240 x 3.5–5μm. Conidia acicular or filiform, sometimes cylindrical, hyaline, straight or curved, 3–29 septate, tip acute, base truncate, 60–447 x 3–4μm.

Habitat: On leaves of *Momordica charantia* (Cucurbitaceae), Bukit Timah, Singapore, leg. G. Lim, Jul. 17, 1969.

Distribution: N. & S. America, Europe, Africa, China, Japan and Singapore.

19. *Cercospora coleiana* Yen & Lim (Fig. 14)

Bull. Soc. Mycol. 85:463, 1969.

Leaf spots amphigenous, circular to irregularly circular, brown to dark brown, but centre becoming whitish and with an indefinite border, 1–6mm in diam. Fruiting amphigenous, but more abundant on the lower side, invisible. Stromata lacking. Fascicles very poor (2–4 stalks), emerging through the stomata. Conidiophores pale brown to brown, simple or branched, erect or flexuous, 0–11 septate, 0–5 slightly geniculate, a small black brown conidial scar at the attenuate apex, usually several (5–10) black brown conidial scars on the upper part of the old ones, 40–181 x 5–7.2μm. Conidia acicular, hyaline, straight or slightly curved, 1–18 septate, tip acute, base truncate with a black brown scar at the end, (40–) 80–276 x 2–4.8μm.

Habitat: On leaves of *Coleus* sp. (Labiatae), Singapore, leg. G. Lim, Jul. 17, 1969.

Note: *Cercospora coleicola* Chupp & Mull and *C. colei* Boed. are different from this fungus by their conidiophores always simple, in dense to very dense fascicles and especially by their epiphyllous fruiting.

20. *Cercospora dioscorae-pyrifoliae* Yen (Fig. 15)

Bull. Soc. Mycol. Fr. 84:5, 1968.

Leaf spots amphigenous, more distinct on the upper side, circular, 0.5–8mm in diam., whitish in the centre, surrounded by a dark brown border, finally forming "shot-hole". Fruiting amphiphyllous, visible as short black hairs in the centre of spots. Stromata lacking or very rudimentary, consisting of few brown cells. Fascicles poor to dense (2–28 stalks), emerging through the stomata. Conidiophores dark brown, simple, erect or slightly flexuous, 1–7 septate, 0–3 geniculate, 1–2 small black brown conidial scars at the rounded tip, 36–200 x 6–8.4μm. Conidia acicular, hyaline, straight or curved, 3–18 septate, tip acute, base truncate, with a black brown scar at the end, 45.6–168 x 3.5–6μm.

Habitat: On leaves of *Dioscorea pyrifolia* (Dioscoreaceae), Jurong, Singapore, leg. Jo-min Yen (No. M.S. 738), Dec. 17, 1965.

Note: This fungus differs from others (*Cercospora ubi* Rac. and *Pseudocerpospora ubicola* (Yen) Deighton) by the "shot-hole" leaf spots and the acicular and hyaline conidia.

21. *Cercospora eupatorii-odorati* Yen (Fig. 16, D-J)

Bull. Soc. Mycol. Fr. 84:10, 1968.

Leaf spots amphigenous, circular, more distinct on the upper side, brown to dark brown, scattered, 2–6mm in diam., sometimes coalescing and forming large patches. Fruiting strictly hypophyllous, invisible. Stromata absent or small, dark brown, globose, 18–42μm in diam. Fascicles poor to meagre (2–9 stalks), sometimes dense, emerging through the stomata. External hyphae hypophyllous, also emerging through the stomata, pale olivaceous brown, septate, branched, 2.5–5μm in width. Both the conidiophores from fascicles and arising from external hyphae may be brown or olivaceous brown, straight or flexuous, simple or branched, 0–10 septate, 0–2 geniculate, 1–2 small black brown conidial scars at the shortly attenuate tip, 38.4–168 x 4.5–6μm. Conidia cylindrical, pale olivaceous brown, catenate or slightly curved, 1–4 (generally 3) septate, small black brown conidial scars at both rounded ends, 22.8–57.6 x 3.6–5μm.

Habitat: On leaves of *Eupatorium odoratum* (Compositae), Ipoh, Malaysia, leg. Jo-min Yen (No. M.S. 728), Dec. 21, 1965.

22. *Cercospora gloriosicola* Yen & Lim (Fig. 17)

Bull. Soc. Mycol. Fr. 85:467, 1969.

Leaf spots distinct, oval or oblong, brown with an indefinite border, scattered 3–14 x 2–7mm. Fruiting amphigenous, appearing as minute black pustules. Stromata very developed, black brown, globose, 48–70μm in diam. Fascicles dense to very dense, emerging through the stomata. Conidiophores pale brown, simple or branched, tortuous, 3–6 geniculate, 4–6 septate, a large black brown conidial scar at the rounded tip and several (3–5) black brown scars laterally displaced on the upper part, 80–168 x 4.8–7.2μm. Conidia hyaline, obclavato-cylindrical, straight or slightly curved, 3–11 septate, apex rounded or subobtuse, base truncate with a black brown scar at the end, 50–120 x 4–5μm.

Habitat: On leaves of *Gloriosa superba* (Liliaceae), Bukit Timah, Singapore, leg. G. Lim, Aug. 2, 1969.

23. *Cercospora henningsii* Allesch.

Engler's Pfl. Ost-Afr. Teil C, p. 35, 1895.

Syn. *Cercospora cassavae* Ell. & Ev., Bull. Torrey Bot. Club, 22:438, 1895.

Cercospora manihotis P. Henn. Hedwigia 41:18, 1902.

Cercospora cearae Petch, Ann. Roy. Bot. Gard. Paradeniya 3:10, 1906.

Septogloeum manihotis Zimm., Centralbl. f. Bakt. Abt. 2, 8:218, 1902.

Helminthosporium manihotis Rangel, Arch. Jard. Bot. Rio de Janeiro 2:71, 1917.

Leaf spots circular to subcircular, more distinct on the upper side of the leaf, scattered, 3–12mm in diam. pale brown or tan dingy to dingy gray with a yellowish brown margin, rather indefinite on the lower surface. Fruiting amphigenous, visible as minute black pustules under the hand lens. Stromata small, dark brown, globose, 20–40μm in diam. Fascicles dense to very dense, filling the stomatal opening. Conidiophores pale olivaceous brown, uniform in colour and width, simple, straight or slightly flexuous, 0–2 midly geniculate, at times sparingly septate, tip rounded with a small brown conidial scar, 10–50 x 3.5–5μm, rarely as long as 100μm. Conidia cylindrical, pale olivaceous brown, straight or slightly curved, 2–8 septate, both ends bluntly rounded or base shortly obconically truncate, 30–60 x 4–6μm (rarely as large as 85 x 7μm).

Habitat: On leaves of *Manihot utilissima* (Euphorbioceae), Bukit Timah, Singapore, leg. G. Lim, Mar. 13, 1969.

Distribution: N. America, E. Africa, Barbados, Belgian Congo, Brazil, Ceylon Colombia, Costa Rica, Gold Coast, Panama, Philippines, Puerto Rico, San Domingo, Sierra Leone, Singapore, Taiwan, Tanganyika, Trinidad and Uganda.

24. *Cercospora holobrunnea* Yen (Fig. 18)

Revue de Mycol. 31:112 1966.

Leaf spots indistinct, yellowish brown. Fruiting amphigenous, but mostly hypophyllous. Stromata lacking. Fascicles lacking. External hyphae amphigenous, but mostly hypophyllous, olivaceous brown, emerging through the stomata, septate, branched, 2–3μm in width. Conidiophores as single branches from external procumbent threads, olivaceous brown, cylindrical, 1–2 septate, 0–1 geniculate, a small brown conidial scar at the rounded tip, 24–36 x 2.4–3.6μm. Conidia cylindrical, pale olivaceous brown, straight or slightly curved, 2–5 septate, tip rounded, base truncate with a dark brown conidial scar at the end, 24–74.4 x 2.4–3μm.

Habitat: On leaves of *Hydrangea macrophylla* (Hydrangeaceae), Bukit Timah, Singapore, leg. Mrs. Shu-hsien Yen (No. 89), Dec. 4, 1964; on the same host-plant, in Hwa Chung College, Singapore, leg. Chih-shao Lee & Mrs. Shu-hsien Pen (No. 109), April 1965.

25. *Cercospora hyalofilispora* Yen (Fig. 19)

Revue de Mycol. 31:115, 1966.

Leaf spots none or indistinct. Fruiting hypophyllous, invisible. Stromata lacking. Fascicles lacking. External hyphae hypophyllous, hyaline, emerging through the stomata, septate, branched, very thin, 1–1.5μm in width. Conidiophores arising as single branches from external threads, pale olivaceous brown, 0–1 septate, not geniculate, with zigzag membrane, a small brown conidial scar at the attenuate tip, 16.8–28.8 x 3–3.6μm; at times some conidiophores emerging through the stomata, 30–50 x 3.6–4μm. Conidia filiform, hyaline, very thin, slightly curved, 3–14 septate, tip acute, base truncate with a dark brown scar at the end, 28–123 x 1–1.5μm.

Habitat: On leaves of *Hydrangea macrophylla* (Hydrangeaceae), Katong, Singapore, leg. Mrs. Shu-hsien Yen (No. 95), Dec. 18, 1964.

26. *Cercospora hydrangeae* Ell. & Ev.

J. Mycol. 8:71, 1902.

Syn. *Cercospora hydrangeicola* Speg., Ann. Nac. Buenos Aires 20:426, 1910.

Cercospora hydrangicola Tharp, Mycologia 9:110, 1917.

Cercospora arboressentis Teh. & Dan., Mycologia 17:246, 1925.

Leaf spots subcircular, pale, brown with a black brown border, scattered, 3–7mm in diam., sometimes confluent. Fruiting amphigenous, but mostly epiphyllous. Stromata poor or small, brown, globose, 20–36μm in doam. Fascicles poor to dense (2–20 stalks), emerging through the stomata. Conidiophores amphigenous, erect or flexuous, medium brown, not branched, 1–5 (rarely 8 or 9) septate, 1–5 geniculate, a large brown conidial scar at the rounded tip, 48–160 x 4.5–7μm. Conidia acicular or obclavato-acicular, hyaline straight or curved, 5–11 septate, tip subacute, base truncate with a terminal dark scar, 84–176 x 3.6–4.8μm.

Habitat: On leaves of *Hydrangea macrophylla* (Hydrangeaceae), Bukit Timah, Singapore, leg. Mrs. Shu-hsien Yen (No. 89), Dec. 4, 1964; on the same host-plant, in Hwa Chung College, Singapore, leg. Chih-shao Lee & Mrs. Shu-hsien Yen (No. 96), Dec. 31, 1964.

Distribution: N. America, Argentine, Japan, Singapore and Taiwan.

27. *Cercospora ipomoeae-pes-caprae* Yen & Lim (Fig. 20)

Bull. Soc. Mycol. Fr. 86:747, 1970b.

Leaf spots amphigenous, distinct, circular to irregular circular, pale brown to brown, paler in the centre, with a thicker black brown border, scattered, 1–4mm in diam., sometimes confluent. Fruiting amphiphyllous, visible as black minute pustules under the hand lens. Stromata substomatic, composed of finely granulate membrane cells, black brown, globose, 19-38μm in diam. Fascicles poor to meagre (2–8 stalks), emerging through the stomata. Conidiophores olivaceous brown, cylindrical, erect, simple, continuous or 1 septate, not geniculate, a large black brown conidial scar at the rounded tip, 30–40 x 4–5μm. Conidia obclavate, hyaline, straight or slightly curved, 3–14 septate, apex obtuse, base truncate with a black brown scar at the end, 44–115 x 3–4.5μm.

Habitat: On leaves of *Ipomoea pes-caprae* (Convolvulaceae), Pulau Besar island, Malaysia, leg. G. Lim, Jan. 10, 1970.

28. *Cercospora mikaniicola* Stev.

Trans. III. Acad. Sci. 10:213, 1917.

Syn. *Cercospora mikaniae-cordiae* Yen, Revue de Mycol. 30:183, 1965.

Leaf spots amphigenous circular, at first very small, 0.5–1mm in diam., reddish brown with a whitish centre, then becoming larger, 3–5mm in diam., forming "Frog eyes" and surrounded by a brown border. Fruiting amphiphyllous, but chiefly hypophyllous. Stromata lacking or very rudimentary. Fascicles very poor (2–7 stalks), emerging through the stomata. Conidiophores simple, never branched, erect, cylindrical, brown, paler toward the apex, 1–2 septate, 0–2 geniculate, a large black brown conidial scar at the rounded tip, some scars laterally displaced, 52–102 x 5–7.2μm. Conidia hyaline, abruptly obclavate, at times somewhat fusiform, straight or curved, 3–9 septate, with a long whip-like tip, base attenuate and truncate, with a black scar at the end, 89–138 x 7.2–12μm.

Habitat: On leaves of *Mikania cordata* (Compositae), Bukit Timah, Singapore, leg. Mrs. Shu-hsien Yen (No. 68), Jul. 1, 1964.

Distribution: Puerto Rico and Singapore.

29. *Cercospora malayensis* Stev. & Solh.

Mycologia 23:394, 1931.

Leaf spots circular to irregular, tan to brown, usually with a purple or red border, fairly broad, 5–25mm in length, frequently extending from the edge of of the leaf to the midrib. Fruiting amphigenous, invisible. Stromata lacking or rudimentary. Fascicles meagre to dense (5–20 stalks), emerging through the stomata or rupture of the epidermis. Conidiophores pale brown, simple, straight or flexuous, apex rounded, 35–250 x 3–4μm. Conidia subhyaline, acicular to obclavato-acicular, multi-septate, tip acute, base truncate, 70–115 x 2.5–3μm.

Habitat: On leaves of *Hibiscus mutabilis* (Malvaceae), Singapore, leg. G. Lim (No. S.U. 48), Apr. 1970.

Distribution: N. & S. America, S. Africa, Brazil, Jamaica, Japan, Philippines, Salvador, Singapore, Taiwan, Trinidad and Venezuela.

30. *Cercospora nicotianae* Ell. & Ev.

Proc. Acad. Sci. Phila. 45:170, 1893.

Syn. *Cercospora raciborskii* Sacc. & Syd., Syll. Fung. 16:1070, 1902.

Leaf spots amphigenous, circular to subcircular, larger ones concentrically zonate, uniformly brown to dark brown, 1–15mm in diam., sometimes confluent. Fruiting amphiphyllous, invisible. Fascicles poor (2–7 stalks), emerging through the stomata. Stromata very rudimentary, consisting of a few brown cells. Conidiophores brown to dark brown, simple, sometimes branched, erect or flexuous, 0–4 geniculate, 2–8 septate, a large conidial scar at the rounded tip, 38–180 x 3.6–6μm. Conidia acicular, hyaline, slightly curved, 3–15 septate, tip subacute, with a black brown scar at the end, 45–165 x 3–4μm.

Habitat: On leaves of *Nicotiana tabacum* (Solanaceae), Jurong, Singapore, leg. Jo-min Yen (No. M.S. 723), Dec. 15, 1965.

Distribution: Africa, S. America, Europe, Japan, Peru, Singapore and Taiwan.

31. *Cercospora nicotianicola* Yen (Fig. 21)

Revue de Mycol. 32:188, 1967a.

Leaf spots amphigenous, distinct, triangular or irregularly angular, vein-limited, white and surrounded by a raised dark brown border, scattered, 1–3mm in diam. Fruiting amphiphyllous, visible as black powder at the white centre of leaf spots. Stromata small, dark brown, subglobose, 24–54μm in diam. Fascicles poor to dense (2–18 stalks), emerging through the stomata. Conidiophores brown to dark brown, paler toward the tip, generally simple, at times branched, 2–4(–5) septate, 0–2 geniculate, one or several small conidial scars at the attenuate tip, 5–15 small brown scars laterally displaced on the upper part, then appearing as denticulate form, 60–218 x 5–6μm. Conidia hyaline, filiform or acicular, straight or slightly curved, 2–48 septate, tip rounded or obtuse, base truncate and with a black scar at the end, 70–480 x 2.5–3.6μm.

Habitat: On leaves of *Nicotiana tabacum* (Solanaceae), Jurong, Singapore, leg. Jo-min Yen (No. M.S. 724), Dec. 18, 1965.

Note: The small, white leaf spots, the attenuate apex conidiophores and the filiform conidia separate this species from *Cercospora nicotianae* Ell. & Ev.

32. *Cercospora peristrophes-acuminatae* Yen (Fig. 22)

Revue de Mycol. 29:230, 1964.

Leaf spots none or indistinct, sometimes as dark, brown areas but not distinct. Fruiting hypophyllous, rarely amphiphyllous. Stromata lacking. Fascicles poor to meagre (2–8 stalks), filling stomatal opening. Conidiophores hypophyllous, rarely amphigenous, simple, erect, brown to dark brown, paler and more narrow towards the tip, a small, black brown conidial scar at the tip and several small, black-brown scars laterally displaced at the upper part, 3–12 septate, not geniculate, 156–295 x 6–7.2μm. Conidia clavate or long-oblong, pale olivaceous brown, 1–3 septate, straight, tip rounded, base attenuate and truncate, 32–45 x 8–8.5μm.

Habitat: On leaves of *Peristrophe acuminata* (Acanthaceae), Katong, Singapore, leg. Mrs. Shu-hsien Yen (No. 20), Apr. 20, 1964.

33. *Cercospora psophocarpicola* Yen (Fig. 23)

Bull. Soc. Mycol. Fr. 83:339, 1967b.

Leaf spots circular or irregular, brown with an indefinite border, scattered, 1–4mm in diam., frequently confluent. Fruiting hypogenous, usually mixed with that of *Pseudocercospora psophocarpi* (Yen) Deighton. Stromata lacking or very rudimentary, black brown, irregularly globose, 15–20μm in diam. Fascicles poor to meagre (2–7 stalks), emerging through the stomata. Conidiophores strictly hypophyllous, dark brown, simple, never branched, erect or slightly flexuous, 1–4 septate, 1–4 geniculate, a large, black brown conidial scar at the rounded tip, 22.8–260 x 4.8–6μm. Conidia acicular, sometimes filiform, hyaline, straight or slightly curved, 4–17 septate, apex acute, base truncate with a black brown scar at the end, 54–234 x 2.4–3.6μm.

Habitat: On leaves of *Psophocarpus tetragonolobus* (Leguminosae), Jurong, Singapore, leg. Jo-min Yen (No. M.S. 717bis), Dec. 31, 1965.

34. *Cercospora pudicae* Yen (Fig. 24)

Revue de Mycol. 29:234, 1964.

Leaf spots none or indistinct. Fruiting amphiphyllous, effuse, whitish on both surfaces of the leaf. Stromata lacking. Fascicles rather dense or meagre, emerging through the stomata. Conidiophores pale olivaceous brown, simple, sometimes branched, erect or tortuous, 0–1 septate, 0–1 geniculate, medium brown conidial scar at the rounded apex, 20.4–36 x 4.8–6μm. Conidia hyaline or subhyaline, long fusiform, 1–4 septate, straight or slightly curved, tip rounded or subconic, base attenuate, 31.2–46 x 3–4.5μm.

Habitat: On leaves of *Mimosa pudica* (Leguminosae), Katong, Singapore, leg. Mrs. Shu-hsien Yen (No. 42), Mar. 15, 1964.

Distribution: Burma, Cuba, India, Jamaica, Mauritius, Puerto Rico, Singapore and Venezuela.

35. *Cercospora sesamigena* Yen & Lim (Fig. 25)

Cahiers du Pacifique 17:103, 1973.

Leaf spots amphigenous, brown, irregularly angular, scattered, 0.3–4mm in diam., sometimes confluent on the edges of leaf. Fruiting amphiphyllous, invisible. Stromata absent or very rudimentary. Fascicles usually poor to meagre (2–8 stalks), emerging through the stomata. Conidiophores pale brown, simple or rarely branched, erect or flexuous, 0–8 septate, 0–3 geniculate, a large black brown conidial scar at the rounded tip, several small brown scars laterally displaced at the upper part, 25–185 x 4–5.5μm. Conidia acicular, hyaline, straight or slightly curved, 3–32 septate, tip acute, base truncate with a black brown scar at the end, 75–490 x 3–4μm.

Habitat: On leaves of *Sesamum orientalis* (Pedaliaceae), Singapore, leg. G. Lim (No. S.U. 74), Feb. 12, 1972.

36. *Cercospora thunbergiana* Yen (Fig. 26)

Revue de Mycol. 30:198, 1965.

Leaf spots amphigenous, circular, brown with a dark brown border scattered, 2–7mm in diam., finally forming "shot-holes". Fruiting amphigenous, invisible. Stromata lacking or very rudimentary, consisting of few brown cells. Fascicles poor (2–7 stalks), emerging through the stomata. Conidiophores either coming from fascicles or arising from the external hyphae, always simple, erect or slightly tortuous, 2–9 septate, 0–2 geniculate, dark brown, paler towards the apex, a large, black brown conidial scar at the truncate tip, 70–228 x 6–8.5μm. Conidia acicular, hyaline, straight or slightly curved, 7–34 septate, tip acute, base truncate with a black brown scar at the end, 95–360 x 5–7μm.

Habitat: On leaves of *Thunbergia alata* (Acanthaceae), Bukit Timah (Hwa Chung College), Singapore, leg. Mrs. Shu-hsien Yen (No. 74), Aug. 3, 1964.

Note: This fungus differs from others (*Cercospora thunbergiae* Boed. and *Pseudocercospora thunbergiicola* (Yen) Deighton by its amphigenous fruiting and specially by its hyaline, acicular conidia.

37. *Cercospora tithoniae* Baker & Dale

Mycol. Papers 33:106, 1951.

Syn. *Cercospora tithoniae* Chidd., Mycopath. appl. Myc. 17:79, 1962.

Cercospora tithonicola (Chidd.) Yen, Revue de Mycol. 31:144, 1966.

Leaf spots distinct, brownish, angular or irregular, vein-limited, small, scattered, 0.3–2mm in diam., at last coalescing and covering the whole surface of the leaf. Fruiting amphigenous, invisible. Stromata brownish, globose or irregularly globose, 16–50μm in diam. Fascicles meagre to very dense (4–35 stalks), emerging through the stomata. Conidiophores amphiphyllous, pale olivaceous brown, unicolour simple, erect or slightly tortuous, 0–3 septate, 0–1 geniculate, a large, black brown conidial scar at the rounded tip, 74–112 x 4–5μm. Conidia obclavato-cylindrical, pale olivaceous brown, straight or midly curved, 1–6 septate, tip rounded, catenulate, then each end of the conidia holding a conidial scar, base slightly attenuate and truncate with a black brown scar at the end, 33.6–85 x 3.6–5μm.

Habitat: On leaves of *Tithonia diversifolia* (Compositae), Botanic Gardens, Singapore, leg. Mrs. Shu-hsien Yen (No. 113), Apr. 13, 1965.

Distribution: India and Singapore.

38. *Cercospora triseptospora* Yen (Fig. 27)

Revue de Mycol. 31: 146, 1966.

Leaf spots none or indistinct, appearing as brownish areas. Fruiting hypogenous, rarely amphiphyllous, invisible. Stromata lacking or very small, black brown, globose, 16–24μm in diam. Fascicles poor to medium (2–11 stalks), emerging through the stomata. External hyphae hypogenous, emerging through the stomata, pale olivaceous brown, septate, branched, 1.5–2.5μm in width. Conidiophores either coming from fascicles or arising from external hyphae, always simple, pale brown, straight, cylindrical, 1–3 septate, 0μ2 geniculate, several black brown conidial scars displaced on the upper part, then the membrane becoming denticulate, 25.5–70 x 3–4.5μm. Conidia cylindrical or obclavato-cylindrical, pale olivaceous brown, straight or slightly curved, with a finely granulate membrane, 3 septate, tip rounded, base slightly attenuate and subtruncate, 24–66 x 2.4–3μm.

Habitat: On leaves of *Hydrangea macrophylla* (Hydrangeaceae), Katong, Singapore, leg. Mrs. Shu-hsien Yen (No. 95), Dec. 18, 1964.

39. *Cercospora volkameriae* Speg.

Revista del Museo de la Plata 15: 47, 1908.

Leaf spots amphigenous, angular, strictly vein-limited, reddish brown to gray brown, scattered, 0.5–12mm in diam., more distinct on the upper side. Stromata lacking or very rudimentary. Fruiting amphiphyllous, invisible. Fascicles poor to medium (3–12 stalks), emerging through the stomata. Conidiophores always simple, erect or flexuous, pale brown to olivaceous brown, 1–11 septate, 0–5 geniculate, a large black brown scar at the rounded tip, 40–261 x 4–7.2μm. Conidia acicular, hyaline, straight or slightly curved, 3–30 septate, apex acute, base truncate with a black brown scar at the end, 82–278 x 3.6–7.2μm.

Habitat: On leaves of *Clerodendron fragrans* (Verbenaceae), Changi, Singapore, leg. Mrs. Shu-hsien Yen (No. 146), Dec. 31, 1966.

Distribution: Brazil and Singapore.

40. *Cercospora zinniae* Ell. & Mart.

J. Mycol. 1: 20, 1885.

Syn. *Cercospora atricinctata* Head & Wolf, Mycologia. 3: 14, 1911.

Cercospora zinniae Takah. & Yosh., Plant Protect (Shoku-butsu-boeki) 7: 17, 1953.

Leaf spots circular to angular or irregularly angular, more or less vein-limited, at first brown, later becoming gray or white, with a dark brown or purplish black margin, scattered, 2–14mm in diam., but often coalescing and forming large patches. Fruiting amphigenous, but mostly epiphyllous, visible as minute black hairs under the hand lens. Stromata black brown, globose or subglobose, 20–42μm. Fascicles poor to dense (2–20 stalks), emerging through the stomata. Conidiophores pale brown to brown, simple, never branched, straight or tortuous, 0–10 septate, 1–4 geniculate, a large black brown conidial scar at the rounded tip (sometimes tip shouldered), 48–300 x 4.8–7.2μm. Conidia acicular or filiform, hyaline, very long, curved or slightly undulate, 14–25 septate, tip obtuse, base truncate with a terminal black brown scar, 150–328 x 3–33.6μm.

Habitat: On leaves of *Zinnia elegans* (Convolvulaceae), Bukit Timah, Singapore, leg. Lee Chih-shao (No. 14), Aug. 20, 1965.

Distribution: N. & S. America, Japan, Guam, Colombia, Guatemala, Puerto Rico, San Domingo, Salvador, Singapore, Taiwan, Trinidad, Uganda and Venezuela.

41. *Cercosporidium personatum* (Berk. & Curt.) Deighton Mycol. Papers 112:71, 1967.

= *Cladosporium personatum* Berk. & Curt., Grevillea 3:106, 1875.

Cercospora personata (Bert & Curt.) Ell. & Ev., J. Mycol. 1:63, 1885.

Passalora personata (Berk. & Curt.) Shakil A. Khan & Mamal, Pakistan J. Sci. Res. 13(4):188, 1961.

Septogloeum arachidis Racib. Z. Pflanzenkr. 8:66, 1898.

Cercospora arachidis P. Henn., Hedwigia 41:18, 1902.

Perfect state: *Mycosphaerella berkeleyii* W.A. Jenkins, J. agric. Res. 56:330, 1938.

Leaf spots orbicular, dark brown, scattered, 0.5–3mm in diam. Fruiting hypophyllous (never epiphyllous), visible as black pustules under hand lens. Fascicles always very dense. Stromata well developed, pale brown, subglobose, 35–70μm in diam., but sometimes extending to 150μm long. Conidiophores strictly hypogenous, emerging through the stomata, olivaceous brown, simple, erect or tortuous, continuous or 1 septate, with 0–3 small geniculations, a large black brown conidial scar at the rounded tip, 35–65 x 5–7μm. Conidia fusiform or obclavato-cylindrical, at times obclavate, straight or very slightly curved, 3–7 septate, tip rounded, base rounded or slightly subtruncate, with a large black brown scar at the end, 42–73 x 6–8μm.

Habitat: On leaves of *Arachis hypogbea* (Leguminosae), Kuala Lumpur, Malaysia, leg. Jo-min Yen (No. 71139bis), Sept. 28, 1971.

Distribution: N. America, Argentina, Australia, Brazil, China (Kwangtung), Congo, Hong-Kong, India, Jamaica, Malaysia, Nepal, New Guinea, Nigeria, W. Pakistan, Paraguay, Philippines, Sarawak, Sierra Leone, Singapore, Trinidad and Turkey.

Note: According to Chupp (1954), *Cercospora arachidicola* Hori and *Cercospora personata* (Berk. & Curt.) Ell. & Ev. (= *Cercosporidium personatum* (Berk. & Curt.) Deighton) always have amphiphyllous fruiting. But this material always presents hypogenous fruiting.

42. *Pseudocercospora abacopteridicola* (Yen & Lim) Yen, comb. nov. (Fig. 7, A B).

= *Cercospora abacopteridicola* Yen & Lim, Cahiers du Pacifique 17:97, 1973.

Leaf spots amphigenous, brown, with an indefinite border, at first vein-limited, later confluent. Fruiting hypogenous, invisible. Stromata lacking. Fascicles absent. External hyphae hypophyllous, emerging through the stomata, pale olivaceous brown, septate, branched, 1.5–2.5μm in width. Conidiophores hypophyllous, simple, erect, 0–1 septate, not geniculate, tip rounded or slightly attenuate, conidial scars inconspicuous, 6–16 x 2.5–3μm. Condia pale olivaceous brown, cylindrical or obclavato-cylindrical, slightly curved, 1–7(–9) septate, tip rounded, base truncate, 32–80 x 2–3μm.

Habitat: On leaves of *Abacopteris urophylla* (Pteridophyte), Singapore, leg. G. Lim (No. 71bis), Mar. 3, 1972.

43. *Pseudocercospora abelmoschi* (Ell. & Ev.) Deighton Mycol. Papers 140:139, 1976.

= *Cercospora abelmoschi* Ell. & Ev., J. Inst. Jamaica 1:347, 1893.

Syn. *Cercospora hibisci-manihotis* P. Henn., Hedwigia 43:146, 1904.

Cercospora hibisci-cannabini Sawada, Descr. Cat. Formosan Fungi 2:153, 1922.

Leaf spots indistinct or small, angular, dark gray, more distinct on lower side of the leaf, vein-limited, sometimes extending over the entire leaf surface. Fruiting amphigenous, invisible. Stromata lacking or small, brown, globose, 21–32μm in diam. Fascicles poor to medium (2–15 stalks), emerging through the stomata. Conidiophores olivaceous brown, simple or branched, erect or slightly flexuous, not geniculate, 0–3(–4) septate, tip rounded or attenuate and truncate, 32–100 x 4.8–6μm. Conidia pale olivaceous brown, attenuate on both ends, then appearing as long fusiform, usually curved, crescent, 1–7 septate (generally 3–5), tip obtuse, base attenuate and truncate, 36–100 x 4.5–6μm.

Habitat: On leaves of *Hibiscus esculentus* (Malvaceae), Bukit Timah, Singapore, leg. Koh Choy-kuan, May 25, 1969.

Distribution: N.C. & S. America, Australia, Japan, Singapore and Taiwan.

44. *Pseducercospora acalyphigena* (Yen) Yen, comb. nov. (Fig. 28)

= *Cercospora acalyphicola* Yen, Revue de Mycol. 31:109, 1966.

Leaf indistinct, at first irregularly subcircular, yellowish with indefinite border, then confluent, yellowish brown or brownish gray. Fruiting amphigenous, invisible. Stromata lacking or consisting of a few olivaceous brown cells. Fascicles poor to medium (2–12 stalks). Conidiophores amphiphyllous, emerging through the stomata, pale olivaceous brown, erect or slightly flexuous, generally simple, sometimes branched, 0–3 septate, 0–1 geniculate, constricted at the septa, tip attenuate and truncate, the base cells much larger (8.5–9.6μm in diam.), 18–50 x 3.6–5μm. Conidia cylindrical or obclavato-cylindrical pale olivaceous brown, straight, sometimes slightly curved, 3–10 septate, tip conic, base attenuate and truncate, 34–135 x 2.5–4.8μm.

Habitat: On leaves of *Acalypha indica* (Euphorbiaceae), Katong, Singapore, leg. Mrs. Shu-hsien Yen (No. 40), May 16, 1964.

Note: *Pseudocercospora acalyphicola* (Petr.) Deighton differs from this fungus by its shorter and hyaline conidia.

45. *Pseudocercospora allamendae* (Yen) Yen, comb. nov. (Fig. 29, A-F)

= *Cercospora allamendae* Yen, Revue de Mycol. 30:166, 1965.

Leaf spots none or indistinct, sometimes appearing as indistinct gray black areas. Fruiting hypophyllous, invisible. Stromata lacking. External hyphae emerging through the stomata, hypogenous, pale olivaceous brown, septate, branched, 2–2.5μm in width. Conidiophores hypogenous, in fascicles poor to meagre (2–8 stalks), may be classified into two kinds: A, conidiophores coming from fascicles, emerging through the stomatal opening, olivaceous brown, paler and more narrow towards the tip, simple or branched, erect or tortuous, 0–2 geniculate, 1–4 septate, 21.6–40 x 3.5–4..8μm, conidial scars inconspicuous; B, conidiophores as single branches from procumbent threads, simple, olivaceous brown, 0–1 geniculate, 0–2 septate, tip rounded or slightly attenuate, condial scars indistinct, 9.6–22 x 3–3.6μm. Conidia cylindrical or obclavato-cylindrical, pale olivaceous brown, straight or slightly curved, 2–5 septate, tip conic rounded, base subtruncate, 31.2–54 x 2.4–3.6μm.

Habitat: On leaves of *Allamanda cathartica* (Apocynaceae), Katong, Singapore, leg. Mrs. Shu-hsien Yen, (No. 22), Apr. 25, 1964.

Note: *Pseudocercospora byliana* (Syd.) Yen is different from this fungus by its very developed stromata and its very dense fascicles.

46. *Pseudocercospora aranetae* (Borl. & Rold.) Yen, comb. nov. (Fig. 30)

= *Cercospora aranetae* Borl. & Rold., Araneta J. Agr. 11:181, 1964.

Leaf sports amphigenous, distinct, angular to irregular, small, with an indefinite border, more or less vein-limited, scattered, 1–4mm in diam., sometimes confluent and forming large patches. Fruiting amphiphyllous, but more abundant on the lower side, appearing as gray or dark gray velvet on the lower surface of the spots. Stromata absent or small, brown, subglobose, 20–30μm in diam. Fascicles poor to dense (4–26 stalks), emerging through the stomata. Conidiophores amphigenous, chiefly hypophyllous, olivaceous brown, erect or flexuous, simple or branched, 1–4 septate, with 0–1 geniculate, tip attenuate, 39.6–68.4 x 4–6μm. Conidia obclavate, pale olivaceous brown, straight or slightly curved, 3–6 septate, tip obtuse, base attenuate and truncate, 42–62.4 x 3.6–4.8μm.

Habitat: On leaves of *Psophocarpus tetragonolobus* (Leguminosae), Jurong, Singapore, leg. Jo-min Yen (No. M.S. 717), Dec. 31, 1965.

Distribution: Philippines and Singapore.

47. *Pseudocercospora asystasiae* (Yen) Yen, comb. nov. (Fig. 31)

= *Cercospora asystasiae* Yen, Revue de Mycol. 32:178, 1967a.

Leaf spots distinct, circular, but more clear on the upper surface, yellowish brown or brown, with a black brown border, scattered, 3–10mm in diam., sometimes confluent. Fruiting amphigenous, invisible. Stromata lacking or very small, dark brown, globose, 14–30μm in diam. Fascicles poor to dense (3–16 stlks), emerging through the stomata. Conidiophores amphiphyllous, straight or slightly flexuous, simple or branched, olivaceous brown, unicolour, 0–1 geniculate, 0–5 septate, tip rounded or truncate, conidial scars inconspicuous, 24–126 x 3.6–5μm. Conidia obclavate, but cylindrical for the short ones, pale olivaceous brown, straight or mildly curved, 3–8 septate, tip obtuse or subrounded, base slightly attenuate and truncate, 37.2–110 x 3.6–5μm.

Habitat: On leaves of *Asystasia coromandeliana* (Acanthaceae), Botanic Gardens, Singapore, leg. Jo-min Yen (No. M.S. 731), Jan. 5, 1966.

48. *Pseudocercospora bauhiniae* (H. & P. Syd.) Deighton Mycol. Papers 140: 140, 1976.

= *Cercospora bauhiniae* H. & P. Syd. Ann. Mycol. 12: 202, 1914.

Leaf spots circular to anguglar, 2–9mm in diam., grayish brown to pale brown, with a dark brown line margin. Fruiting chiefly hypophyllous. Stromata dark brown, globose to subglobose, 15–40μm in diam. Fascicles dense to very dense. Conidiophores pale brown to medium brown, paler and more narrow towards the tip, simple, 0–1 septate, straight to mildly curved, not geniculate, unthickened small conidial scar at the bluntly rounded tip, 10–20 x 3–4.5μm, sometimes as long as 40μm. Conidia subhyaline to pale olivaceous brown, obclavate, short ones may be cylindrical, almost straight, 3–9 septate, tip subobtuse, base obconically truncate, 30–125 x 2.5–5μm.

Habitat: On leaves of *Bauhinia malabarica* (Leguminosae), Botanic Gardens, Singapore, leg. Mrs. Shu-hsien Yen (No. 114), May 13, 1965.

Distribution: Colombia, Ethiopia, Gold Coast, Singapore, Philippines, Transvaal and Venezuela.

49. *Pseudocercospora byliana* (Syd.) Yen, comb. nov.

= *Cercospora byliana* Syd., Ann. Mycol. 22: 433, 1924.

Leaf spots angular to irregular, gray to reddish tinge with narrow reddish brown line border, 2–8mm in diam. Fruiting amphigenous, more abundant on the upper side, appearing as minute black pustules in the centre part of the spots. Stromata globular to irregular, 50–85μm in length, pale brown. Fascicles dense to very dense. Conidiophores pale olivaceous brown, paler towards the tip, simple, never branched, 0–1 septate, not geniculate, 8–24 x 3–4μm. Conidia obclavate, pale olivaceous brown, straight or slightly curved, multiseptate, tip subobtuse, base obconically truncate, 40–12 x 3.5–5μm.

Habitat: On leaves of *Allamanda cathartica* (Apocynaceae), Katong, Singapore, leg. Mrs. Shu-hsien Yen (No. 45), May 19, 1964.

Distribution: Singapore, Transvaal and Tzaneen.

50. *Pseudocercospora cassiae-alatae* (Yen & Lim) Yen, comb. nov. (Fig. 32, D et E)

= *Cercospora cassiae-alatae* Yen & Lim, Cahiers du Pacifique 17:99, 1973.

Leaf spots amphigenous, irregularly circular, black brown with an indefinite border, scattered, 1–5mm in diam. Fruiting amphiphyllous, invisible. Stromata lacking. Fascicles absent. External hyphae amphigenous, emerging through the stomata, septate, branched, pale olivaceous brown, 1.5–2.5μm in width. Conidiophores arising from the external hyphae, pale olivaceous brown, simple, erect or slightly curved, 0–6 septate, 0–2 geniculate, apex irregularly rounded or truncate, conidial scars inconspicuous, 3–45 x 2.5–3.5μm. Conidia cylindrical, very thin, pale olivaceous brown, usually curved, 1–10 septate, tip rounded or obtuse, base slightly attenuate and truncate, 15–90 x 1.5–2μm.

Habitat: On leaves of *Cassia alata* (Leguminosae), Singapore, leg. G. Lim (No. S.U. 66), Jan. 5, 1971.

Note: This fungus differs from others by only the presence of external hyphae and solitary conidiophores.

51. *Pseudocercospora cassiigena* (Yen & Lim) Yen, comb. nov. (Fig. 32, A-C).

= *Cercospora cassiigena* Yen & Lim, Cahiers du Pacifique 17:98, 1973.

Leaf spots angular to irregular, brown, more or less vein-limited, scattered 1–4mm in diam., sometimes confluent. Fruiting amphiphyllous, invisible. Stromata pale brown to brown, globose, 25–40μm in diam. Fascicles dense to very dense, emerging through the rupture of epidermis. Conidiophores pale brown, always simple, erect, continuous, not geniculate, apex rounded or slightly attenuate and truncate, conidial scars inconspicuous, 6–11 x 2–3μm. Conidia pale olivaceous brown, obclavate, or obclavato-cylindrical, straight or slightly curved, strictly 3 septate, tip rounded, base slightly obconically truncate, 22–36 x 2–2.5μm.

Habitat: On leaves of *Cassia alata* (Leguminosae), Singapore, leg. G. Lim (No. S.U. 66bis), Jan. 5, 1971.

Note: This species is different from others by its continuous conidiophores and its strictly 3 septate conidia.

52. *Pseudocercospora centrosematicola* (Yen & Lim) Yen, comb. nov. (Fig. 33)

= *Cercospora centrosematicola* Yen & Lim, Cahiers du Pacifique 17:101, 1973.

Leaf spots irregularly angular, brown, with an indefinite yellowish border, more distinct on the upper side, scattered, 1–4mm in diam. Fruiting amphigenous, invisible. Stromata usually forming inside the epidermal cells, sometimes under the epidermal cells, dark brown, globose or irregularly globose, 20–45μm in diam. Fascicles dense, emerging through rupture of the epidermal cells. External hyphae hypophyllous, emerging through the stomata, pale olivaceous brown, septate, branched, 1.5–2.5μm in width. Conidiophores may be divided into two kinds: A, conidiophores arising from fascicles, amphigenous, olivaceous brown, simple when young, branched when old, continuous or 1-7 septate, 0-3 geniculate, apex irregularly rounded or shortly attenuate, a small unthickened conidial scar at the tip, 12–65 x 3.5–4μm; B, conidiophores arising from the external hyphae, hypogenous, olivaceous brown, always simple, erect or slightly curved, generally continuous, sometimes 1 septate, apex slightly attenuate and truncate, 6–30 x 3.5–4μm. Conidia pale olivaceous brown, filiform or obclavato-cylindrical, straight or slightly curved, apex subobtuse, 3–12 septate, base obconically truncate, 50–127 x 2–3μm.

Habitat: On leaves of *Centrosema pubescens* (Leguminosae), Sembawang, Singapore, leg. G. Lim (No. S.U. 72), Dec. 1971.

Note: *Cercospora cylindrospora* Stev. & Solh. and *C. centrosemae* Chupp & Muller are different from this species by their strictly hypophyllous fruiting. *Pseudocercospora bradburyae* (Young) Deighton and *Cercospora clitoria* Atk. differ from this fungus by their strictly epiphyllous fruiting.

53. *Pseudocercospora chrysanthemicola* (Yen) Deighton (Fig. 34)
Mycol. Papers 140: 141, 1976.

= *Cercospora chrysanthemicola* Yen, Revue de Mycol. 29: 215, 1964.

Leaf spots circular, sometimes oblong up to 30mm, generally scattered, 3–10mm in diam., at first yellowish on upper side and grayish brown on the lower side, then becoming dark brown with brown margin on the under surface. Fruiting amphiphyllous invisible. Stromata amphigenous, substomatal, dark brown, globular, 22–60μm in diam. Fascicles poor to dense (2–20 stalks), filling stomatal opening. Conidiophores amphiphyllous, simple, not branched, olivaceous brown, cylindrical, erect or tortuous, an unthickened scar at the rounded tip, 0–5 septate, 0–2 geniculate, 20–110 x 3.6–6μm. Conidia pale olivaceous brown, obclavate or obclavato-cylindrical, straight or slightly curved, 1–5 septate, tip rounded, base obconically truncate, 31.2–92.4 x 3.6–5μm.

Habitat: On leaves of *Chrysanthemum sinense* (Compositae), Katong, Singapore, leg. Mrs. Shu-hsien Yen (No. 17), Apr. 10, 1964.

Note: *Cercospora chrysanthemi* Heald & Wolf differs from this fungus by its hyaline and acicular conidia.

54. *Pseudocercospora columnaris* (Ell. & Ev.) Yen, comb. nov.

= *Cercospora columnaris* Ell. & Ev., Proc. Acad. Nat. Phila. 46: 380, 1894.

Syn. *Isariopsis griseola* Sacc., Michelia 1: 273, 1878.

Graphium laxum Ellis, Torrey Bot. Club 8: 64-66, 1881.

Arthrobotryum puttemansii P. Henn., Hedwigia 41: 309, 1902..

Cercospora stuhlmanni P. Henn., Bot. Jahrb. v. Engler, 33: 40, 1904.

Phaeoisariopsis griseola (Sacc.) Ferr., Ann. Mycol. 7: 273, 1909.

Leaf spots distinct, angular brown to grayish brown, strictly vein-limited, 2–5mm in diam. Fruiting amphigenous or only hypophyllous, often effuse, appearing as short black brown hairs or a dark gray velvet. Stromata none or very rudimentary. Fascicles dense to very dense. Conidiophores olivaceous brown, simple, cylindrical, or filamentous, 1–9 septate, not geniculate, tip rounded or attenuate and truncate, conidial scars inconspicuous, 220–410 x 3.6–6μm. Conidia crescent, attenuate at both ends, pale olivaceous brown, generally 3 septate (sometimes 5–6 septate), with constrictions at septa, apex rounded-conic, base obconico-truncate, 30–60 x 4–7μm.

Habitat: On leaves of *Phaseolus vulgaris* (Leguminosae), Jurong, Singapore, leg. Lin Shu-ling, Dec. 10, 1968.

Distribution: Africa, N. America, China, Europe, Hawaii, Japan, Puerto Rico, Singapore and Trinidad.

55. *Pseudocercospora cordiicola* (Yen) Yen, comb. nov. (Fig. 35)

= *Cercospora cordiicola* (Yen) Yen, Revue de Mycol. 32:182, 1967a.

Syn. *Cercospora cordiae* Yen, Revue de Mycol. 29:216, 1964.

non *Cercospora cordiae* Chupp, Monogr. Univ. P.R. Ser. B, 2:245, 1934.

Leaf spots indistinct, sometimes appearing as small angular dark brown speckles. Fruiting amphiphyllous, invisible. Stromata lacking or very rudimentary. Fascicles poor to meagre (2–9 stalks), filling stomatal openings. External hyphae pale olivaceous brown, emerging through the stomata, septate, branched, 2–2.5μm in width. Conidiophores may be classified into two kinds: A, conidiophores coming from fascicles, simple or branched, tortuous, olivaceous brown, paler and more narrow towards the tip, 1–3 septate, 0–2 geniculate, with unthickened conidial scar at the tip, 22.4–32.4 x 3.6–4.8μm; B, conidiophores arising from external hyphae, olivaceous brown, 0–2 septate, 0–1 geniculatee, 13–24 x 3.6–4.8μm. Conidia filiform or obclavato-acicular, hyaline, curved, 4–8 septate, tip acute, base obconically truncate, 79.2–126 x 1.5–2.4μm.

Habitat: On leaves of *Cordia cylindristachya* (Boraginaceae), Katong, Singapore, leg. Mrs. Shu-hsien Yen (No. 28), Apr. 24, 1964.

56. *Pseudocescorpora crotalaricola* (Yen) Yen, comb. nov. (Fig. 36)

= *Cercospora crotalaricola* Yen, Revue de Mycol. 29:220, 1964.

Leaf spots none or indistinct. Fruiting amphigenous, invisible. Stromata lacking. Fascicles poor to meagre (2–8 stalks), filling stomatal openings. External hyphae pale olivaceous brown, also filling stomatal openings, septate, branched, 2.4–4μm in width. Conidiophores may be divided into two kinds: A, conidiophores coming from fascicles, straight or tortuous, single or branched, olivaceous brown, 1–5 septate, 0–2 geniculate, with constrictions at septa, tip rounded, thickened conidial scars inconspicuous, 36–149 x 4.8–7.8μm; B, conidiophores as single branches from procumbent threads, olivaceous brown, 1–3 septate, not geniculate, tip rounded, 36–48 x 4.5–7μm. Conidia acicular, cylindrical or obclavato-cylindrical, pale olivaceous brown, straight or undulate, 5–12 septate, tip conic or rounded, base obconically truncate, 10–134 x 3.5–5μm.

Habitat: On leaves of *Crotalaria striata* (Leguminosae), Katong, Singapore, leg. Mrs. Shu-hsien Yen (No. 33), Apr. 25, 1964.

57. *Pseudoercospora cruenta* (Sacc.) Deighton (Fig. 11)

Mycol. Papers 140:142, 1976.

= *Cercospora cruenta* Sacc., Michelia 2:149, 1880.
(*Mycosphaerella cruenta* (Sacc.) Latham, Mycologia 26:516, 1934).

Cercospora phaseolorum Cooke, Grevillea 12:30, 1883.

Cercospora vignae Ell. & Ev., J. Mycol. 3:19, 1887.

Cercospora dolichi Ell. & Ev., J. Mycol. 68:72, 1889.

Cercospora vignae Raciborski, Zeit. Pflanzenkr. 8:66, 1898.

Cercospora lusoniensis Sacc., Ann. Mycol. 12:314, 1914.

Cercospora raciborskii Mats. & Nag., J. Plant Protect. (Byochugai-zashi) 18:714-722, 1931.

Cercospora vignae-sinensis Tai & Wei, Sinensia 4:126, 1933.

Cercospora neovignae Yamam., Trans. Sapporo Nat. Hist. Soc. 13:142, 1934.

Cercospora vignae-sinensis Sawada, Descr. Cat. Formosan Fungi 8:125, 1934.

Leaf spots circular to irregular, 1–10mm in diam., yelowish to rusty brown or blood red, sometimes concentrical with gray centre and somewhat darker margin, often confluent. Fruiting amphigenous, but mainly hypophyllous, sometimes distinctly effuse. Stromata rudimentary or small, filling stomatal openings, olivaceous brown. Fascicles medium to dense, emerging through the stomata. Condiophores simple, straight or subflexuous, pale olivaceous brown, 0–3 septate, 1–3 geniculate, an unthickened small conidial scar at the conic tip, 10–75 x 3–5μm. Conidia cylindrical or oblcavato-ylindrical, pale olivaceous brown, straight or slightly curved, 4–14 septate, tip rounded, base sharply obconic and subtruncate, 25–50 x 2–5μm.

Habitat: On leaves of *Vigna sinensis* (Leguminosae), Taiping, Singapore, leg. Jo-min Yen, Dec. 30, 1965; on *V. sinensis*, Jurong, Singapore, leg. Lin Shu-ling, Dec. 10, 1968; on *V. sinensis*, Singapore, leg. G. Lim, Apr. 11, 1969.

Distribution: N. & S. America, Ceylon, China, Europe, Japan and Singapore.

58. *Pseudocercospora daturina* (Yen) Deighton (Fig. 37)

Mycol. Papers 140:143, 1976.

= *Cercospora daturina* Yen, Revue de Mycol. 30:169, 1965.

Leaf spots none or indistinct. Fruiting amphigenous, invivsible. Stromata lacking. Fascicles poor to meagre (2–8 stalks), emerging through the stomata. Conidiophores amphiphyllous, pale olivaceous brown, single or branched, erect or tortuous, 1–4 septate, 1–3 geniculate, an unthickened small conidial scar at the attenuate tip, 30–80 x 4–6μm. Conidia cylindrical, pale olivaceous brown, straight or slightly curved, 3–10 septate, tip subconic, base obconic truncate, 51–123 x 3.5–5μm.

Habitat: On leaves of *Datura alba* (Solanaceae), Botanic Gardens, Singapore, leg. Mrs. Shu-hsien Yen (No. 70), Aug. 4, 1964.

59. *Pseudocercospora delonicis* (Yen) Yen, comb. nov. (Fig. 38)

= *Cercospora delonicis* Yen, Revue de Mycol. 29:223, 1964.

Leaf spots none or indistinct. Fruiting amphigenous, sparingly effuse. Stromata lacking. External hyphae amphigenous, filling stomatal openings, pale olivaceous brown, septate, branched, 2–3.6μm in width. Conidiophores as solitary branches from procumbent threads, olivaceous brown, cylindrical, 0–3 septate, 0–1 geniculate, tip rounded, conidial scars inconspicuous, 6–31 x 2.5–3.5μm. Conidia cylindrical, pale olivaceous brown, straight or slightly curved, 1–6 septate, tip rounded, base attenuate and truncate, 40.5–61.2 x 2.5–4.5μm.

Habitat: On leaves of *Delonix regia* (Leguminosae), Katong, Singapore, leg. Mrs. Shu-hsien Yen (No. 41), May 15, 1964.

60. *Pseudocercospora ervatamiae* (Yen & Lim) Yen, comb. nov. (Fig. 39)

= *Cercospora ervatamiae* Yen & Lim, Bull. Soc. Mycol. Fr. 86:745, 1970b.

Leaf spots irregular, brown to dark brown, with an indefinite yellowish border, scattered, 0.5–5mm in diam., sometimes confluent. Fruiting amphiphyllous, appearing as black minute pustules under hand lens. Stromata well developed, black brown, globose, 15–40 (–60)μm in diam. Fascicles dense to very dense, emerging through the stomata. Conidiophores pale olivaceous brown, very short, simple, sometimes branched, erect, rarely with one geniculation, continuous, sometimes one septate, apex attenuate and truncate, conidial scars inconspicuous, 12–25 x 3–4μm. Conidia cylindrical, pale olivaceous brown, straight or slightly curved, 1–6 spetate, apex rounded, base attenuate and truncate, 28–80 x 3–4μm.

Habitat: On leaves of *Ervatamia coronaria* (Apocynaceae), Singapore, leg. G. Lim, Mar. 11, 1970.

Note: *Pseudocercospora tabernaemontanae* (H. & P. Syd.) Deighton sometimes resembles this fungus, but it is different from this species by its big "shot-hole" leaf spots and especially by its branched and septate conidiophores.

61. *Pseudocercospora eupatorii-formosani* (Saw.) Yen, comb. nov. (Fig. 16, A-C)

= *Cercospora eupatorii-formosani* Sawada, Taiwan Agr. Res. Inst. 86:169, 1943.

Leaf spots brown, angular, vein-limited, small, scattered, 2–4mm in diam., rarely confluent. Fruiting amphiphyllous, invisible. Stromata black brown, globose or subglobose, 18–57.5μm in diam. Fascicles dense to very dense (10–30 stalks), emerging through the stomata. Conidiophores amphigenous, short, pale brown, simple, slightly flexuous, continuous, rarely one-septate, tip rounded or shortly attenuate and truncate, conidial scars inconspicuous, 18–26.5 x 3–4.8μm. Conidia cylindrical or filiform, pale olivaceous brown, slightly curved, 3–10 septate, tip conic, base slightly obconic-truncate, 34–110 x 2.5–3.5μm.

Habitat: On leaves of *Eupatorium odoratum* (Compositae), Ipoh, Malaysia, leg. Jo-min Yen (No. M.S. 728), Dec. 21, 1965.

Distribution: Malaysia and Taiwan.

62. *Pseudocercospora fici-chartaceae* (Yen & Lim) Yen, comb. nov. (Fig. 40)

= *Cercospora fici-chartaceae* Yen & Lim, Cahiers du Pacifique 14:97, 1970a.

Leaf spots circular with an indefinite border, orange brown with a black brown centre on the upper side, pale brown to yellowish brown on the lower side, 2–8mm in diam. Fruiting amphigenous, but chiefly epiphyllous. Stromata epigenous and endogenous within an epidermal cell, globose or subglobose, 21.5–40μm in diam. Fascicles poor to dense (2–20 stalks), emerging through rupture of epidermal cells. Conidiophores usually epigenous, but sometimes hypogenous and emerging through the stomata, simple, erect, dark brown, 2–7 septate, not geniculate, tip rounded and paler, conidial scars indistinct, 60–124 x 4.5–6μm. Conidia obclavate, sometimes obclavato-cylindrical, pale olivaceous brown, straight or curved, at times crescent, 3–5 septate, tip rounded, base obconic-truncate, 39.5–70 x 3.5–5μm.

Habitat: On leaves of *Ficus chartacea* (Moraceae), Bukit Timah, Singapore, leg. G. Lim, Apr. 4, 1969.

63. *Pseudocercospora formosana* (Yamam.) Deighton (Fig. 41)

Mycol. Papers 140:144, 1976.

= *Cercospora formosana* Yamam., J. Soc. Trop. Agr. 6:600, 1934.

Syn. *Cercospora lantana-aculeatae* Yen, Revue de Mycol. 31:124, 1966.

Leaf spots small, angular, vein-limited, black brown on the upper side, brown on the lower side, scattered, 0.5–2mm in diam. Fruiting hypophyllous, invisible. Stromata lacking. External hyphae emerging through the stomata, pale olivaceous brown, septate, branched, 1.5–2.5μm in width. Conidiophores may be divided into two kinds: A, conidiophores arising from poor fascicles (2–6 stalks), simple or branched, pale olivaceous brown, straight or flexuous, 0–2 geniculate, 1–3 septate, sometimes with constrictions at septa, tip attenuate and truncate, sometimes shouldered, conidial scars inconspicuous, 12–36 x 3.5–5μm; B, conidiophores as solitary branches from external hyphae, not branched, pale olivaceous brown, straight or slightly flexuous, 0–2 septate, 0–2 geniculate, tip attenuate and truncate, 5–28 x 2.5–3.6μm. Conidia filiform, pale olivaceous brown, slightly curved, 2–6 septate, tip obtuse, base obconic-truncate, 36–82 x 2–3μm.

Habitat: On leaves of *Lantana aculeata* (Verbenaceae), Katong, Singapore, leg. Mrs. Shu-hsien Yen (No. 86), Sept. 20, 1964.

Distribution: Singapore and Taiwan.

64. *Pseudocercospora globosae* (Yen) Deighton (Fig. 42)

Mycol. Papers 140:144, 1976.

= *Cercospora globosae* Yen, Revue de Mycol. 29:224, 1964.

Leaf spots none or indistinct. Fruiting amphigenous, effuse, dark gray. Stromata amphigenous, brown, in shape of dumb-bell, each end globular, 15.5–33.5μm in diam. Fascicles dense, filling stomatal openings. Conidiophores simple or branched, tortuous, olivaceous brown, 0–3 geniculate, 0–6 septate, condial scars inconspicuous, tip attenuate and truncate, 31–111.5 x 3.5–6μm. Conidia acicular or filiform, pale olivaceous brown, straight or curved, 2–12 septate, tip conic, base obconic-truncate, 62.5–150 x 2.5–3.5μm.

Habitat: On leaves of *Gomphrena globosa* (Amaranthaceae), Katong, Singapore, leg. Mrs. Shu-hsien Yen (No. 19), Apr. 20, 1964.

Note: *Cercospora gomphrenicola* Speg. resembles this fungus by the indistinct leaf spots, but differs from it by its mostly one septate and constricted conidia.

65. *Pseudocercospora hiratsukana* (Tog. & Kats.) Deighton

Mycol. Papers 140:34, 1976.

= *Cercospora hiratsukana* Tog. & Kats., J. Jap. Bot. 28:286, 1953.

Leaf spots subcircular or irregular, brown with an indefinite border, frequently confluent and forming large patches. Fruiting amphigenous, but chiefly hypophyllous. Stromata amphigenous, olivaceous brown, globose, 24–64μm in diam. Fascicles dense to very dense. Conidiophores very short, pale olivaceous brown, continuous, tip attenuate and truncate, conidial scars unthickened, 6–10 x 2.5–3μm. Conidia subhyaline or very pale olivaceous brown, cylindrical, straight or midly curved, 2–5 septate, tip rounded or subobtuse, base slightly attenuate and truncate, 31–62 x 1.5–2.5μm.

Habitat: On leaves of *Dioscorea* sp. (Dioscoreaceae), Botanic Gardena, Singapore, leg. Mrs. Shu-hsien Yen (No. 54bis), Jun. 7, 1964.

Distribution: Japan and Singapore.

66. *Pseudocercospora ipomoeae-purpureae* (Yen) Yen, comb. nov. (Fig. 43)

= *Cercospora ipomoeae-purpureae* Yen, Revue de Mycol. 30:173, 1965.

Leaf spots circular to angular, dark brown, more distinct on the upper side, scattered, 0.5–3mm in diam. Fruiting amphiphyllous, but more abundant on the lower surface. Stromata amphigenous, small, brown or dark brown, globose, 18–40μm in diam. Fascicles medium to very dense (6–30 stalks), emerging through the stomata. Conidiophores amphiphyllous, simple or branched, straight or flexuous, olivaceous brown or pale olivaceous brown, 0–1 geniculate, 0–2 septate, with constrictions at the septa, small unthickened condial scars at the rounded or attenuate and truncate tip, 22–35 x 3.5–4.8μm. Conidia cylindrical or obclavato-cylindrical, pale olivaceous brown, straight or slightly curved, 3–11 septate, tip rounded or subconic, base obconic-truncate, 40–120 x 3–4μm.

Habitat: On leaves of *Ipomoea purpurea* (Convolvulaceae), Botanic Gardens, Singapore, leg. Mrs. Shu-hsien Yen (No. 72), Apr. 4, 1964.

67. *Pseudocercospora ixoricola* (Yen) Yen, comb. nov. (Fig. 44)

= *Cercospora ixoricola* Yen, Revue de Mycol. 31:119, 1966.

Leaf spots distinct, angular or irregular, with an indefinite border, reddish brown on upper side, yellowish brown on lower side, centre whitish and zonate, frequently vein-limited, scattered, 3–14mm in diam., sometimes confluent. Fruiting hypophyllous, invisible. Stromata lacking or very poor. Fascicles poor to meagre (2–8 stalks), emerging through the stomata. Conidiophores hypophyllous, brown, unicolour, simple or branched, erect or slightly flexuous, 0–2 geniculate, 3–5 septate, with constrictions at the septa, tip rounded or attenuate-truncate, conidial scars inconspicuous, 38.5–78 x 3.5–5μm. Conidia obclavate, pale olivaceous brown, straight or slightly curved, 3–10 septate, tip obtuse to acute, sometimes rounded, base obconic-truncate, 44–138 x 3.5–5μm.

Habitat: On leaves of *Ixora javanica* (Rubiaceae), Katong, Singapore, leg. Mrs. Shu-hsien Yen (No. 117), May 12, 1965.

Note: *Pseudocercospora ixorae* (Solh.) Deighton differs from this species by its amphiphyllous fruiting and cylindrical conidia.

68. *Pseudocercospora jasminicola* (Muller & Chupp) Deighton

Mycol. Papers 140:74, 1976.

= *Cercospora jasminicola* Muller & Chupp, Arch. Inst. Biol. Veg. Rio de Janeiro 3:93, 1936.

Leaf spots circular, brown with a reddish brown border, more distinct on the upper side, scattered, 1–3mm in diam., sometimes coalescing and forming large patches. Fruiting amphigenous, but chiefly hypogenous, visible as minute black pustules under hand lens. Fascicles poor or mildly dense (3–16 stalks), emerging through the stomata. Conidiophores olivaceous brown, simple, never branched, straight or flexuous, 1–2 geniculate, 2–6 septate, with constrictions at septa, tip attenuate and truncate, sometimes shouldered, conidial scars indistinct, 5–50 x 2–4μm. Conidia obclavato-cylindrical, pale olivaceous brown, straight or slightly curved, 1–4 septate, tip obtuse, base obconically subtruncate, 24–60 x 2–3μm.

Habitat: On leaves of *Jasminum grandiflorum* (Oleaceae), Katong, Singapore, leg. Jo-min Yen (No. M.S. 732), Jan. 18, 1966.

Distribution: Brazil, India, Singapore and Taiwan.

69. *Pseudocercospora jatrophae-curcas* (Yen) Deighton (Fig. 45)

Mycol. Papers 140:146, 1976.

= *Cercospora jatrophae-curcas* Yen, Revue de Mycol. 30:176, 1965.

Leaf spots none or indistinct, fruiting amphiphyllous, but more abundant on the lower surface, invisible. Stromata lacking or very small, consisting of few dark brown cells. Fascicles poor to dense (2–20 stalks), emerging through the stomata. External hyphae pale brown, filling the stomatal openings, septate, branched, 2–2.5μm in width. Conidiophores either coming from fascicles or arising from external hyphae, pale brown, simple or branched, generally tortuous, 0–4 septate, 0–3 geniculate, with constrictions at septa, tip attenuate and truncate, (5–) 18–48 x 3–5μm. Conidia cylindrical, pale olivaceous brown, slightly curved, 3–7 septate, tip rounded, base obconic-truncate, 42–102 x 2.5–3.5μm.

Habitat: On leaves of *Jatropha curcas* (Euphorbiaceae), in Botanic Gardens, Singapore, leg. Mrs. Shu-hsien Yen (No. 55), Jun. 7, 1964.

70. *Pseudocercospora katongensis* (Yen) Yen, comb. nov. (Fig. 46)

= *Cercospora katongensis* Yen, Revue de Mycol. 31: 120, 1966.

Leaf spots none or indistinct, sometimes mixed with spots of *Cercospora hydrangeae* Ell. & Ev. Fruiting hypogenous, invisible. Stromata poor or small, black brown, globular, 13.5–36μm in diam. Fascicles poor to very dense (2–32 stalks), emerging through the stomata. Conidiophores hypophyllous, pale olivaceous brown, simple or branched, straight or mildly flexuous, not geniculate, 0–3 septate, sometimes with constrictions at septa, tip rounded, conidial scars inconspicuous, 25–36 x 2.5–3.6μm. Conidia cylindrical or oblcavato-cylindrical, pale olivaceous brown, straight or slightly curved, sometimes with a geniculation, 3–8 septate, tip subrounded, base obconic truncate, 36–90 x 2.5–3.6μm.

Habitat: On leaves of *Hydrangea macrophylla* (Hydrangeaceae), Katong, Singapore, leg. Mrs. Shu-hsien Yen (No. 95), Dec. 18, 1964; on the same host plant, leg. Lee Chih-shao & Mrs. Shu-hsien Yen (No. 109), Apr. 18, 1965.

Note: *Cercospora hydrangeae* Ell. & Ev. differs from this species by its amphigenous fruiting and hyaline conidia.

71. *Pseudocercospora lyciicola* (Yen) Yen, comb. nov. (Fig. 47)

= *Cercospora lyciicola* Yen, Revue de Mycol. 30: 180, 1965.

Leaf spots indistinct, sometimes appearing as yellow areas on the upper side and dark gray areas on the lower side. Fruiting amphigenous, invisible. Fascicles poor to very dense (2–30 stalks), emerging through the stomata. Stromata substomatous, globular or irregular, dark brown, 30–46μm in diam. Conidiophores amphiphyllous, pale brown to brown, paler towards the tip, simple or branched, straight or tortuous, 1–4 septate, with constrictions at septa, unthickened small condial scar at the attenuate and truncate tip, 23–78 x 3.5–5.5μm. Conidia cylindrical or obclavato-cylindrical, pale olivaceous brown, straight or slightly curved, 3–13 septate, tip rounded, base obconic truncate, 33.5–148 x 3.6–6μm.

Habitat: On leaves of *Lycium chinense* (Solanaceae), Geylang, Singapore, leg. Mrs. Shu-hsien Yen (No. 65), Jun. 28, 1964.

Note: *Cercospora chengtuensis* Tai and *C. lycii* Ell. & Hals. are different from this fungus by their strictly hypogenous fruitings.

72. *Pesudocercospora macarangae* (H. & P. Syd.) Deighton (Fig. 48)

Mycol. Papers 140:47, 1976.

= *Cercospora macarangae* H. & P. Syd., Ann. Mycol. 12:575, 1914.

Syn. *Cercospora macarangae* Yen & Lim, Bull. Soc. Mycol. Fr. 86:748, 1970b.

Leaf spots distinct, circular, brown to dark brown, with an indefinite border, more distinct on the lower side, scattered, 2–7mm in diam., sometimes confluent. Fruiting epiphyllous, visible as black minute pustules under hand lens. Stromata globose, black brown, usually above the stomata, 25–40μm in diam. Fascicles poor to dense (2–25 stalks), emerging through the stomata. Conidiophores brown, paler toward the tip, simple, never branched, erect or flexuous, 1–10 septate, apex rounded or slightly truncate, 20–200 x 4–5μm. Conidia obclavate, pale olivaceous brown, straight or slightly curved, 2–6 septate, tip obtuse or subacute, base obconically truncate, 22–72 x 4–5μm.

Habitat: On leaves of *Macaranga indica* (Euphorbiaceae), Singapore, leg. G. Lim, Nov. 28, 1969.

73. *Pseudocercospora mori* (Hara) Deighton

Mycol. Papers 140:148, 1976.

= *Cercospora mori* Hara, J. Sericult. Assoc. Japan 27:227, 1918.

Syn. *Cercospora mori* Mar. & Stey., Bull. Soc. Roy. Bot. de Belg. 61 (N.S. 11):166, 1929.

Leaf spots none or indistinct. Fruiting strictly hypophyllous, scantily effuse, olivaceous gray to dark brown. Stromata lacking or consisting of few brown cells. Fascicles lacking or very poor (2–6 stalks), emerging through the stomata. External hyphae hypogenous, filling stomatal openings, olivaceous brown, septate, branched, 2–2.5μm in width. Conidiophores (either arising from fascicles or from external hyphae) simple or branched, erect or slightly flexuous, 1–2 geniculate, 1–4 septate (occasionally 7–8 septate), brown, paler toward the apex, tip sharply attenuate, conidial scars inconspicuous, 19–71 x 3.5–5.5μm (occasionally to 148μm long). Conidia obclavate, but obclavto-cylindrical for the short ones, pale olivaceous brown, 3–8 septate, straight or midly curved, tip acute or obtuse, base obconically truncate, 20–80 (–108) x 3.5–5μm.

Habitat: On leaves of *Morus alba* (Moraceae), Bukit Timah, Singapore, leg. Jo-min Yen (No. M.S. 648), Nov. 25, 1965.

Distribution: N. America, Belgium Congo, Japan, W. Pakistan, Singapore and Taiwan.

74. *Pseudocercospora muntingiae* (Petr. & Cif.) Deighton

Mycol. Papers 140:148, 1976.

= *Cercospora muntingiae* Petr. & Cif., Ann. Mycol. 30:324, 1932.

Leaf spots distinct, angular to irregular, reddish brown with a yellowish margin, scattered, 0.5–5mm in diam. Fruiting epiphyllous, invisible. Stromata dark brown, globose or subglobose, small, 10–25μm in diam. Fascicles medium to dense. Conidiophores pale olivaceous brown, uniform in colour and in width, sparingly septate, not geniculate not branched, undulate or bent variously, unthickened conidial scars at the rounded to conic tip, 10–35 x 2–4μm. Conidia obclavato-cylindrical, pale olivaceous brown, straight or curved, 2–8 septate, tip rounded, base subtruncate to obconically truncate, 20–65 x 2–4μm.

Habitat: On leaves of *Muntingia calabura* (Elaeocarpaceae), Bukit Timah, Singapore, leg. G. Lim, Apr. 4, 1969.

Distribution: N. America, San Domingo and Singapore.

75. *Pseudocercospora peltophori* (Yen) Yen, comb. nov. (Fig. 49)
= *Cercospora peltophori* Yen, Revue de Mycol. 29:228, 1964.

Leaf spots none or indistinct. Fruiting hypophyllous, invisible. Stromata lacking. Fascicles lacking or very poor (2–4 stalks), emerging through the stomata. Conidiophores hypogenous, either coming from fascicles or arising from procumbent threads, pale olivaceous brown, simple or branched, erect or tortuous, 0–4 septate, 0–2 geniculate, tip conic, conidial scars inconspicuous, 10–36 x 3–5μm. External hyphae hypogenous, pale olivaceous brown, filling stomatal openings, septate, branched, 2–3.5μm in width. Conidia pale olivaceous brown, obclavato-cylindrical or subacicular, slightly curved or undulate, 3–6 septate, tip conic, base obconically trunate, 31–72 x 2.5–3.5μm.

Habitat: On leaves of *Peltophorum pterocarpum* (Leguminosae), Katong, Singapore, leg. Mrs. Shu-hsien Yen (No. 37), May 7, 1964.

76. *Pseudocercospora pergulariae* (Yen & Lim) Yen, comb. nov. (Fig. 50)
= *Cercospora pergulariae* Yen & Lim, Cahiers du Pacifique 14:100, 1970a.

Leaf spots angular or irregular, more distinct on the lower side, vein-limited, black brown on the upper side, black on under side, scattered, 1–4mm in diam. Fruiting strictly hypophyllous, appearing as black carpet on the lower surface of the spots. Stromata black brown, globose, 24–40μm in diam. Fascicles dense to very dense, emerging through the stomata. Conidiophores hypophyllous, dark brown, simple, not branched, erect or flexuous, 0–4 septate, 0–2 geniculate, tip attenuate and truncate, conidial scars inconspicuous, 30–91 x 5–6μm. Conidia cylindrical or obclavato-cylindrial, pale olivaceous brown to brown, straight or slightly curved, with a finely granulated membrane, 1–5 septate, tip rounded, base obconically truncate, 40–91 x 4.5–5.5μm.

Habitat: On leaves of *Pergularia minor* (Asclepiadaceae), Bukit Timah, Singapore, leg. G. Lim, Apr. 11, 1969.

77. *Pseudocercospora phyllanthi-niruri* (Yen) Yen, comb. nov. (Fig. 51).
= *Cercospora phyllanthi-niruri* Yen, Revue de Mycol. 32:192, 1967a.
Syn. *Cercospora phyllanthicola* Yen, Revue de Mycol. 30:186, 1965.
non *Cercospora phyllanthicola* Shakil & Kamal, Indian Phytopath. 15:296, 1962.

Leaf spots none or indistinct. Fruiting hypophyllous, effuse, gray, often extending and covering the whole lower surface of the leaf. Stromata lacking. Conidiophores olivaceous brown, simple or branched, erect or flexuous, 1–5 septate, 1–3 geniculate, at times with constrictions at septa, unthickened small conidial scar at the rounded tip, 54–126 x 4.5–6μm. Conidia crescent shaped, pale olivaceous brown, generally 3 septate, tip rounded, base slightly attenuate and truncate, 45–60 x 4.5–6μm.

Habitat: On leaves of *Phyllanthus niruri* (Euphorbiaceae), Katong, Singapore, leg. Mrs. Shu-hsien Yen (No. 18), Apr. 1, 1964.

Note: This fungus is different from *Cercospora phyllanthicola* Shakil & Kamal and *Pseudocercospora phyllanthi* (Chupp) Deighton by its crescent shaped and 3 septate conidia.

78. *Pseudocercospora piperina* (Yen) Yen, comb. nov. (Fig. 52)

= *Cercospora piperina* Yen, Revue de Mycol. 31:131, 1966.

Leaf spots distinct, circular, dark brown with grayish brown centre on the upper side, surrounded by a raised border, olivaceous brown with an indefinite margin on the lower side, scattered, 2–10mm in diam. Fruiting amphiphyllous, but more abundant on the upper side, appearing as minute black pustules in the centre of leaf spots. Fascicles dense to very dense. Stromata black brown, globular to irregularly globular, 36–76μm in diam.. Conidiophores amphiphyllous, always simple, cylindrical, straight, continuous (rarely one septate), laterally shouldered at the tip, pale olivaceous brown, tip generally rounded, conidial scars inconspicuous, 21–30 x 2.5–6μm. Conidia cylindrical, pale olivaceous brown, generally straight, at times slightly curved, 3–6 septate, tip rounded, base truncate, 38.5–73.5 x 3–4.5μm.

Habitat: On leaves of *Piper muricatum* (Piperaceae), Katong, Singapore, leg. Mrs. Shu-hsien Yen (No. 105), Feb. 15, 1965.

Note: *Cercospora cartanthes* P. Henn. resembles somewhat this fungus, but is different from this species by its hypogenous fruiting and obclavate conidia.

79. *Pseudocercospora piperis-muricati* (Yen) Yen, comb. nov. (Fig. 53)

= *Cercospora piperis-muricati* Yen, Revue de Mycol. 31:134, 1966.

Leaf spots circular or irregularly circular, dark brown, with an indefinite border on the upper side, pale brown on the lower side, scattered, 2–8mm in diam. Fruiting strictly hypogenous, invisible. Stromata lacking or very rudimentary. Fascicles hypophyllous, poor to dense (5–28 stalks), emerging through the stomata. Conidiophores olivaceous brown or pale olivaceous brown, simple or branched, straight or tortuous, 1–3 septate, 0–1 geniculate, tip long attenuate and truncate, conidial scars inconspicuous, 30–56.5 x 3.5–4.8μm. Conidia cylindrical, generally straight, sometimes slightly curved, pale olivaceous brown, 1–5 septate, tip rounded, base slightly attenuate and truncate, 31–65 x 2–3.5μm.

Habitat: On leaves of *Piper muricatum* (Piperaceae), Katong, Singapore, leg. Mrs. Shu-hsien Yen (No. 103bis), Feb. 15, 1965; on same host plant, Bukit Timah, Singapore, leg. Mrs. Shu-hsien Yen (No. 105bis), Mar. 19, 1965.

Note: *Cercospora piperata* Asth. & Mah. resembles somewhat this species, but differs from it by its continuous and unbranched conidiophores and especially by its obclavate conidia.

80. *Pseudocercospora psophocarpi* (Yen) Deighton (Fig. 30, D-G)
Mycol. Papers 140:151, 1976.
= *Cercospora psophocarpi* Yen, Bull. Soc. Mycol. Fr. 83:338, 1967b.

Leaf spots distinct, circular with an indefinite border, brown on upper side, olivaceous brown on lower side, scattered, 3–10mm in diam., sometimes confluent. Fruiting amphigenous, mostly epiphyllous, visible as minute black pustules under hand lens. Stromata black brown, irregularly globose, 24–57.5μm in diam. Fascicles dense to very dense. Conidiophores pale olivaceous brown, simple, short, erect or slightly tortuous, continuous, not geniculate, tip shortly attenuate, 13–28 x 3–4μm. Conidia cylindrical, pale olivaceous brown, curved, 1–6 septate, sometimes with slight constrictions at septa, tip rounded, base attenuate and truncate, 25.5–54 x 4–6μm.

Habitat: On leaves of *Psophocarpus tetragonolobus* (Leguminosae), Jurong, Singapore, leg. Jo-min Yen (No. 717bis), Dec. 31, 1965.

Note: This species differs from *Pseudocercospora aranetae* (Borl. & Rold.) Yen by its well developed stromata and continuous conidiophores.

81. *Pseudocercospora pterocarpicola* (Yen) Yen, comb. nov. (Fig. 54)
= *Cercospora pterocarpicola* Yen, Revue de Mycol. 42:145, 1978.

Leaf spots distinct, orbicular, yellowish brown, 1–2mm in diam. Fruiting strictly hypophyllous, invisible. Stromata rather developed, substomatic, globose or irregularly globose, 25–40μm in diam. Fascicles dense to very dense, emerging through the stomata. Conidiophores hypophyllous, always simple, erect or flexuous, brown, paler toward the apex, 1–16 septate, 0–3 geniculate, tip rounded, conidial scars inconspicuous, 35–203 x 4μm. Conidia obclaviform, pale olivaceous brown, generally curved, 3–7 septate, tip conic or conic rounded, base obconically

Habitat: On leaves of *Pterocarpus indicus* (Leguminosae), Kuala Lumpur (For. Res. Inst.), Malaysia, leg. Jo-min Yen (No. 71341), Sept. 28, 1971.

82. *Pseudocercospora puerariicola* (Yamam.) Deighton (Fig. 55, A, C)
Mycol. Papers 140:151, 1976.
= *Cercospora puerariicola* Yamam., Phytopath. Lab. Taihoku Imp. Univ. Contr. 26:142, 1934.

Leaf spots subcircular to angular, at first pale brown, then becoming brown to dark brown, scattered, 1–3mm in diam., sometimes confluent. Fruiting amphiphyllous, chiefly epiphyllous. Stromata dark brown, globose, 26–50μm in diam. Fascicles dense to very dense, emerging through the stomata. Conidiophores olivaceous brown, simple, continuous, straight or slightly tortuous, unthickened conidial scars at the attenuate and truncate tips, 13–24 x 3.5–4.8μm. Conidia obclavato-cylindrical, pale olivaceous brown, midly curved, 3–6 septate, tip subobtuse, base obconically truncate, 40–66 x 3–4.5μm.

Habitat: On leaves of *Pueraria phaseoloides* (Leguminosae), Tanglin, Singapore, leg. Mrs. Shu-hsien Yen (No. 51), May 29, 1964.

Distribution: N. America, Japan, Singapore and Taiwan.

83. *Pseudocercospora puerariina* (Yen) Yen, comb. nov. (Fig. 55, B, D-H).

= *Cercospora puerariina* Yen, Revue de Mycol. 30: 189, 1965.

Leaf spots more distinct on upper surface of the leaf, at first very small (0.5mm in diam.), gray, irregular or polygonal, vein-limited, then becoming yellow brown and more heavily coloured in the centre, 1–2mm in diam., sometimes becoming large brown areas. Fruiting amphigenous, more abundant on the lower side. Stromata lacking. Fascicles poor to meagre (2–12 stalks), emerging through the stomata. External hyphae pale brown, filling stomatal openings, septate, branched, 2–2.5μm in width. Conidiophores may be divided into two kinds: A, conidiophores coming from fascicles pale brown, paler at the tip, simple or branched, generally tortuous, 1–3 geniculate, 1–6 septate, with constrictions at septa, unthickened small conidial scar at the shortly attenuate tip, 30–53 x 4–6μm; B, conidiophores as solitary branches from procumbent threads, pale oblivaceous brown, never branched, cylindrical, 0–2 septate, 0–1 geniculate, tip attenuate, 15–27.5 x 3.5–5μm. Conidia obclaviform or acicular, pale olivaceous brown, straight or slightly curved, 6–12 (–15) septate, tip acute, base obconically truncate, 90–200 x 3.5–5μm.

Habitat: On leaves of *Pueraria phaseoloides* (Leguminosae), Katong, Singapore, leg. Mrs. Shu-hsien Yen (No. 44), Mar. 18, 1964.

Note: *Pseudocercospora puerariicola* (Yamam.) Deighton is different from this fungus by its continuous and always unbranched conidiophores.

84. *Pseudocercospora salicina* (Ell. & Ev.) Deighton (Fig. 56) Mycol. Papers 140: 94, 1976.

= *Cercospora salicina* Ell. & Ev., J. Mycol. 3: 19, 1887.

Syn. *Cercospora babylonicae* Saw. Formosan Agr. Res. Inst. Rept. 87: 79, 1944.

Cercospora minutipes Yen, Revue de Mycol. 31: 128, 1966.

Cercospora salicis-babylonicae Yen, Rsvue de Mycol. 31: 139, 1966.

Leaf spots amphigenous, subcircular or irregularly angular, more distinct on the upper side, dark brown, with an indefinite border, scattered, 0.5–4mm in diam., sometimes confluent. Fruiting amphigenous, visible as minute black pustules under hand lens, but sometimes invisible, even under hand lens. Stromata subepidermic, black brown, globose, 30–60μm in diam., but sometimes lacking. Fascicles poor to very dense. Conidiophores amphiphyllous, brown to dark brown, short, simple, generally continuous, at times 1–2 septate, tip rounded or attenuate and truncate, conidial scars inconspicuous, 8.5–17 x 3–4.5μm. Conidia obclavato-cylindrical or fusiform for the short ones, pale olivaceous brown, straight or slightly curved, 1–6 septate, tip rounded, base obconically truncate, 18–60 x 2.5–3.5μm.

Habitat: On leaves of *Salix babylonica* (Salicaceae), Katong, Singapore leg. Mrs. Shu-hsien Yen (No. 92), Dec. 14, 1964.

Distribution: N. America, India, Japan, Singapore and Taiwan.

85. *Pseudocercospora scopariicola* (Yen) Deighton (Fig. 57)

Mycol. Papers 140:152, 1976.

= *Cercospora scopariicola* Yen, Bull. Soc. Mycol. Fr. 84:11, 1968.

Leaf spots none or indistinct. Fruiting amphigenous, effuse, visible as a thin gray velvet on the underside. Stromata lacking or very small, consisting of few brown cells. Fascicles meagre to dense (3–18 stalks), emerging through the stomata. External hyphae hypophyllous, very abundant, filling stomatal openings, pale brown, septate, branched, 2.5–3.5μm in width. Conidiophores (either arising from fascicles or from external hyphae), pale brown, simple or branched, 0–2 geniculate, 1–5 septate, with constrictions at septa, tip rounded or slightly attenuate and truncate, conidial scars inconspicuous, 12–48 x 2.5–5μm. Conidia cylindrical or obclavato-cylindrical, sometimes filiform, pale olivaceous brown, slightly curved, 3–13 septate, tip rounded or obtuse, base slightly obconically truncate, 67–165 x 2.5–3.6μm.

Habitat: On leaves of *Scoparia dulcis* (Scrophulariaceae), Taiping, Singapore, leg. Jo-min (No. M.S. 730), Dec. 30, 1965.

Note: *Cercospora scopariae* Lagy & Thir. differs from this fungus by the presence of leaf spots and absence of external hyphae and especially by the hyaline conidia.

86. *Pseudocercospora singaporensis* (Yen) Yen, comb. nov. (Fig. 58)

= *Cercospora singaporensis* Yen, Revue de Mycol. 29:237, 1964.

Leaf spots distinct, subcircular, yellowish gray to brownish gray, vein-limited on the upper side, scattered, 0.5–4mm in diam. Fruiting amphiphyllous, invisible. Stromata lacking. Fascicles poor to medium (2–10 stalks), emerging through the stomata. Conidiophores olivaceous brown, simple or branched, erect or tortuous, 0–2 geniculate, 1–4 septate, a small unthickened conidial scar at the conic tip, 31–77 x 4.5–5.5μm. Conidia cylindrical or obclavato-cylindrical, pale olivaceous brown, straight or slightly curved, generally 3 septate (rarely 1 or 4 septate), tip rounded base obconically truncate, 30–67 x 3.5μm.

Habitat: On leaves of *Cassia occidentalis* (Leguminosae), Katong, Singapore, leg. Mrs. Shu-hsien Yen (No. 16), Apr. 2, 1964.

Note: This fungus is different from *Pseudocercospora nigricans* (Cooke) Deighton by its distinct leaf spots and 3 septate conidia.

87. *Pseudocercospora stahlii* (F.L. Stev.) Deighton

Mycol. Papers 140:82, 1976.

= *Helminthosporium stahlii* F.L. Stev., Trans. Ill. Acad. Sci. 10:208, 1917.

Syn. *Cercospora stahlii* (Stev.) Subramanian, J. Indian Bot. Soc. 35:460, 1956.

Cercospora passiflorae-foetidae Yen, Revue de Mycol. 29:226, 1964.

Leaf spots hypophyllous, angular or irregular, vein-limited, dark gray on lower side, scattered, 1–6mm in diam. Fruiting amphiphyllous, but mostly hypophyllous, effuse, dark gray. Stromata small, pale brown, globose, 20–40μm in diam. Fascicles meagre to dense (2–18 stalks), filling stomatal openings. Conidiophores brown to dark brown, branched, 3–7 septate, 1–4 geniculate, apex long attenuate as sharp point, 78–153 x 5–7μm. Conidia clavate, pale olivaceous brown, paler toward the base, straight, 1–3 septate, tip rounded, base attenuate and subtruncate, 20.5–43 x 4–7μm.

Habitat: On leaves of *Passiflora foetida* (Passifloraceae), Katong, Singapore, leg. Mrs. Shu-hsien Yen (No. 23), Apr. 25, 1964.

Distribution: Africa, N. America, Brunei, India, Malaysia, New Guinea, Puerto Rico, Sabah, Singapore, Taiwan and Trinidad.

88. *Pseudocercospora stephanotidis* (Yen) Yen, comb. nov. (Fig. 59)

= *Cercospora stephanotidis* Yen, Revue de Mycol. 32:193, 1967a.

Leaf spots amphigenous, angular or irregular angular, more distinct on the lower side, vein-limited, brown to dark brown, with an indefinite border, scattered, 2–6mm in diam., sometimes confluent. Fruiting amphiphyllous, but chiefly hypophyllous, visible as black velvet on the lower surface of the spots. Stromata black brown globose, 30–60μm in diam. Fascicles dense to very dense, emerging through the stomata. Condiophores brown or dark brown, paler toward the apex, simple or branched, erect or flexuous, 0–5 septate, 0–2 geniculate, tip rounded, membrane finely granulated, conidial scars inconspicuous, 30–80 x 6–7.5μm. Conidia obclavate or obclavato-cylindrical, brown or dark brown, straight or slightly curved, membrane finely granulated, 1–5 septate, tip rounded, base obconically truncate, 37–92 x 4.5–7μm.

Habitat: On leaves of *Stephanotis floribunda* (Asclepiadaceae), Serangoon Garden, Singapore, leg. Jo-min Yen (No. M.S. 729), Nov. 28, 1965.

89. *Pseudocercospora stigmaphyllicola* (Yen) Deighton (Fig. 60)

Mycol. Papers 140:153, 1976.

= *Cercospora stigmaphyllicola* Yen, Revue de Mycol. 30:192, 1965.

Leaf spots amphigenous, at first irregular, brown on upper side, but dark brown on lower side, at last coalescing and covering the whole surface of the leaf. Fruiting hypophyllous, invisible. Stromata lacking. Fascicles poor to medium (2–11 stalks), filling the stomatal openings. External hyphae hypogenous, abundant, emerging through the stomata, septate, branched, pale olivaceous brown, 1.5–2.5μm in width. Conidiophores hypophyllous, either arising from fascicles (poor to meagre, 2–6 stalks) or from external hyphae, simple (sometimes branched), straight or tortuous, 0–2 septate, 0–2 geniculate, apex attenuate and truncate or laterally shouldered, conidial scars inconspicuous, 8.5–36 x 3.5–4.5μm. Conidia obclavato-cylindrical or cylindrical, pale olivaeous brown, straight or slightly curved, 2–7 (rarely 1 or 8) septate, tip obtuse, base obconically truncate, 38–113 x 2–3μm.

Habitat: On leaves of *Stigmaphyllon ciliatum* (Malpighiaceae), Botanic Gardens, Singapore, leg. Mrs. Shu-hsien Yen (No. 57), Jun. 7, 1964.

90. *Pseudocercospora tabernaemontanae* (H. & P. Syd.) Deighton

Mycol. Papers 140: 154, 1976.

= *Cercospora tabernaemontanae* H. & P. Syd., Philipp. J. Sci. (Bot.) 8: 507, 1913.

Leaf spots distinct, circular, 3–10mm in diam., pale tan or dingy gray with a narrow brown border, often forming "shot-holes". Fruiting amphigenous, invisible. Stromata globose to elongate, bark brown, 20–50μm in diam. Fascicles dense to very dense. Conidiophores pale olivaceous brown, short, not septate, not geniculate, unthickened, small conidial scar at the conic tip, 10–35 x 2–4μm. Conidia cylindrical or obclavato-cylindrical, pale olivaceous brown, straight or slightly curved, multiseptate, tip subobtuse to conic, base obconically truncate, 15–65 x 2–3.5μm.

Habitat: On leaves of *Tabernaemontana malacaensis* (Apocynaceae), Tampines, Singapore, leg. Jo-min Yen (No. M.S. 726), Dec. 30, 1965.

Distribution: Burma, India, W. Malaysia, Philippines, Sabah and Singapore.

91. *Pseudocercospora tabernaemontanicola* (Yen) Yen, comb. nov.

= *Cercospora tabernaemontanicola* Yen, Bull. Soc. Mycol. Fr. 84: 14, 1968.

Leaf spots circular, brown, with an indefinite yellowish brown border on the upper side, scattered, 2–5mm in diam. Fruiting hypophyllous, visible as minute black pustules on the lower side. Stromata lacking or consisting of few brown cells. Fascicles poor to medium (3–15 stalks), emerging through the stomata. External hyphae hypogenous filling stomatal openings, pale brown, septate, branched, 2.5–4.5μm in width. Conidiophores strictly hypophyllous, either arising from fascicles or arising from external hyphae, simple or branched, erect or flexuous, 0–4 septate, 0–2 geniculate, apex attenuate and truncate, conidial scars inconspicuous, 18–79 x 3.5–5μm. Conidia cylindrical (rarely obclavato-cylindrical), pale olivaceous brown, curved, straight for the short ones, 3–8 septate, tip rounded or subobtuse, base slightly attenuate and truncate, 50–130 x 3–4.5μm.

Habitat: On leaves of *Tabernaemontana coronaria* (Apocynaceae), Botanic Gardens, Singapore, leg. Jo-min Yen (No. M.S. 725), Nov. 26, 1965.

Note: *Pseudocercospora tabernaemontanae* (H. & P. Syd.) Deighton is different from this fungus by its "shot-hole" leaf spots and its simple and continuous condiophores.

92. *Pseudocercospora thunbergiicola* (Yen) Deighton (Fig. 61)

Mycol. Papers 140: 154, 1976.

= *Cercospora thunbergiicola* Yen, Revue de Mycol. 30: 1965, 1965.

Leaf spots amphigenous, circular to angular, or irregular, with a whitish centre, surrounded by a dark brown border, scattered, 0.5–3mm in diam. Fruiting amphiphyllous, invisible. Stromata rudimentary or small, brown, subglobose, 20–30μm in diam. Fascicles meagre to dense (2–22 stalks), emerging through the stomata. External hyphae amphigenous, also emerging through the stomata, pale brown, septate, branched, 2–3μm in width. Conidiophores either arising from fascicles or arising from external hyphae, olivaceous brown, paler and narrower towards the apex, generally simple, sometimes branched, erect or tortuous, 0–4 septate, 0–2 geniculate, tip attenuate and truncate, conidial scars inconspicuous, 12–80 x 3.5–5μm. Conidia cylindrical or obclavato-cylindrical, pale olivaceous brown, straight or slightly curved, 4–11 septate, tip subacute, base attenuate and truncate, 67–174 x 3.5–5μm.

Habitat: On leaves of *Thunbergia alata* (Acanthaceae), Botanic Gardens, Singapore, leg. Mrs. Shu-hsien Yen (No. 60), Jun. 20, 1964.

Note: *Cercospora thunbergiae* Boel. is different from this fungus by its hypogenous fruiting and continuous and non-septate conidiophores.

93. *Pseudocercospora timorensis* (Cooke) Deighton (Fig. 50)

Mycol. Papers 140: 154, 1976.

= *Cercospora timorensis* Cooke, Grevillea 12: 38, 1883.

Syn. *Cercospora batatae* Zimm., Ber. Land. — Forstw. Deutsch. Ostafr. 2: 28, 1904.

Cercospora batatae P. Henn., Bot. Jahrb. von Engler 38: 118, 1907.

Leaf spots circular to irregular, at first yellowish brown with an indefinite border, later becoming grayish in the centre, scattered, 6–10mm in diam. Fruiting amphigenous, but mostly hypophyllous, invisible. Stromata lacking, or very rudimentary. Fascicles poor to medium (3–12 stalks), emerging through the stomata. Conidiophores pale olivaceous brown, always simple, cylindrical, erect or slightly flexuous, continuous, sometimes 1–2 septate, tip attenuate and truncate, 14–50 x 3–5μm. Conidia cylindrical, pale olivaceous brown, slightly curved, 3–7 septate, tip rounded, base very slightly attenuate and truncate, 40–103 x 3.5–4.5μm.

Habitat: On leaves of *Ipomoea batatas* (Convolvulaceae), Bukit Timah, Singapore, leg. G. Lim, Apr. 25, 1969..

Distribution: Africa, China, Ecuador, Japan, Panama, Philippines and Singapore.

94. *Pseudocercospora trematicola* (Yen) Deighton (Fig. 62)

Mycol. Papers 140: 154, 1976.

= *Cercospora trematicola* Yen, Bull. Soc. Mycol. Fr. 86: 752, 1970b.

Leaf spots distinct on the lower side, but indistinct on the upper sider, gray, angular, very small, strictly vein-limited, scattered, 0.2–1mm in diam., often coalescing and forming gray large patches. Fruiting strictly hypophyllous, visible as gray velvet under hand lens. Stromata lacking. Fascicles occasionally present, Very poor (2–6 stalks), emerging through the stomata. External hyphae hypophyllous, emerging through the stomata, pale olivaceous brown, septate, branched, 2.5–3.5μm in width. Conidiophores either arising from fascicles or from external hyphae, simple or branched, erect or flexuous, not geniculate, 0–5 septate, tip attenuate and truncate, 12–57.5 x 3.5–7μm. Conidia obclavato-cylindrical, but cylindrical for the short ones, pale olivaceous brown, straight or slightly curved, 2–10 septate, tip rounded, base obconically truncate, 36–96 x 4–5μm.

Habitat: On leaves of *Trema orientalis* (Urticaceae), Jurong, Singapore, leg. Jo-min Yen (No. M.S. 727), Dec. 17, 1965.

95. *Pseudocercospora trematis-cannabini* (Yen & Lim) Deighton (Fig. 63).

Mycol. Papers 140: 154, 1976.

= *Cercospora trematis-cannabini* ('tremae-canabinae') Yen & Lim, Bull. Soc. Mycol. Fr. 86: 749, 1970b.

Leaf spots amphigenous, circular to irregularly circular, pale brown, with an indefinite border, scattered, 0.5–5mm in diam., sometimes confluent. Fruiting strictly epiphyllous, visible as minute black hairs under hand lens. Stromata dark brown, globose, 18–30μm in diam. Fascicles medium to dense, emerging through the stomata. Conidiophores olivaceous brown, paler toward the apex, simple, never branched, filamentous, 2–14 septate, 0–2 geniculate, tip rounded or occasionally truncate, 45–170 x 3–4μm. Conidia obclavato-cylindrical or cylindrical, pale olivaceous brown, usually curved, 5–12 septate, tip rounded or subobtuse, base shortly attenuate and truncate, 50–115 x 3–4μm.

Habitat: On leaves of *Trema cannabina* (Urticaceae), Johor Baru, Malaysia, leg. G. Lim, Nov. 28, 1969.

Note: This fungus differs from others by its strictly epigenous fruiting and long filamentous conidiophores.

96. *Pseudocercospora ubicola* (Yen) Deighton (Fig. 64).

Mycol, Papers 140: 155, 1976.

Leaf spots amphigenous, irregular, brown, at first small and vein-limited, then confluent and forming large patches with an indefinite border. Fruiting strictly hypogenous, invisible. Stromata lacking. Fascicles poor to medium (2–15 stalks) emerging through the stomata. External hyphae hypophyllous, also emerging through the stomata, 2–5 in fascicles, pale, olivaceous brown, septate, branched, 1.2–2.5μm in width.. Conidiophores either arising from fascicles or from external hyphae, generally simple, erect or tortuous, 0–3 septate, 0–2 geniculate, sometimes with constrictions at septa, pale olivaceous brown, tip attenuate and truncate, 6–30 x 3.5–5μm. Conidia very thin, acicular or filiform, subhyaline, straight or slightly curved, 3–8 septate, tip conic, base slightly obconic truncate, 56–101 x 2–2.5μm.

Habitat: On leaves of *Dioscorea* sp. (Dioscoreaceae), Botanic Gardens, Singapore, leg. Mrs. Shu-hsien Yen (No. 54), Jun. 7, 1964.

97. *Pseudocercospora viticicola* (Yen & Lim) Yen, comb. nov. (Fig. 65).
= *Cercospora viticicola* Yen & Lim, Cahiers du Pacifique 17:104, 1973.

Leaf spots irregularly circular to irregularly angular, grayish brown, with an indefinite black brown border, scattered, 1–4mm in diam., distinct on the upper side, but strictly indistinct on the lower side, sometimes confluent. Fruiting amphiphyllous, visible as black minute pustules under hand lens. Stromata epigenous, forming within the epidermal cell, black brown, globose, 24–44μm in diam. Fascicles dense to very dense, emerging through rupture of epidermal cells. External hyphae strictly hypophyllous, emerging through the stomata, pale olivaceous brown, septate, branched, 2–3μm in width. Conidiophores may be divided into two kinds: A, conidiophores arising from fascicles, always epigenous, pale olivaceous brown, simple, never branched, continuous or one septate, erect or slightly tortuous, apex irregularly rounded or slightly attenuate and truncate, 8–35 x 2–4.5μm; B, conidiophores arising from external hyphae, always hypogenous, pale olivaceous brown, simple, erect, continuous, tip attenuate and truncate, 2–15 x 2–3.5μm. Conidia obclavato-cylindrical or obclavate, pale olivaceous brown midly curved, 3–7 septate, tip subobtuse, base obconically truncate, 33–70 x 2.5–3.5μm.

Habitat: On leaves of *Vitex pubescens* and *V. trifolia* (Verbenaceae), Singapore, leg. G. Lim (No. S.U. 75), Mar. 3, 1972.

Note: *Cercospora weberi* Chupp differs from this species by its epigenous fruiting and strictly epiphyllous external hyphae.

98. *Stenella fagraeae* Yen
Revue de Mycol. 32:200, 1967a.

Leaf spots amphigenous, very distinct, circular, pale brown but heavily coloured in the centre, later forming "Frog eyes", with fine concentric lines in the centre and surrounded by a raised and thick border, cattered, 1–3mm in diam. Fruiting amphiphyllous, appearing as minute black pustules under hand lens. Stromata generally small, sometimes well developed, globose or irregularly globose, dark brown to nearly black, 40–90μm in diam. Fascicles medium to dense 2–20 stalks), emerging through the stomata or through the rupture of the epidermis. External hyphae emerging through the stomata, pale brown to brown, septate, branched, 3.5–4.5μm in diam. Conidiophores amphiphyllous, either arising from fascicles or arising from external hyphae, always simple, cylindrical, straight, pale brown to brown, 0–1 septate, not geniculate, with a finely granulated membrane, tip rounded or irregularly truncate, 1–2 brown conidial scars at the apex, 28–43 x 3.5–4.5μm. Conidia cylindrical or obclavato-cylindrical, pale brown, straight or slightly curved, with a finely granulated membrane, 1–5 septate, tip rounded, base obconically truncate, 26–48 x 3.5–4.2μm.

Habitat: On leaves of *Fagraea fragrans* (Loganiaceae), Bukit Timah, Singapore, leg. Chih-shao Lee (No. 13), Aug. 20, 1965.

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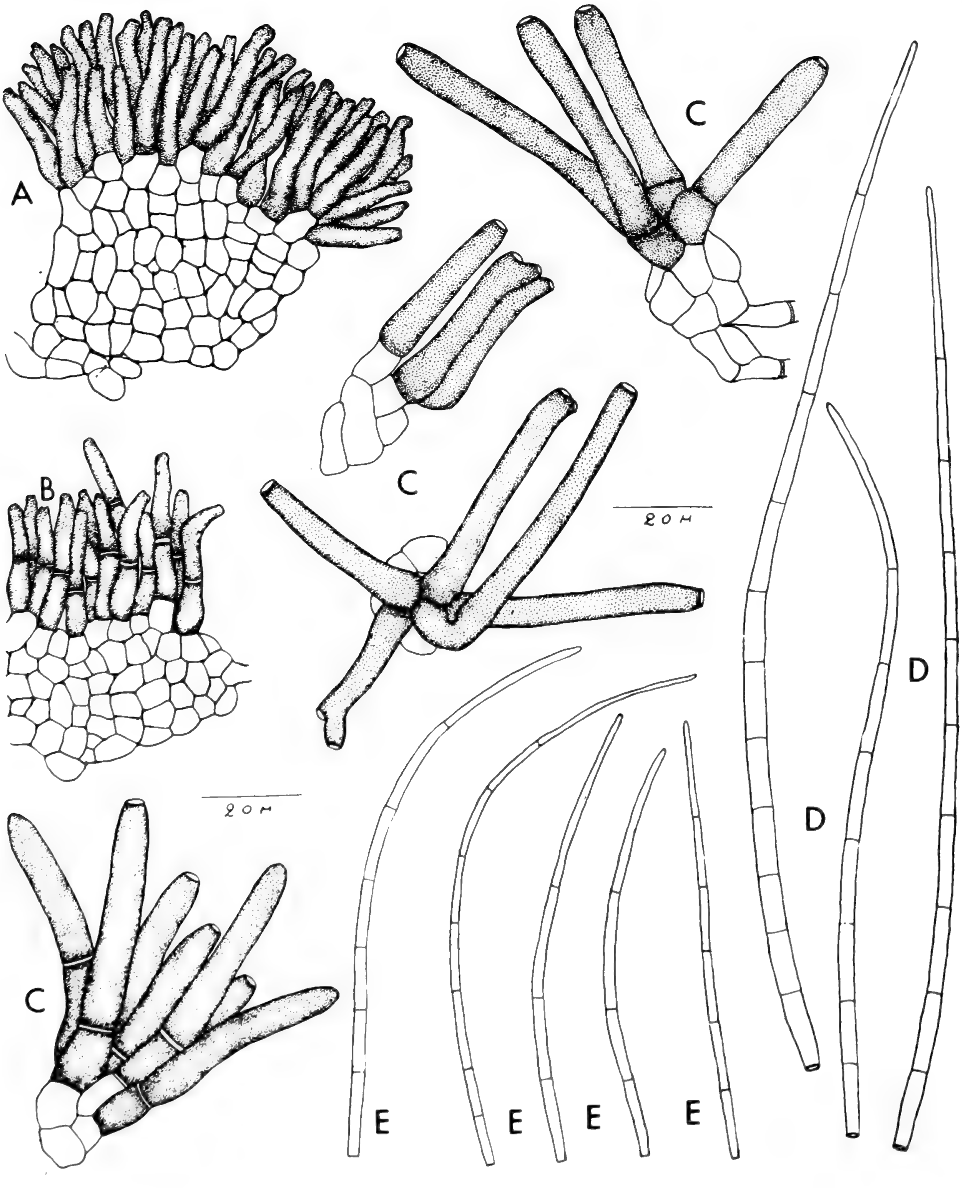

Fig. 1. *Cercoseptoria balsaminicola* (Yen & Lim) Yen (A, B & E): A, stromata and fascicle of young conidiophores; B, old conidiophores; E, conidia. *Cercospora balsaminiana* Yen & Lim (C & D): C, fascicle of condiophores; D. conidia.

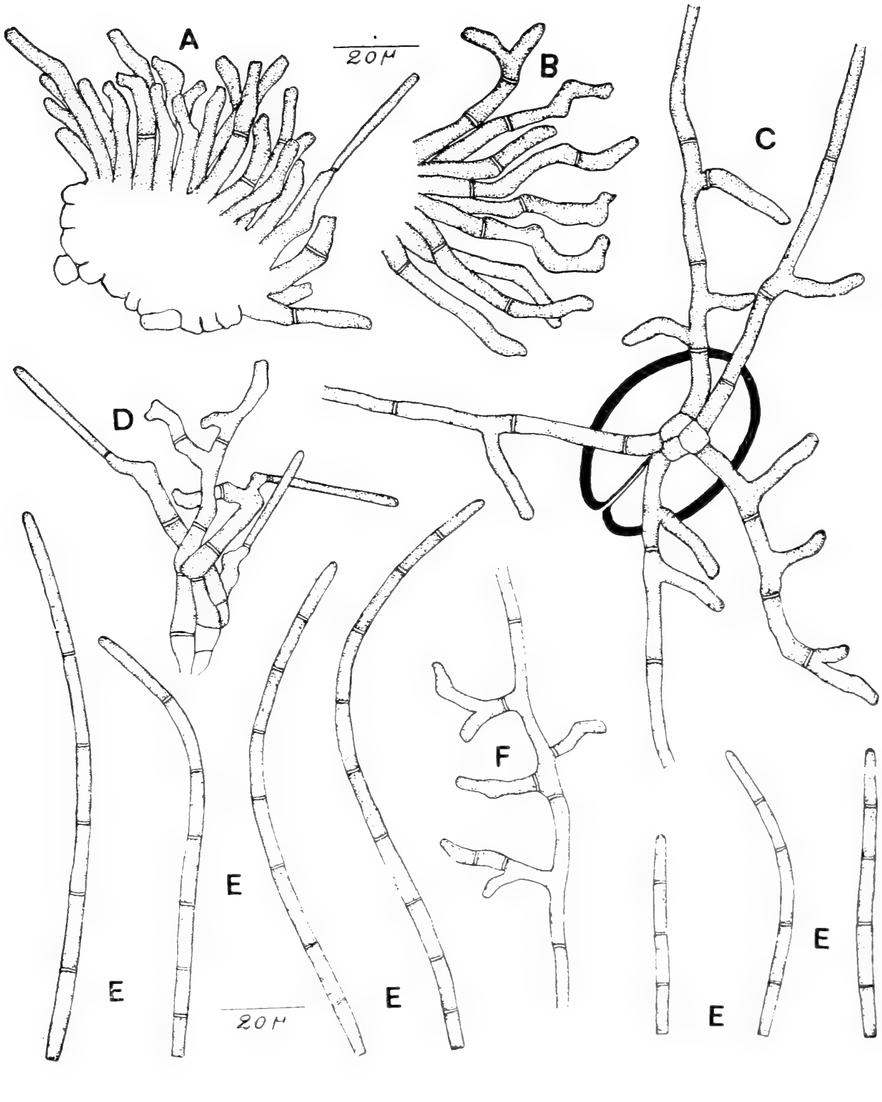

Fig. 2. *Cercoseptoria ixoriana* (Yen & Lim) Yen: A, fascicle of young conidiophores; B & D, old conidiophores; C & F, external hyphae and unbranched conidiophores; E, conidia.

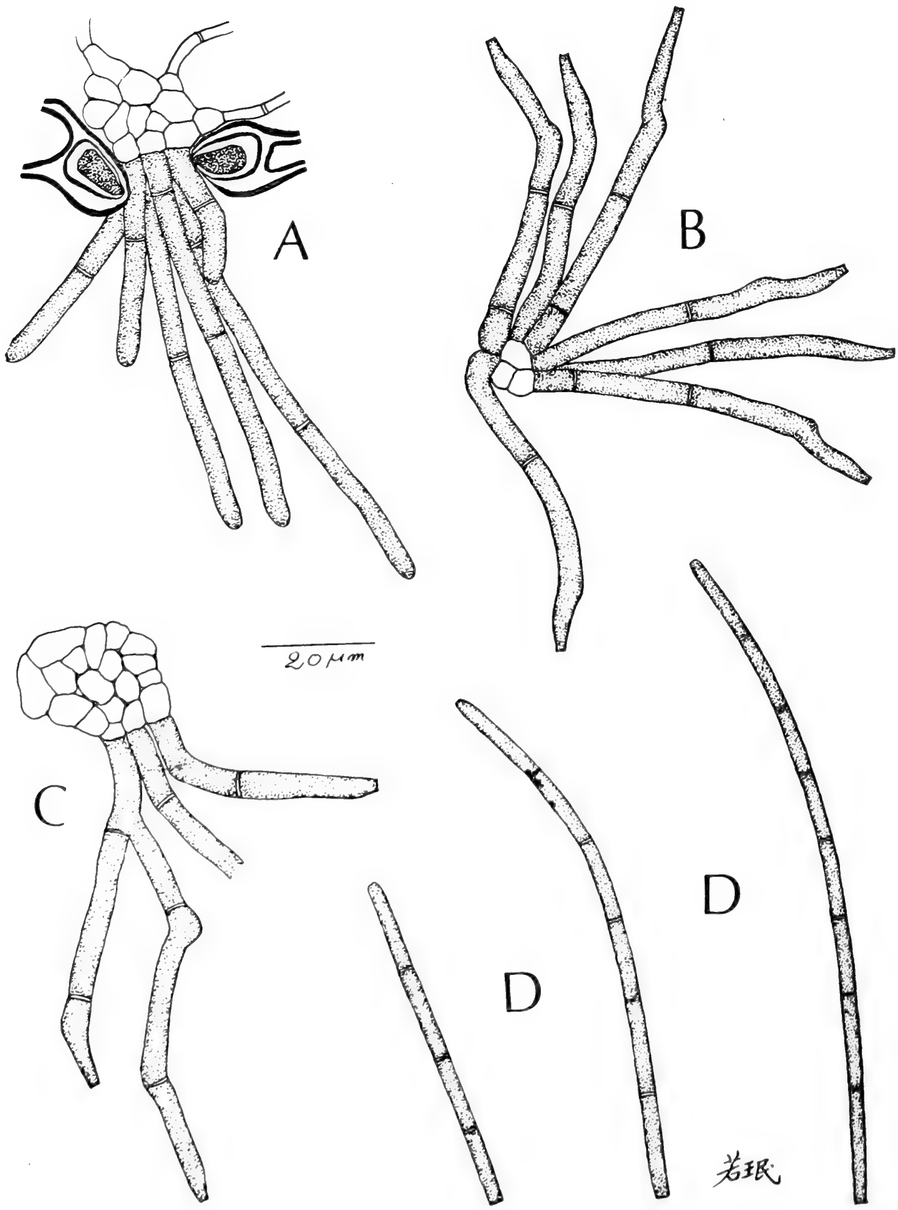

Fig. 3. *Cercoseptoria polygonigena* (Yen) Yen: A, fascicle of young conidiophores; B & C, fascicles of old conidiophores; D, conidia.

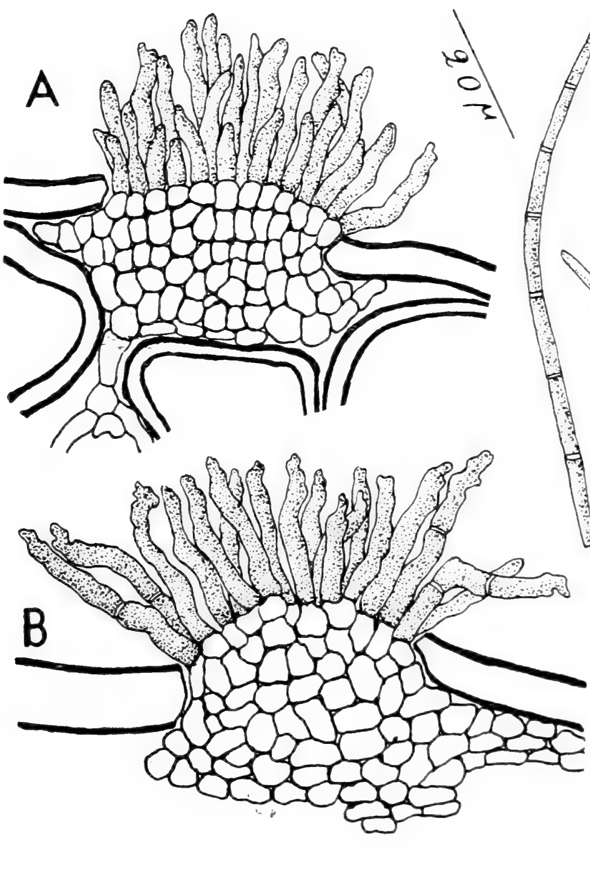

Fig. 4. *Cercoseptoria rhododendricola* (Yen) Deighton: A & B, fascicles of conidiophores and stromata; C, conidia.

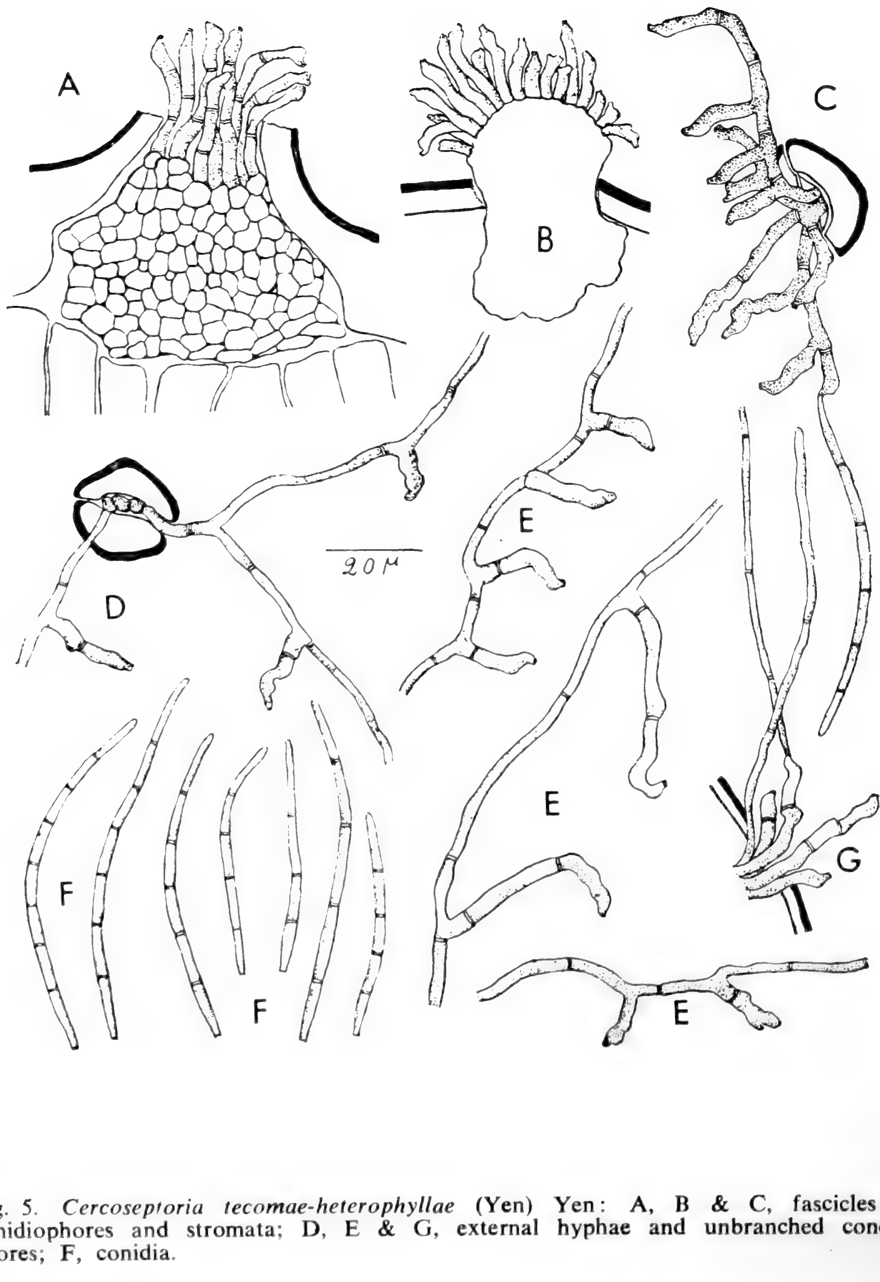

Fig. 5. *Cercoseptoria tecomae-heterophyllae* (Yen) Yen: A, B & C, fascicles of conidiophores and stromata; D, E & G, external hyphae and unbranched condiophores; F, conidia.

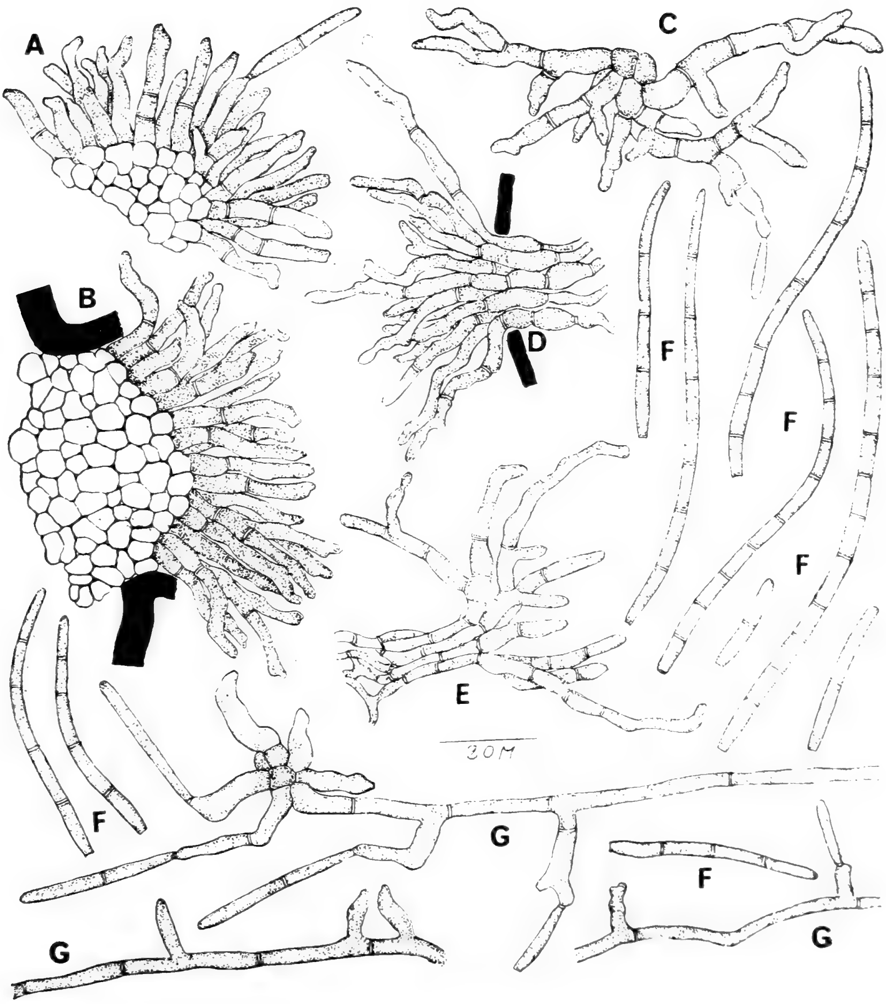

Fig. 6. *Cercoseptoria tecomicola* (Yen) Yen: A & B, fascicles of young conidiophores and stromata; C, D & E, fascicles of old conidiophores without stromata; F, conidia, G, external hyphae and unbranched conidiophores.

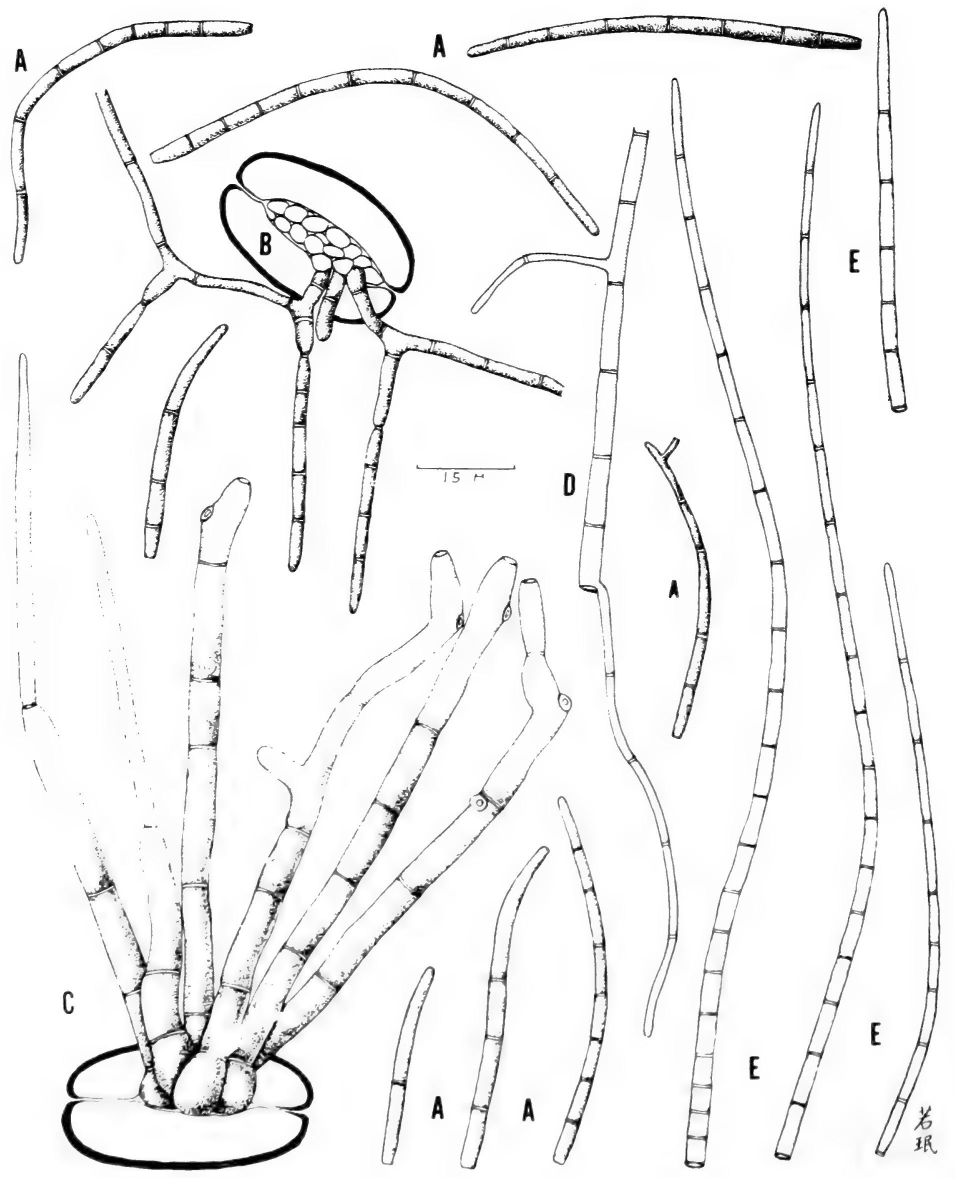

Fig. 7. *Cercospora abacopteridis* Yen & Lim (C-E): C, fascicle of conidiophores; D, germination of conidia; E, conidia. *Pseudocercospora abacopteridicola* (Yen & Lim) Yen (A & B): A, conidia; B, external hyphae and conidiophores.

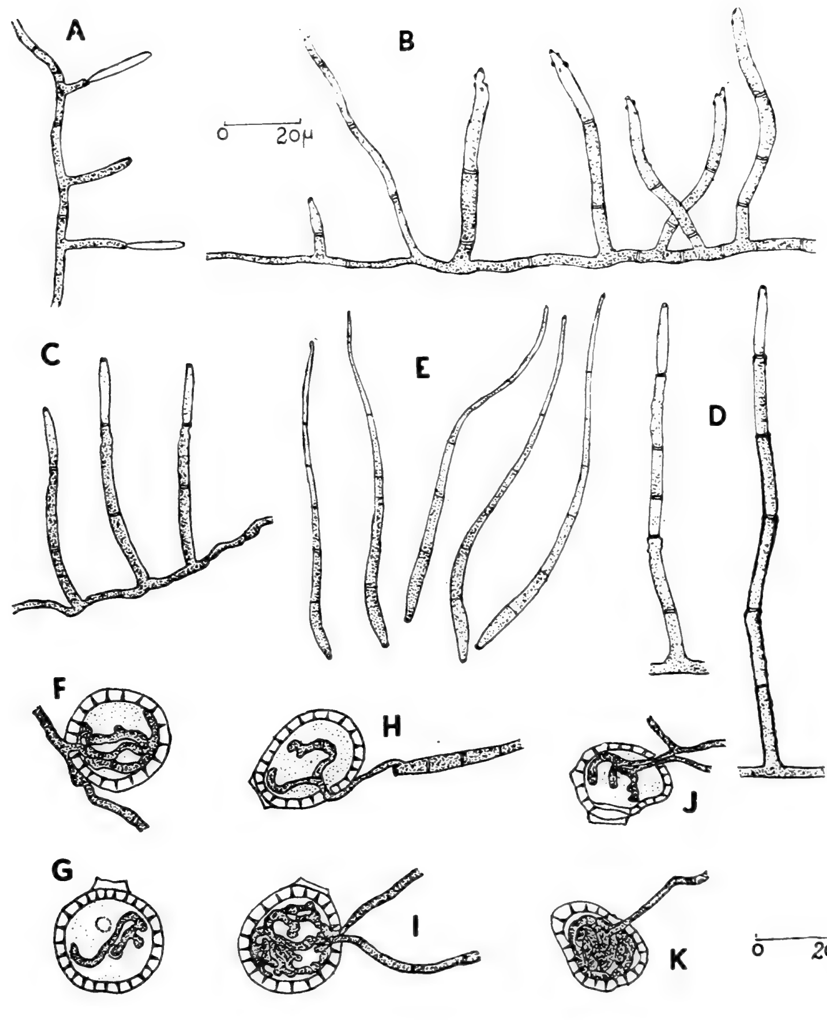

Fig. 8. *Cercospora acori* Yen: A, B & C, young conidiophores; D, old conidiophores; E, conidia; F-K, penetration by *Cercospora hyphae* via the germinative pore of uredospores.

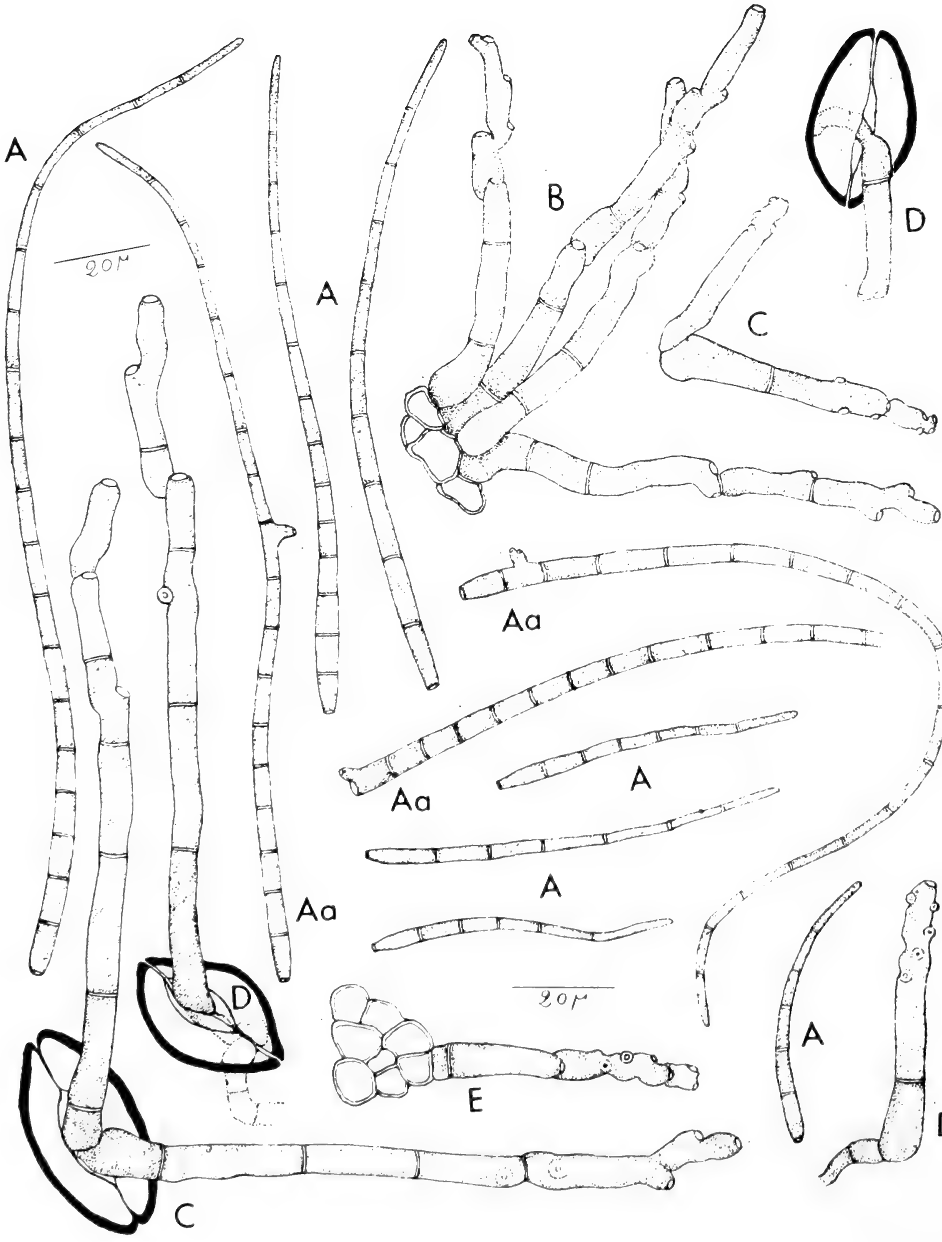

Fig. 9. *Cercospora asystasiana* Yen: A, conidia; Aa, germination of conidia; B & C, fascicles of conidiophores; D, single conidiophore; E, rudimentary stromata.

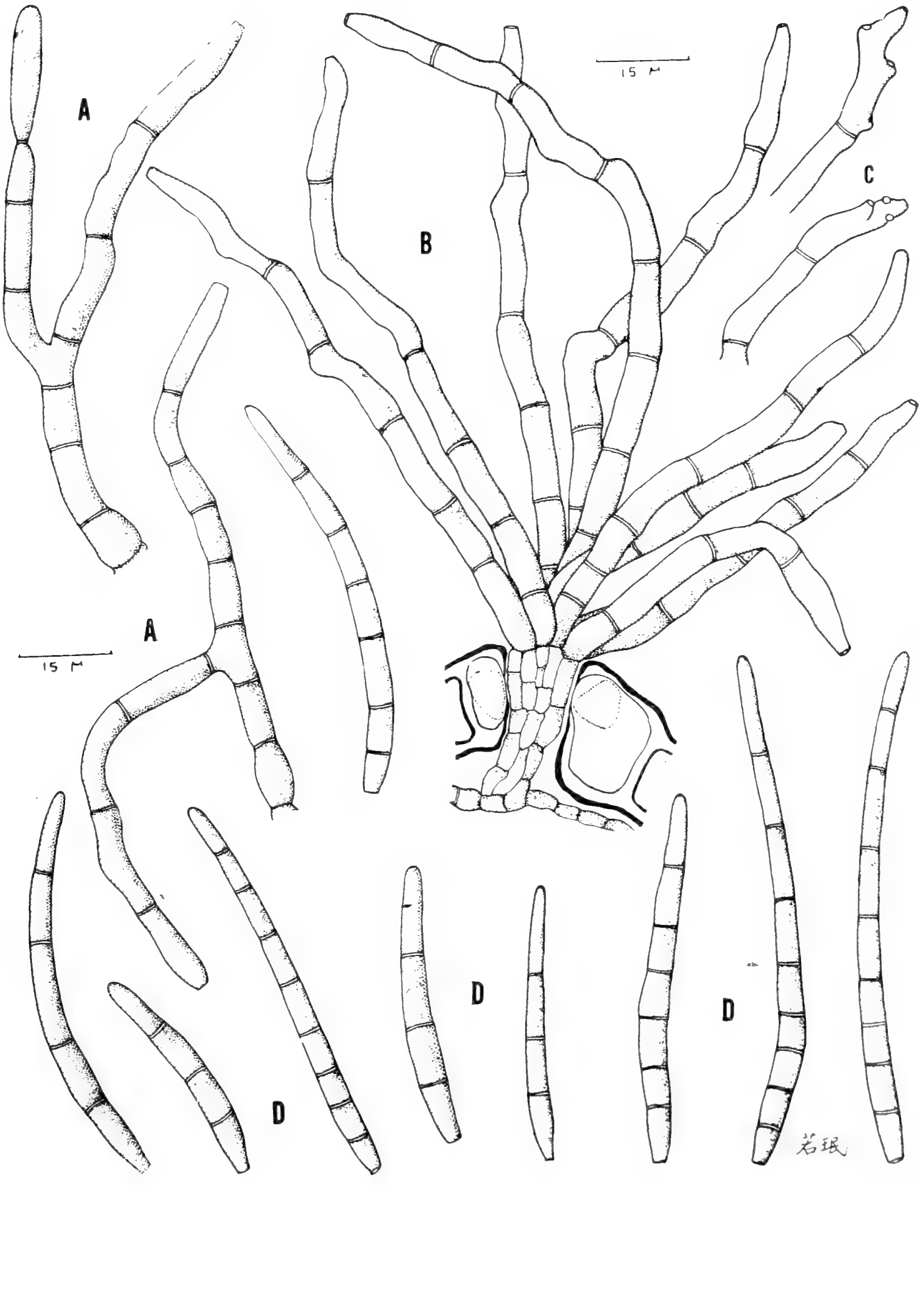

Fig. 10. *Cercospora barleriae* Yen & Lim: A, branched conidiophores; B, fascicle of conidiophores; C, ends of conidiophores; D, conidia.

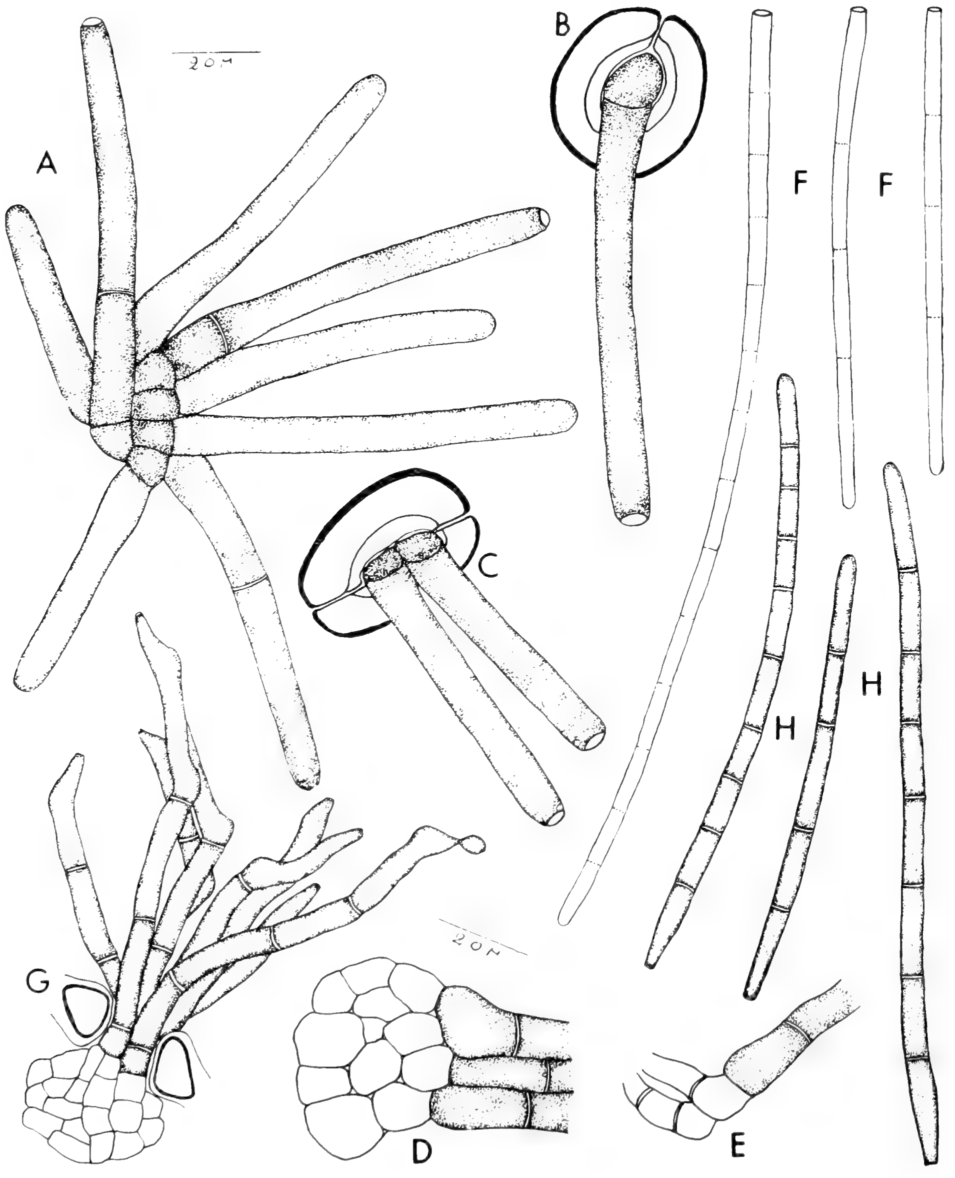

Fig. 11. *Cercospora canavaliiana* Yen & Lim (A-F): A & C, fascicles of conidiophores; B, unbranched conidiophore: D & E, rudimentary stromata; F. conidia. *Pseudocercospora cruenta* (Sacc.) Deighton (G & H): G, stromata and conidiophores; H, conidia.

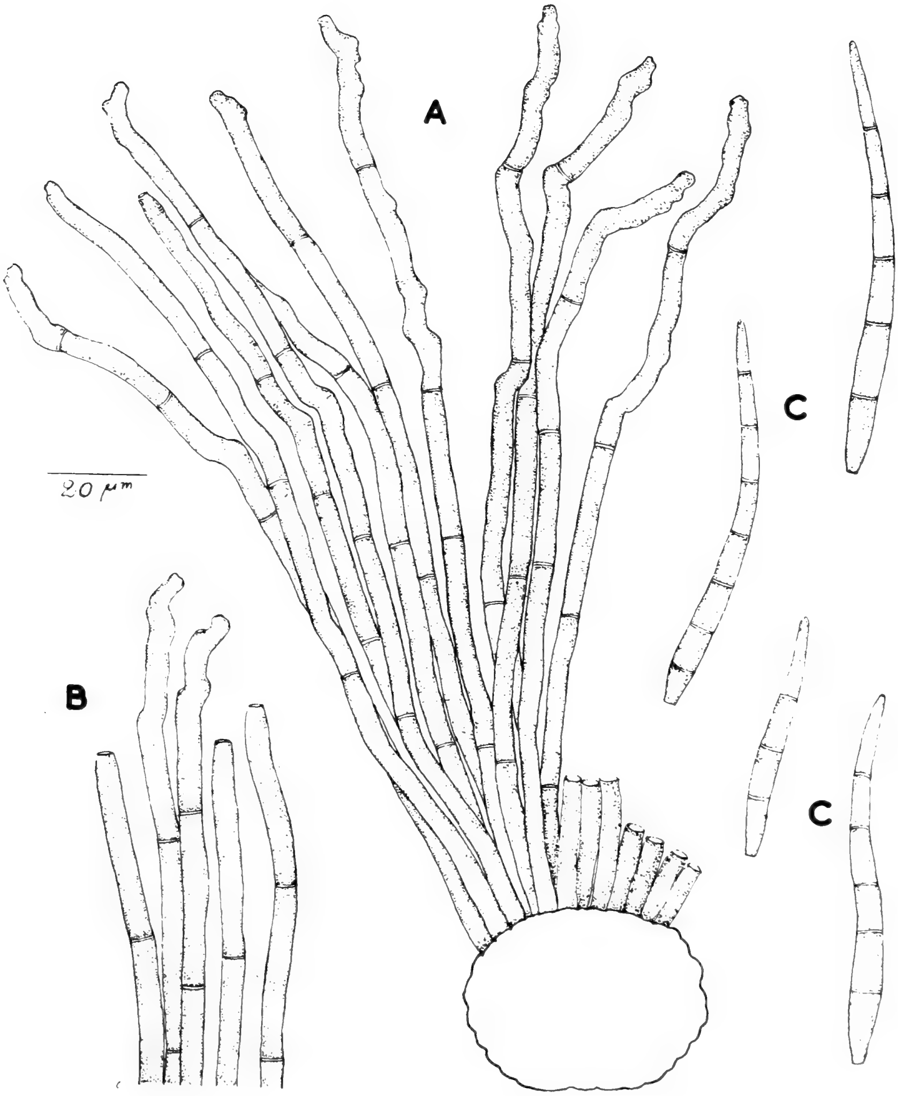

Fig. 12. *Cercospora cassiae-nodosae* Yen: A, fascicle of conidiophores; B, ends of conidiophores; C, conidia.

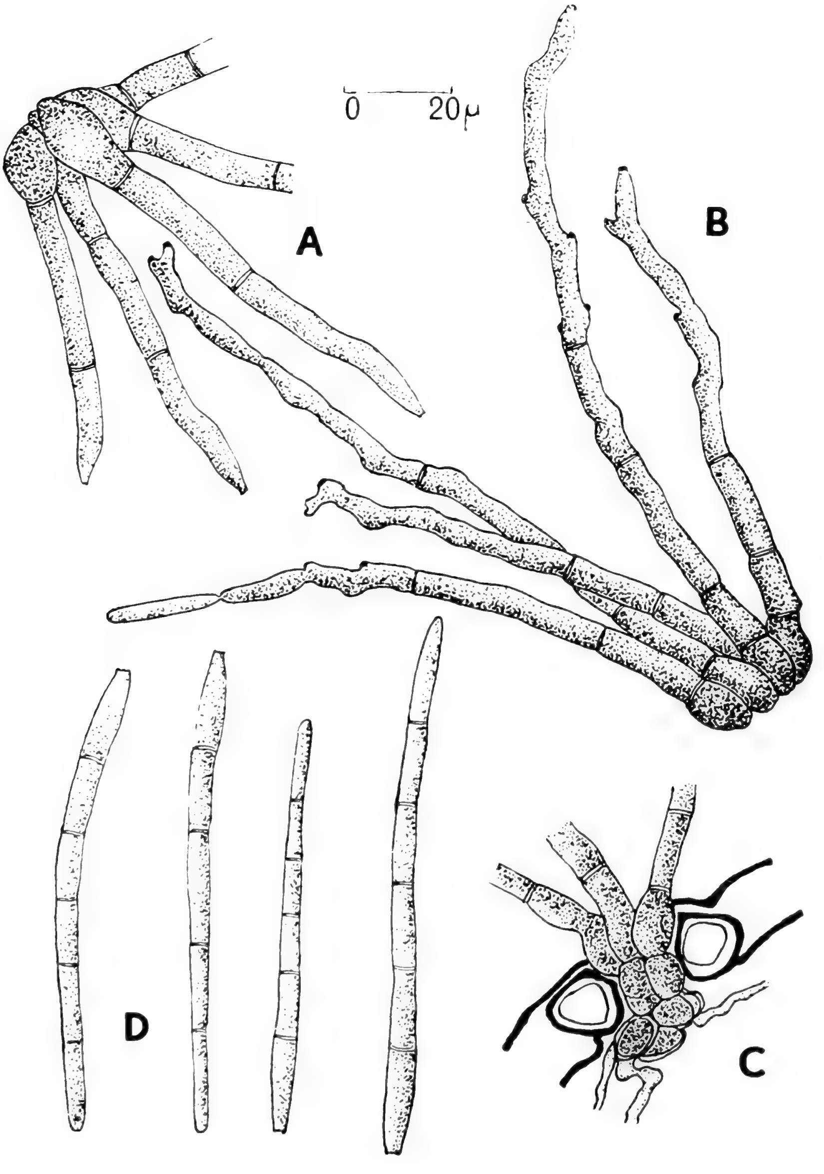

Fig. 13. *Cercospora cassiae-occidentalis* Yen: A, fascicle of young conidiophores; B, fascicle of old conidiophores; C, rudimentary stromata; D, conidia.

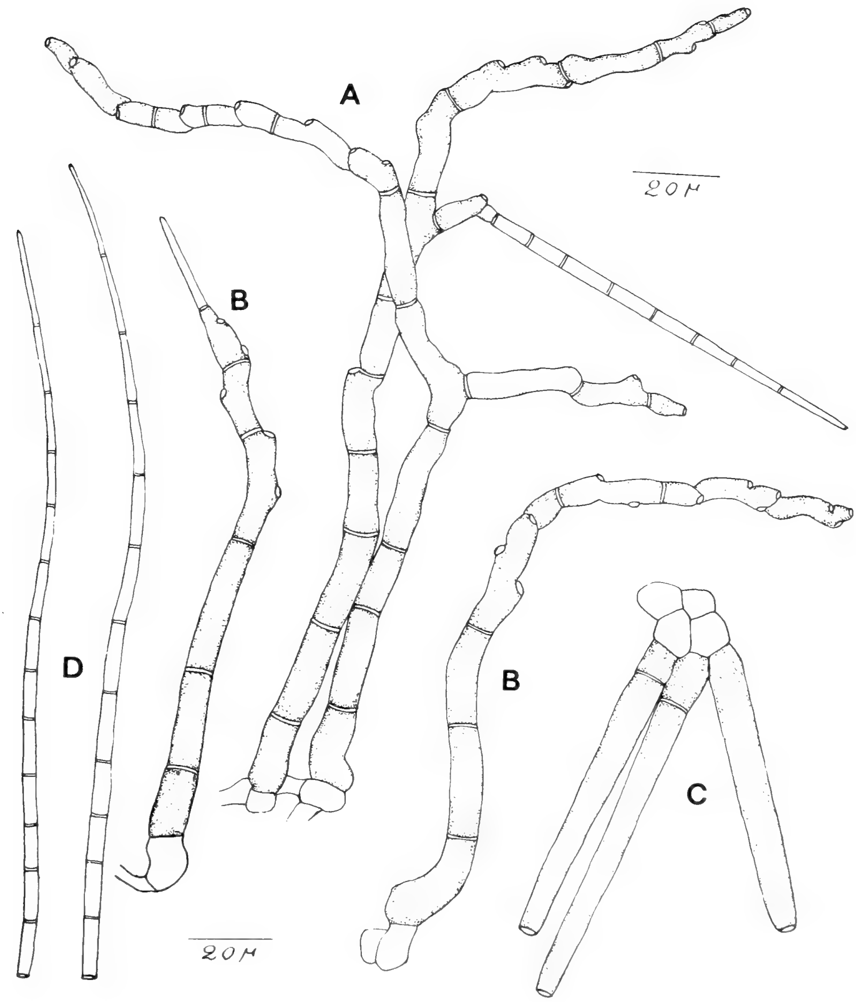

Fig. 14. *Cercospora coleiana* Yen & Lim: A, fascicle of old conidiophores; B, unbranched conidiophores; C, fascicle of young conidiophores; D, conidia.

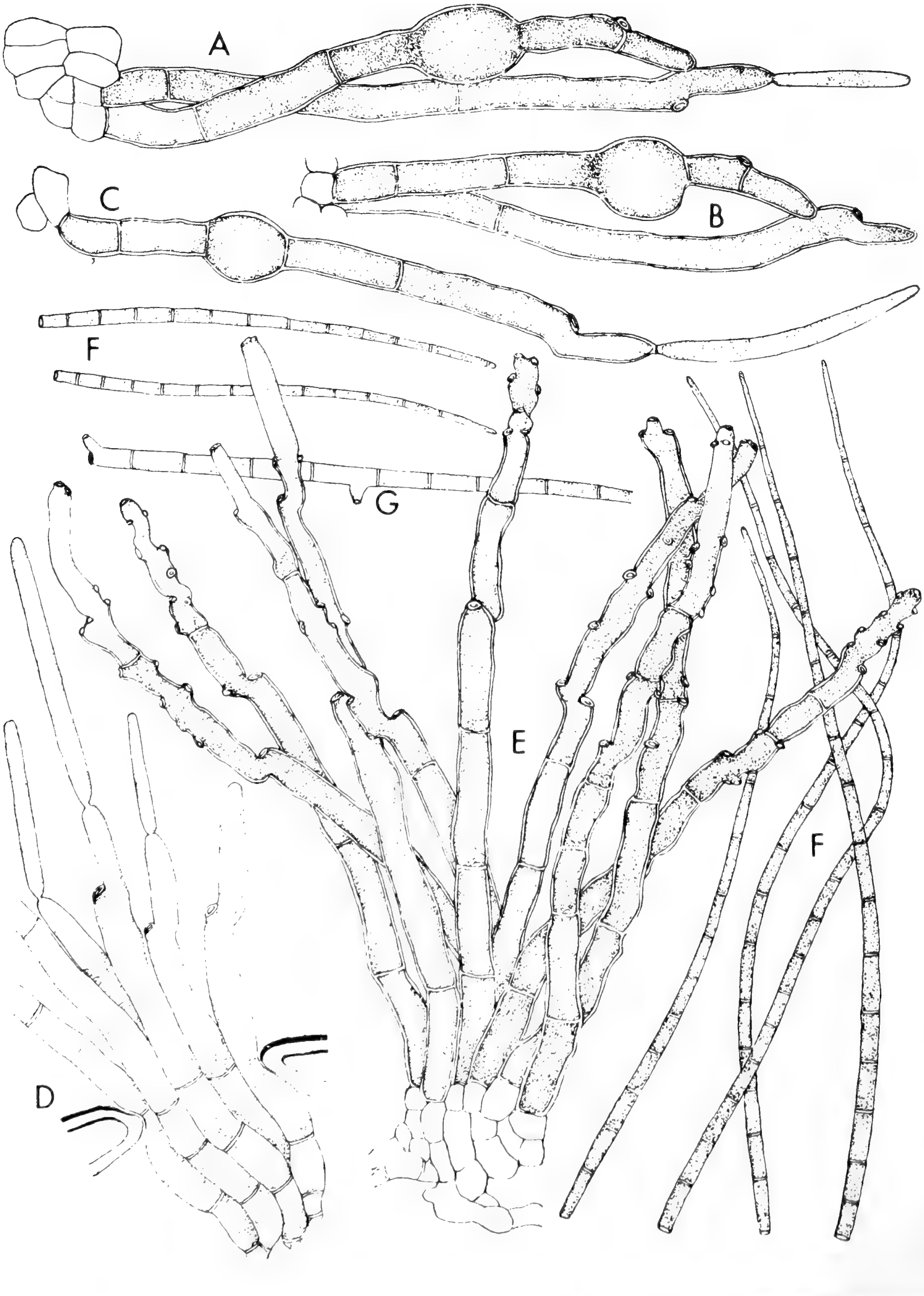

Fig. 15. *Cercospora dioscoreae-pyrifoliae* Yen: A, B & C, conidiophores with abnormal globular swellings; D, fascicle of young conidiophores; E, fascicle of old conidiophores; F, conidia.

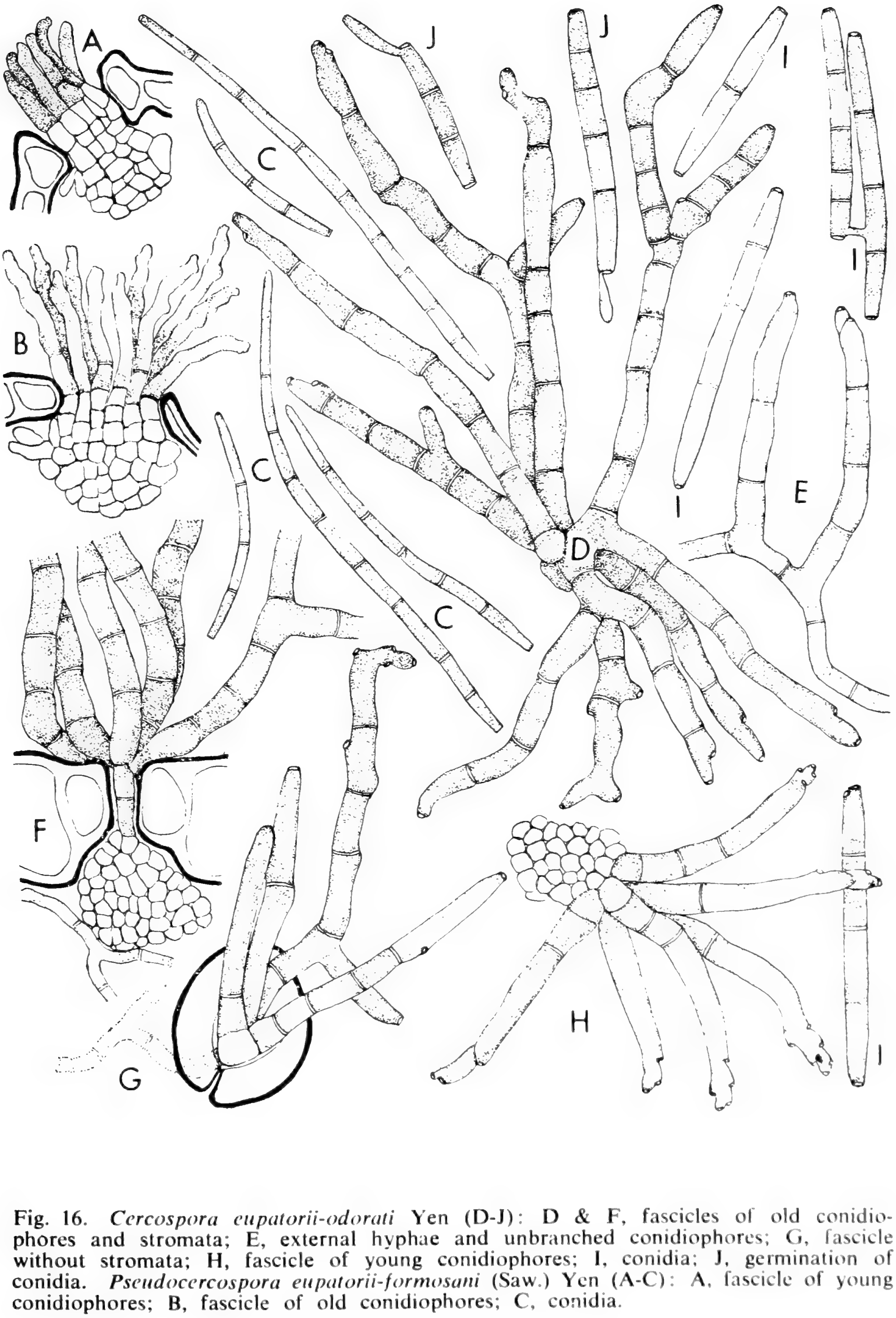

Fig. 16. *Cercospora eupatorii-odorati* Yen (D-J): D & F, fascicles of old conidiophores and stromata; E, external hyphae and unbranched conidiophores; G, fascicle without stromata; H, fascicle of young conidiophores; I, conidia; J, germination of conidia. *Pseudocercospora eupatorii-formosani* (Saw.) Yen (A-C): A, fascicle of young conidiophores; B, fascicle of old conidiophores; C, conidia.

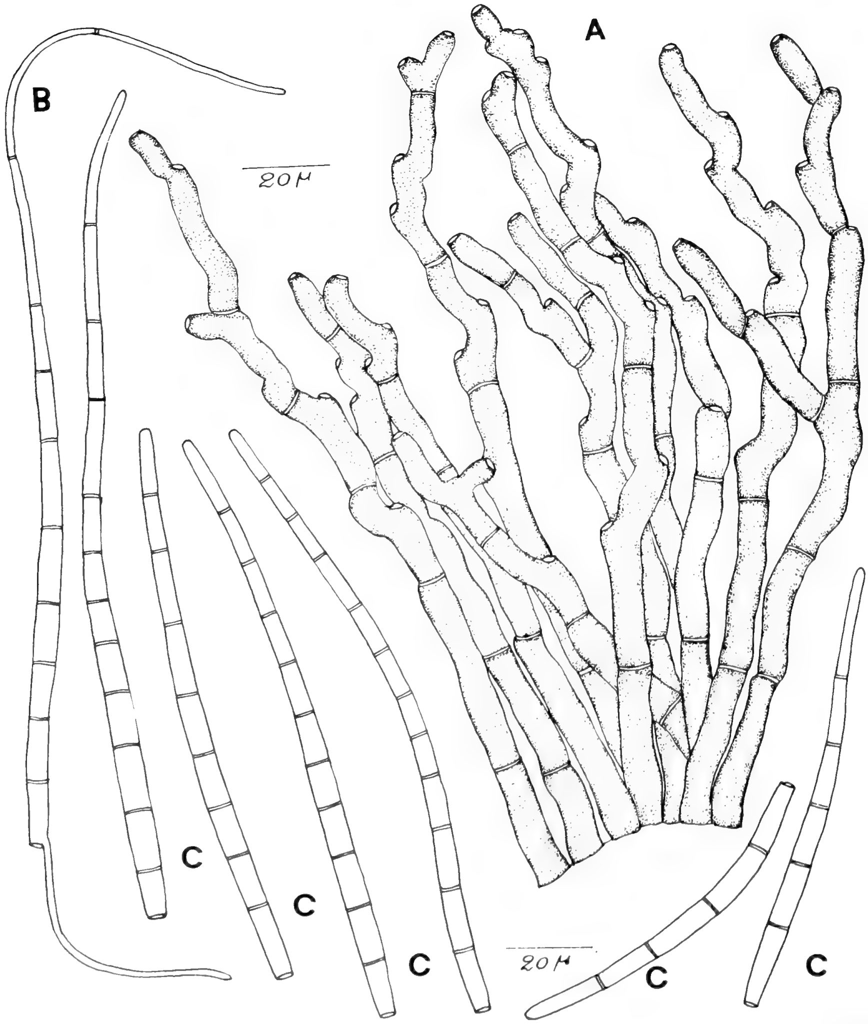

Fig. 17. *Cercospora gloriosicola* Yen & Lim: A, fascicle of conidiophores; B, germination of conidia; C, conidia.

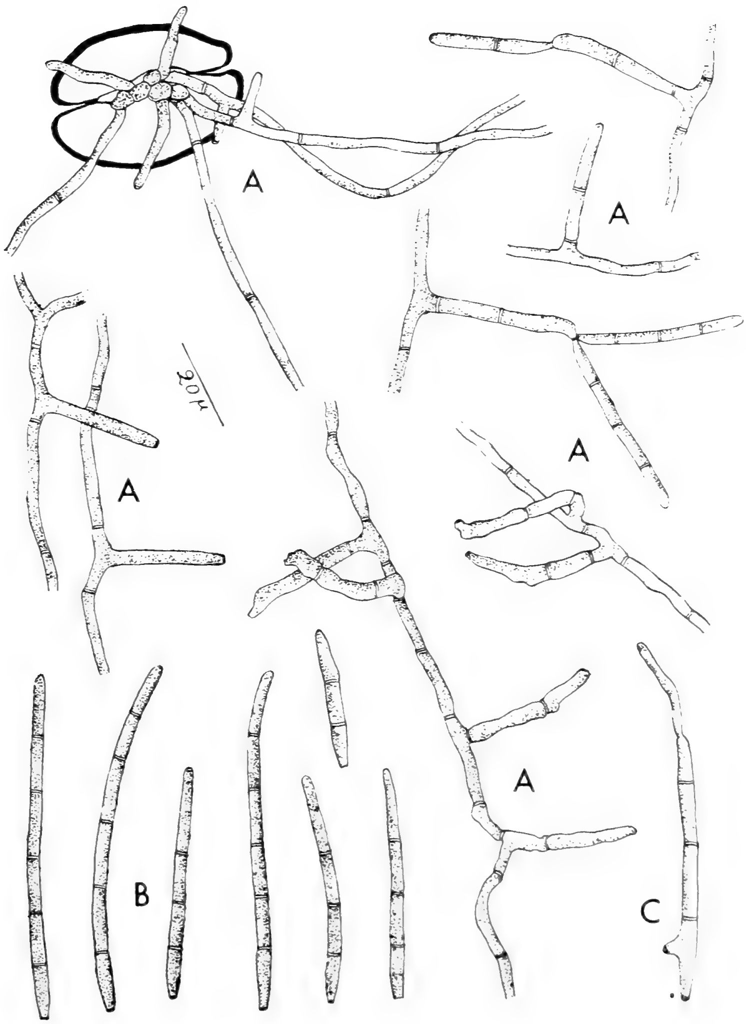

Fig. 18. *Cercospora holobrunnea* Yen: A, external hyphae and unbranched conidiophores; B, conidia; C, germination of conidia.

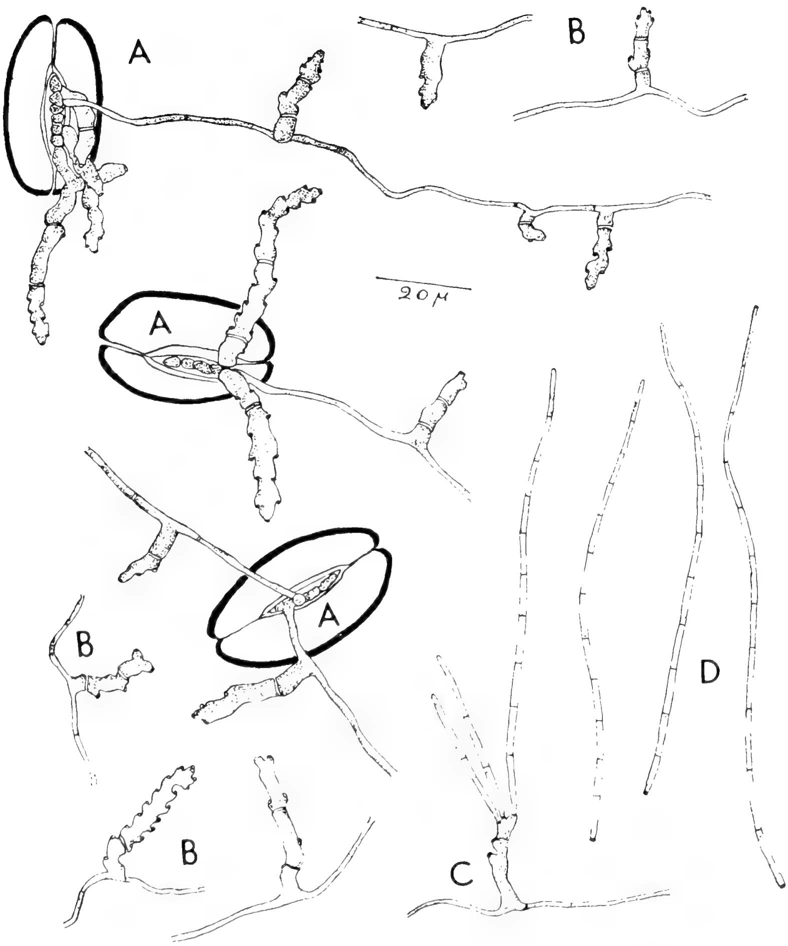

Fig. 19. *Cercospora hyalofilispora* Yen: A & B, external hyphae and unbranched conidiophores; C, formation of conidia; D, conidia.

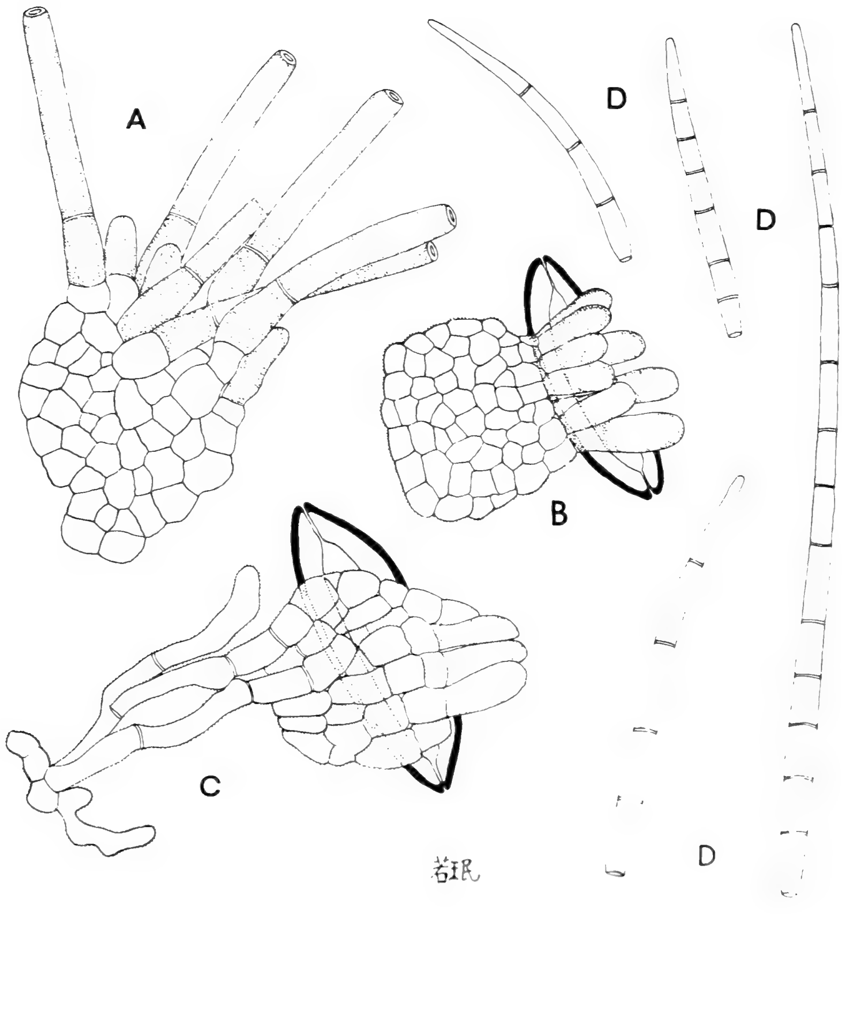

Fig. 20. *Cercospora ipomoeae-pes-caprae* Yen & Lim: A, fascicle of old conidiophores; B & C, fascicle of young conidiophores; D, conidia.

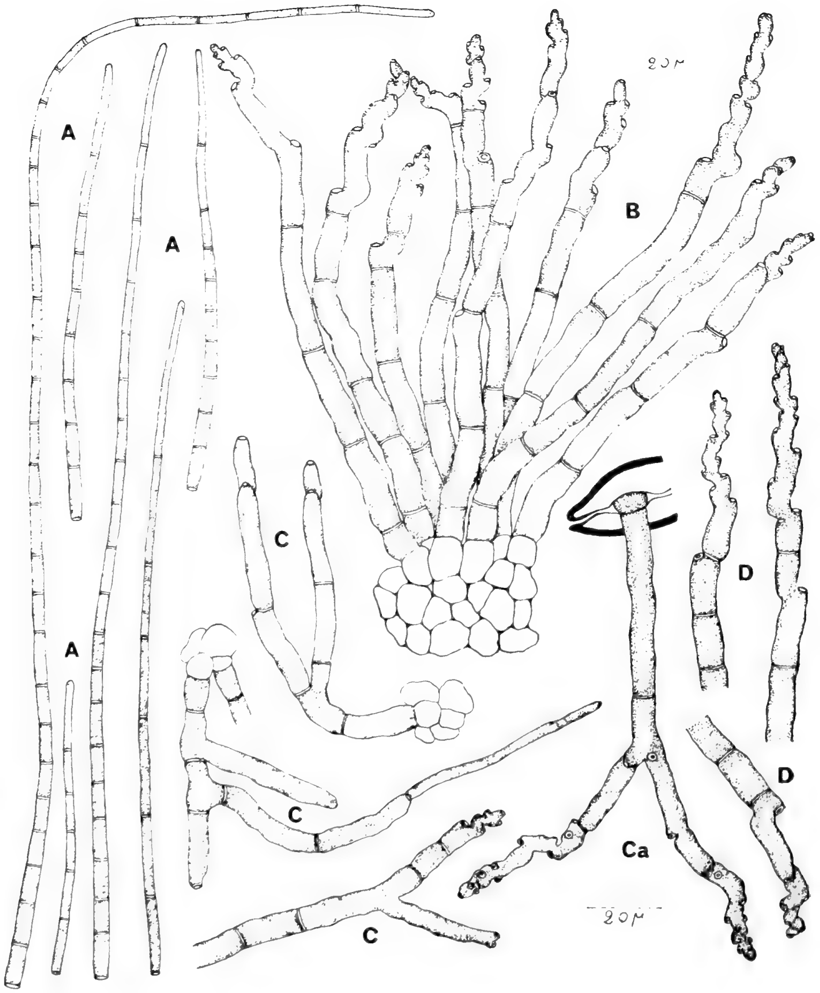

Fig. 21. *Cercospora nicotianicola* Yen: A, conidia; B, fascicle of old conidiophores and stromata; C & Ca, branched conidiophores; D, ends of conidiophores.

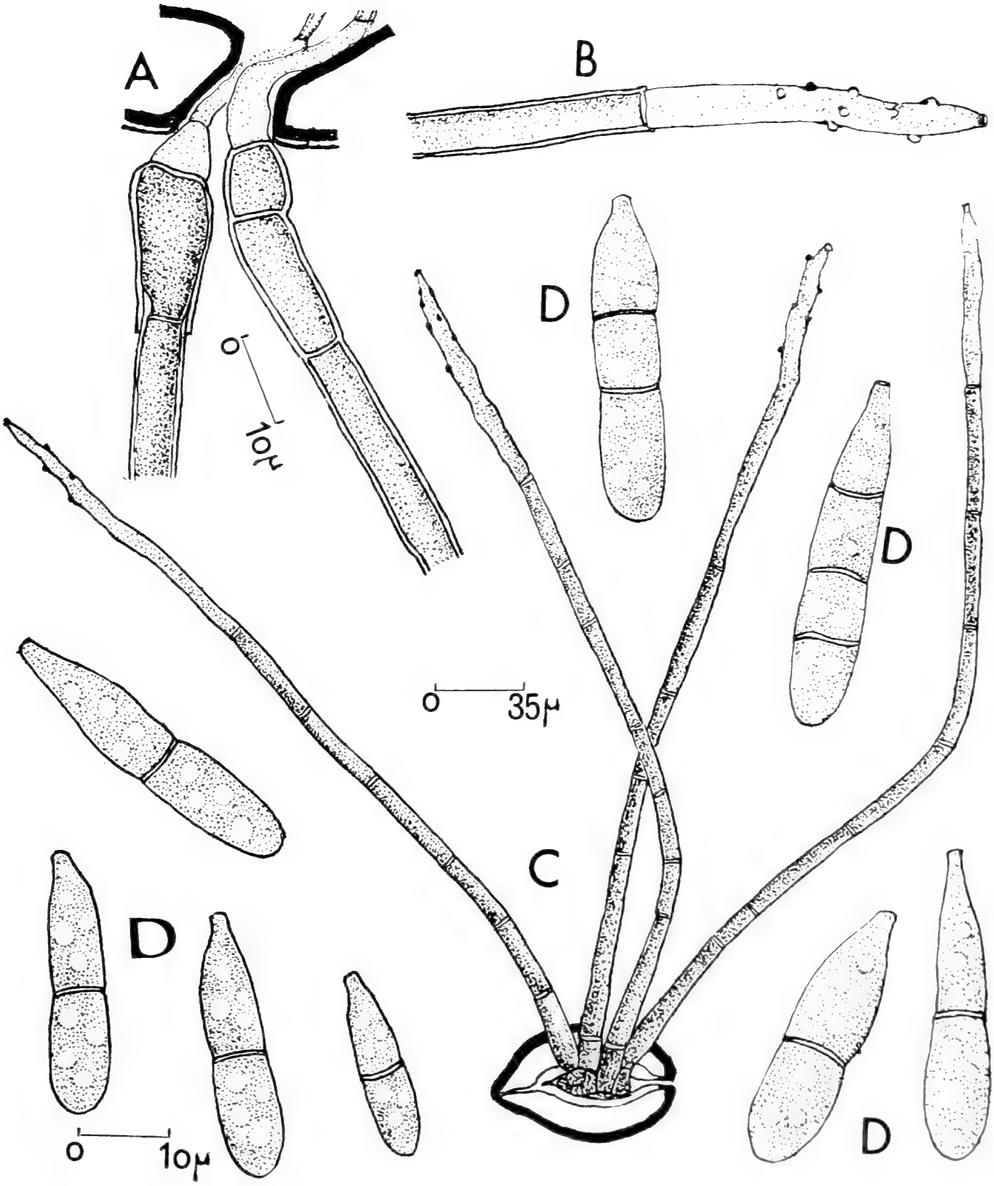

Fig. 22. *Cercospora peristrophes-acuminatae* Yen: A & C, fascicles of conidiophores; B, tip of conidiophore; D, conidia.

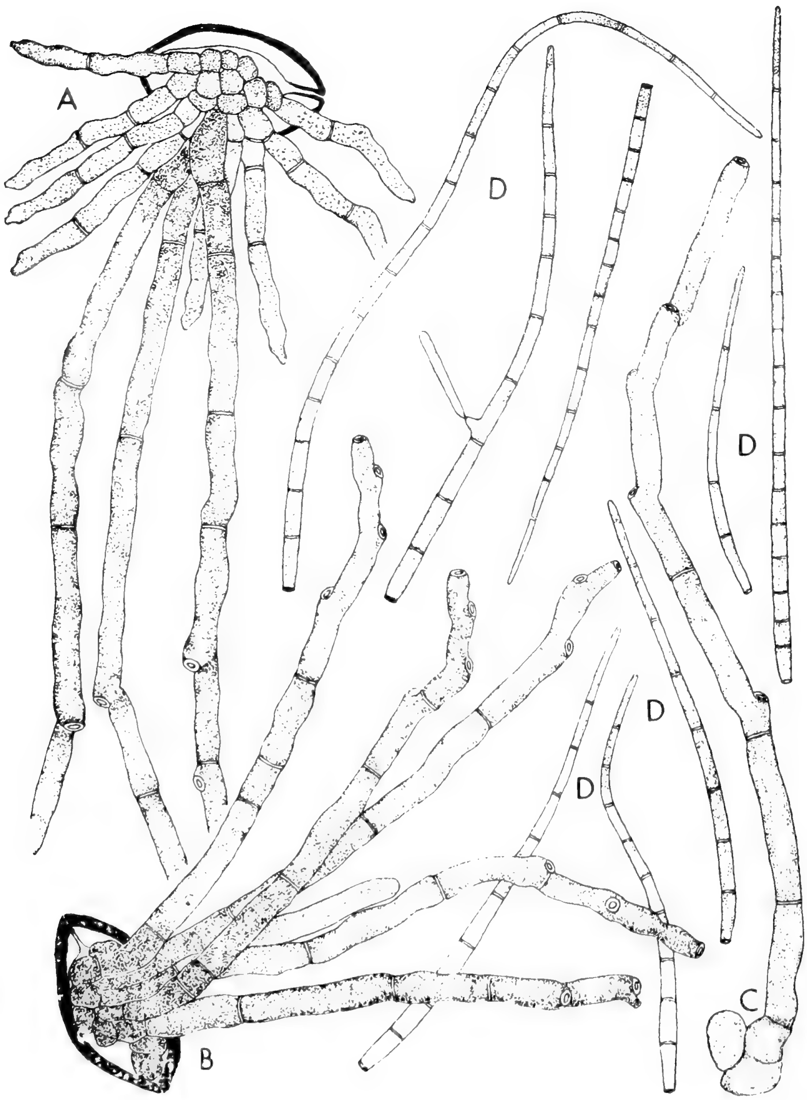

Fig. 23. *Cercospora psophocarpicola* Yen: A & B, fascicles of conidiophores; C, old single conidiophore; D, conidia.

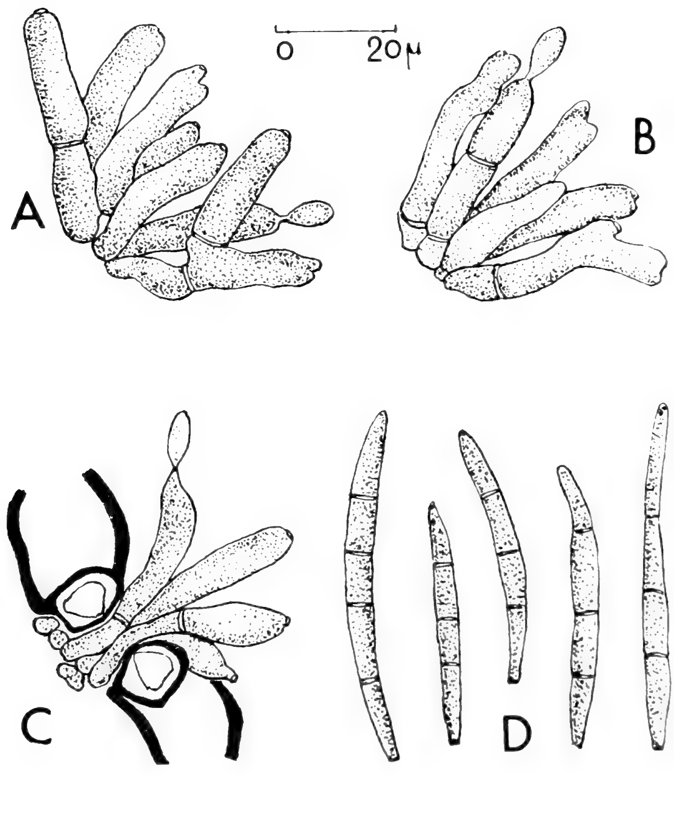

Fig. 24. *Cercospora pudicae* Yen: A-C, fascicles of conidiophores; D, conidia.

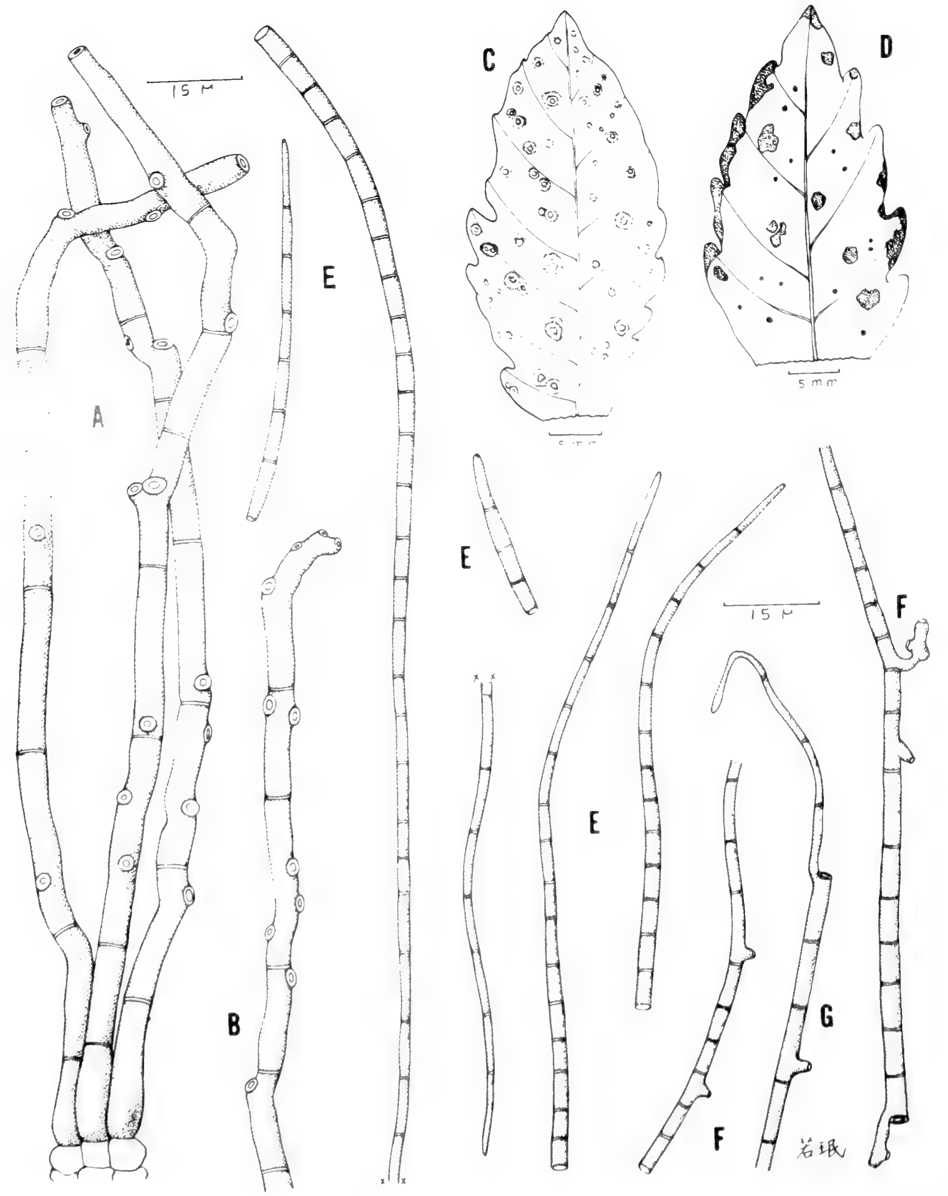

Fig. 25. *Cercospora sesamigena* Yen & Lim: A, fascicle of conidiophores; B, tip of old conidiophore; D, leaf spots; E, conidia; F & G, germination de conidia; C, leaf spots of *Cercospora sesami* Zimm.

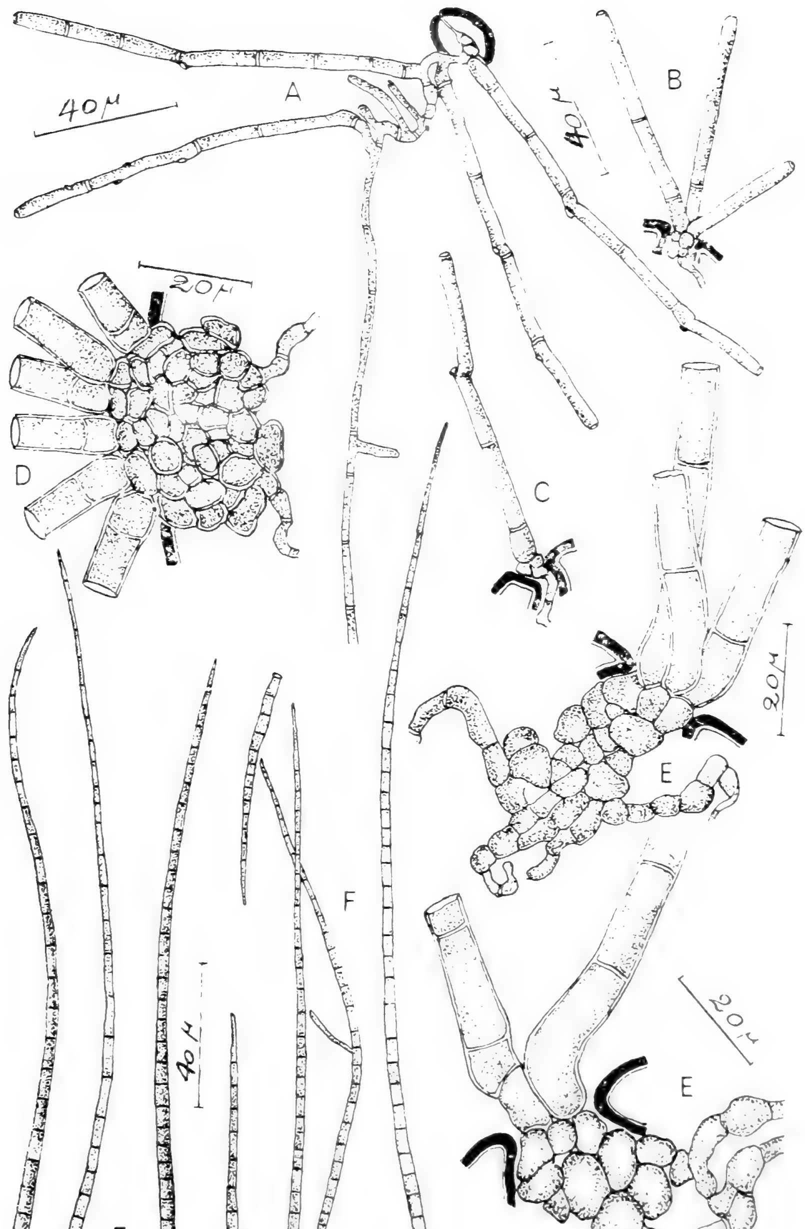

Fig. 26. *Cercospora thunbergiana* Yen: A-C, fascicles of conidiophores; D & E, formation of stromata; F, conidia.

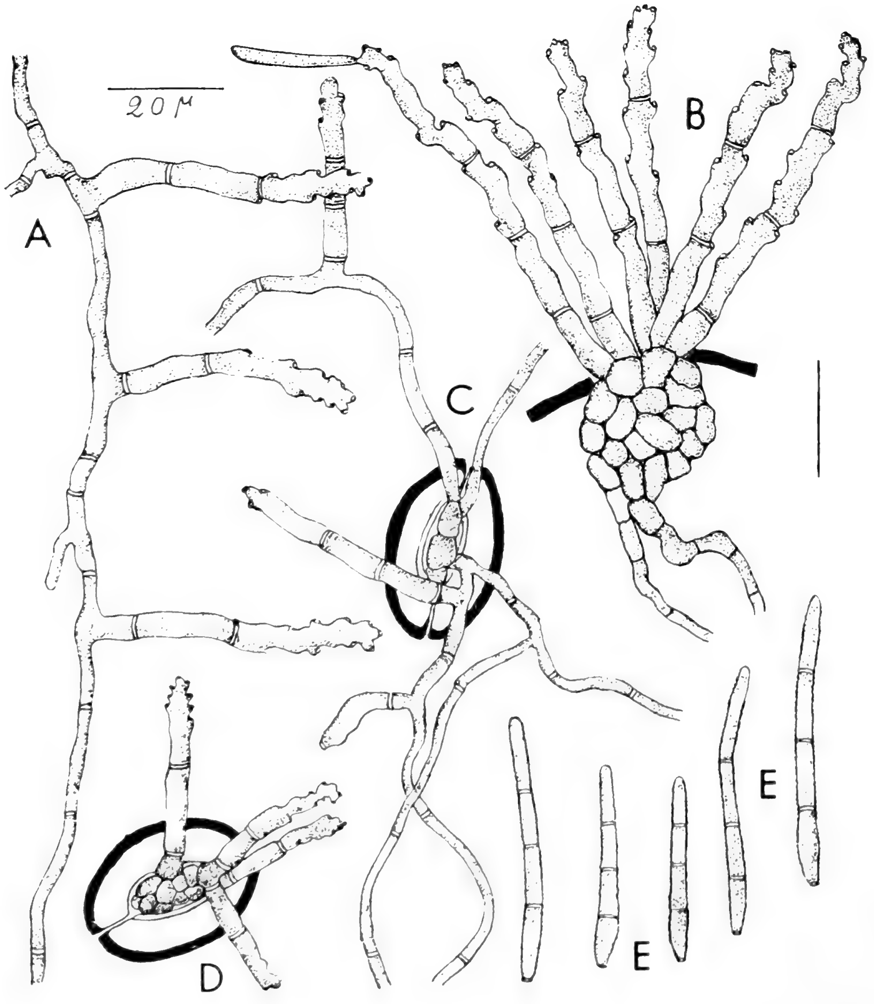

Fig. 27. *Cercospora triseptospora* Yen: A & C, external hyphae and unbranched conidiophores; B & D, fascicles of conidiophores and stromata;; E, conidia.

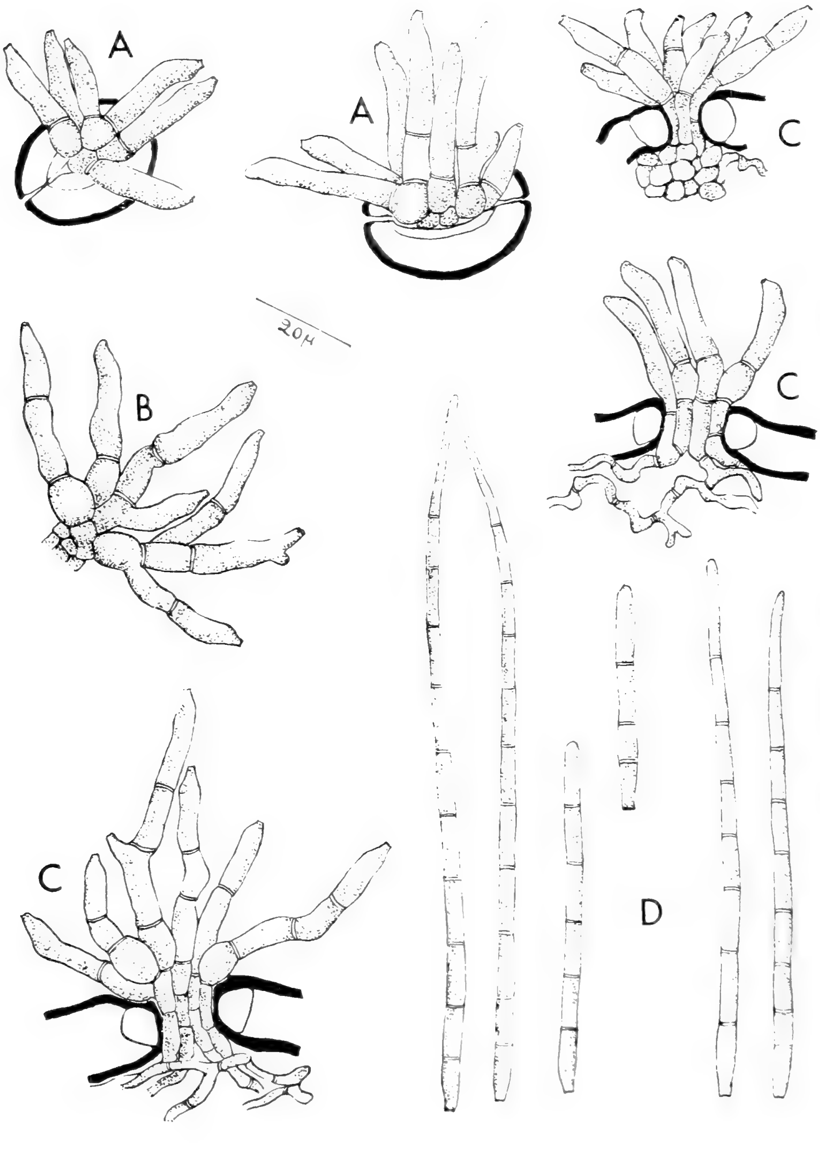

Fig. 28. *Pseudocercospora acalyphigena* (Yen) Yen: A, young conidiophores; B, old and branched conidiophores; C, rudimentary stromata; D, conidia.

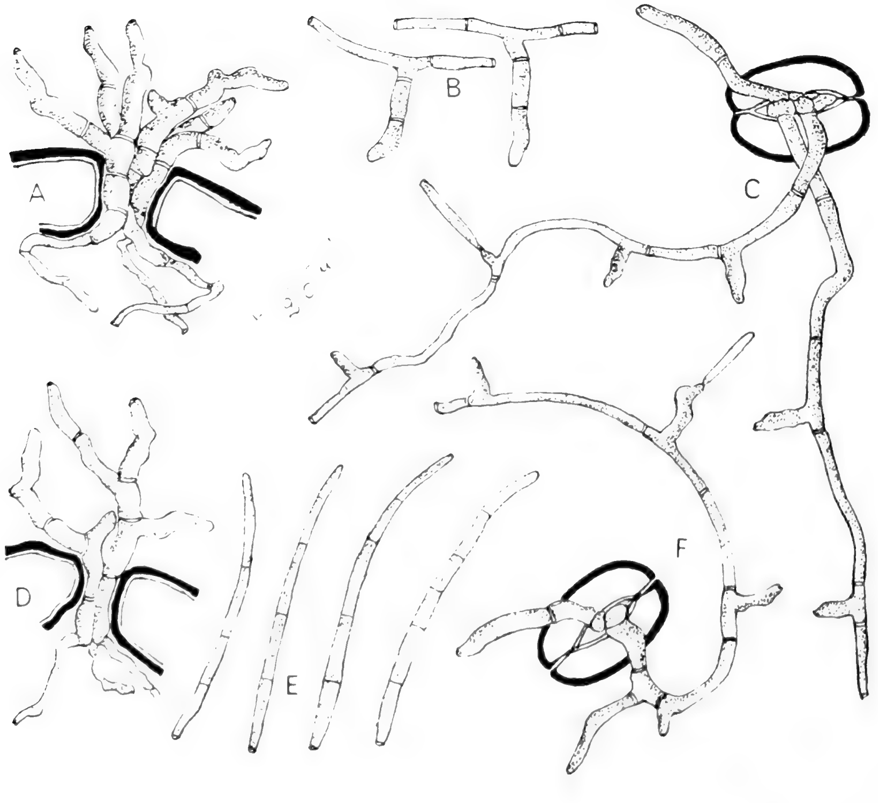

Fig. 29. *Pseudocercospora allamendae* (Yen) Yen: A, fascicle of conidiophores; B, C & F, external hyphae and unbranched conidiophores; D, branched conidiophores; E, conidia.

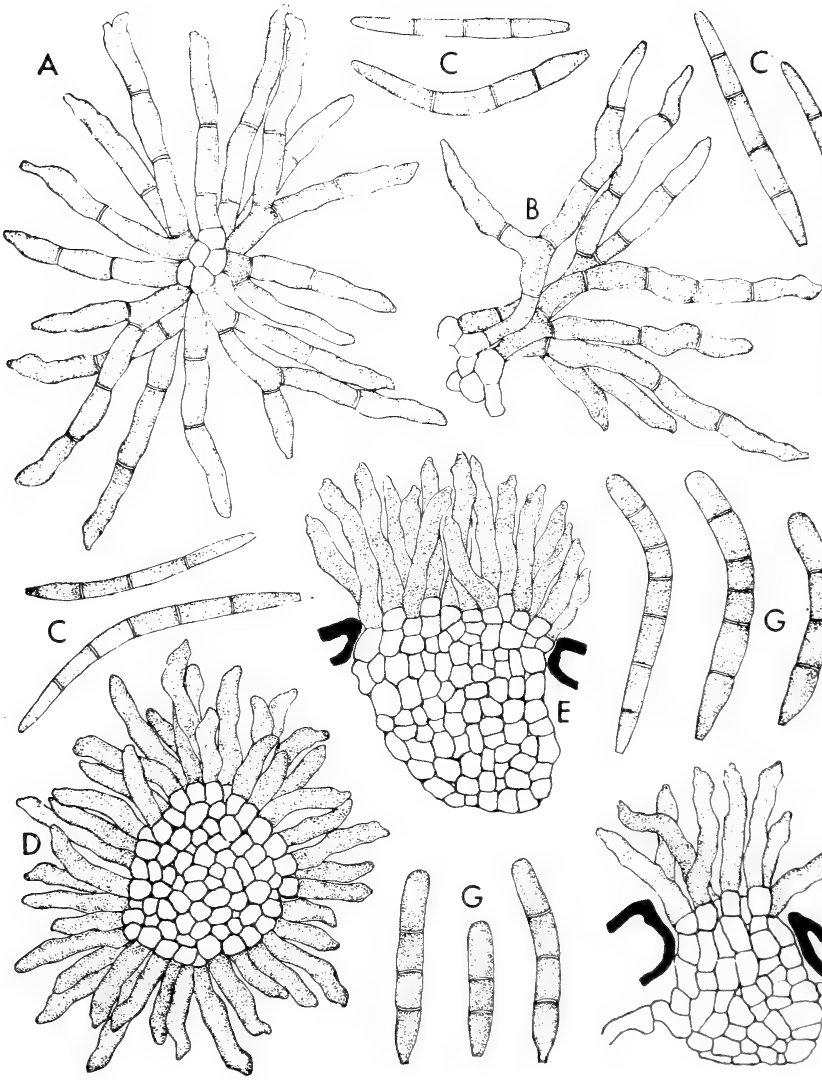

Fig. 30. *Pseudocercospora aranetae* (Borl. & Rold) Yen (A-C): A & B, fascicles of conidiophores; C, conidia. *Pseudocercospora psophocarpi* (Yen) Deighton (D-G): D-F, fascicles of conidiophores and stromata; G, conidia.

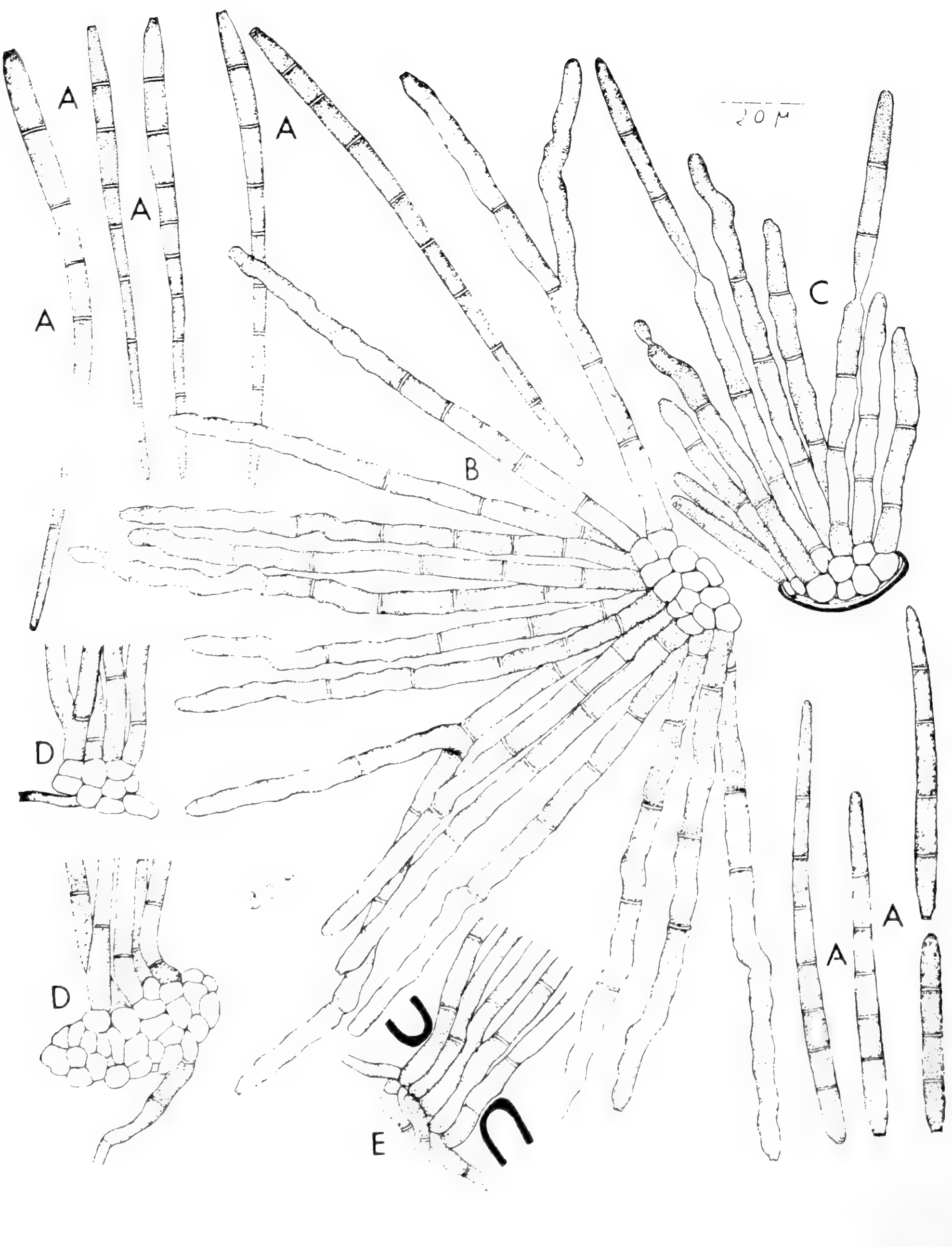

Fig. 31. *Pseudocercospora asystasiae* (Yen) Yen: A, conidia; B, fascicle of old conidiophores; C, fascicle of young conidiophores; D, stromata; E, absence of stromata.

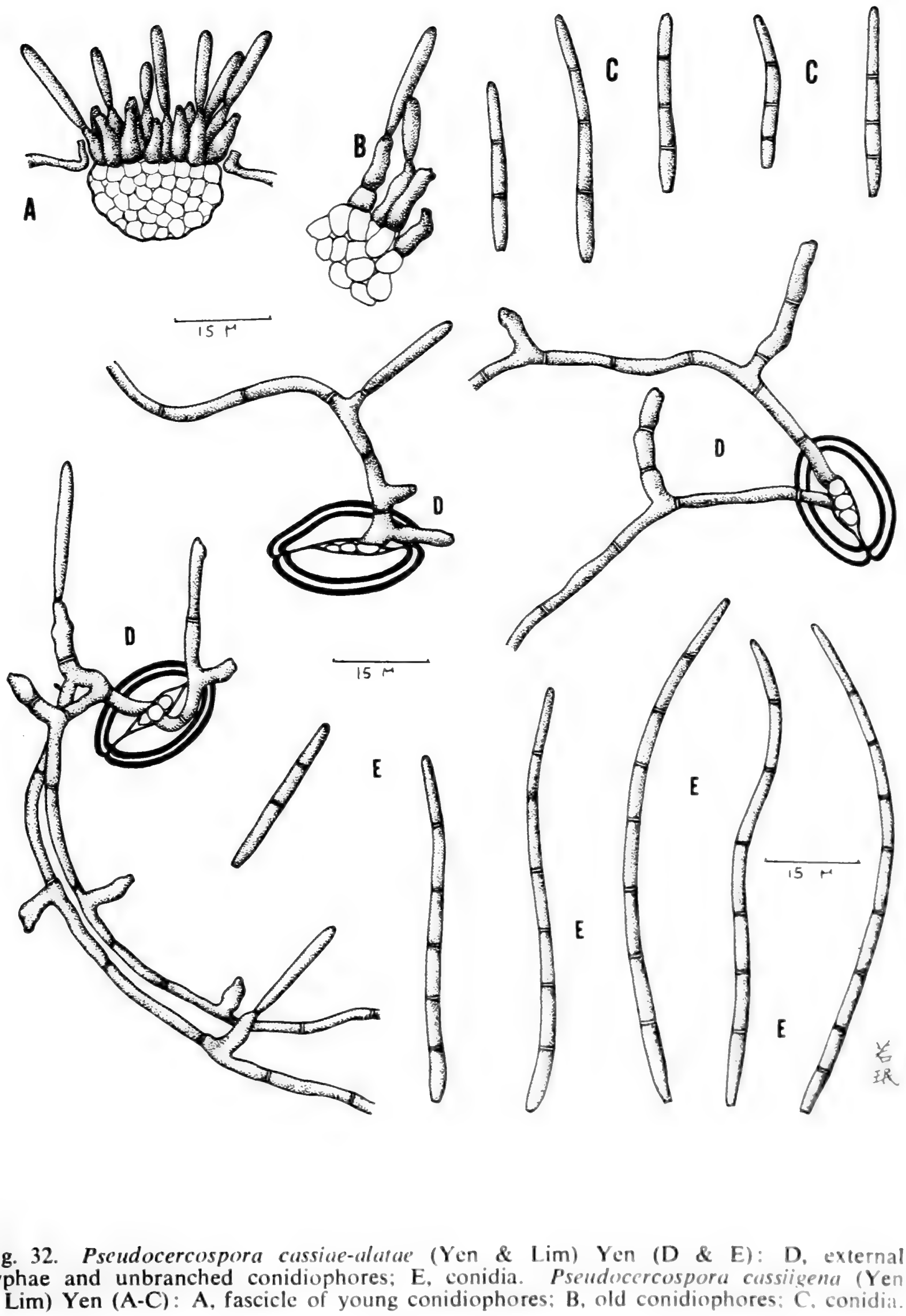

Fig. 32. ***Pseudocercospora cassiae-alatae*** **(Yen & Lim) Yen (D & E):** D, external hyphae and unbranched conidiophores; E, conidia. *Pseudocercospora cassiigena* (Yen & Lim) Yen (A-C): A, fascicle of young conidiophores; B, old conidiophores; C, conidia.

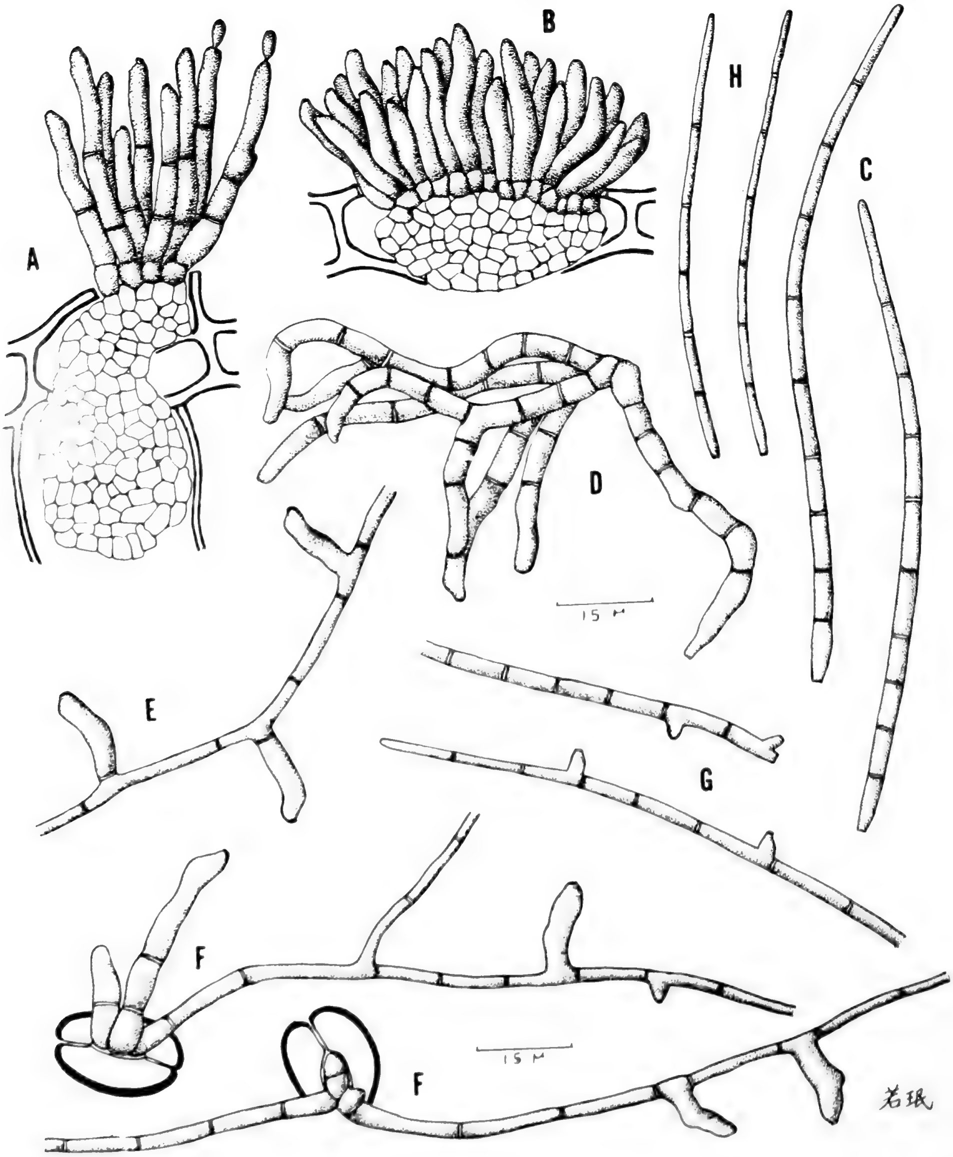

Fig. 33. *Pseudocercospora centrosematicola* (Yen & Lim) Yen: A, fascicle of old conidiophores and stromata; B, fascicle of young conidiophores and stromata; C. conidia. D, branched conidiophores; E & F, external hyphae and single conidiophores; G, germination of conidia; H, secondary conidia.

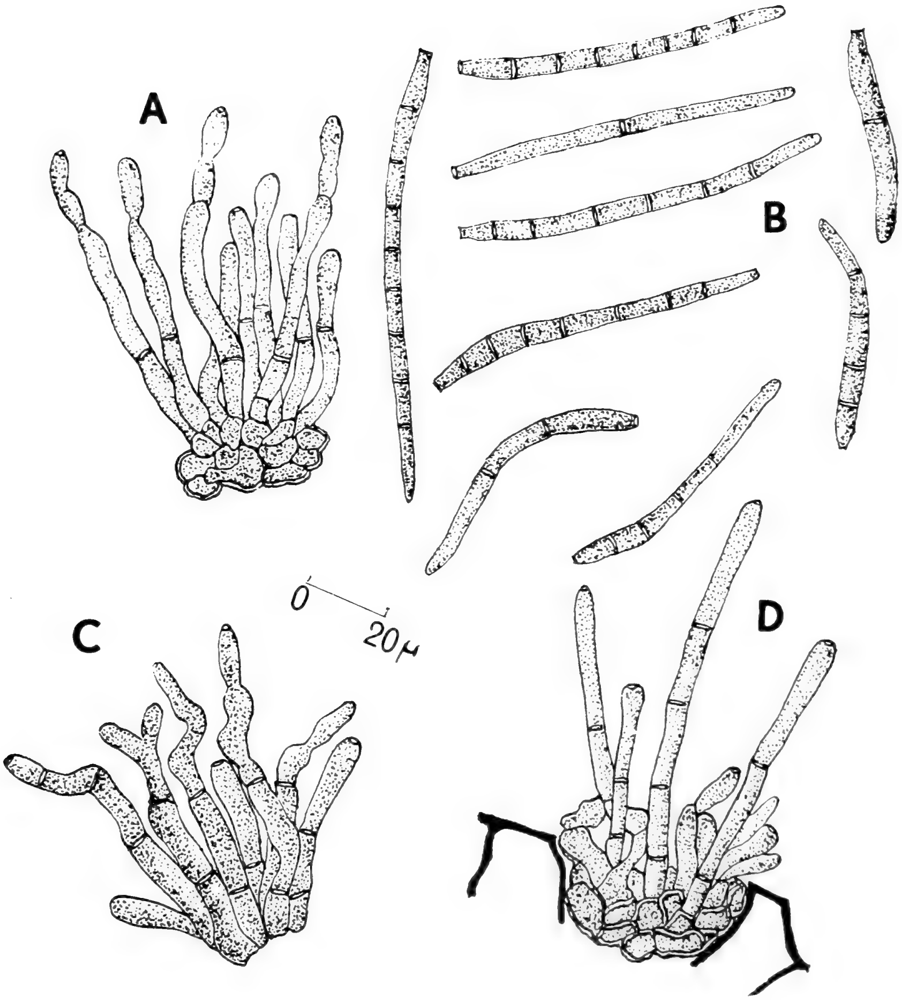

Fig. 34. ***Pseudocercospora chrysanthemicola*** (Yen) Deighton: A, fascicle of young **conidiophores and stromata;** B, conidia; C & D, fascicle of old conidiophores.

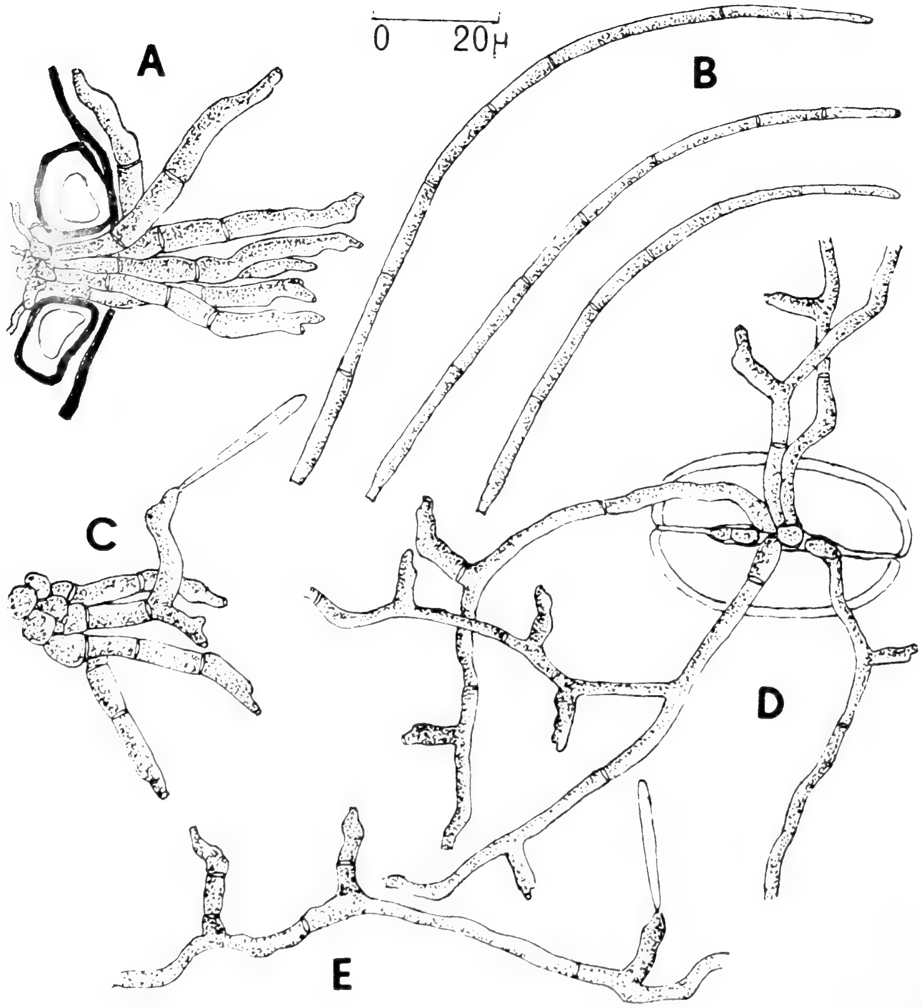

Fig. 35. *Pseudocercospora cordiicola* (Yen) Yen: A & C, fascicle of conidiophores; B, conidia; D & E, external hyphae and unbranched conidiophores.

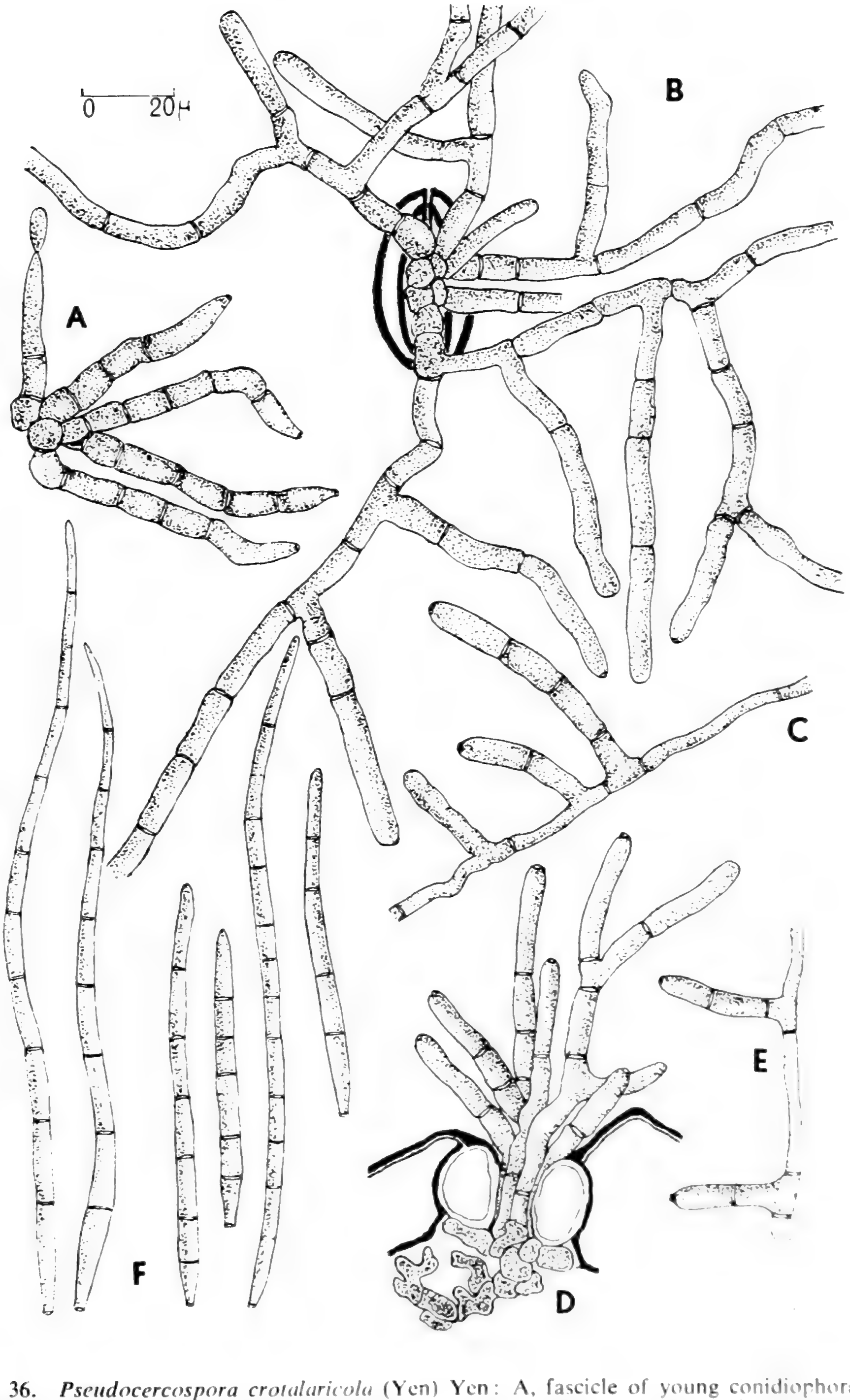

Fig. 36. ***Pseudocercospora crotalaricola*** (Yen) Yen: A, fascicle of young conidiophores; B, old conidiophores and external hyphae; C & E, external hyphae and unbranched conidiophores; D, branched conidiophores; F, conidia.

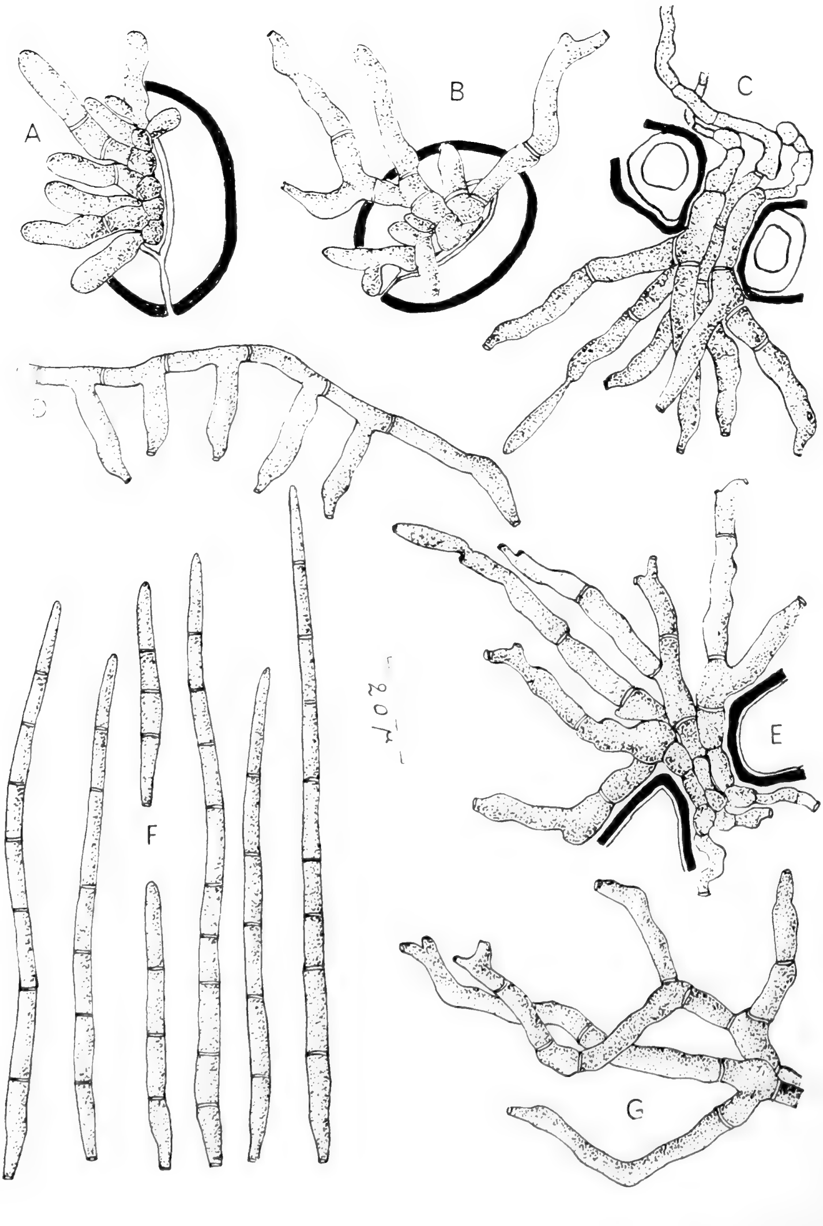

Fig. 37. *Pseudocercospora daturina* (Yen) Deighton: A, fascicle of young conidiophores; B, C & E, fascicle of old conidiophores; F, conidia; G, branched conidiophores.

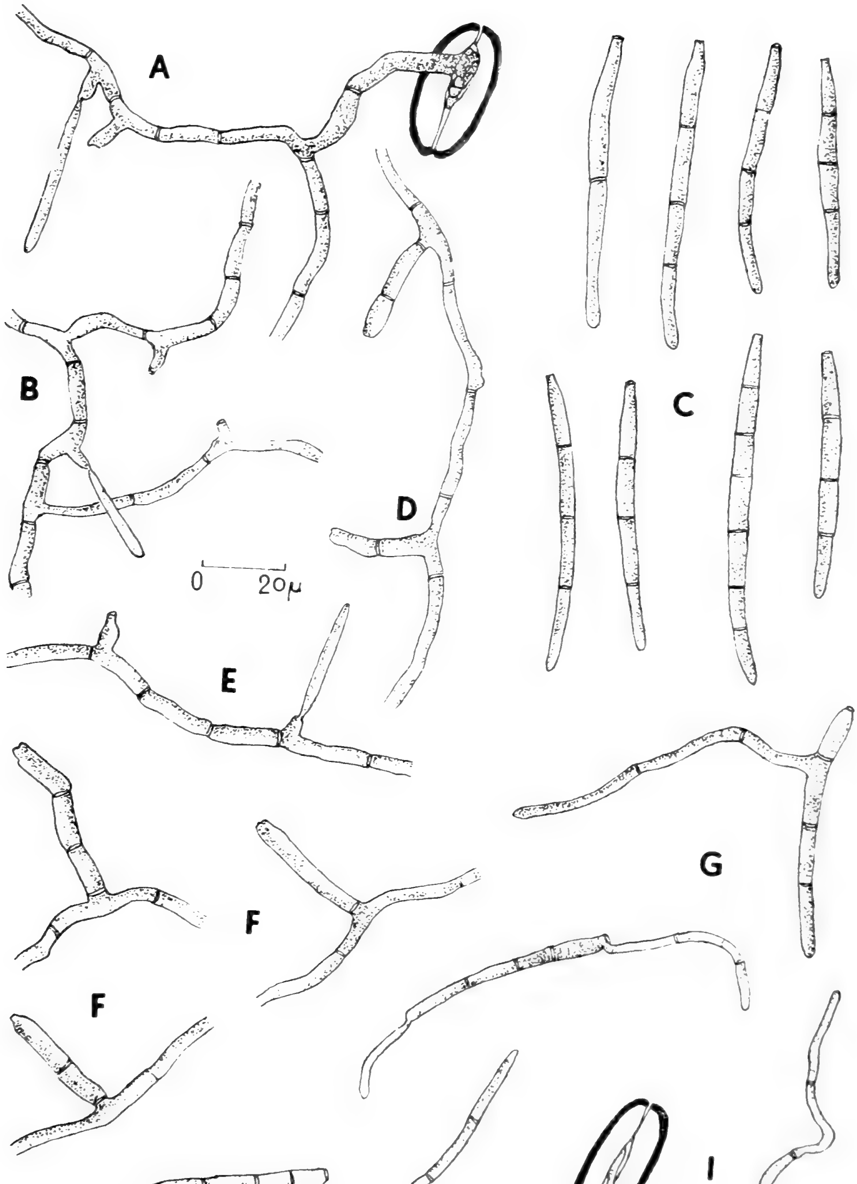

Fig. 38. ***Pseudocercospora delonicis*** **(Yen) Yen: A, B, D, E & F, external hyphae and unbranched conidiophores; C, conidia; G & H, germination of conidia; I, infection by germinative tube through leaf stoma.**

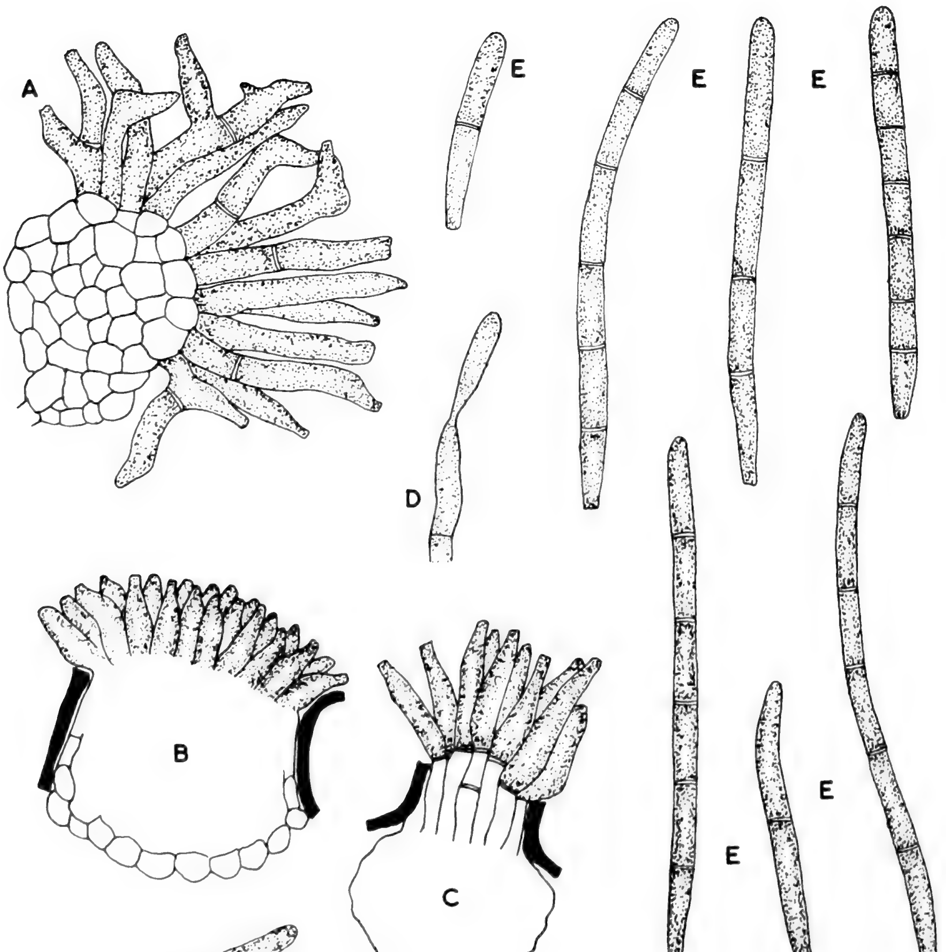

Fig. 39. *Pseudocercospora ervatamiae* (Yen & Lim) Yen: A, fascicle of old conidiophores and stromata; B & C, fascicle of young conidiophores; D, formation of conidia; E, conidia.

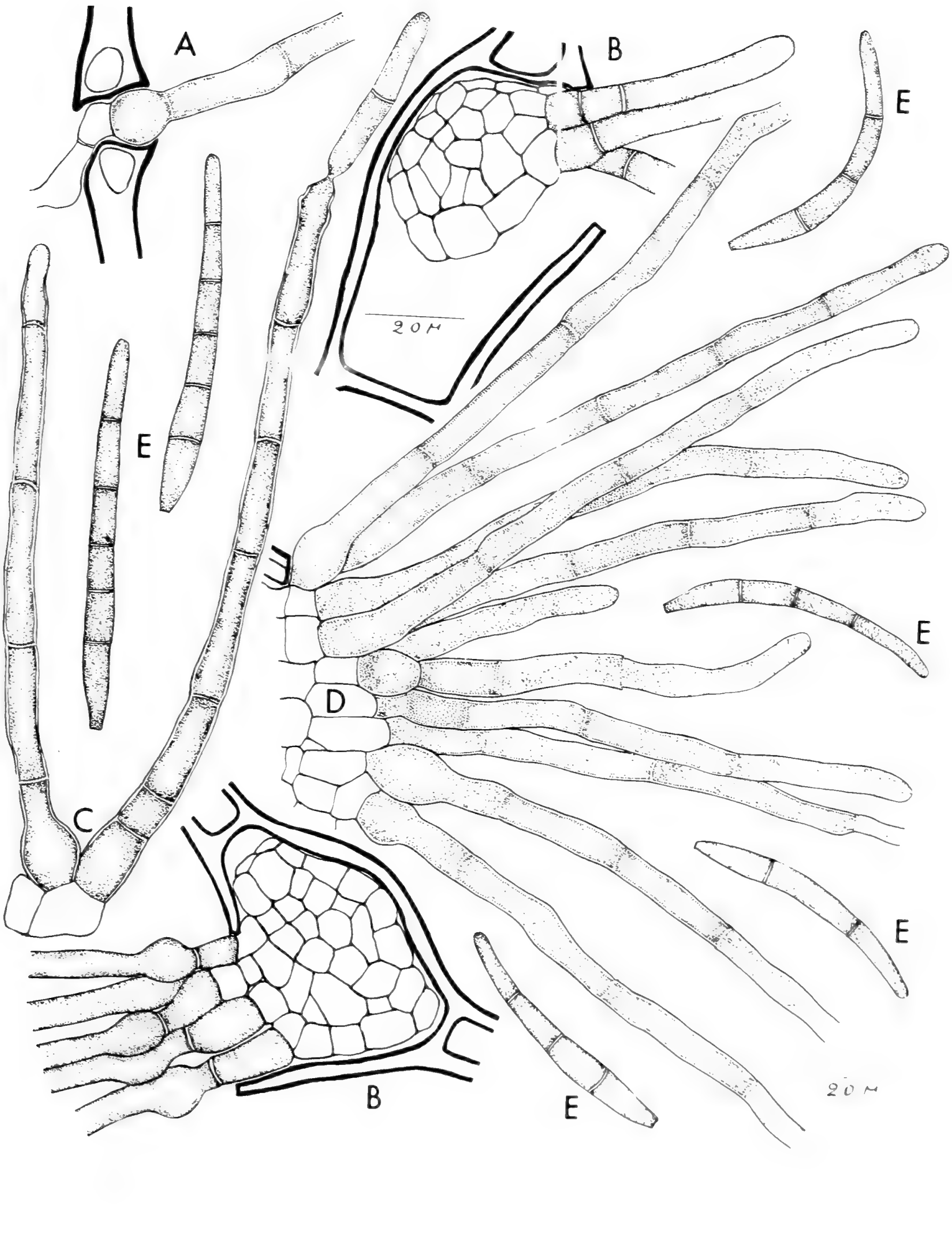

Fig. 40. ***Pseudocercospora fici-chartaceeae*** **(Yen & Lim) Yen: A & C, conidiophores emerging through stomata; B, fascicle of young conidiophores emerging through rupture of epidermis; D, fascicle of old conidiophores; E, conidia.**

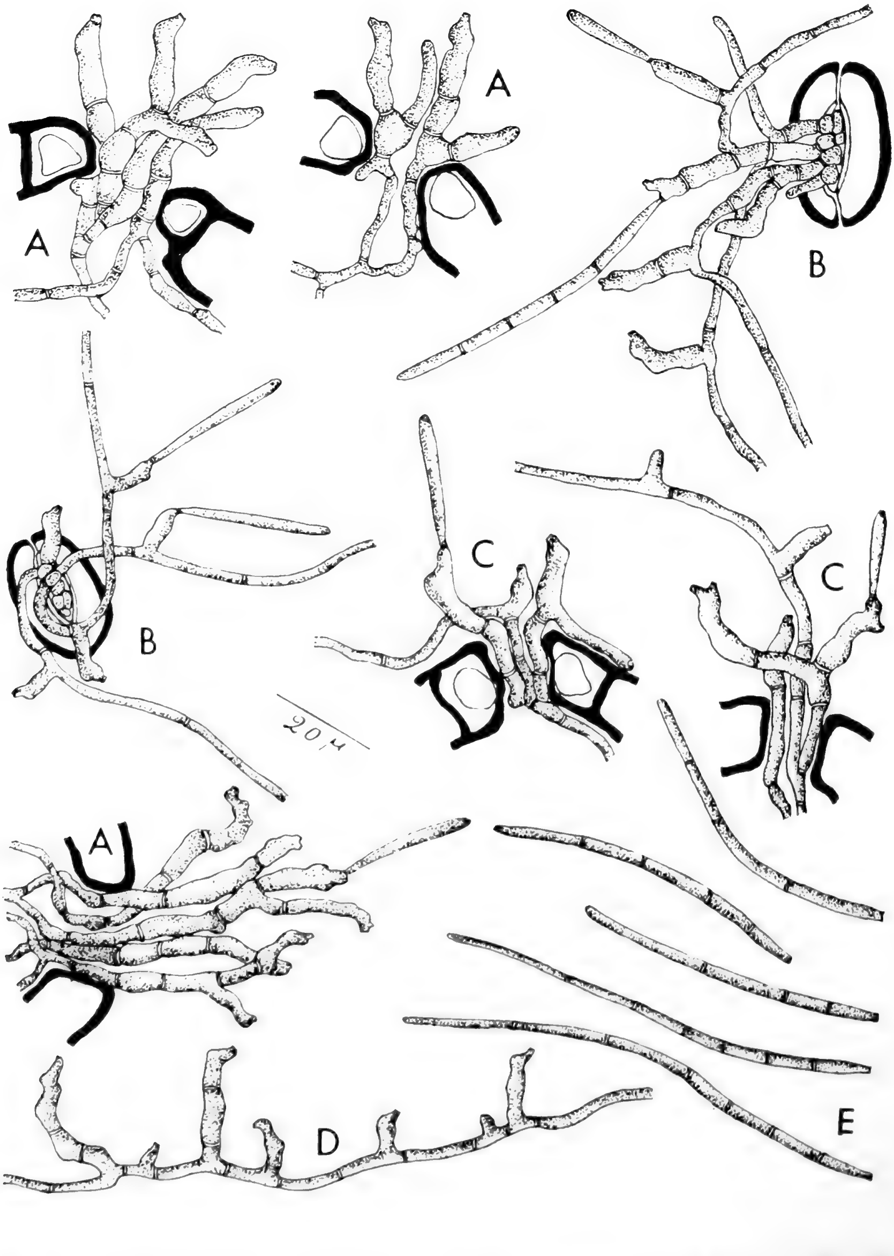

Fig. 41. *Pseudocercospora formosana* (Yamam.) Deighton: A & C, fascicle of old conidiophores; B & D, external hyphae and unbranched conidiophores; E, conidia.

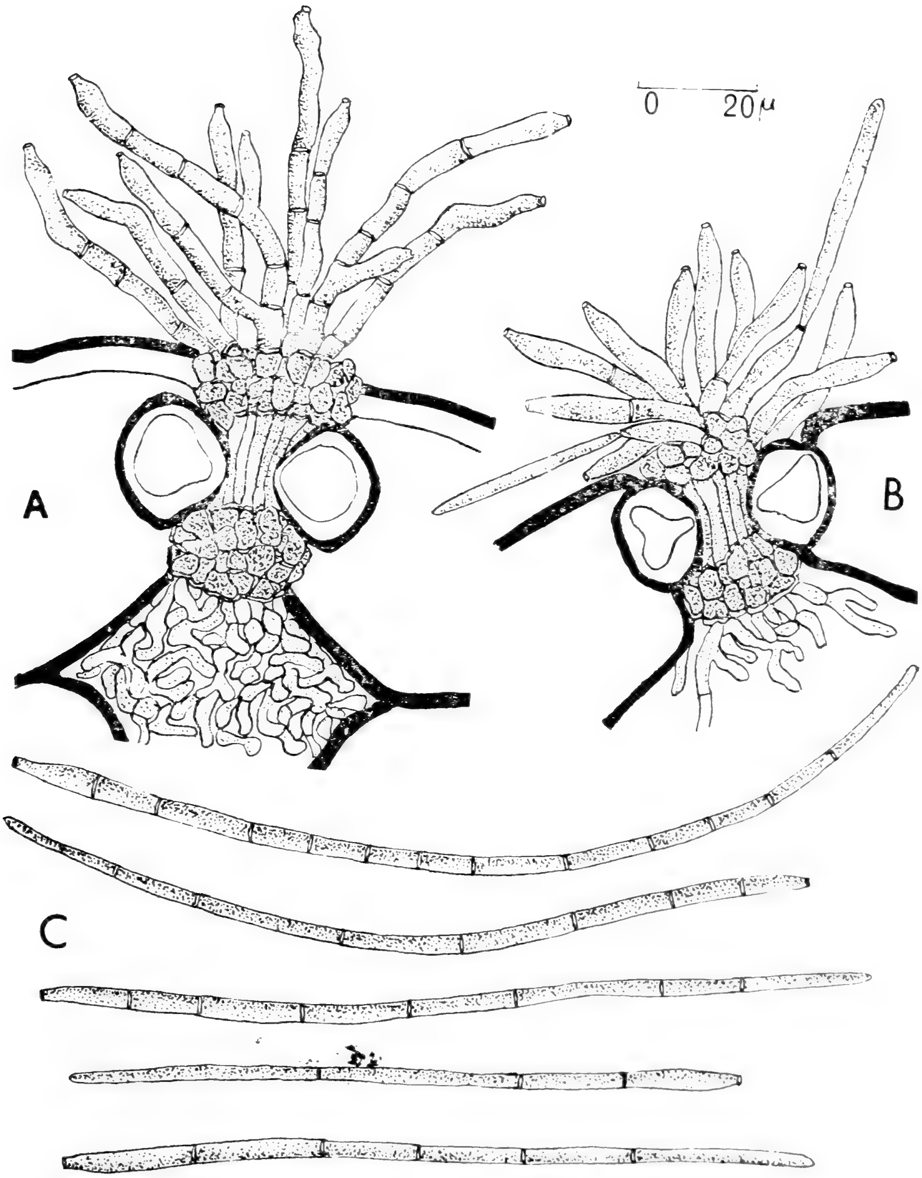

Fig. 42. ***Pseudocercospora globosae*** **(Yen) Deighton: A, fascicle of old conidiophores and stromata; B, fascicle of young conidiophores; C, conidia.**

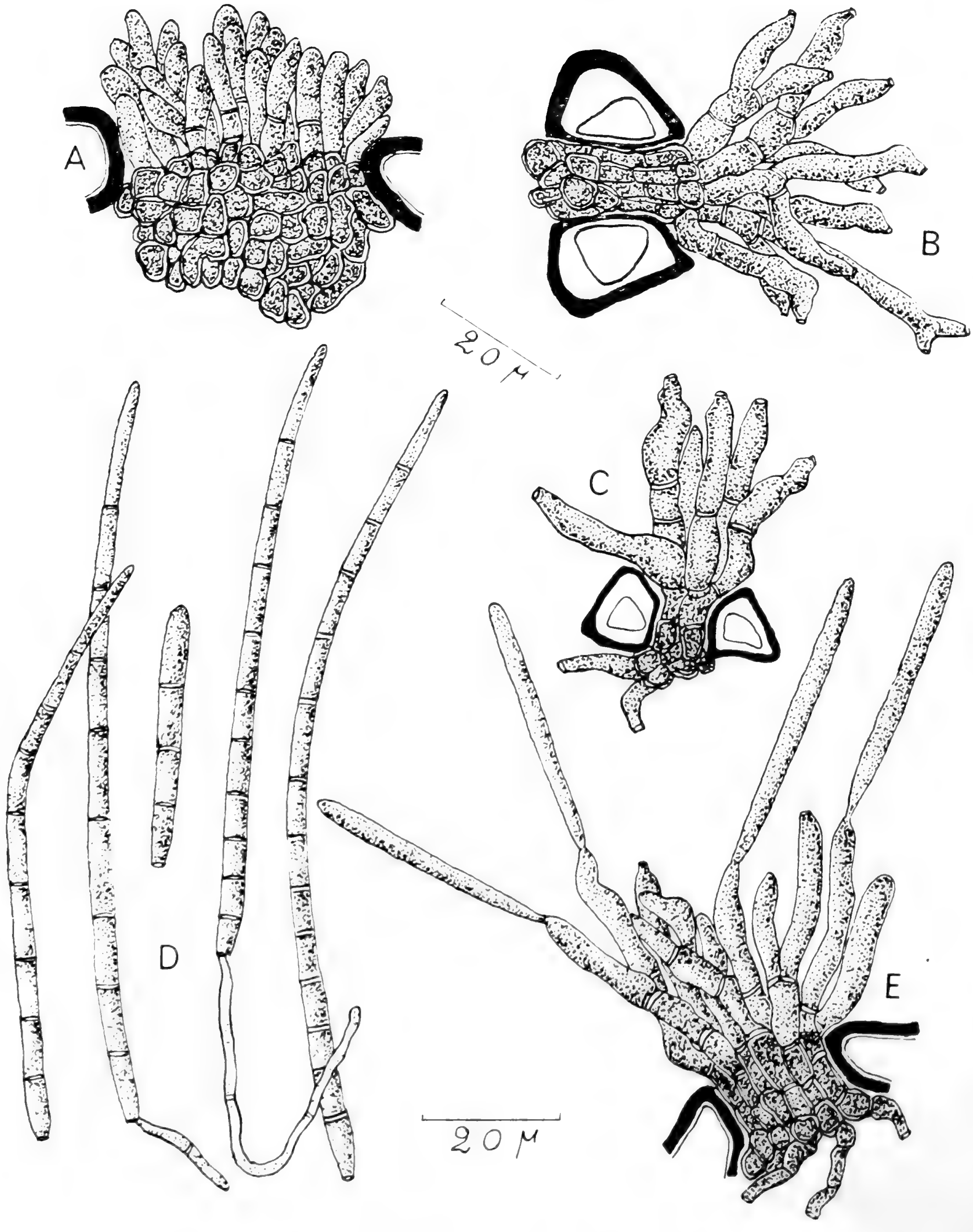

Fig. 43. *Pseudocercospora ipomoeae-purpureae* (Yen) Yen: A, fascicle of young conidiophores and stromata; B & C, fascicle of old conidiophores; D, conidia and germination of conidia; E, formation of conidia.

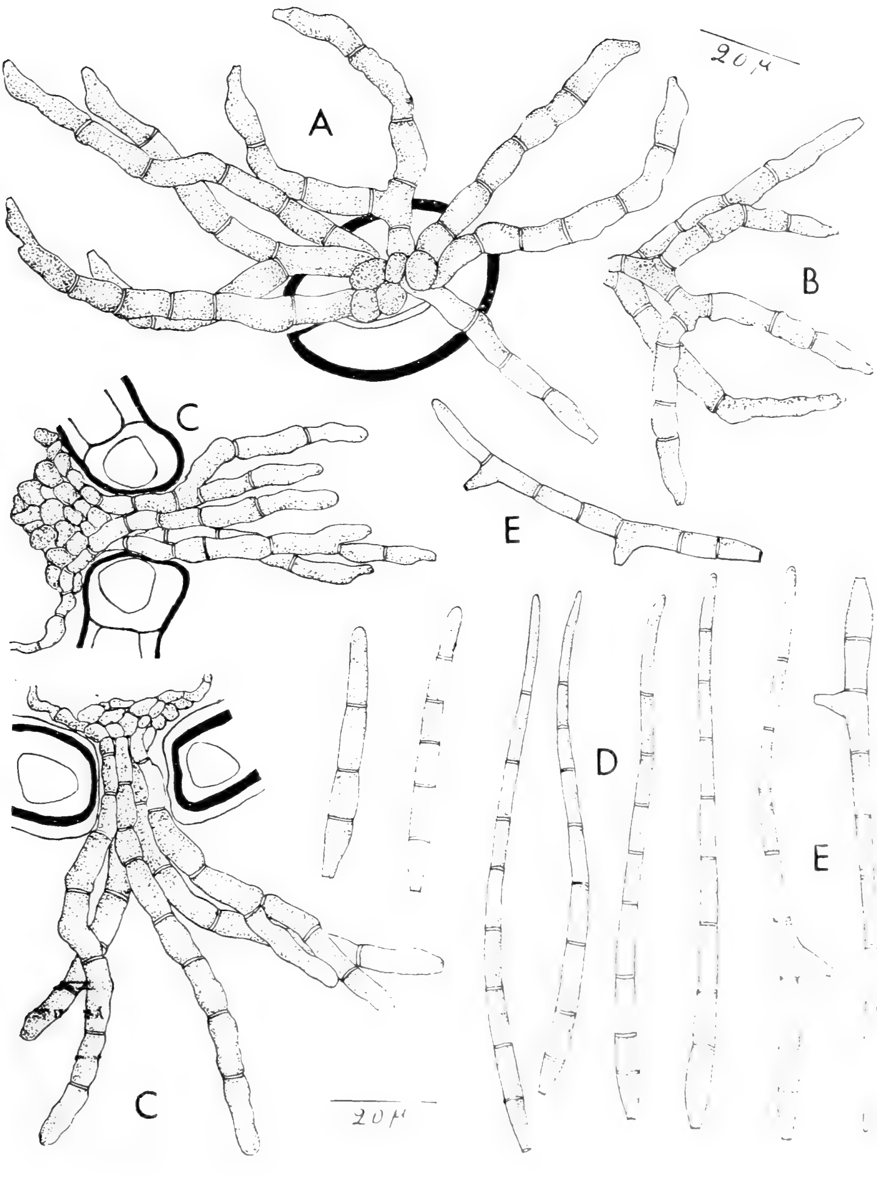

Fig. 44. ***Pseudocercospora ixoricola*** **(Yen) Yen: A & B, fascicles of old conidiophores; C, fascicle of young conidiophores; D, conidia; E, germination of conidia.**

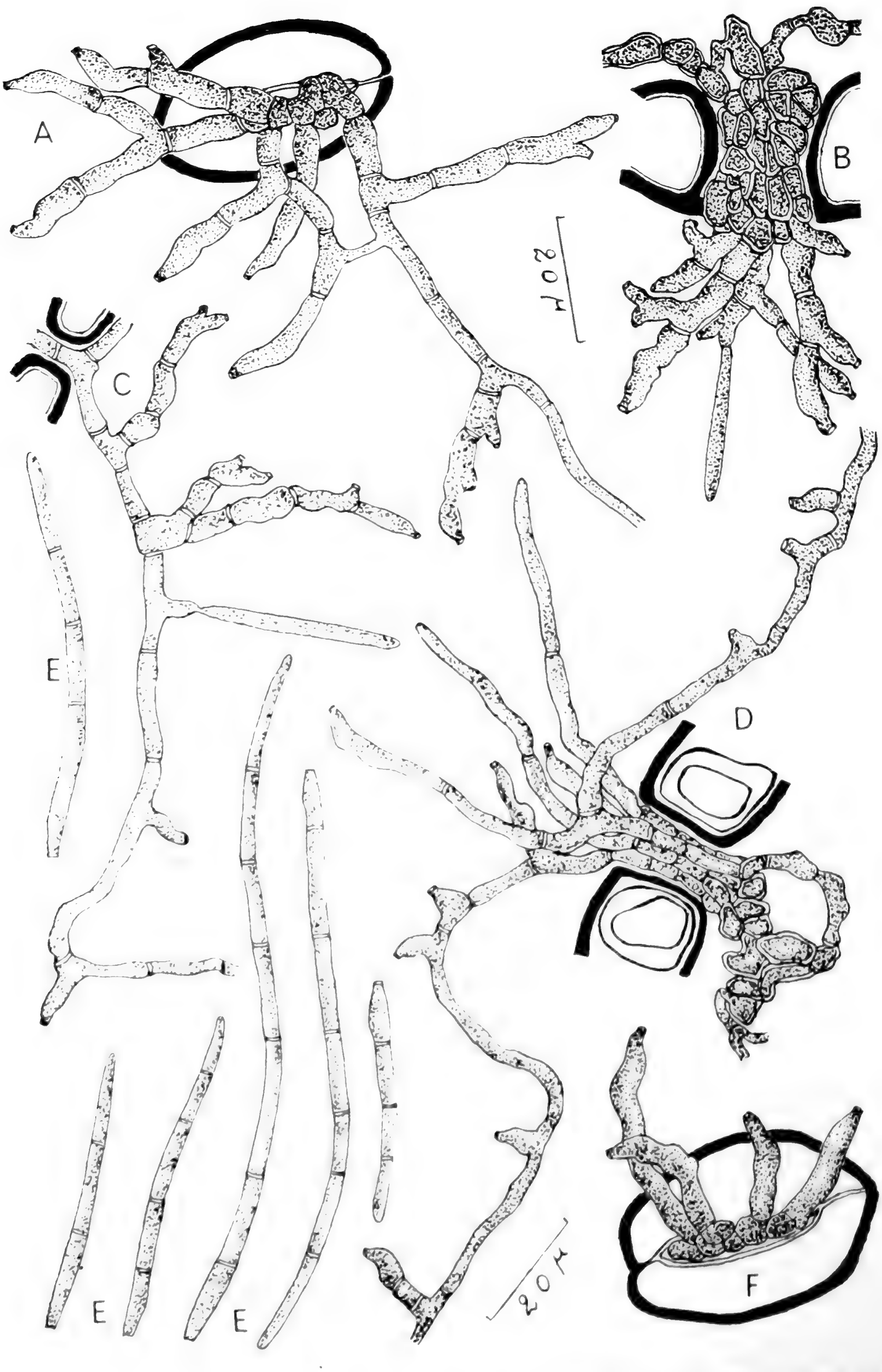

Fig. 45. *Pseudocercospora jatrophae-curcas* (Yen) Deighton: A & B, fascicles of old conidiophores; C & D, external hyphae and unbranched conidiophores; E, conidia; F, fascicle of young conidiophores.

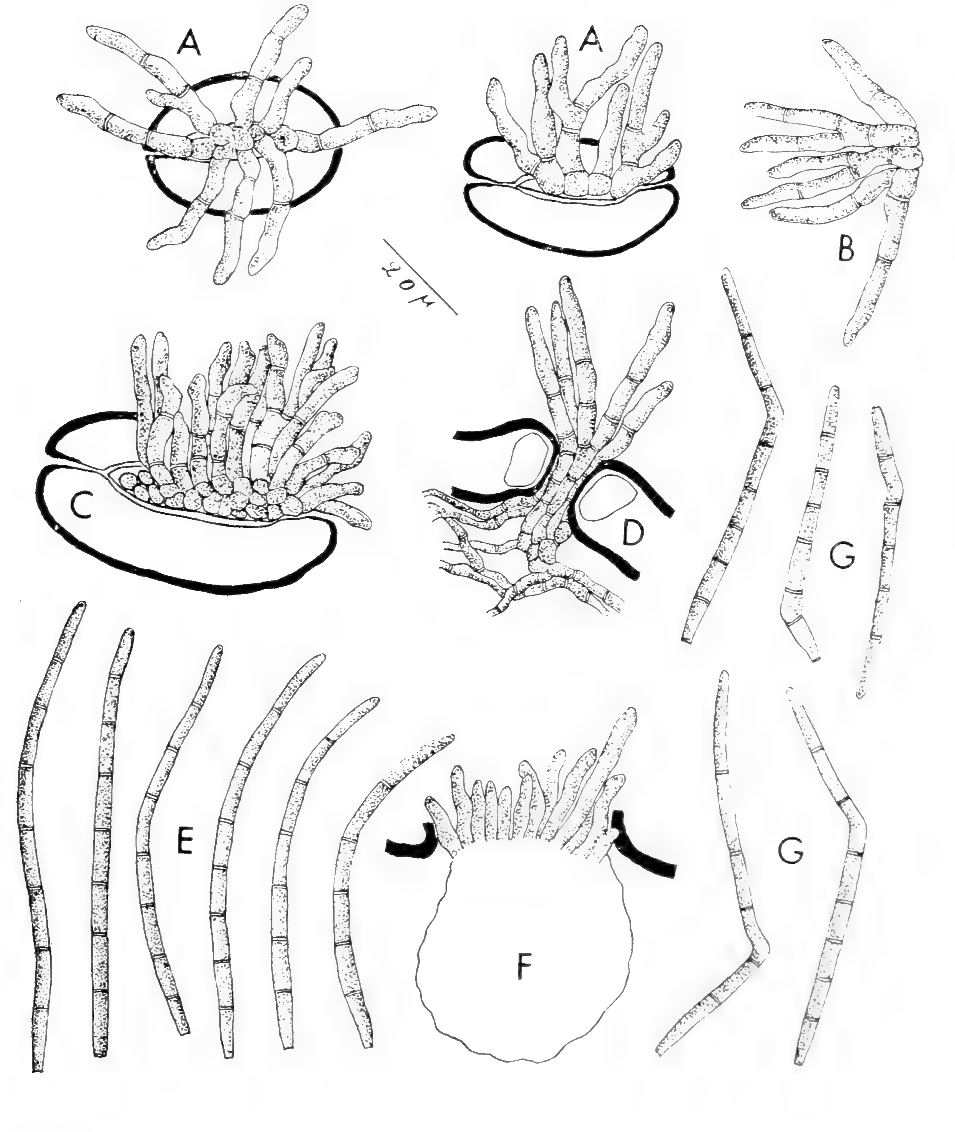

Fig. 46. ***Pseudocercospora katongensis*** (Yen) Yen: A, B & D, meagre fascicles; C & F, dense fascicles of conidiophores and stromata; E, conidia; G, geniculate conidia.

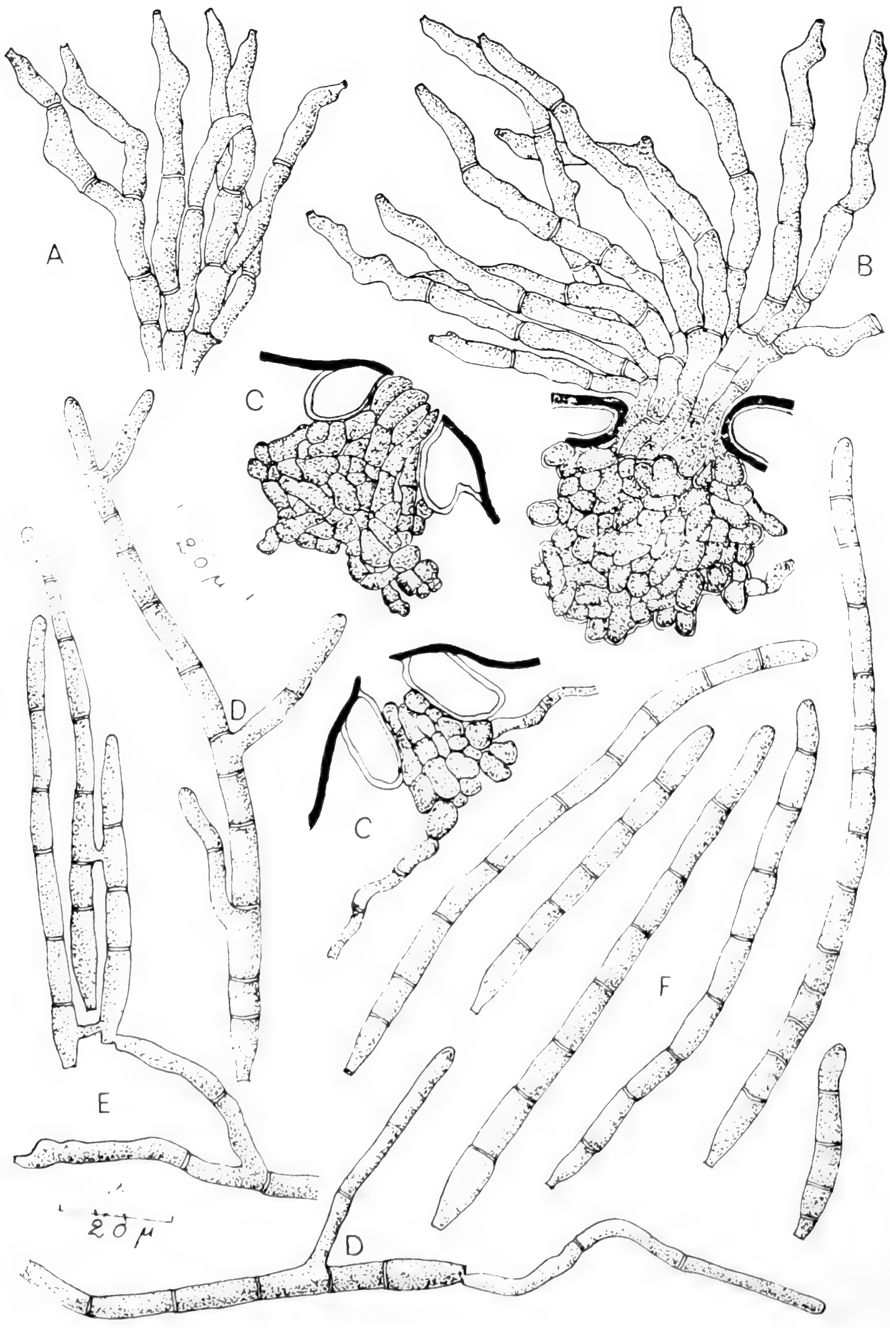

Fig.. 47. *Pseudocercospora lyciicola* (Yen) Yen: A & B, fascicles of old conidiophores and stromata; C, formation of stromata; D, germination of conidia; E, anastomosis of conidia; F, conidia.

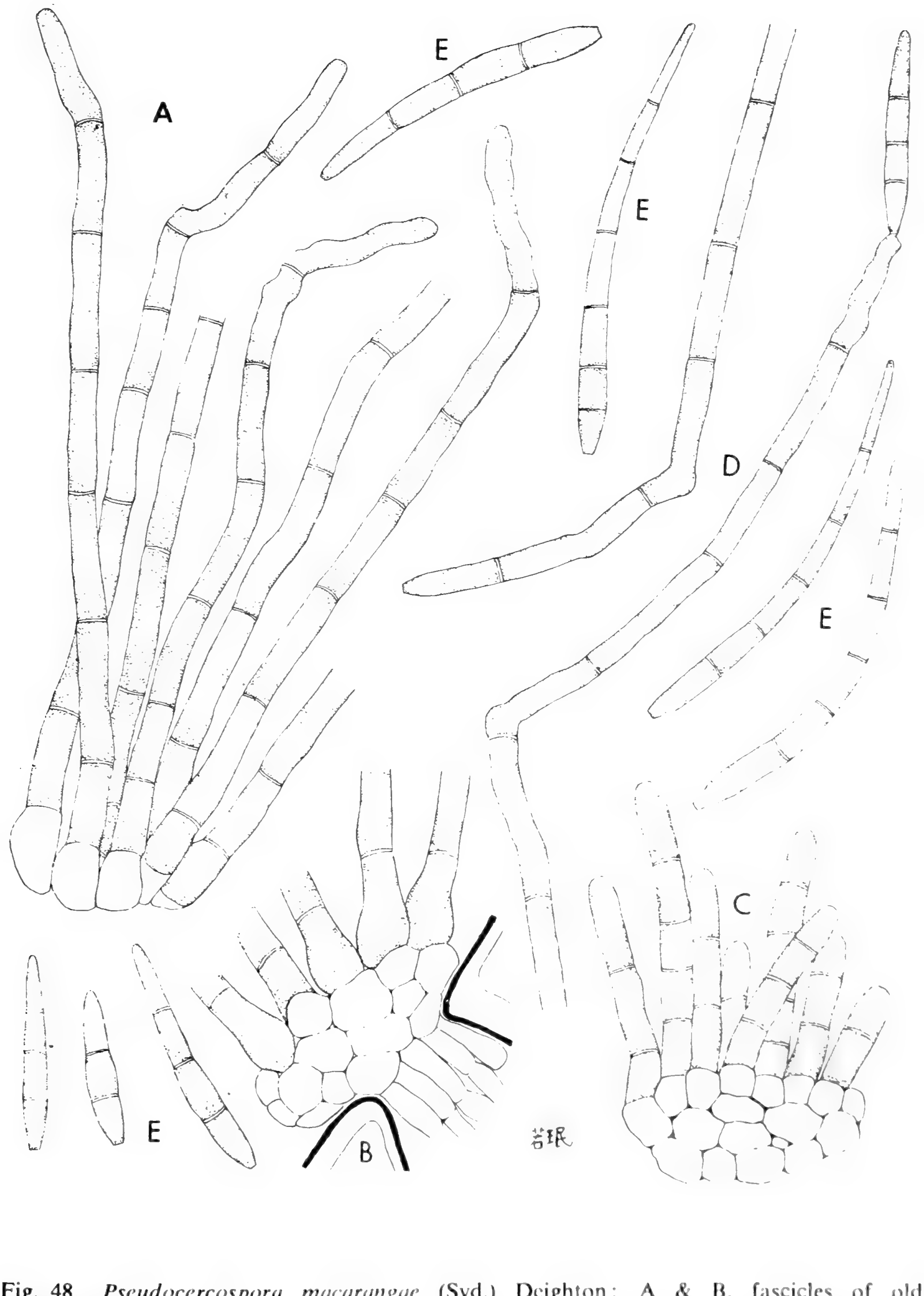

Fig. 48. *Pseudocercospora macarangae* (Syd.) Deighton: A & B, fascicles of old conidiophores and stromata; C, fascicle of young conidiophores; D, formation of conidia; E, conidia.

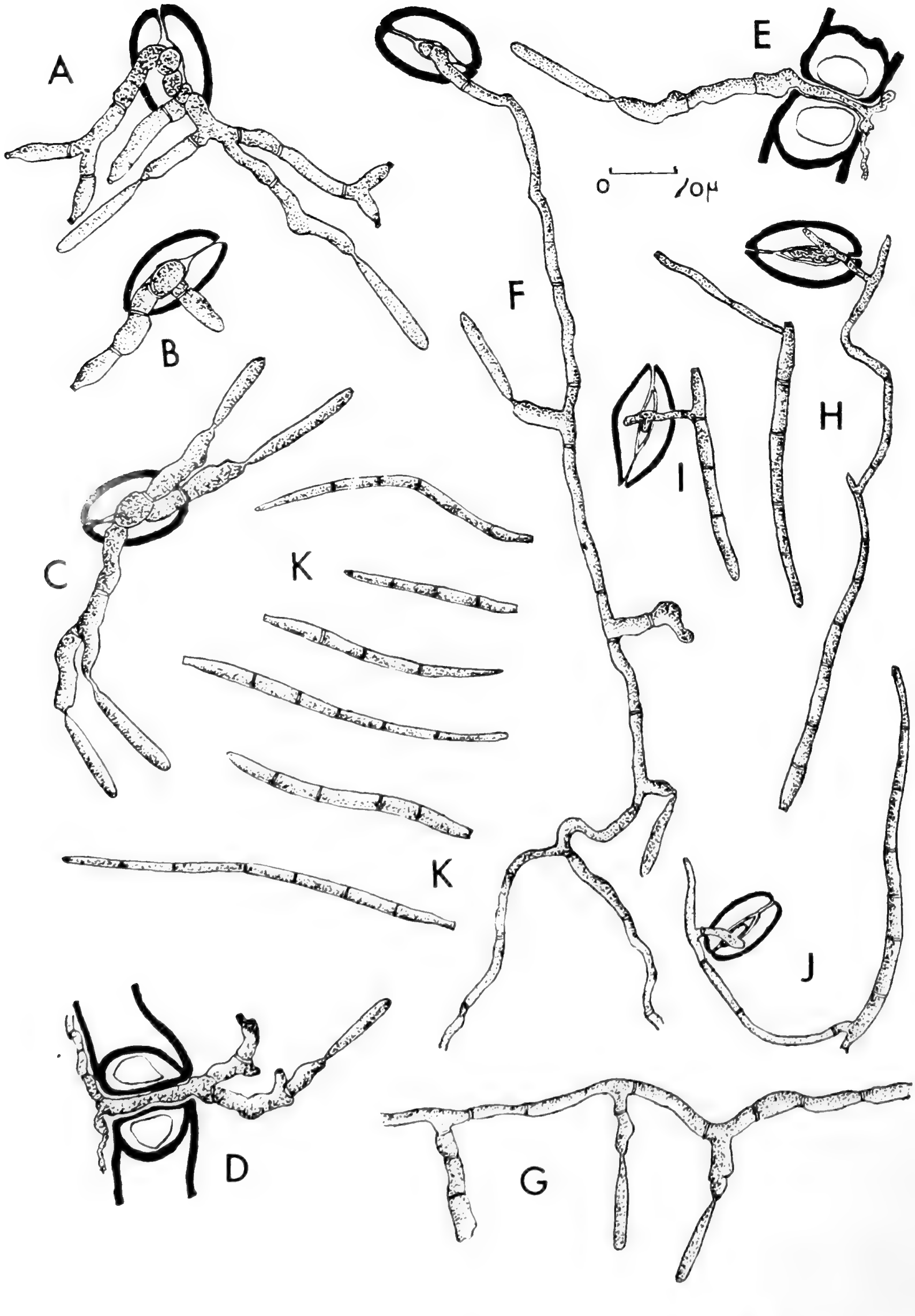

Fig. 49. *Pseudocercospora peltophori* (Yen) Yen: A-E, fascicles of conidiophores; F & G, external hyphae and unbranched conidiophores; H-J, germination of conidia; K, conidia.

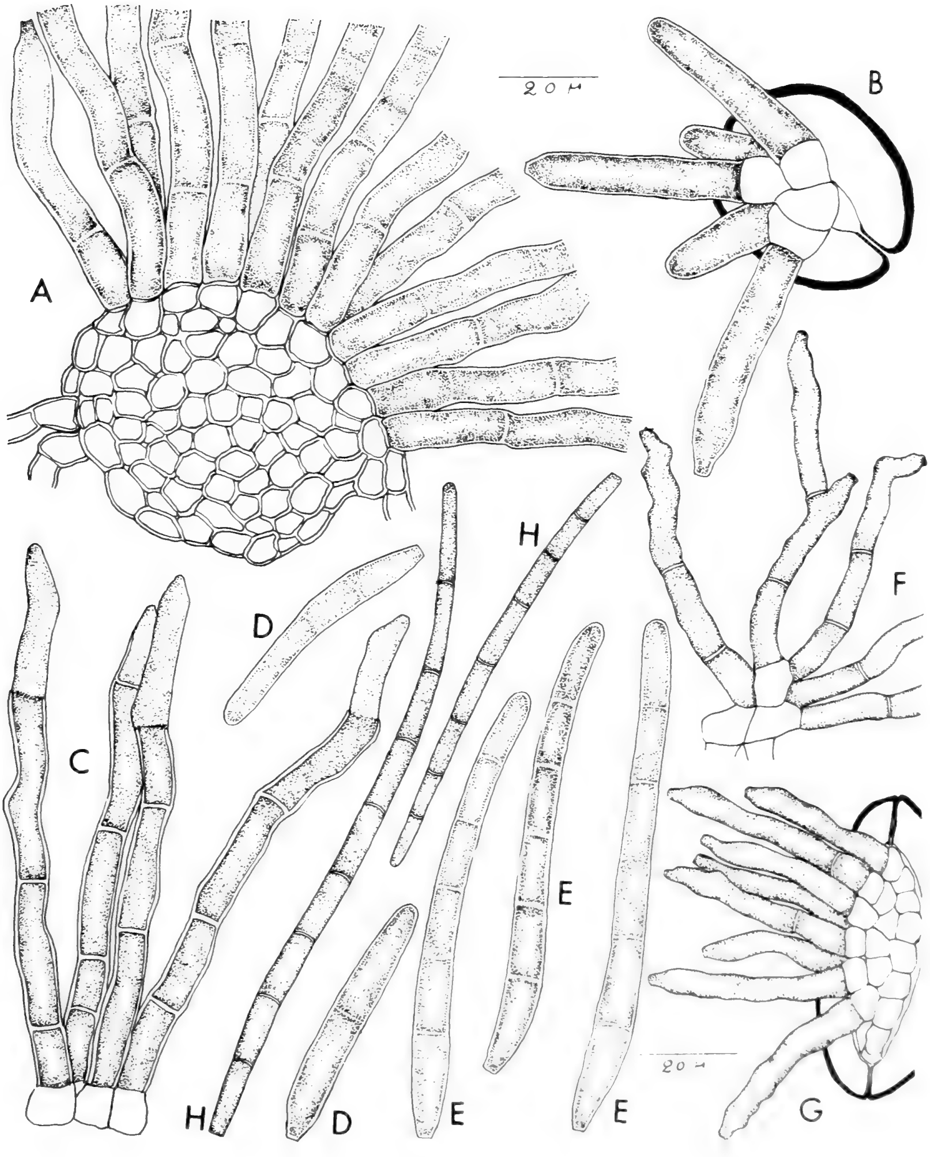

Fig. 50. ***Pseudocercospora pergulariae*** **(Yen & Lim) Yen (A-E): A, fascicle of conidiophores and stromata;** B, fascicle of young conidiophores; C, old conidiophores; **D & E, conidia.** ***Pseudocercospora timorensis*** (Cooke) Deighton (F-H): F, old conidiophores; G, fascicle of young conidiophores; H, conidia.

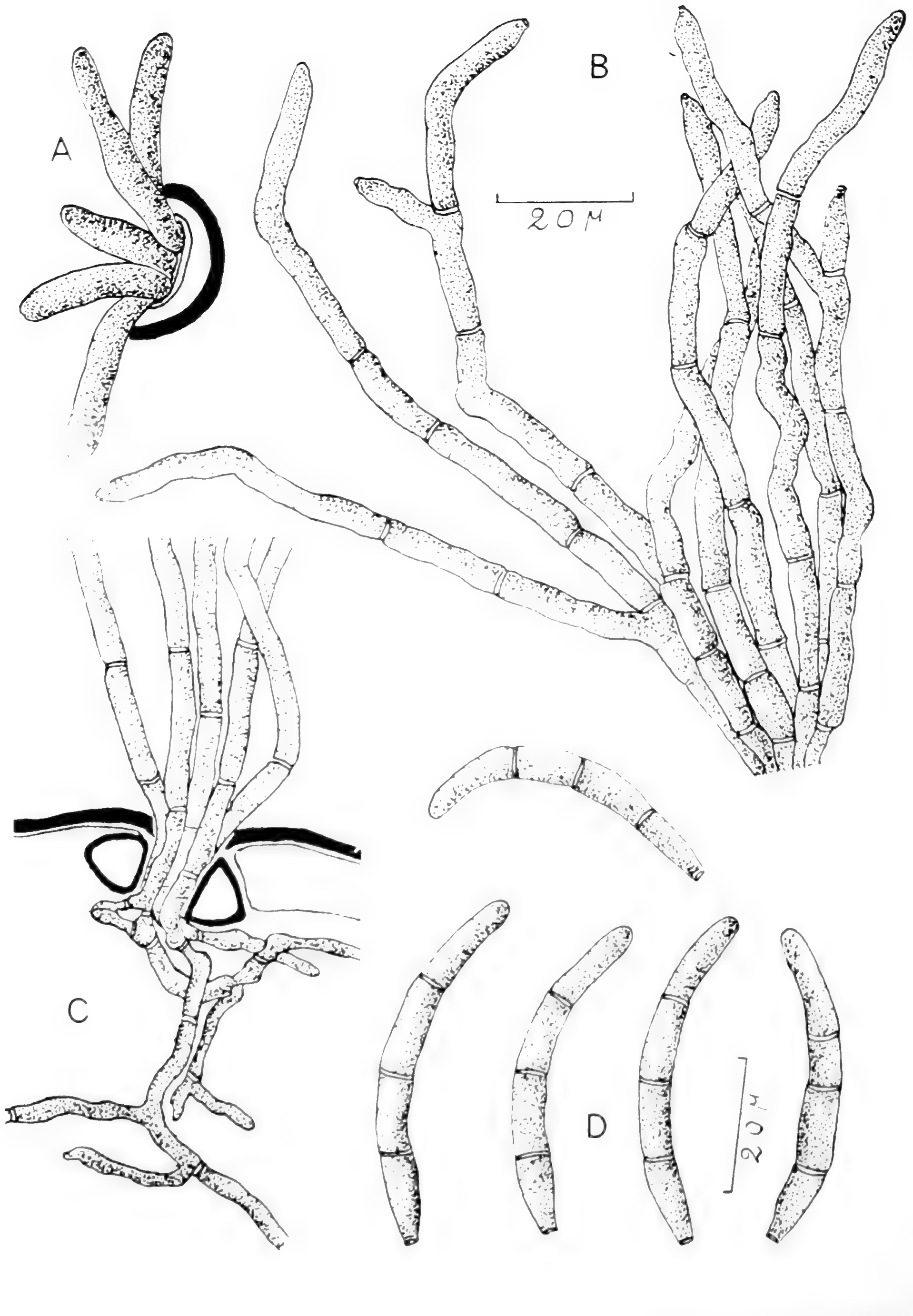

Fig. 51. *Pseudocercospora phyllanthi-niruri* (Yen) Yen: A, fascicle of young conidiophores; B & C, fascicles of old conidiophores; D, conidia.

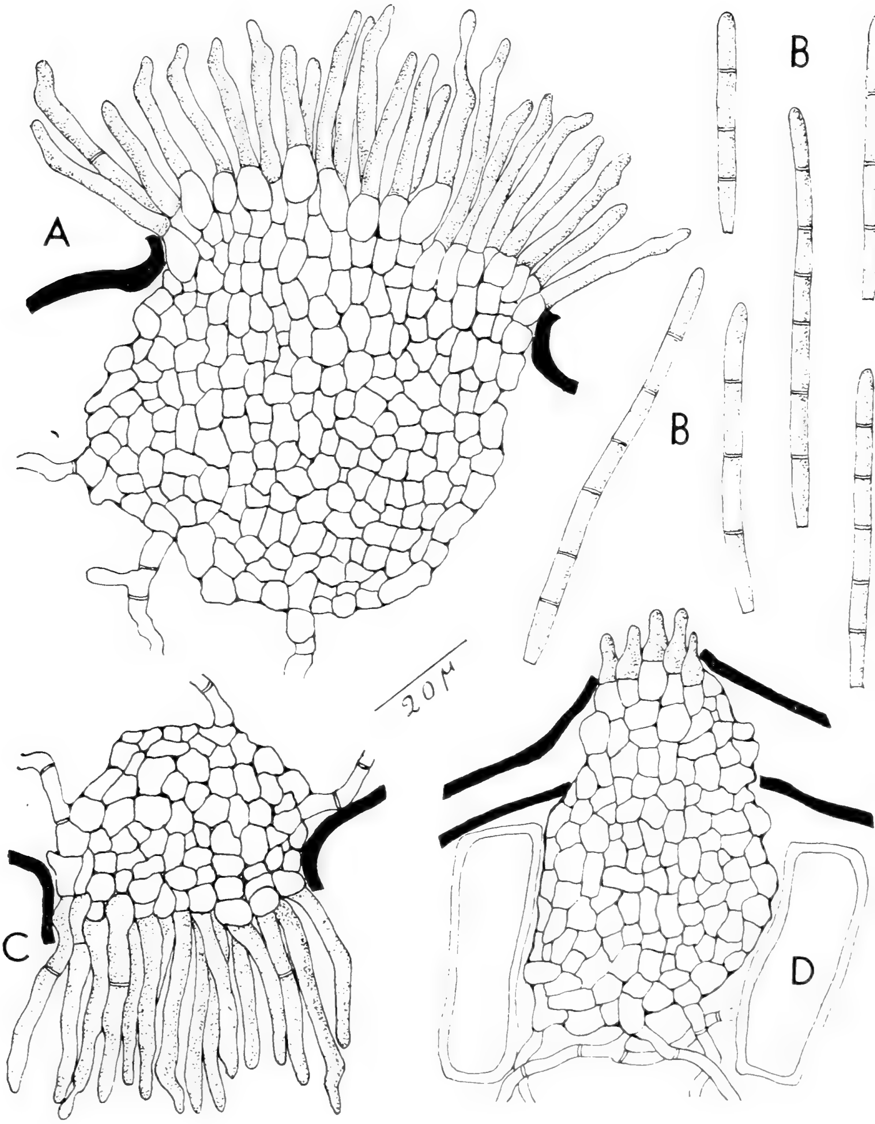

Fig. 52. *Pseudocercospora piperina* (Yen) Yen: A & C, fascicles of conidiophores; B, conidia; D, formation of stromata.

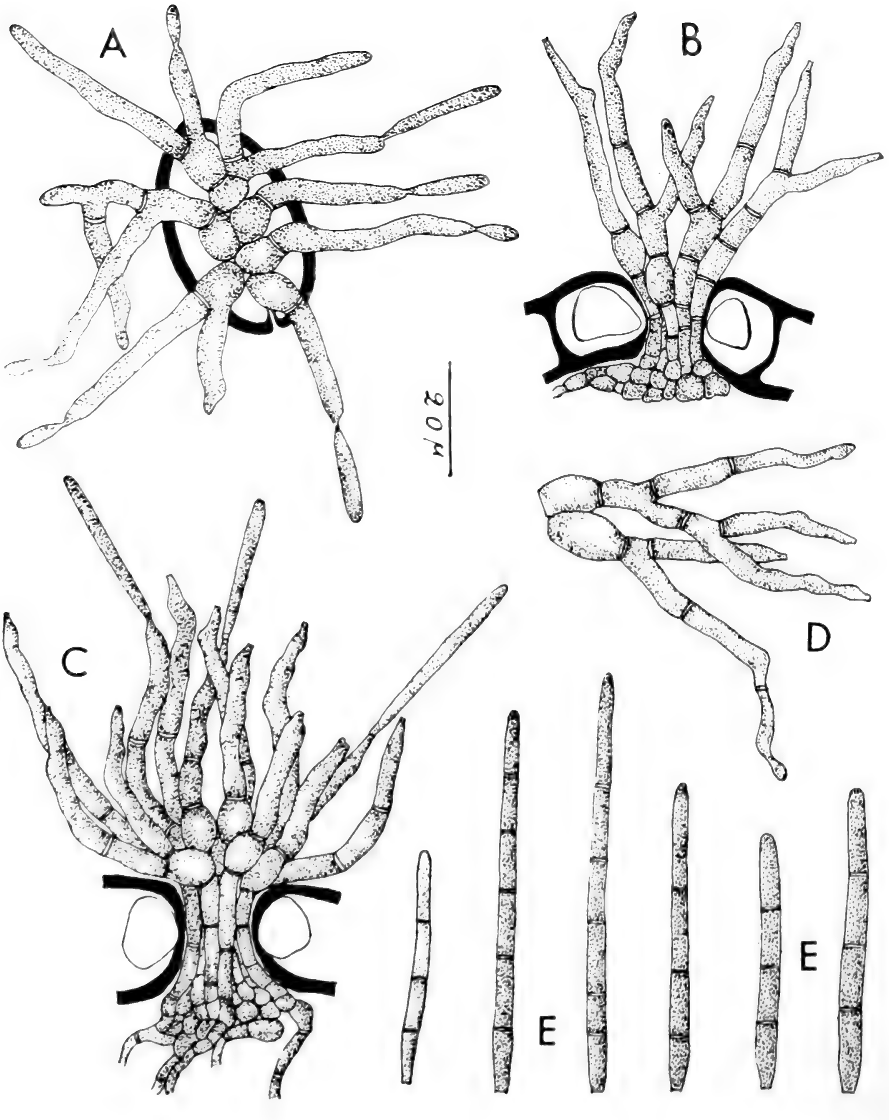

Fig. 53. *Pseudocercospora piperis-muricati* (Yen) Yen: A-C, fascicles of conidiophores; D, old conidiophores; E, conidia.

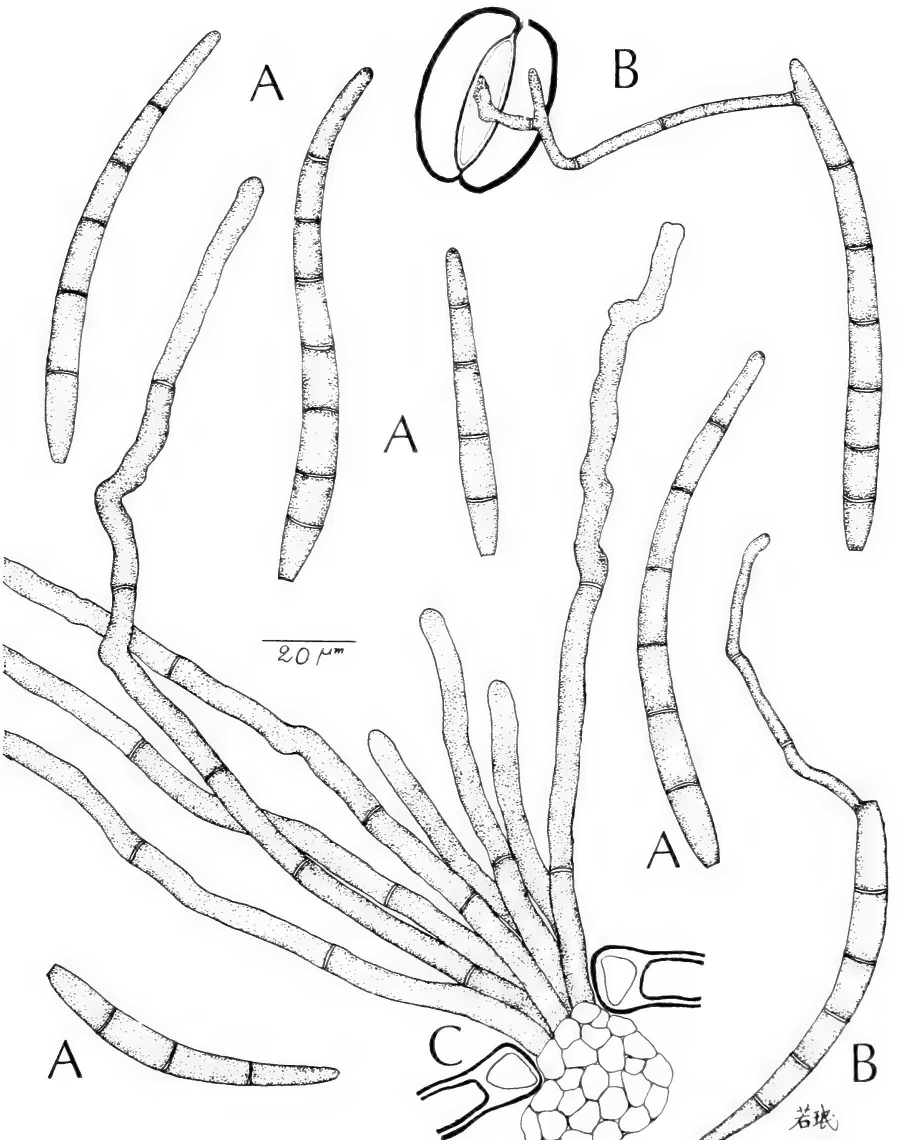

Fig. 54. *Pseudocercospora pterocarpicola* (Yen) Yen: A, conidia; B, germination of conidia; C, fascicle of conidiophores and stromata.

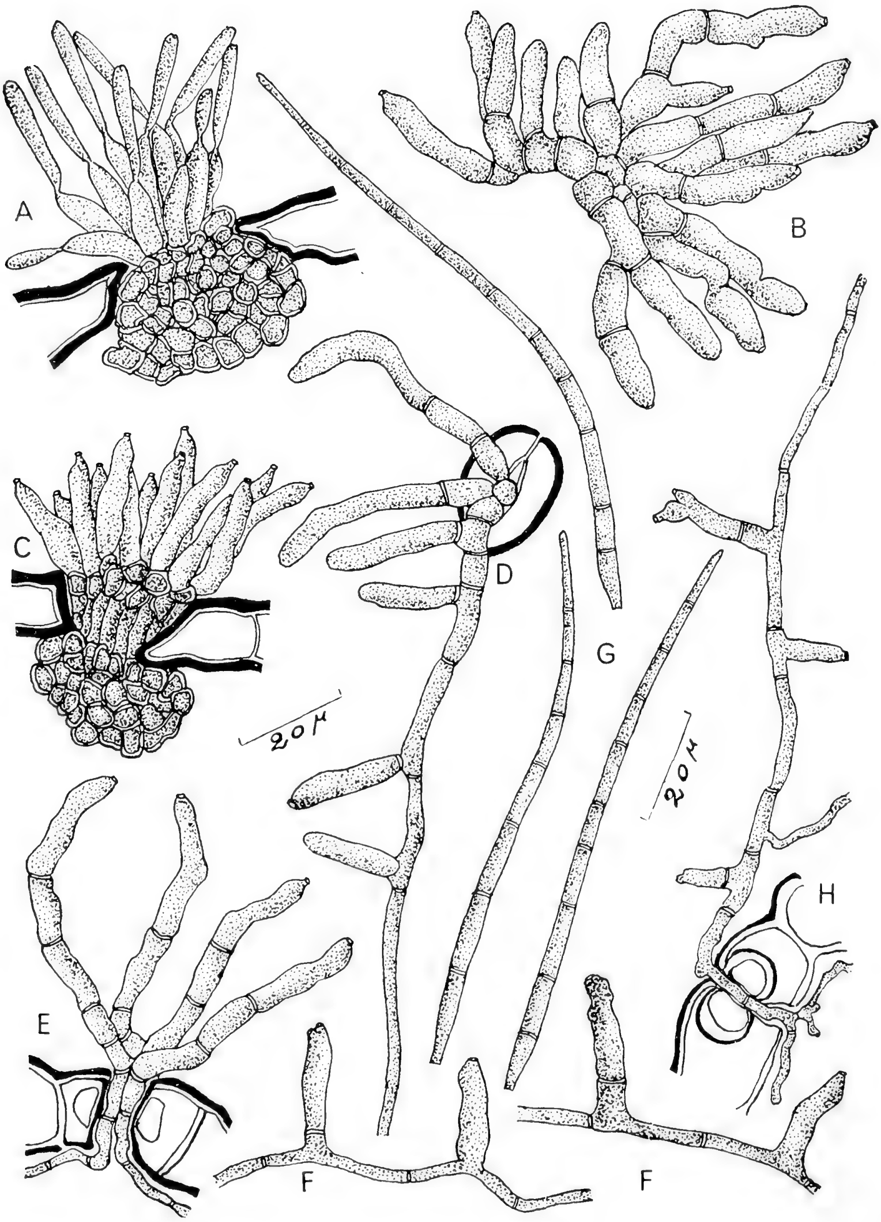

Fig. 55. *Pseudocercospora puerariicola* (Yen) Yen (A & C): A, fascicle of conidiophores and formation of conidia; C, fascicle of old conidiophores. *Pseudocercospora puerariina* (Yen) Yen (B & D-H): B & E, fascicles of conidiophores; D, F & H, external hyphae and unbranched conidiophores; G, conidia.

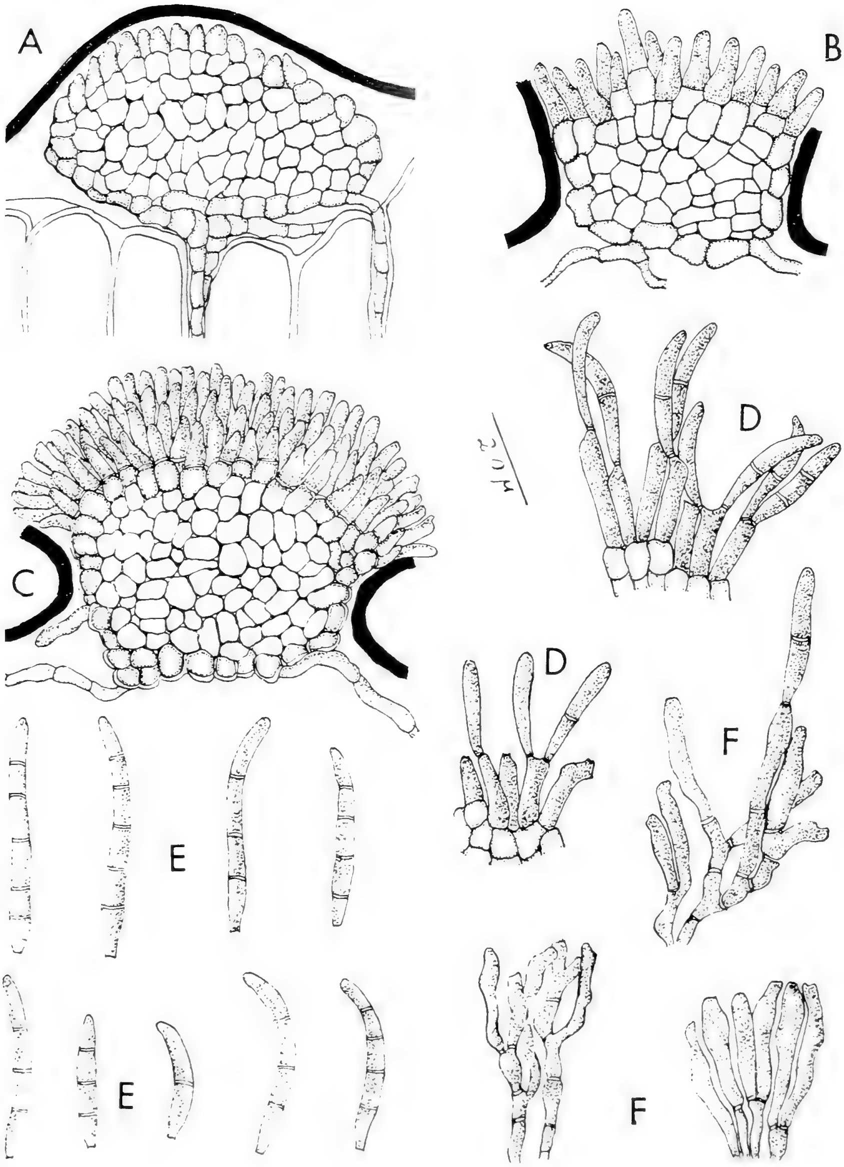

Fig. 56. *Pseudocercospora salicina* (Ell. & Ev.) Deighton: A, formation of stromata; B & C, fascicles of young conidiophores and stromata; D, old conidiophores and formation of conidia; E, conidia; F, branched conidiophores and formation of conidia.

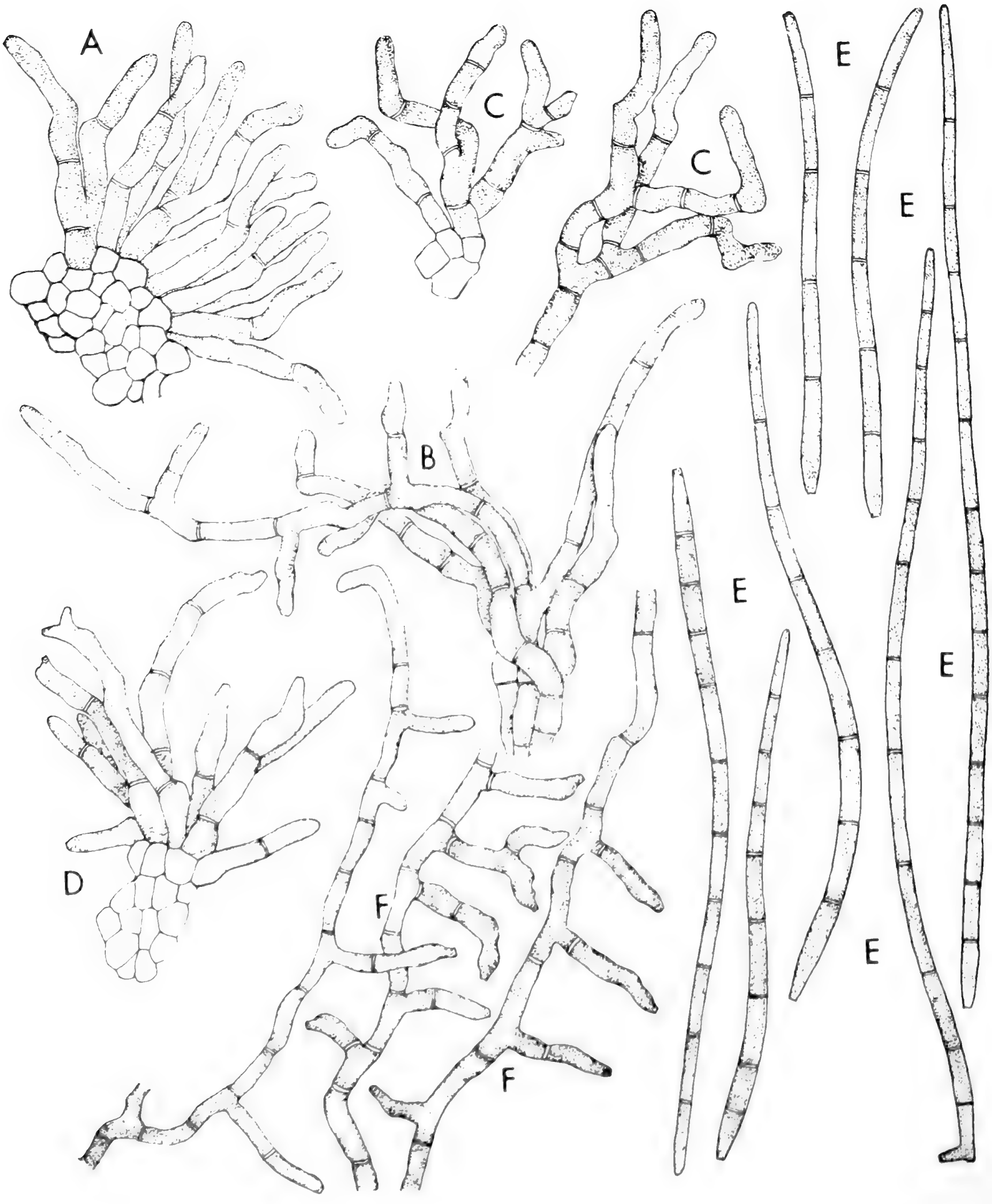

Fig. 57. *Pseudocercospora scopariicola* (Yen) Deighton: A & D, fascicles of conidiophores and stromata; C, old branched conidiophores; B & F, external hyphae and unbranched conidiophores;; E, conidia.

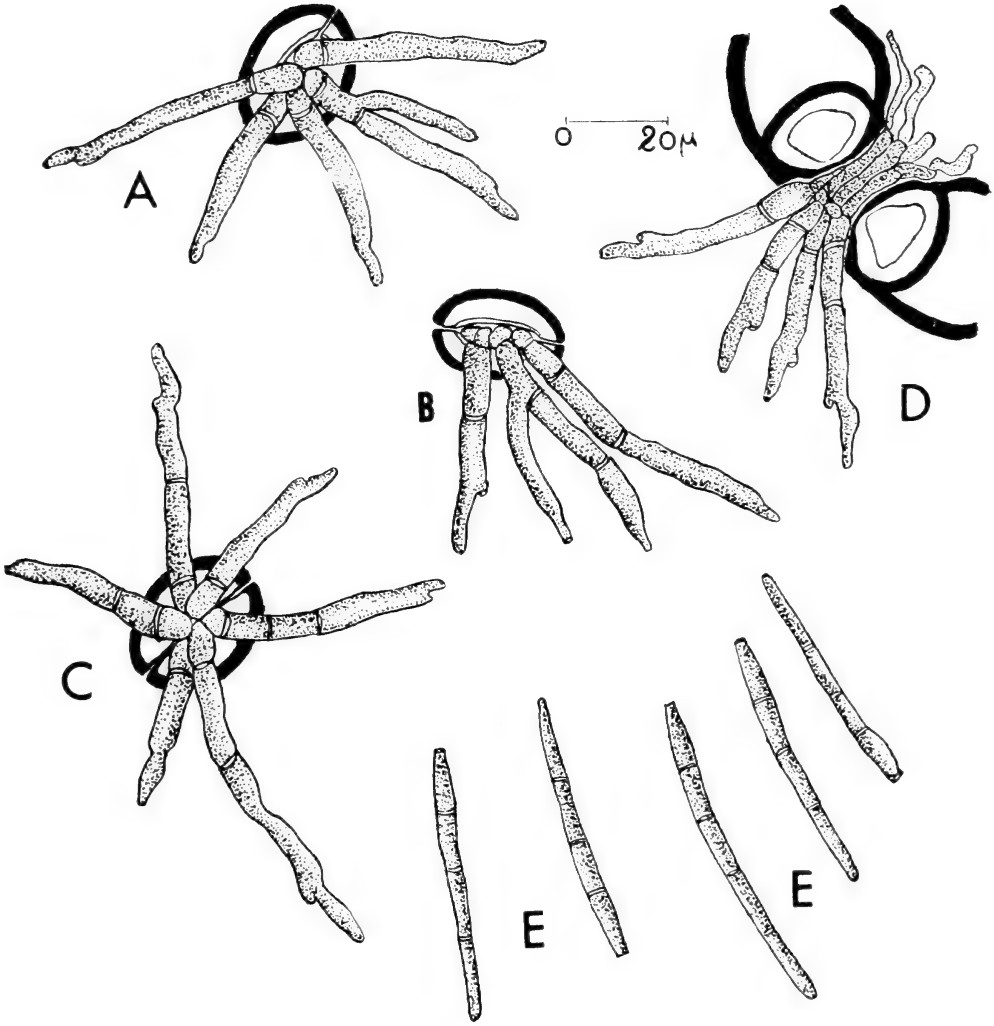

Fig. 58. ***Pseudocercospora singaporensis*** **(Yen) Yen: A-D, fascicles of conidiophores; E, conidia.**

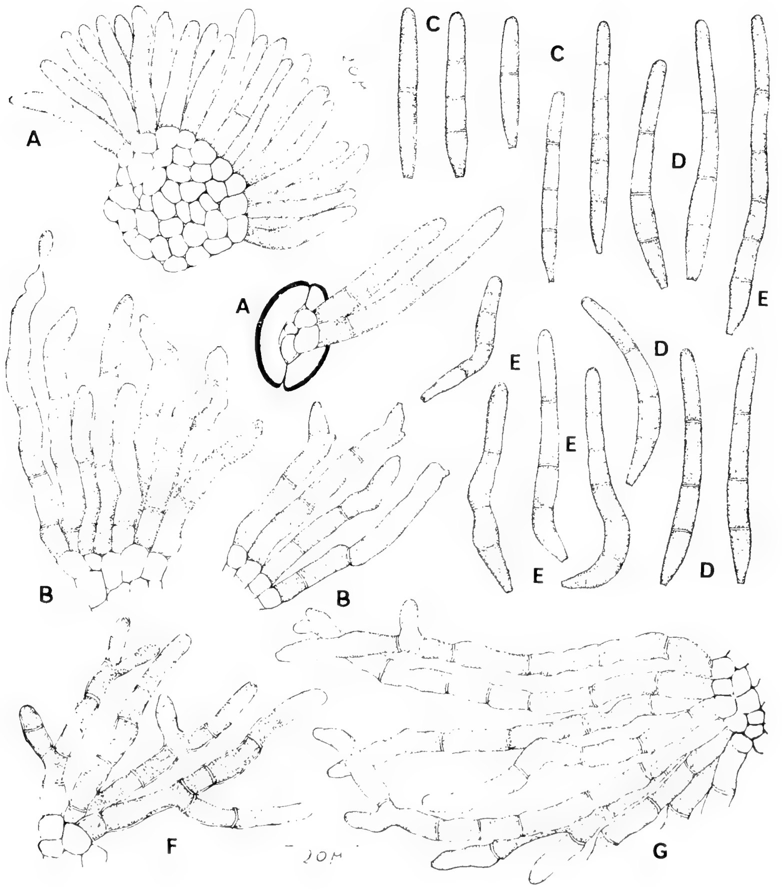

Fig. 59. *Pseudocercospora stephanotidis* (Yen) Yen: A & B, fascicles of conidiophores and stromata; C-E, conidia; F & G, old branched conidiophores.

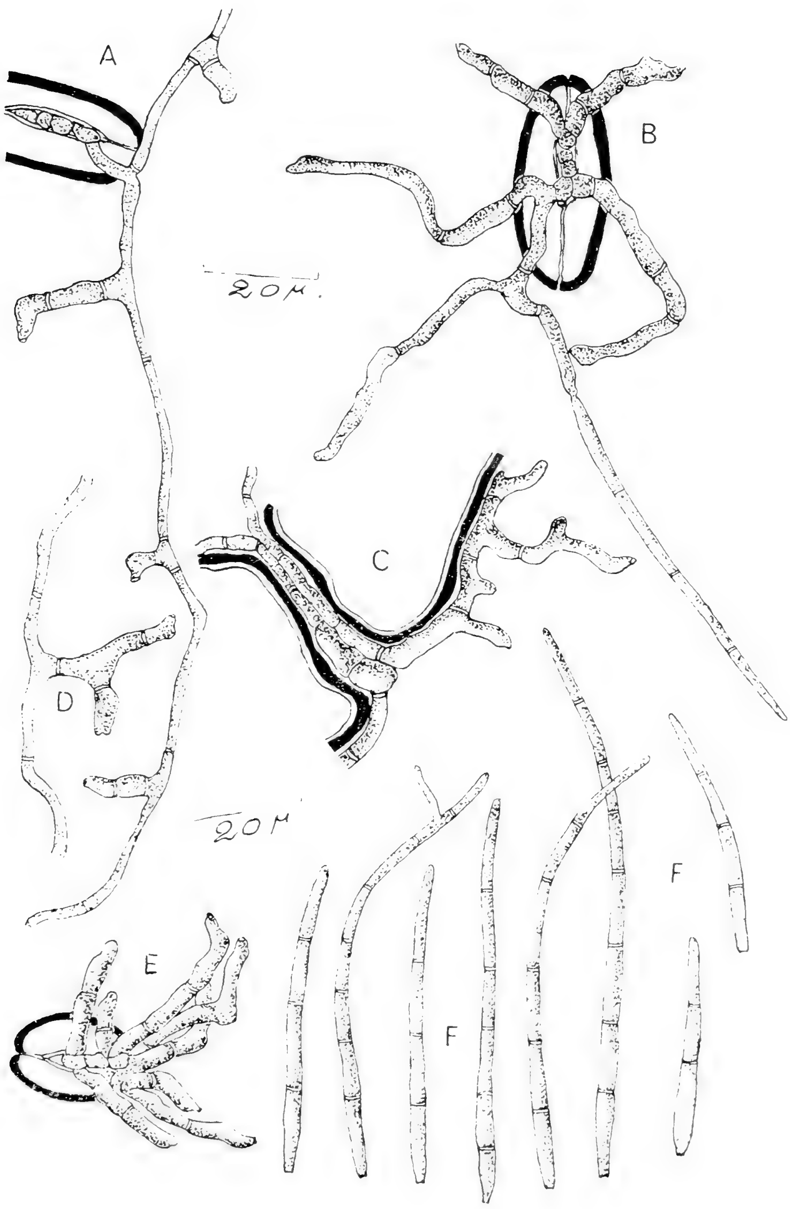

Fig. 60. *Pseudocercospora stigmaphyllicola* (Yen) Deighton: B & E, fascicles of conidiophores; A, C & D, external hyphae and unbranched conidiophore; F, conidia.

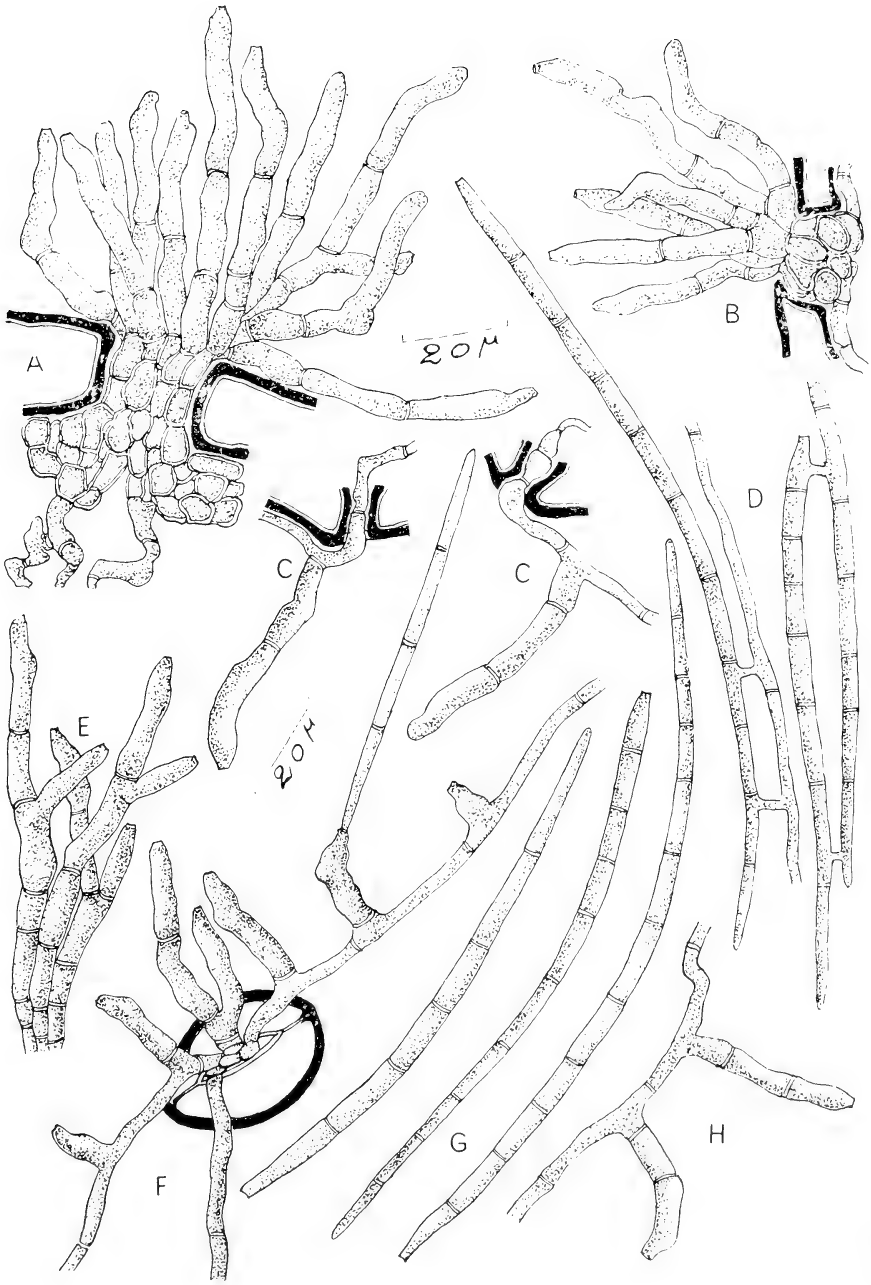

Fig. 61. *Pseudocercospora thunbergiicola* (Yen) Deighton: A & B, fascicles of conidiophores; E, old conidiophores; C, F & H, external hyphae and unbranched conidiophores; D, anastomosis of conidia; G, conidia.

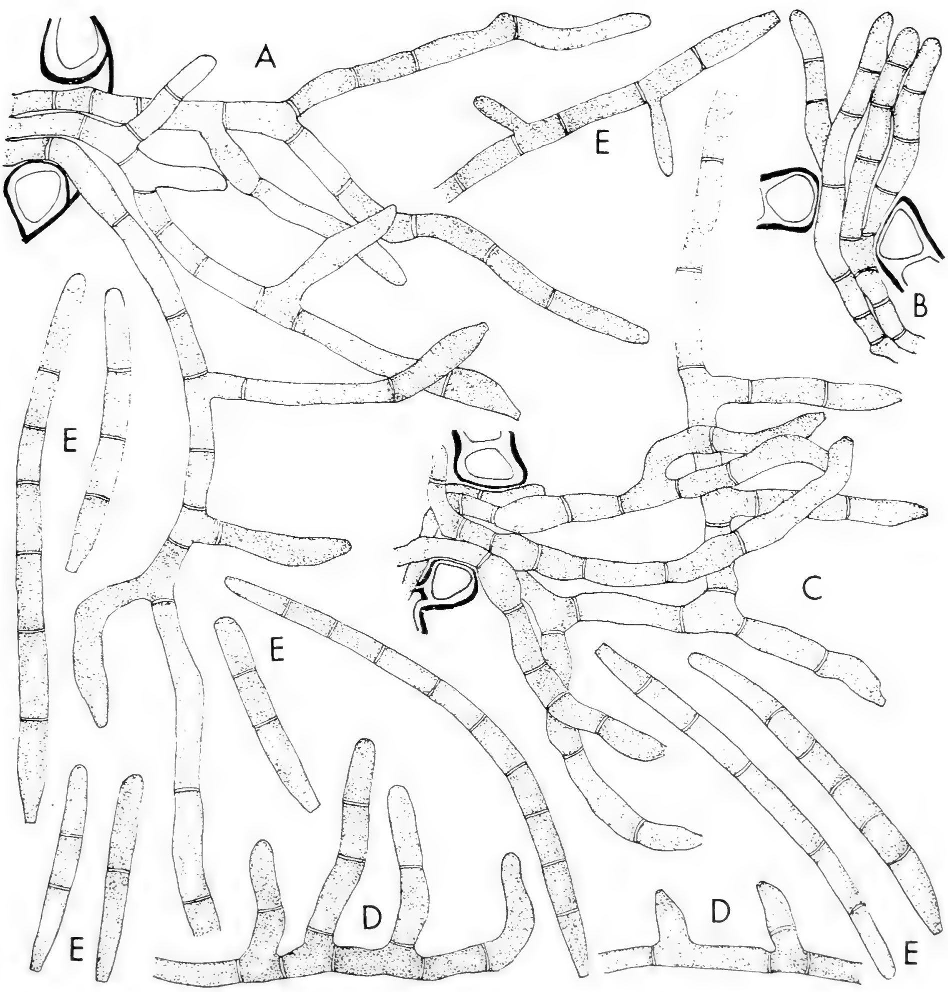

Fig. 62. *Pseudocercospora trematicola* (Yen) Deighton: A, B & C, fascicles of conidiophores and external hyphae; D, external hyphae and formation of unbranched conidiophores; E, conidia.

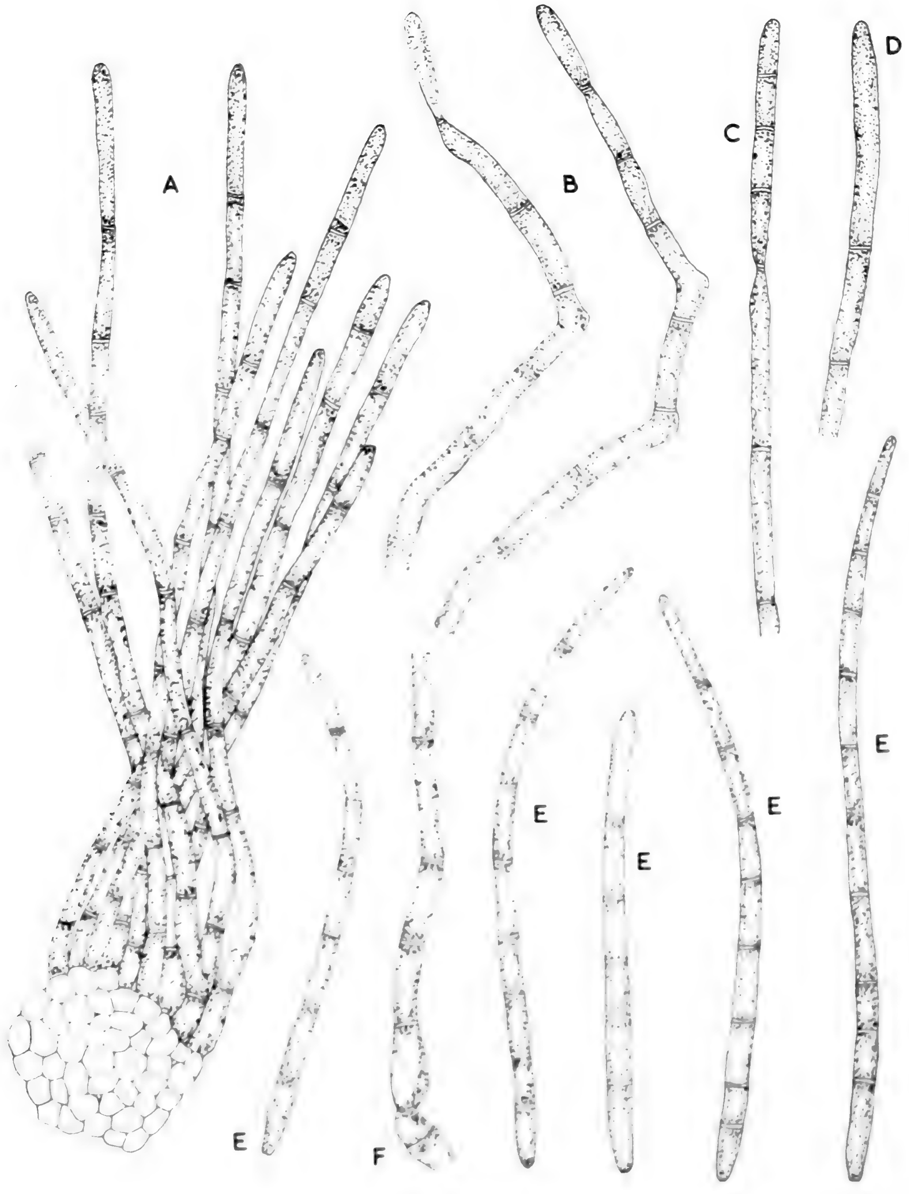

Fig. 63. *Pseudocercospora trematis-cannabini* (Yen & Lim) Deighton: A, fascicle of young conidiophores and stromata; B, C & D, ends of conidiophores and formation of conidia; E, conidia; F, base of conidiophore.

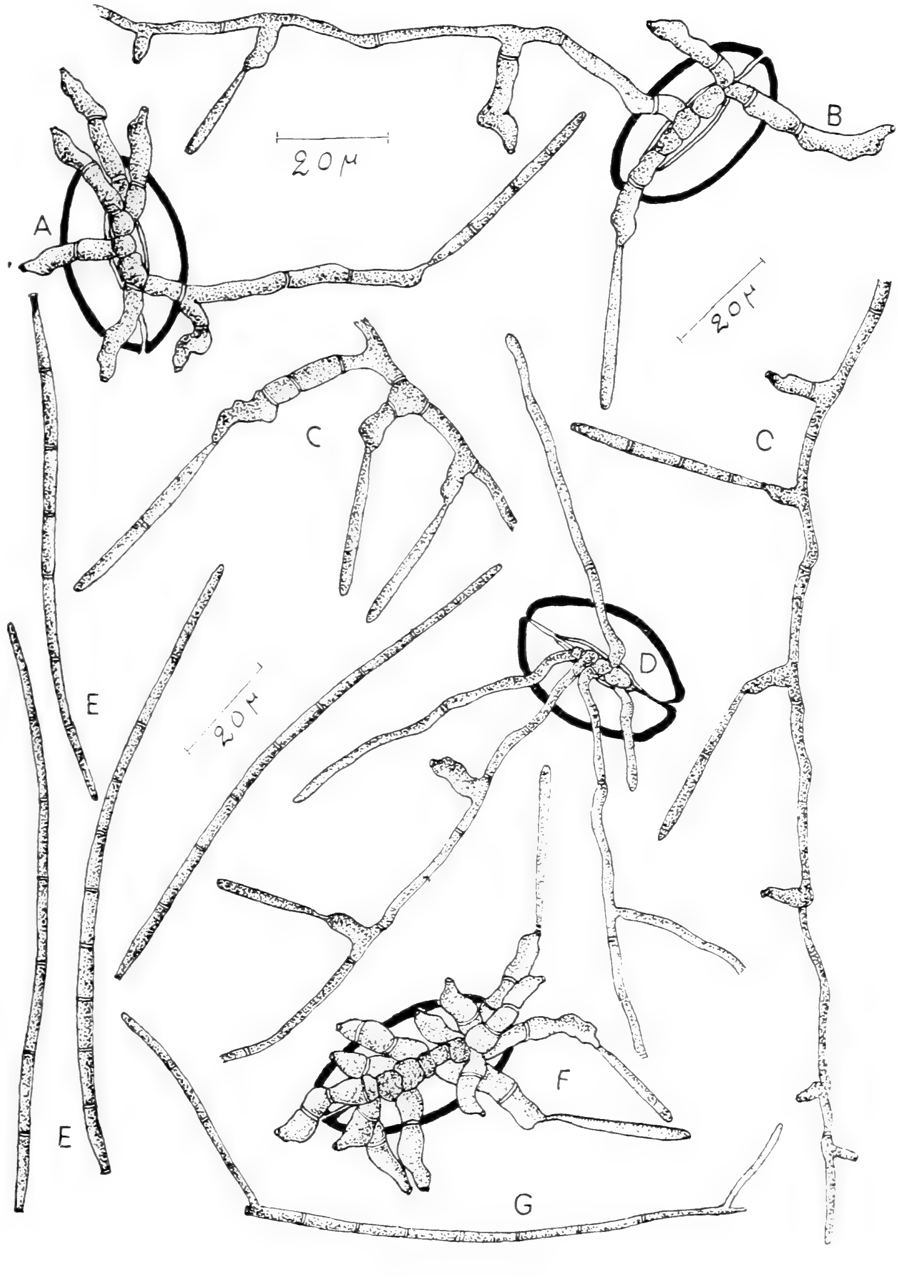

Fig. 64. *Pseudocercospora ubicola* (Yen) Deighton: A & F, fascicles of conidiophores; B, C & D, external hyphae and unbranched conidiophores; E, conidia.

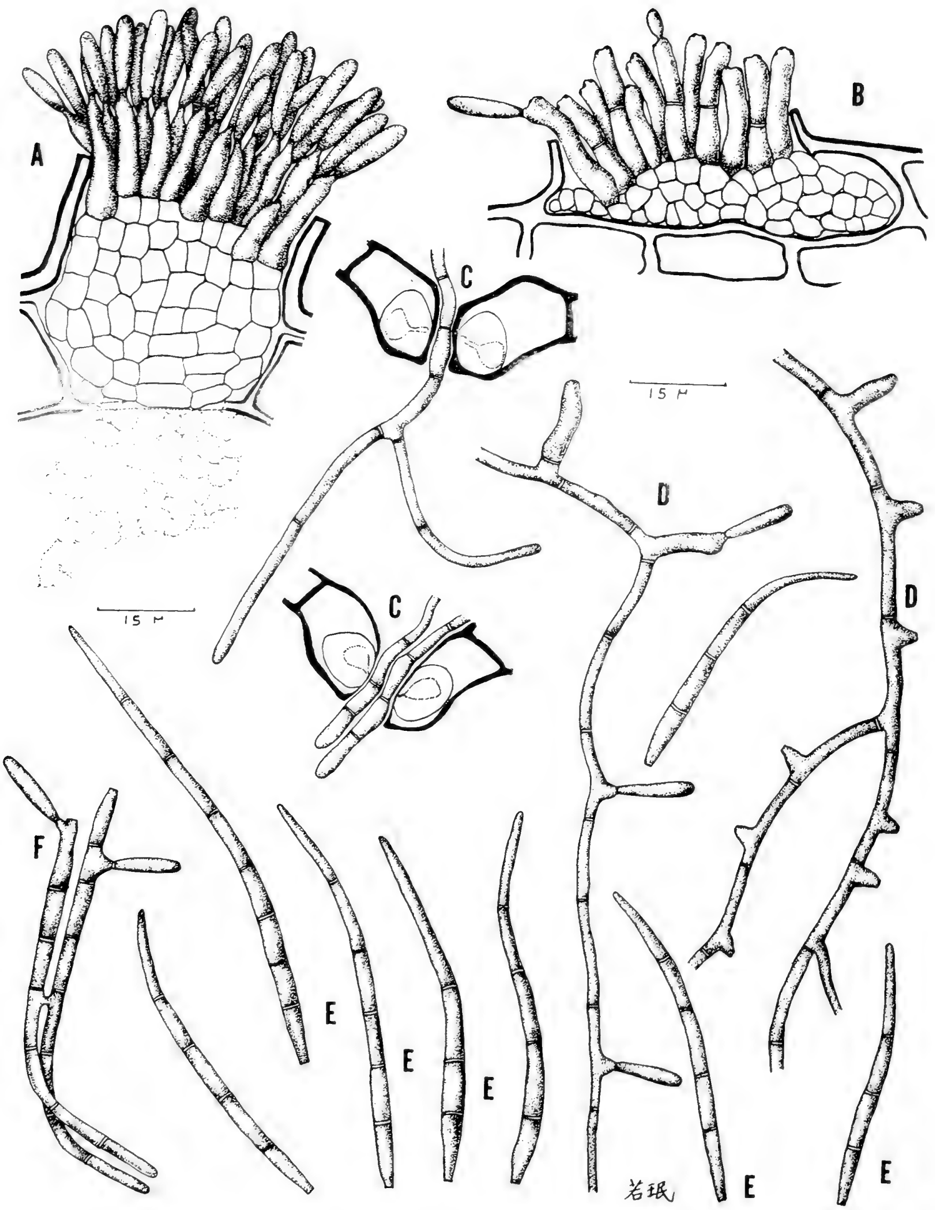

Fig. 65. *Pseudocercospora viticicola* (Yen & Lim) Yen: A, fascicle of young conidiophores and stromata; B, fascicle of old conidiophores; C & D, external hyphae and unbranched conidiophores; E, conidia; F, germination of conidia.

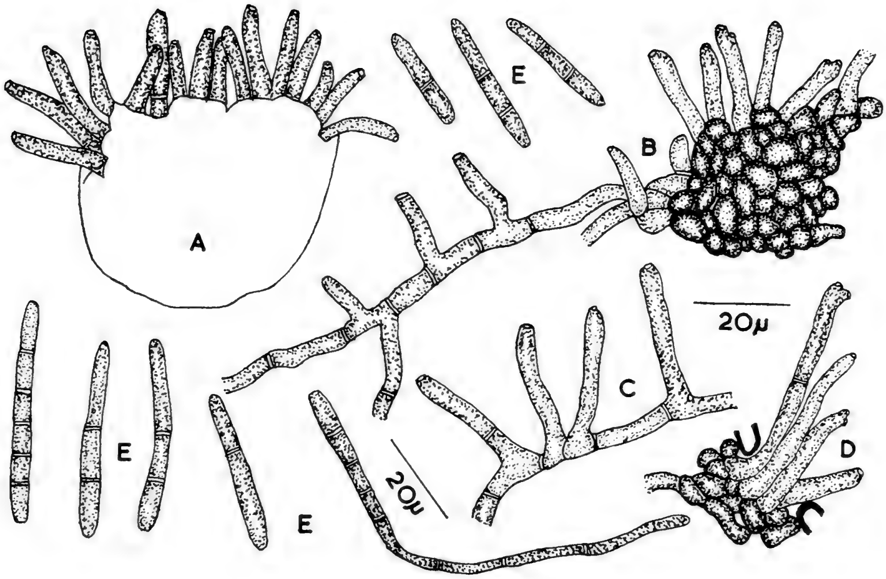

Fig. 66. *Stenella fagraeae* Yen: A & D, fascicles of conidiophores and stromata; B, stromata and formation of external hyphae; C, external hyphae and unbranched conidiophores; E, conidia.

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Scientific names: The complete scientific name — genus, species and authority, and cultivar where appropriate — must be cited for every organism at time of first mention. The generic name may be abbreviated to the initial thereafter except where intervening references to other genera with the same initial could cause confusion.

Tables: Should be numbered and carry headings describing their content. These should be comprehensive without reference to the text.

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