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NOTICE.

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On Fungi Parasitic on Scale-Insects found in Formosa.

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The present study was made, in the Botanical Institute of our College during the spring and summer of 1912, on the materials brought over from Formosa by one of the authors. The materials had been collected by the Station-staff during a period extending over more than five years. To most of the specimens are attached short notes by Mr. Y. Fujikuro, a member of the station, recording the shape and size of spores. They were of no little help to us in pursuing our study.

On account of the imperfect conditions of their specimens, we have left some species unrecorded in the present contribution. They will be treated in a future paper together with the fungi parasitic on scale-insects found in other parts of our country.

In this paper, the following seven species are described; viz., *Aschersonia Aleyrodes* Webber, *A. marginata* Ell. et Ev., *A. Suzukii* sp. n., *Sphaerostilbe coccophila* Tul., *Microcera Fujikuroi* sp. n., *Ophionectria coccicola* (Ell.

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et Ev.) Berl. et Vogl. and *O. tetraspora* sp. n. Of these, *Sphaerostilbe coccophila* has the widest distribution, extending as far north as Hokkaido. *Aschersonia marginata* and *Asch. Suzukii* have also been found outside of the Island of Formosa; the former in Kagoshima, and the latter in Shizuoka and a few other places.

Very little has been done concerning the researches on coccophilous fungi in Japan. In 1901, H. Nomura (18)* published the result of his study on the "scarlet-fungus disease" of scale-insects. As his paper was written in Japanese, it did not draw the attention of the scientific world, which it deserves. He described there a new species of Nectria under the name of *Nectria coccophila*,** which is parasitic on *Aspidiotus perniciosus* infesting pear-trees in Gifu, and also on *Diaspis pentagona* infesting mulberry-trees in Toyama. It appeared just one month previous to the appearance of Zimmermann's paper (32) describing *Nectria coccidophthora* from Java. These two species, although closely related, are decidedly distinct, judging from the descriptions and figures given by the authors.

According to Nomura, the sporodochia of his species is not stilboid, but of irregular-shaped protuberances of the type of Tubercularia. By comparing it with the figures of *Sphaerostilbe coccophila* by Rolfs (21), he came to the conclusion, that the Japanese and Florida forms seem to belong to one and the same species, and that both of them are quite distinct from the typical *Sphaerostilbe coccophila* of Tulasnes (29). Matsumura (16) and Shirai (27) mistook the author's view, when they considered that Nomura's fungus should be called by the name of *Nectria coccophila* (Tul.)

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* The number in brackets denotes the number in the "literature cited" placed at the end of this paper.

** *Nectria coccophila* Nomura (18).

Sporodochia irregularly pulvinate, not stilboid, orange-red, on reddish stroma, sometimes confluent. Conidia falcate, of Fusarium-type, 3–5–septate, reaching 100μ in length. Perithecia flask-shaped, bright red colored, appearing on the outer surface of a scale, 3–4 in a group, 260–340μ in length and 240–320μ in breadth. Asci fusiform, obtusely pointed at apex, 90–110μ× 8–10μ, 8–spored. Ascospores in one row, more or less inclined, light brown, 1–septate, slightly constricted at septum, 15–20μ× 5–6μ. Stroma scarlet, sclerotioid in texture.

Hab. On *Aspidiotus perniciosus* and *Diaspis pentagona*, infesting *Pirus sinensis*, and *Morus alba* respectively, in Honsiu, Japan.

Nom.

Kuwana (15) in a Special Report on San José Scales records the presence of *Sphaerostilbe coccophila* Tul. in different parts of Japan as a beneficial natural enemy to *Aspidiotus perniciosus*, as well as to *Diaspis pentagona*. On the latter insect, he found the fungus in question even at the summit of Mt. Togakushi in Central Japan. These facts seem to indicate that the fungus is a native of our country and not of a recent introduction. Although we do not find any definite statement in his report, the author seems to entertain a view, that the Nomura's fungus mentioned above is identical with *Sphaerostilbe coccophila* Tul.; for he reproduced in plate VII. some of the Nomura's figures of *Nectria coccophila* to illustrate his fungus.

In 1907, Nishida (17), in his "Diseases of Orange-trees", touched upon two species of Aschersonia, which he found parasitic on the scale-insects infesting the orange-trees in different parts of our country. The one he called the "black-fungus", *Aschersonia* sp., is what we have identified in the present paper with *A. marginata* Ell. et Ev.; and the other, the "red-fungus", he referred to *A. Aleyrodes* Webber. Judging from the figures and brief descriptions of the fungus, however, we are inclined to regard it as identical with our new species, *A. Suzukii*. It was found parasitic on *Aspidiotus aurantii* in Honsiu, Kiusiu and Riukiu.

Sawada (24, 25), in 1911, reports on the coccophilous nature of *Septobasidium albidum* Pat. and *S. Acaciae* Sawada. The former is the cause of the "plaster-disease" of camphor-trees, while the latter that of *Acacia confusa* Merr. as well as of *Citrus nobilis* Lour. and *Glochidion obovatum* S. et Z. in Formosa. They are not directly parasitic on the host-plants, no trace of the mycelium being found in their tissues. According to the author, the mycelium of these fungi grows and develops at first on the excretions of scale-insects, which are finally completely overgrown and killed by the thick subiculum of the fungus.

Shortly before the publication of Sawada's paper on Septobasidium, a short preliminary note on the biology of the genus by T. Petch (20) appeared. The author announces the discovery of the coccidophagous habit of several species of Septobasidium found in Ceylon and also in North America.

In every instance, he invariably found beneath the subiculum of the fungus a colony of scale-insects entirely overgrown and destroyed by the mycelium. He seems to regard, that the fungus is from the beginning purely parasitic on scale-insects, and that it does not require a preliminary nourishment on their excretions, as Sawada has pointed out.

Quite recently, Sawada (26) has also shown that *Helicobasidium Tanakae* Miyabe, which causes a "plaster-disease" on the branches of *Morus alba*, *Prunus Mume*, *P. communis*, *P. Persica*, *P. serrulatus*, *Pirus sinensis* and *Broussonetia papyrifera*, behaves similar to his Septobasidium in Formosa. In these cases, *Diaspis pentagona* is concerned with the development and growth of the fungus.

Practically nothing has been done so far in our country in the way of controlling the ravages of scale-insects by means of the artificial infection of their fungus-parasites. Nomura (18) succeeded in making artificial cultures of his Nectria and recommended its employment for such a practical end.

From the time Webber (31) suggested the economic importance of these fungi, many American botanists and entomologists, especially those connected with the Florida Agricultural Experiment Station, have been actively engaged in perfecting the method of artificial infection. The names of Rolfs (21, 22), Gossard (12), Forbes (11), Fawcett (10) and Berger (1–5) should be mentioned in connection with this interesting work.

Aschersonia Aleyrodis Webber. (Pl. VI. fig. 1–7)

Webber, in U. S. Dep't. Agric. Div. of Veg. Phys. and Path. Bull. **13.** (1897), p. 20; Rolfs and Fawcett, Florida Agric. Exp. Stat. Bull. **94.** (1908), p. 15; Fawcett, Special Studies. No. 1. Univ. of the State of Florida. (1908), pp. 10–17; Saccardo, Syll. Fungorum, **14.** (1899) p. 991.

Aschersonia tahitensis Webber, in Jour. of Mycology, **7.** (1894), p. 363; Swingle & Webber, Div. Veg. Phys. and Path. Bull. **8.** (1896), p. 27.

Stroma hypophyllous, depressed hemispherical, yellowish-white to cream colored, coriaceous, 1–3 mm. in diameter, sclerotioid formed of thick-walled

mycelium 3.5–8μ in diameter, and provided with mycelial hypothallus of grayish white color, forming a thin membrane adhering to the leaf surface and extending 1–2.5 mm. beyond the stroma. Pycnidia immersed in the stroma, irregular in shape, and opening by small round or elliptical pores or slits at the surface; conidiophores filiform, much branched, continuous, densely packed together, 55–70$\mu \times 1\mu$; paraphyses similar to the conidiophore in shape, projecting beyond them, 85–108μ long; stylospores fusiform, continuous, mucilaginous, hyaline, 11–13$\mu \times$ 1–1.5μ, often oozing out in ochraceous spore-masses.

HAB.—On *Parlatoria zizyphi* (Lucas) Sign. infesting the leaf of *Citrus nobilis* Lour.

Formosa: Seira, Kagi. Nov. 13, 1909. (K. Sawada, Nov. 13, 1909).

DISTRIB. North America, Cuba and Japan.

REMARKS. Our fungus corresponds so closely in almost all important characters with the descriptions and figures of *Aschersonia Aleyrodis* of North America, that we are led to think it more appropriate to consider them for the present as one and the same rather than to treat ours as a distinct species.

In the Formosan form the paraphyses are also always present. They are very delicately filiform, and continuous with dense homogeneous refringent contents. In many of these paraphyses, we noticed interspersed here and there portions devoid of the contents, which appear under a microscope as darkened sections. (Pl. VI. fig. 4). Some of the paraphyses are seen to have lost almost all of their refringent contents. These vacant spaces sometimes collapse giving to the filament an appearance of a series of short cells. What Webber (31) considered as characteristic darkened cells is no more than the vacant sections in a filiform cell. The conidiophores are not simple but irregularly dichotomous or trichotomous, and their ultimate branchlets are subulate and 10–26μ in length. (Pl. VI. fig. 5,6).

The color of the spore-mass in our dried specimens is generally ochraceous. As we have not yet examined fresh material with sufficient care, we could not say that the mass presents a conspicuous coral-red or rufus color as described by Webber and others.

In Floridia, the present fungus has been successfully employed for controlling the white-fly *(Aleyrodes citri)* infesting orange trees.

Aschersonia Aleyrodis has been known so far only from the Southern States of the United States and West Indies. Among Parkin's (19) Ceylon forms of *Aschersonia*, there are some which are said to resemble the Webber's species; of which the *forma 1.* approaches most closely to our plant. They may prove identical after a careful comparative study.

Aschersonia marginata Ell. et Ev. (Pl. VI. fig. 8-15).

Ellis & Everhart, Bull. Torrey Bot. Club, **22,** (1895), p. 436; Saccardo, Sylloge Fungorum, **14,** (1899), p. 989.

Aschersonia sp. Nishida, Diseases of Orange-trees. (1907), p. 76.

Stroma amphigenous or caulicolous, sessile, adnate, hemispherical to depressed subspherical, dark to black colored, narrowly marginate around the base or not, smooth or somewhat verrucose, 1–5 mm. in diameter, interior cream-colored, sclerotioid formed of thick-walled mycelium, 4–8μ in diameter. Pycnidia irregular in shape, 4–19, immersed in the stroma, opening by small roundish pores at the surface, 40-300μ in diameter; conidiophores filiform, subumbellately branched, continuous, densely packed together, 18–30$\mu \times 1\mu$; stylospores fusiform, small, continuous, hyaline, 6–8$\mu \times$ 1–1.5μ. Paraphyses wanting.

Hab. On *Coccus longulus* Dougl. and *Parlatoria zizyphi* (Lucas) Sign. infesting *Citrus nobilis* Lour. and *Psidium Guyava* L.

Formosa: Tennaiho, Taihoku, on *Citrus nobilis* (Inao Nitobe, May 1, 1911; Y. Fujikuro, May 8, 1911). Roppo, Giran, on *Psidium Guyava* (R. Suzuki, Feb. 29, 1908).

Distrib. Sandwich Islands and Japan.

Remarks. Ellis and Everhart (9) in describing the present species were not aware of the fact that the fungus is entomogenous. The original specimens were collected by Heller on the living leaves of a species of Psidium in the Sandwich Islands.

Our specimens, which correspond exactly to the description given by Ellis and Everhart, were collected also on Psidium as well as on the species of Citrus. In our cases, the fungus is parasitic on scale-insects in every instance.

The stroma is generally dark or black colored on the surface, but this colored portion can easily be wiped off with a wet cloth, exposing a smooth amber colored surface. In all our specimens, the fungus is always accompanied by a sooty mold, which covers the surface of both leaves and stems to a greater or less extent. The blackened color of the stroma, in the present case, may be due to the overgrowth of a sooty mold, and not to the color of its rind cells. Ellis and Everhart (9) seem to have noticed this particular character, when they described the color of the stroma as somewhat black (or yellow in a living state?)

The marginate character of the stroma is not constant. Among the stromata formed on *Parlatoria zizyphi* infesting *Psidium Guyava*, the marginate ones are less than the immaginate, while on those on Citrus, the case is just the opposite, the marginate ones being predominent. The marginate stroma is generally hemispherical in shape, while the immarginate one is mostly depressedly subspherical (Pl. VI. fig. 8–11).

The conidiophores are so densely packed together that their mode of branching is not easily observable in even a very thin section; but it becomes evident, when such a section is flattened out by a pressure given under a cover-glass. The branching is almost in all cases subumbellate, the number of the branches varying from 3 to 5. The branches are relatively short and of about the same length. They are finely subulate, and 10–16μ in length (Pl. VI. fig. 14).

The present fungus parasitic on *Parlatoria zizyphi* infesting *Citrus nobilis* was collected also by Nishida (17) in Kagoshima, Kiusiu, in May 1903. He gives a short description and figures of the fungus in the work cited above.

Aschersonia Suzukii Miyabe et Sawada, sp. nov.
(Pl. VI. fig. 16 – 23.)

Aschersonia Aleyrodis Nishida, Diseases of Orange-trees, p. 80.

Stroma scattered or more or less clustered, ramicolous or amphigenous, cream to cinnamon colored, hemispherical, subspherical, conico– or subtruncato–hemispherical, smooth, then irregularly verrucose, 1 – 4 mm. in diameter, marginate around the base, with rather thick light colored hypothallus, interior similarly colored, sclerotioid composed of mycelium 3 – 6μ in diameter. Pycnidia 4 – 16, immersed in the stroma, irregular in shape, 130–270μ in diameter, and opening by small pores and slits on the surface ; conidiophores filiform, simple or sparsely branched, densely packed together, continuous, 22 – 56μ × 1μ; stylospores fusiform, continuous, mucilaginous, hyaline or light orange-colored, acute at both ends, 8 – 11μ × 2.5 – 3.5μ. Papaphyses wanting.

Hab. Parasitic on *Coccus longulus* Dougl. infesting the living leaves and branches of *Citrus nobilis* Lour. and *Fagara nitida* Roxb.

Formosa : Ako, on *Citrus nobilis* (R. Suzuki, Oct. 28, 1908). Rokumasan, Kagi, on *Citrus nobilis* (Y. Nambu, Nov. 26, 1909). Tennaiho, Taihoku, on *Fagara nitida* (Y. Fujikura, Oct. 3, 1911).

Remarks. Our fungus is very colosely related to *Aschersonia Eugeniae* Koord. (14), parasitic on a scale-insect on the living leaves and branches of Eugenia in Java.

The points of difference between the Javanese and Formosan forms are as follows :—

1. In the shape and length of conidiophores. In our form, the conidiophores are longer, and are simple or sparsely branched, gradually tapering toward the tip and densely packed together, and are not fusiformly swollen at the tip, and not so loose nor uniformly simple as they are represented in the Koorder's figures. The mode of branching of the conidiophore is not constant. It is more often dichotomous apparently in a sympodial manner or rarely trichotomous. (Pl. VI. fig. 22 – 23).

2. In the color of the stroma, our fungus is cream-colored when young,

turning to cinnamon-color as it matures, but is not exactly orange-colored.

3. In the shape and size of the stroma, our form is quite variable. In shape it ranges from semispherical to subspherical, some approaching to conico– or subtruncato–hemispherical, provided always with a narrow rather thick light colored hypothallial margin. The surface of the stroma is not always smooth but becomes irregularly verrucose, when the inner pycnidia become matured. In size, our fungus is decidedly larger, the largest ones measuring 4 mm. in diameter. (Pl. VI. fig. 16 – 20).

4. In the shape and size of the conidia, these two forms coincide fairly closely. In our form, however, the conidia are always straight, and are not so curved as represented in one of the K o o r d e r's figures. (Pl. VI. fig. 21).

These two species are certainly most closely related. But judging from the K o o r d e r's description and figures, we are rather inclined to regard our fungus as quite distinct from his *Aschersonia Eugeniae*.

We have the pleasure of associating this new fungus with the name of the first collector of the fungus in Formosa, Mr. R i k i j i S u z u k i, the late phytopathologist to the Agricultural Experiment Station, Taihoku, Formosa.

Aschersonia Suzukii seems to be widely distributed in Japan. It has recently been found on scale-insects infesting orange-trees in the Province of Suruga. What N i s h i d a (17) thought to be *Aschersonia Aleyrodis* W e b b e r, is apparently of the present species. The shape of the sporodochia and marginate stroma shown in his figures coincide closely with our fungus. According to the author, it is parasitic on *Aspidiotus aurantii* infesting orange-trees in Fukuoka, Shimane and Riukiu.

Sphaerostilbe coccophila T u l. (Pl. VII. fig. 1 – 5).

T u l a s n e s, Carpologia, **3** (1865) p. 105; S a c c à r d o, Syll. Fung. **2**, p. 513; R o l f s, Fl. Agr. Exp. St. Bull. **41**; R o l f s, & F a w c e t t, Fl. Agr. Exp. St. Bull. **94**, p. 8; F a w c e t t, Special Stud. No. 1. p. 25.

Microcera coccophila Desm., Ann. Sc. Nat. 3. Sér. **10**, (1848), p. 359; Tulasnes, l. c. p. 105; Saccardo, Syll. Fung. **4**, p. 727.

Sporodochia obovoid to clavate, variable in shape, scarlet, single or subcespitose at the margin of a scale, 0.5 – 1.5 mm. in length, with or without a pinkish flattened stroma at the base. Conidiophores long, filiform, septate, branched at the base, 3 – 4μ in diam. Conidia long, fusarioid, slightly curved, or straight with somewhat falcate ends, hyaline or very light pinkish, 5 – 9–septate, 74 – 135μ × 4 – 9μ.

Perinthecia formed at the base of sporodochia or on stroma, ovoid, globose or ellipsoidal, with short thick obtuse papilla, single or cespitose or sometimes 2 – 3 coalescent, bright red, smooth, 262 – 365μ × 194 – 320μ; asci cylindical, rounded at apex, 96 – 113μ × 8 – 10μ; ascospores ellipsoidal or ovoid-ellipsoidal, 1–septate, hyaline, 8 – 10μ × 4 – 5μ.

Hab. Parasitic on *Parlatoria zizyphi* (Lucas) Sign., *Mytilaspis gloverii* (Pack.) Comst., and *Aspidiotus ficus* Comst., infesting *Citrus nobilis* Lour., *Ficus Wightiana* Wall., and *Thea chinensis* Sims.

Formosa: On *Citrus nobilis*, Taihoku, Tennaiho (Y. Fujikura, Feb. 24, 1911; March 1, 1911); Koteisho (K. Sawada, April 25, 1911); Shirin, (K. Sawada, March 5, 1911). Shinchiku, Shimpo, (Y. Fujikuro, May 4, 1910; Jan. 1, 1911). Tainan, Mato (K. Sawada. Oct. 28, 1908). On *Ficus Wightiana*, Taihoku, Sōzan (K. Sawada, May, 1911). On *Thea chinensis*, Taihoku, Sōzan (K. Sawada, May, 1911).

Distrib. Europe, Asia (Japan and Ceylon), Africa, N. America, West Indies and Australia.

Remarks. This fungus has also been found in other parts of Japan. K. Sawada collected it on a scale-insect infesting *Prunus Persica* at Morioka, Prov. Rikuchu, in 1912. In the vicinity of Sapporo, S. Kuwayama found the same fungus in 1907 on *Mytilaspis pomorum* infesting apple-trees. Apparantly the present species is the most common fungus-parasite on different kinds of scale-insects in Japan, and is actually serving as an effective natural means for controlling their ravages and spread.

It is extremely rare to find it in its ascosporous stage in Formosa as well as in other parts of Japan, the conidial being the usual form, by

which the fungus seems to be propagating. In only one instance, have we met with its perithecia, that is, on scale-insects infesting the tea-plant at Sōzan in 1911.

With no small degree of diffidence, we identify here our fungus with *Sphaerostilbe coccophila* Tul. There are some points in its characteristics, which do not coincide exactly with the description of the European type. We shall leave further remarks on this fungus for a future occasion.

Microcera Fujikuroi Miyabe et Sawada, sp. nov.
(Pl. VII. fig. 6 – 10)

Stroma well developed around the base and over a part of the surface of a scale, 0.7 – 1 mm. in breadth, and light rose- to flesh-colored. Sporodochia conical, acute, projecting horizontally or slightly obliquely upward from the marginal stroma, 1 – 3 to a scale, 0.5 mm. in length, and rose-colored. Conidiophores filiform, septate, branched at the base, 3μ in diameter. Conidia falcate or crescent-shaped, long, narrow, hyaline, 5 – 6 – septate, 67 – 95μ × 3.5 – 4.5μ.

Hab. On *Aspidiotus ficus* Comst. infesting *Citrus nobilis* Lour.

Formosa: Koteisho, Taihoku (Y. Fujikuro, Feb. 29, 1908; K. Sawada, April 25, 1911). Shimpo. Shinchiku (Y. Fujikuro, May 7, 1910; Jan. 1, 1911). Naiho, Akō, (K. Sawada, Nov. 7, 1909). Sensōho, Hōzan (T. Kawakami, Oct. 30, 1906).

Remarks. The most remarkable character of this fungus is its effect on the host, changing the projecting central portion of the scale into a brilliant scarlet color, which is especially intense at the middle, fading gradually toward the periphery.

This species is commonly found throughout the Island of Formosa, often associated with *Microcera coccophila* Desm. on the same leaf. They can easily be distinguished from each other by the shape and color of the sporodochia.

The present fungus resembles closely some of the Ceylon forms of *Mi-*

crocera described by Parkin (19), especially the *form (b.)*. These two forms, the Formosan and Ceylon, resemble each other in the following characters; viz.— a conspicuous develpment of the stroma, the shape, color and sparsity of the sporodochia, and the shape and size of the conidia, provided the figure 66 of the Plate IV. in the Parkin's paper (19) represent the conidia of his *form (b.)*. As the host insects differ in species in these two forms, their effect on the host may not necessarily be identical. Whether the shell of *Aonidia bullata* attacked by *Microcera f. (b.)* Parkin is similarly affected as in the case of the Formosan Aspidiotus or not, could not be ascertained from the brief description given.

From these considerations, we may safely regard our form as a new species, for which we propose the name *Microcera Fujikuroi*, in honor of Mr. Y. Fujikuro, an assistant-mycologist to the Agricultural Experiment Station, Taihoku, Formosa, who has devoted much time and attention to the collection and study of the fungi parasitic on the scale-insects in Formosa.

Ophionectria coccicola (Ell. et Ev.) Berl. et Vogl.
(Pl. VII. fig. 11–16)

Berlese et Voglino, Add. Syll. Fung. (1886), p. 218; Saccardo, Syll. Fung. **9.** (1891), p. 996; Zimmermann, Centralbl. f. Bakt. 2. Abt. **7.** (1901), p. 872; Rolfs & Fawcett, Florida Agric. Exp't. St. Bull. **94.** (1908), p. 11.

Nectria coccicola Ell. et Ev., Jour. Mycol. **2**, (1886), p. 39.

Sporodochia globose to obovoid, rounded or sometimes obscurely lacerate at the apex, one or two from the margin of a scale, grayish, 0.5–2 mm. in diameter. Conidiophores densely packed together, simple, moniliform, bearing 3 conidia on each apical cell. Conidia become free connected together by the apical cell; single conidium filiform-lanceolate, long acuminate, hyaline, 16–27–septate, 124–210μ × 6–8μ.

Perithecia cespitose, obovoid, light to dark brown colored, 0,5 mm. in

height and 0.3 mm. in diameter. Asci fasciculate, cylindrical-clavate, rounded at the apex, hyaline, 189 – 280μ × 17 – 20μ. Paraphyses filiform, hyaline, of about the same length as asci. Ascospores 8 in an ascus, cylindrical-clavate, hyaline to straw-colored, 20 – 24–septate, 75 – 165μ × 6 – 8μ.

HAB. On *Parlatoria zizyphi* (Lucas) Sign., *Aspidiotus ficus* Comst., *Mytilaspis gloverii* (Pack.) Comst. and *Mytilaspis citricola* (Pack.) Comst. infesting *Citrus nobilis* Lour.

Formosa: Koteishō, Taihoku, (K. Sawada, April 25, 1911). Shimpo, Shinchiku, (Y. Fujikuro, May 6, 1911).

DISTRIB. North and South America, West Indies, Japan, Java and South Africa.

REMARKS. The present species is rather common in Formosa on different scale-insects infesting the orange-leaves, but is not so common as *Sphaerostilbe coccophila*. With us, both the ascosporous and conidial stages are found. Their characters coincide very closely with the descriptions given by Ellis and Everhart (8), and also by Zimmermann (32). Only in the size of the asci, we see some difference. In our form, the length of the asci ranges from 225 to 280μ, the average being about 256μ; while the length given by Ellis and Everhart is 150 – 190μ. The breadth, however, is exactly the same in both cases.

Ophionectria tetraspora Miyabe et Sawada, sp. nov.
(Pl. VII. fig. 17 – 22).

Sporodochia globose to obovoid, grayish white, mostly 3 – 6 on a scale, 0.3 – 0.8 mm. in diameter. Conidiophores densely packed together, moniliform, bearing 3 – 5 mostly 4 conidia on the apical cell. Conidia become free connected together by the apical cell; single conidium cylindrical slightly tapering toward the acute or obtuse tip, subclavately cylindrical, when half matured, hyaline, 12 – 20–septate, 105 – 190μ × 7 – 9.5μ.

Perithecia cespitose, subglobose to obovoid, darkish brown, about 0.5 – 0.6 mm. in height and 0.5 mm. in diameter. Asci fasciculate, clavate,

rounded at the tip, hyaline, $150-177\mu \times 17-20\mu$, accompanied by many thread-like paraphyses. Ascospores 8 in an ascus, clavate, hyaline to straw-colored, 11–17-septate, $50-64\mu \times 6.5-7.5\mu$.

HAB. On *Parlatoria zizyphi* (Lucas) Sign. infesting *Citrus nobilis* Lour.

Formosa: Tennaiho, Taihoku. (Y. Fujikuro, March 11, 1911).

REMARKS. The distinguishing characteristic of the present species is the production of four conidia on the apical cell of the conidiophore, although there are occasionally cases with three or five. From the previous species, it is easily distinguished also by the shape of the conidia as well as by the size and shape of asci and ascospores, and also by the shape of perithecia.

This fungus, although not so common as *Ophionectria coccicola*, is still commonly found on the scale-insects infesting the orange-trees in Formosa, often associated with the latter on the same leaf.

By comparing it with the other species of this genus already described, we have not been able to find one which corresponds exactly with our plant. Moreover, *Ophionectria coccicola* has been so far the only species of the genus known to infect the scale-insects. The other species may upon further investigations be found to be entomophilous as in our present case.

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Literature Cited.

1. **Berger, E. W.** (1907) ... Whitefly conditions in 1906. The use of the fungi. (Florida Agric. Exp. Sta. Bull. **88**, p. 49, pl. 3).
2. ..... (1908) ... Control of the whitefly by natural means. (Trans. Fl. St. Hort. Soc. for 1907, p. 69, pl. 1).
3. ..... (1908) ... Report of the Entomologist. (Fl. Agr. Exp. St. Rept. for 1907. p. XXX. pl. 2).
4. .... (1909) ... Whitefly studies in 1908. (Fl. Agr. Exp. St. Bull. **97**, p. 43, 18 figs.)
5. ..... (1910) ... Whitefly control. (Fl. Agr. Exp. St. Bull. **103**, p. 5, 2 figs.)
6. **Berlese, A. N.** et **Voglino, P.** (1886) .. Additamenta to the Vol. I–IV. of Saccardo, Sylloge Fungorum, p. 218.
7. **Desmazières, J. B. H. J.** (1848) ... Notice sur les plantes cryptogames récemment découvertes en France. (Ann. des Sc. Nat. 3. Sér. **10**, p. 359).
8. **Ellis, J. B.** & **Everhart, B. M.** (1886) ... Synopsis of the North American Hypocreaceae. (Jour. of Mycology, **2**, p. 39).
9. .. .. (1895) ... New species of fungi. (Bull. Torr. Bot. Club, **22**, p. 434).
10. **Faweett, H. S.** (1908) .. Fungi parasitic upon *Aleyrodes citri*. (Special Studies, No. 1. Univ. of the State of Florida. 7 pls. and 19 text-figs.)
11. **Forbes, E. B.** (1893) ... Recent work on the San José scale in Illinois. (Ill. Agr. Exp. St. Bull. **56**).
12. **Gossard, H. A.** (1903) ... White-fly. (Fl. Agr. Exp. St. Bull. **67**).
13. **Hennings, P.** (1904) .. Die Gattung Aschersonia Mont. (Festschrift f. P. Ascherson, p. 68).
14. **Koorders, S. H.** (1907) . Botanische Untersuchungen über einige in Java vorkommende Pilze, besonders über Blätter bewohnende, parasitisch auftretende Arten.
15. **Kuwana, J.** (1904) ... On San José scales. (Imp. Agr. Exp. St. Tokyo, Special Rept. **19**, p. 73. In Japanese).

16. **Matsumura, J.** (1904) ··· Index Plantarum Japonicarum. I. Cryptogamae.

17. **Nishida, T.** (1907) ··· Diseases of Orange-trees. p. 73. (In Japanese).

18. **Nomura, H.** (1901) ··· Scarlet-fungus disease of scale-insects. (Imp. Agr. Exp. St. Rept. **18,** p. 105, pl. 9. In Japanese).

19. **Parkin, J.** (1906) ··· Fungi parasitic upon scale-insects, (*Coccidae* and *Aleurodidae*): a general account with special reference to Ceylon forms. (Ann. Roy. Bot. Gard. Perademiya. **3,** p. 11. pl. I–IV.)

20. **Petch, T.** (1911) ··· Note on the biology of the genus Septobasidium. (Ann. of Bot. **25,** p. 843).

21. **Rolfs, P. H.** (1897) ··· A fungus disease of the San José scale. (Fl. Agr. Exp. St. Bull. **41**).

22. **Rolfs, P. H.** and **Fawcett, H. S.** (1908) ··· Fungus diseases of scale-insects and whitefly. (Fl. Agr. Exp. St. Bull. **94.** with 20 textfigs.)

23. **Saccardo, P. A.** (1891, 1899) ··· Sylloge Fuugorum, **9, 14.**

24. **Sawada, K.** (1911) ··· Plaster-disease of the camphor-tree. (Agric. Exp. St. Govern. of Formosa. Special Rept. **2.** p. 85. pl. 9, 10. In Japanese).

25. ····· ··· (1911) ··· Plaster-disease of *Acacia confusa.* (*Ditto,* p. 99. pl. 11, 12. In Japanese).

26. ····· (1912) ··· On *Helicobasidium Tanakae* Miyabe. (Tokyo Bot. Magazine, **26,** p. (102). In Japanese).

27. **Shirai. K.** (1905) ··· A List of Japanese fungi hitherto known.

28. **Swingle, W. T.** and **Webber, H. J.** (1898) The principal diseases of citrous fruits in Florida. (U. S. Dept. of Agr. Div. of Veg. Phys. and Path. Bull. **8.**)

29. **Tulasne, L.** et **C.** (1865) ··· Selecta fungorum carpologia. **3,** p. 105.

30. **Webber, H. J.** (1894) ··· Preliminary notice of a fungus parasite on *Aleyrodes citri.* (Jour. of Mycol. **7,** p. 363).

31. ····· ··· (1897) Sooty mold of the orange and its treatment. (U. S. Dep. of Agr. Div. of Veg. Phys. and Path. Bull. **13**).

32. **Zimmermann. A.** (1901) · Einige javanische, auf Coccidae parasitierende Ascomyceten. (Centralb. f. Bakt. 2. Abt. **7,** p. 872).

Explanation of Plates VI–VII.

Plate VI.

Aschersonia Aleyrodis. 1—7.

1. Showing stroma with mycelial hypothallus. (3/1).
2. Cross-section of stroma. (5/1).
3. Section of stroma and pycnidium, showing sclerotioid stroma, conidiophores, stylospores and paraphyses. (Zeiss 4 × DD).
4. Paraphyses. (Zeiss 4 × F).
5. Conidiophores. (Z. 4 × F).
6. Conidiophores. (Z. 4 × DD).
7. Stylospores. (Z. 4 × DD).

Aschersonia marginata. 8—15.

8. Stromata on Citrus twig. (3/1).
9. Stromata on the upper surface of the leaf of *Psidium Guyava.* (3/1).
10. Stromata on the under surfpce of the leaf of *Psidium Guyava.* (3/1).
11. Section of stroma of depressed-spherical type. (5/1).
12. Section of stroma of hemi-spherical type. (5/1).
13. Section of stroma and pycnidium, showing sclerotioid stroma, conidiophores and stylospores. (Z. 4 × DD).
14. Conidiophores. (Z. 4 × DD).
15. Stylospores. (Z. 4 × F).

Aschersonia Suzukii. 16—23.

16-17. Stromata on *Citrus nobilis.* (3/1).
18. Stromata on *Fagara nitida.* (3/1).
19. Section of stromata on Citrus. (5/1).
20. Section of stroma on *Fagara nitida.* (5/1).
21. Stylospores. (Z. 4 × F).
22. Section of stroma and pycnidium, showing sclerotioid stroma, conidiophores and stylospores. (Z. 4 × DD).
23. Cocnidiophores. (Z. 4 × DD).

Plate VII.

Sphaerostilbe coccophila. 1—5.

1. Sporodochia. (5/1).
2. Conidia on *Citrus nobilis.* (Zeiss 4 × DD).
3. Conidia on *Malus communis.* (Z. 4 × DD).

4. Conidia on *Prunus Persica.* (Z. 4 × DD).
5. Conidiophores. (Z. 4 × DD).

Microcera Fujikuroi. 6—10.

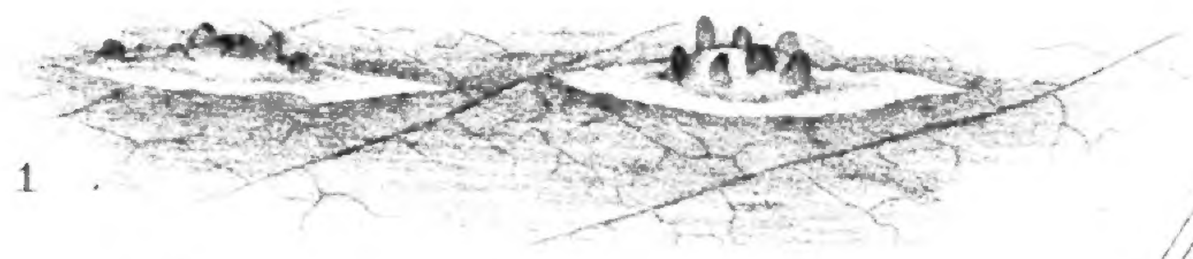
6. Sporodochia. (5/1).
7. Sporodochia. (10/1).
8. Conidia. (Z. 4 × DD).
9. Conidiophores. (Z. 4 × DD).
10. Mycelium composing the stroma. (Z. 4 × DD).

Ophionectria coccicola. 11—16.

11. Sporodochia. (5/1).
12. Perithecia. (5/1).
13. Conidia. (Z. 4 × DD).
14. Conidiophores and very young conidia. (Z. 4 × DD).
15. Ascus and paraphyses. (Z. 4 × DD).
16. Ascospores. (Z. 4 × DD).

Ophionectria tetraspora. 17—22.

17. Sporodochia. (5/1).
18. Perithecia. (5/1).
19. Conidia. (Z. 4 × DD).
20. Ascus and paraphyses. (Z. 4 × DD).
21. Ascus. (Z. 4 × DD).
22. Ascospores. (Z. 4 × DD).



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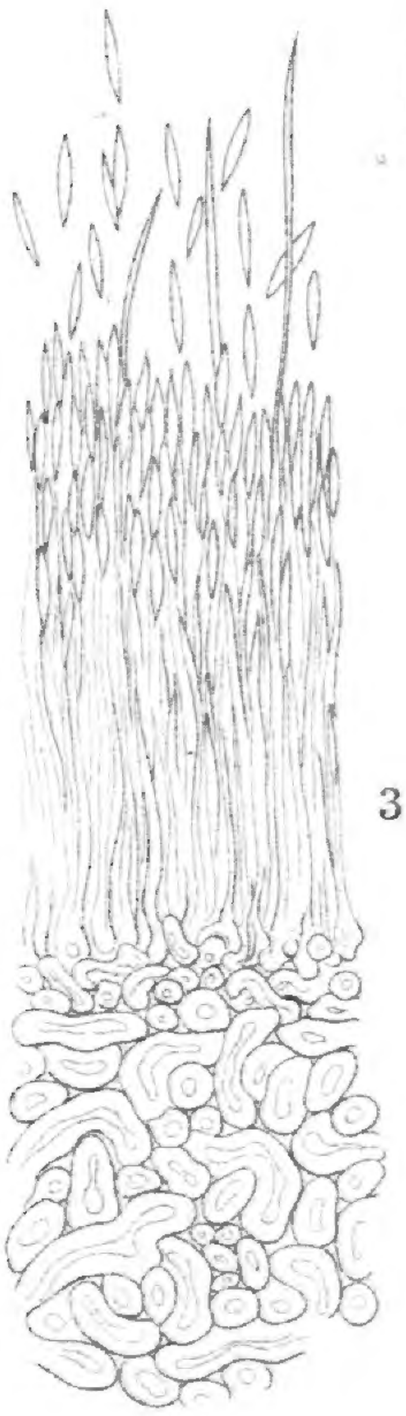

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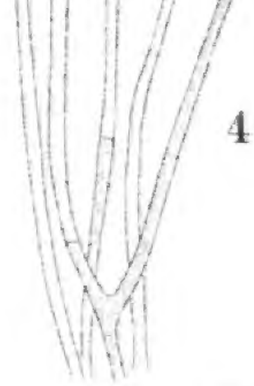

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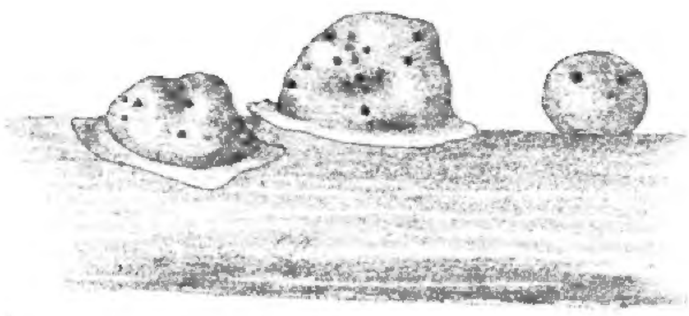

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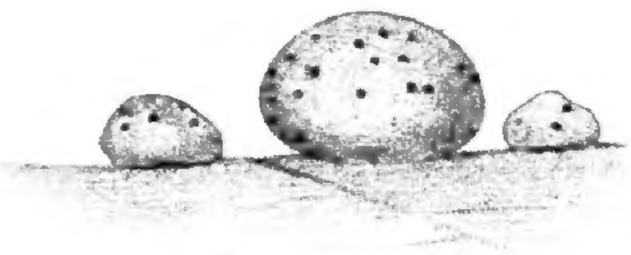

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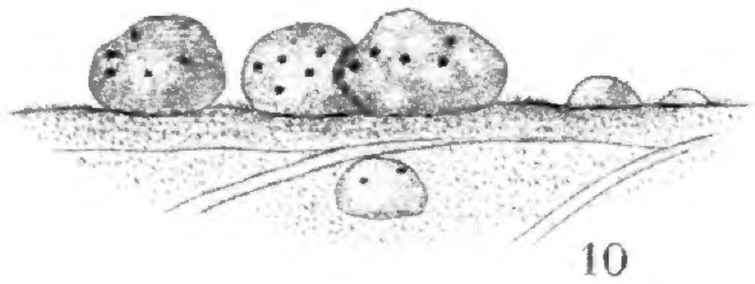

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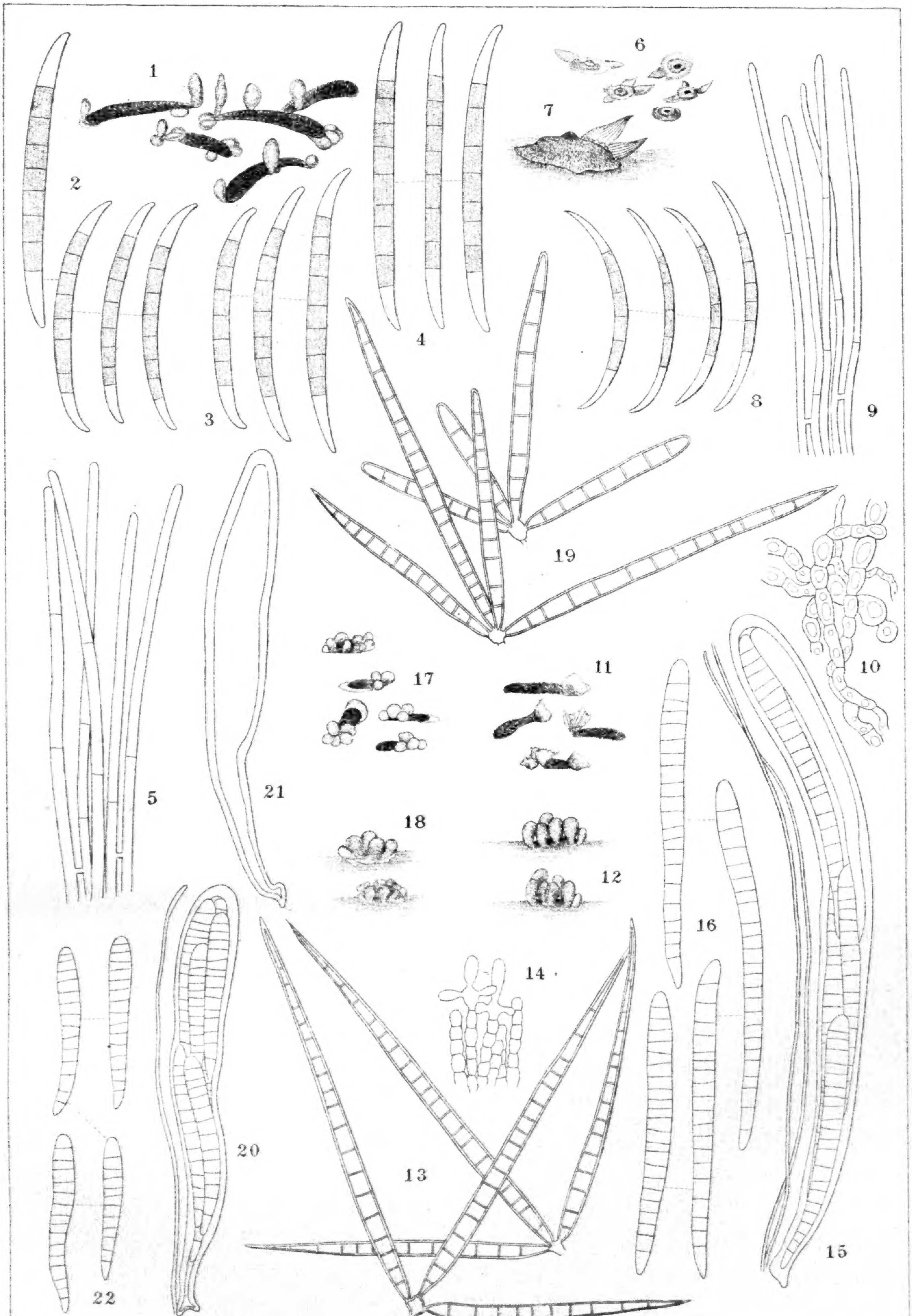
1—7. Aschersonia Aleyroides Webber. 8—15. A. marginata Ell. et Ev 16—23. A. Suzukii Miyabe et Sawada.



K. Sawada. Del.

1—5. Sphaerostilbe coccophila Tul. 6—10. Microcera Fujikuroi Miyabe et Sawada. 11—16. Ophionectria coccicola (Ell. et Ev.) Berl. et Vogl. 17—22. O. tetraspora Miyabe et Sawada.

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