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A Report on Sterility in Irises

BY

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and A. B. STOUT

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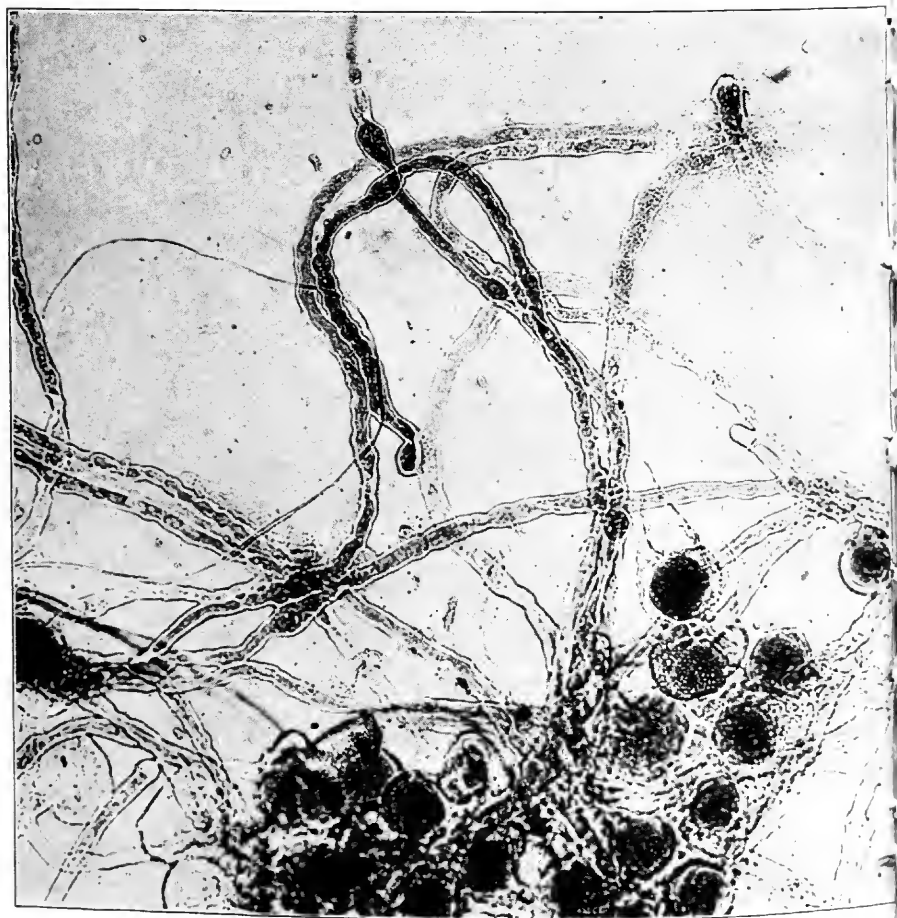


Plate I.—Photo of pollen tubes (magnified 100 times) of the variety Amas grown on a drop of the agar-sugar medium used in the germination tests. The pollen of Amas is highly viable and potent and its use should give capsules in cross-pollination provided the intended seed parent is able to produce fruit and the incidental factors are favorable.

The variety Amas is itself only very feebly fruitful and evidently rarely sets capsules even to the best of pollen.

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Introduction

Any grower of irises may readily observe that many of the flowers do not yield capsules and seeds. Since the structure of the flower is adapted to insect pollination some of this sterility may be due to lack of insect pollination. But the structure of the flowers does not limit pollination by insects from one flower to another flower of the same variety or even from one side to another in the individual flower. Hence when a variety is decidedly or even always fruitless wherever grown one realizes that either insect pollination is entirely lacking or that there is some type of sterility present which is inherent and fundamental in the nature of the variety and is independent of mere processes of pollination.

It is the inherent sterility (or sterilities) which the breeder of irises will continually encounter. When the pollen is artificially supplied and proper pollinations made under conditions favorable to seed setting, the inherent sterilities operate to defeat the efforts that are made to secure seed for breeding.

An indication of the nature and the range of the inherent sterilities in irises has been well presented by Miss Grace Sturtevant in an article published in Bulletin No. 2 of the American Iris Society. In her survey of experiences in breeding irises she finds four main groups of varieties as follows:—

1. Varieties that have proved fertile.
2. Varieties that do not set seed but have fertile pollen.
3. Varieties that set seed but the pollen is absent or sterile.
4. Varieties that are sterile.

From this it is evident that some varieties are fertile both as seed and pollen parents, that some can function only as a seed or as a pollen parent, and that others are sterile both as seed and as pollen parents. Those who attempt to breed irises from seed are certain to encounter these sterilities and their efforts will in considerable measure, be facilitated by an understanding of what is possible and what is impossible in seed breeding. To determine this more fully and for as many varieties as possible was the aim of the investigation here reported. The work was done at The New York Botanical Garden in cooperation with the American Iris Society which provided the funds for the two scholarships awarded for the study. The period of the work extended through May and June 1925.*

*The laboratory studies of the pollen were made by Miss Swabey and the hand pollinations and field studies were made by Miss Cover. The research was done under the direction of Dr. A. B. Stout, of The New York Botanical Garden who contributed most of the text, exclusive of the tables, of this report.

—Editors.

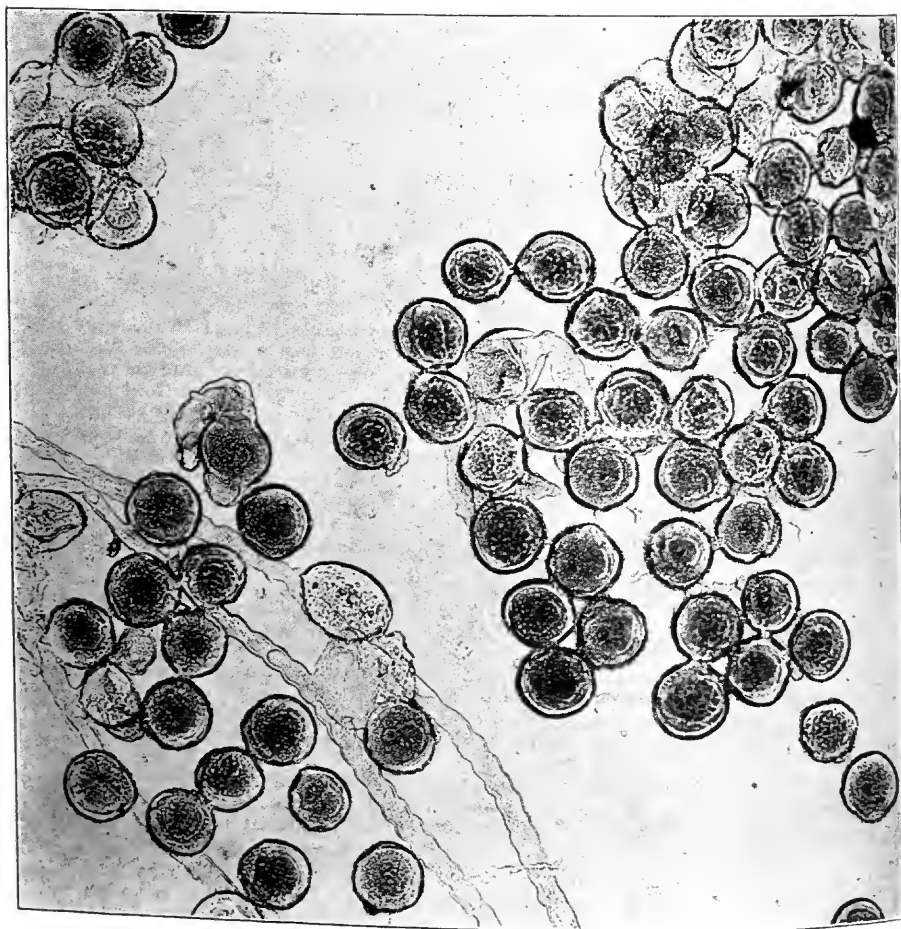


Plate II.—The pollen of the variety *Asiatica* is abundant, it looks "good" even when examined with a microscope but in the germination tests only a small percentage of the grains is viable. In controlled pollination such pollen occasionally results in seed pods.

Sterility in Clonal Varieties

Iris are mostly propagated as **clonal** varieties. The variety originates as a seedling and then there is continued vegetative propagation by division of rhizomes, bulbs or tubers as the case may be. The entire clonal variety is really one plant whose parts have been separated and grown in different places. In respect to the presence and behavior of

inherent sterilities the **entire variety acts as one plant**. Thus in the variety Gertrude all plants true in vegetative descent from the original seedling have sterile anthers quite as that seedling evidently had. A variety which sets fruit freely to its own pollen in one locality will do so elsewhere provided of course that incidental conditions do not interfere. It may, however, be found that some varieties are somewhat variable in their maleness or femaleness but as a rule rather uniform behavior in inherent sterility is to be expected of clonal varieties.

Methods of Study

Hand pollinations. To determine the ability of a variety to produce fruit and seed, hand pollinations were made using pollen known to be capable of functioning in seed production. The most proper time for pollination seems to be when the stigma is bent away from the crests and the stigmatic lobe is somewhat drooping. This is usually from the afternoon of the first day a flower is open to about the morning of the third day when the flower parts begin to wilt. In making pollinations fresh anthers which were shedding pollen profusely, or as fully as is possible for them, were brushed over the stigmatic surfaces of all three pistils. The flower was then tagged and a record made of the later condition or development.

In respect to the ability to produce fruit and seeds when properly pollinated with good pollen varieties may be classed as follows:—

- A. **Highly fruitful.**
Will produce fruit to good and viable pollen ("a" and "b" pollen as discussed later), with usually a high percentage of successes.
- B. **Feebly fruitful.**
Will produce fruit but usually only to "a" pollen and with a low percentage of successes.
- C. **Entirely fruitless.**
No seeds will evidently be obtained to crosses made with any pollen.

The hand pollinations also constitute a test of the ability of pollen to function when used on varieties known to be able to produce fruit. The work was done in the display beds at The New York Botanical Garden where it was impracticable to "bag" the flowers and hence stray open pollinations could not be avoided. Under such conditions the pollination tests are less conclusive for a judgment of pollen than for a judgment of the ability to set fruit. To obtain further evidence regarding the character and quality of pollen, laboratory studies were made.

Germination of pollen. A direct study of the viability of pollen was made by laboratory tests for germination. Preliminary tests showed that good pollen of the irises germinates well on a medium made up of 1 gram agar agar and 15 grams cane sugar dissolved in 100 cc distilled water. With 10 grams cane sugar good germination is also to be had.

The method of making the germination tests is as follows: A large drop of the melted medium is placed on a glass slide and allowed to become cold and to solidify. Samples from the pollen to be tested are then scattered or "planted" on the drop. The slide is numbered and placed in a moist chamber and kept at room temperature for about 18 hours. The pollen is then examined with the aid of a microscope which

readily reveals the presence of pollen tubes. (See Plates 1 and 2). The relative number of grains that germinate can be determined.

A study of the condition of pollen is facilitated further by the addition of aceto-carmin stain and especially when there is very poor or no germination. The stain shows that pollen grains may swell up and be plump in water and on the medium used for germination tests and yet contain very little granular material or none at all. In other cases pollen grains may be so aborted that they remain shrunken and collapsed. Sometimes, however, pollen grains that appear to be good do not germinate (See Plate 2).

In respect to the condition of the pollen and its viability and its ability to function in seed production when used properly, varieties may be classed as follows:

- a. Pollen excellent; anthers well-formed, dehiscing properly, pollen abundant, high percentage of germination when grown in culture tests. In controlled pollination such pollen frequently results in seed pods.
- b. Pollen good; anthers well-formed, dehiscing properly, pollen abundant, fair percentage of germination in culture tests. In controlled pollination such pollen occasionally results in seed pods.
- c. Pollen appearing good, anthers well-formed, dehiscing properly, pollen abundant, when grown in culture tests little or no germination but apparently sometimes able to produce seed.
- d. Pollen scant, or none, anthers not well-formed, if pollen is present it does not dehisce but is "caked."

Irregularities in the character of stamens and pollen are to be found among the flowers of certain varieties and even for different flowers of a same stalk. Thus *Amabilis* had very little pollen in flowers that opened on May 20th, but viable pollen was collected from flowers open on May 29th. In the case of *Golden Plume* no pollen was found in flowers open on June 9th, but on June 20th, pollen was obtained which gave 40% germination. No pollen was found for *Queen of May* on May 27th, three days later considerable pollen was being shed which gave about 10% germination but on June 2nd and June 12th the flowers open on this variety seemed to be pollen sterile. Such variations are apparently characteristic of certain varieties and may, in part at least, be due to external influences such as unfavorable weather conditions. For most varieties of the "a" class the pollen appears to be very constantly potent.

The Report of the Data Obtained

It seems advisable to give the data of the investigations in the two tables that follow. For convenience the varieties are arranged in alphabetical order using the names given in the American Iris Society Preliminary Complete Check List, Seventh Revision, Jan. 1, 1922. The varieties were worked as known in the test garden and grouped under the preferred name as listed in the check list. No attempt has been made here to group varieties according to the botanical or natural relationships.

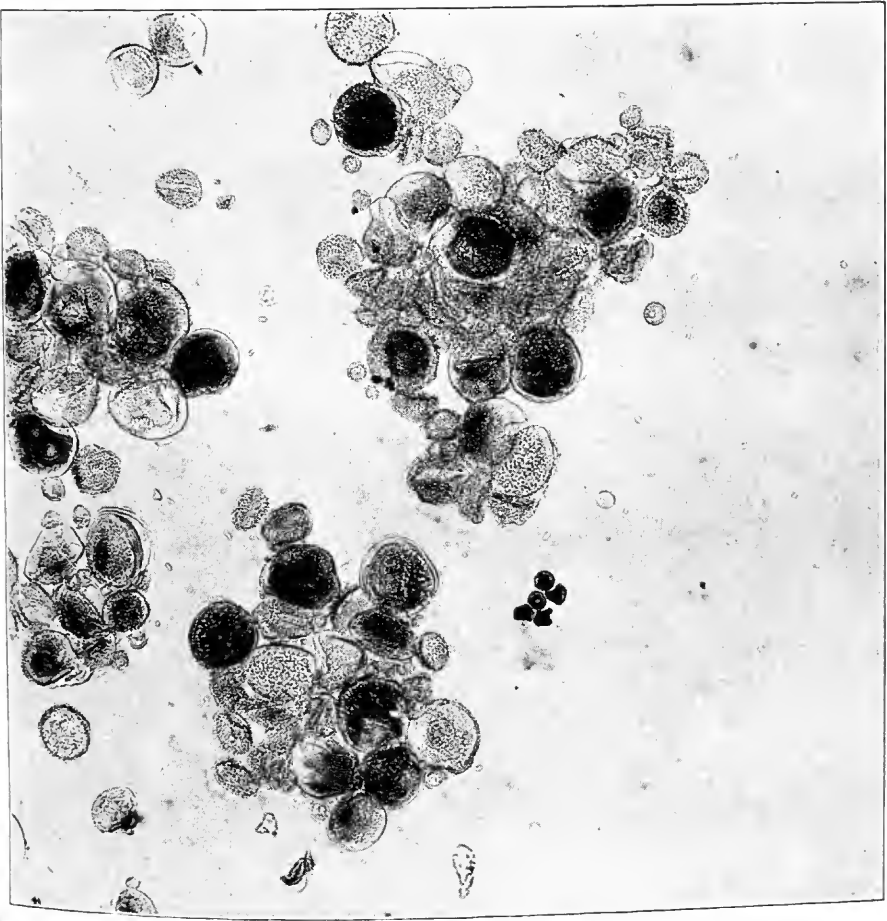


Plate III.—The pollen of *Iris germanica* is poor and apparently almost worthless. Many of the grains are small and shrivelled. There was no germination in tests made on five different dates. Such pollen will rarely or perhaps never function in the production of viable seed even when used on varieties that are inherently highly fruitful.

Iris germanica is, however, somewhat fruitful. In the tests (see record in table II) some capsules with viable seed were obtained.

TABLE I.

A LIST OF THE VARIETIES OF IRISES STUDIED Showing the Class to Which Each is Assigned With Respect to the Ability to Produce Capsules and in Regard to the Condition of the Anthers and Pollen

A capital letter (A, B, or C) indicates the ability of the variety to function as a seed parent in the pollination tests at the New York Botanical Gardens as described above (See page 5). **Bold face type** in the name of a variety indicates that the variety is known to be able to produce seed, either in tests made or in open pollination at the New York Botanical Gardens, or in the records supplied by Miss Grace Sturtevant. This, with a capital A or B, indicates that the variety set seed to hand pollination in the tests made; when there is no such letter the variety set seed to open pollination.

A small letter (a, b, c, or d) indicates the group to which the variety has been assigned with regard to the condition of its pollen as determined in the laboratory studies. (See discussion on page 6 for details). As asterisk (*), indicates that the pollen was studied in the laboratory but was not used in the hand pollinations. A dagger (†) before a name indicates that that variety has yielded fruit for Miss Sturtevant, data from unpublished records.

NAME OF VARIETY	NAME OF VARIETY
c *A. E. Kunderd	Atlas
b *Afterglow	C c Augustina
c *Agness	c *Aunt Rachel
A-b Albert Victor	†Aurea
C c Alfred Fiddler	C c Aurea maculata
Alcazar	c *Aurora
C c Alice	C c Australis
d Alonzo	C d *Autocrat
c *Alphonse	B c Aven'r
A c Alpin	A. W. Blakeley
Alvarez	c *Aymard
d *Amabilis	B c Azure
C d *Ambassadeur	Balceng Curiosity
B a Amas	d *Banba
d Annie Jane	Beatrice
b Anne Leslie	c *Belcolor
A b Anton Mauve	C *Beracensis
c *Aphylla	Berchta
d Apollo	B b Berlioz
b Arabesque	*Bicolor
c *Arc-en-Ciel	Bigotini
C c *Archeveque	Bizarre
C d Argus	Blanche
c *Arlequin Malinai	Blanda
Armand Clavaud	c *Blue
c *Armer Raken	A c Blue Beard
d †Arnols	c *Blue Bird
d Arsace	C a Blue Boy
b *Asiatica	B c Blue Jay
c *Aspasie	C *Blue Lagoon
Assuerus	A c Blue Stone

NAME OF VARIETY

- A d *Bluet
- c **Boccage**
- c *Bougere
- c *Bossuet
- B c *Bride
- A c **Bridesmaid**
- A a **Brionense**
- c *Bronze Age
- c ***Bronze Beauty**
- C- *Bronze Lady
- c Bronze Stoffel
- c *Brooklyn
- c *Brunette
- Buriensis Elizabeth**
- A b **Butterfly**
- c ***Camelcon**
- B **Camelia**
- C b C. A. Pfeiffer
- a *Carmencita
- d Carnot
- B c **Caterina**
- c Cazes
- B d *Celeste
- A d *Celia
- A d **Cengialti**
- A b **Cengialti purpurea**
- d Chalcedonica
- C c **Chamaeiris aurea**
- A c * " delicata
- c *Chenedolle
- c *Chereau
- d *Cherubim
- B d ***Chester Hunt**
- c *Chloris
- C c Citrea
- c *Clara
- C b Clarissa
- ***Clarence Wedge**
- C **Clematis**
- B c **Clio**
- Cluny**
- Coelestis**
- A c **Coerulea**
- B b ***Colduchat**
- Colonial Dame**
- Compacta**
- Comtesse de Courcy**
- c *Comtesse d Hauteville
- C b C. P. Connell
- Cordon Bleu**
- B d ***Corrida**
- B d **Cristata**
- A a ***Cristata Biglumis**
- A **Crusader**
- A b ***Curiosa**
- A a **Cyanea**

NAME OF VARIETY

- b *Cyanea x Xiphium
- A d ***Daisy Hill**
- c *Dalmarius
- C c **Dandy**
- A d **Dawn**
- C b **Delicata**
- c ***Demi Deuil**
- d ***Diamond**
- A **Diana**
- Die Fee**
- Ditton Purple**
- c ***Dolphin**
- c ***Donna Maria**
- c ***Dorinde**
- Douglasiana**
- Drake**
- d ***Dr. Bernice**
- c ***Dr. Bless**
- c ***Dream**
- b ***Dr. Lyons**
- b ***Dr. Mantor**
- C c **Eclipse**
- a ***Eden Philpotts**
- c ***Edina**
- C c †**Edouard Michel**
- c ***E. H. Jenkins**
- C c †**Eldorado**
- Eleon**
- c ***Elizabeth**
- c ***Emilie**
- a ***Emperor**
- Empire**
- B a **ensata**
- A c **Esmeralda**
- B c **Etta**
- c ***Eugene Verdier**
- c ***Eupanloup**
- b **Excelsa**
- C c ***Faith**
- B c **Fairy**
- c ***Faustine**
- Faustriana**
- B b **Flancee**
- b ***Fille d'Eve**
- c ***Firmament**
- C a **Flavalba**
- B c **Flavescens**
- B c **Florence Wells**
- C c **Florentina**
- A a **Floribunda**
- Florida**
- C c **Fontarabia**
- c ***Foster's Yellow**
- C b **Fritiof**
- Froid Bouquet**
- c ***Fryers Glory**

NAME OF VARIETY
 d **Garrick**
 Gajus
 George V.
 B b **Gerda**
 B c **germanica**
 B " **alba**
 " **Major**
 C c * " **mecena**
 A d **Gertrude**
 b ***Gisele**
 b ***Gladstone**
 b ***Golden Plume**
 c ***Golden Spire**
 C b **Gorgeous**
 b **Gov. Hughes**
 B a **gracillipes**
 A c **Gracillis**
 b ***Grand Bouquet**
 C b ***Grandee**
 c ***G. W. Peake**
 c **Gypsy Queen**
 B c **Halophylla**
 C d ***Hakador**
 Harmonia
 Harriet
 C d ***Harriet Presby**
 A a **Hartz**
 c **Haydee**
 C c †**Hector**
 B c **Helze**
 c ***Henkler**
 C c **Helvetia**
 B a **Herant**
 d **Hercules**
 c ***Heriartiana**
 C c ***Hestione**
 A c **Hiawatha**
 B **Hilda**
 A a **Hobbema**
 B c **Honorabile**
 b **Hoogiana**
 B a **Hookeri**
 c †**Hope**
 d **Humboldt**
 c ***Idion**
 b ***Indian Queen**
 B c ***Ingeborg**
 c ***Innocenza**
 Iris King
 Ismall
 C c †**Isoleme**
 B c ***Ivorie**
 Jacqueliana
 C c **Japanesque**
 c ***J. B. Dumas**
 c *†**Jeanne d'Arc**

NAME OF VARIETY
 Jean Sophie
 Jenny Lind
 c ***Joie de l'Oeil**
 Josephine
 b ***Kathleen**
 c ***Kathryn Fryer**
 b ***Kelly**
 b **Khedive**
 C c **King Christian**
 c **King George V.**
 B c **King Humbert**
 b ***Knysna**
 C b **Kochii**
 c ***La Clarte**
 c ***Lady**
 c **Lady Seymour**
 B c **Languedoc**
 d **La Beaute**
 c ***La Nult**
 La Pactol
 c ***La Vallette**
 a **Lavater**
 C b **Lavendulacea**
 d **La Vensil**
 Laurentinus
 d **Lea Leveque**
 b ***Leander**
 c ***Leda**
 c ***Lelieur**
 B b **Le Mesge**
 c ***Lemon**
 d **Lesquie**
 c ***Le Reve**
 c ***Leopold**
 d **Leseble**
 C d ***Leverrier**
 d **Lilacina**
 B b **Lobelia**
 B b **Lohengrin**
 C d ***Loppio**
 c ***Lord Grey**
 c ***Lord Mayor**
 d ***Lord Rosse**
 h ***Lord Salisbury**
 d ***Lorelev**
 B c **Luccarda**
 A **Lurida**
 B c **Lutescens**
 B a **Macilla**
 c ***Maid Marian**
 b ***Main-herd**
 Maiesteux
 c ***Major**
 C b ***Malvina**
 Ma Mio
 b ***Mandarin**

NAME OF VARIETY

- A a **Mandraliscae**
- b ***Maori King**
Marengo
- A a **Margaret**
- c **Margaret Moor**
- c ***Marginata**
- c ***Maria Theresa**
- B **Marjolin**
- C b **Marocain**
- C b ***Marvar**
- c ***Mary Barnett**
- A b **Mary Gray**
- B c ***Massasoit**
- b ***Maurelie**
- A **Mauvine**
- c ***May Morn**
- A ***May Wood**
- C b ***Mazarin**
- c ***Mephisto**
- C c **Mephistopheles**
- e ***M. G. Peters**
- c ***Merlin**
- c **Mercedes**
- ***Mestor**
Meyerbeer
- C ***Milton**
- c ***Miralba**
- b ***Miss Eardley**
- c ***Miss Margaret Sheridan**
- c ***Mithras**
- d **Mlle. Schwartz**
- e ***Mme. Blanche Pion**
- d **Mme. Bories**
- c **Mme. Bohuuet**
- B c **Mme. de Sevigne**
- c **Mme. Patti**
- b ***Mme. Thibault**
- d **Modest Guerin**
Moliere
- c ***Monaroup**
- d **Monsignor**
- c ***Moonstone**
- c ***Mountain Maid**
- c ***Mrs. Andrist**
- c ***Mrs. A. M. Brand**
- d **Mrs. Christman**
- b **Mrs. Cowley**
- C c **Mrs. Curtis**
- C c **Mrs. George Darwin**
- b ***Mrs. Erver**
- c ***Mrs. Hayes**
Mrs. Hughes
- b ***Mrs. Kimball**
- b **Mrs. Sanford**
- b ***Mulfordae**
- d **Muta**

NAME OF VARIETY

- B a **My Lady**
- c ***Nauset**
- C c **Naushon**
- b ***Navajo**
- b ***Nemours**
- c ***Nicola**
- B **Nibelungen**
- c ***Nimrod**
- c ***Ninsart**
Niobe
- B c **Nothung**
- B c **Nudicaulis**
- d **Ochracea caerulea**
- C **Oldenbarneweld**
- c ***Ophelia plicata**
- c ***Orchid**
- C c **Oriental**
- c ***Osiris**
- d **Othello**
- C c **Pacquita**
- c ***Paxatawney**
- d **Pajol**
- c ***Paladin**
- d **Pallissy**
Pameron
- b ***Pancrease**
- B **Pare de Neuilly**
- B **Pauline**
- c ***Perthuis**
- B c **Plumeri**
- c ***Pluton**
- c ***Pres. Thiers**
- B c **Prestige**
- b ***Prince of Orange**
- c ***Prince of Wales**
- B b **Princess Beatrice**
- d **Princess Elise**
Princess Louise
- B b **Princess of Wales**
- b ***Princess Royal**
- A c ***Prof. Seeliger**
- c ***Pulcherrima**
- c † **Prosper Laugier**
- A b **pumila**
- C b " **alba**
- C c **Purdy's Blue**
- A a **Purple-and-Gold**
- A **Purpurascens**
- A a ***pseudacorus**
- a ***Quaker Lady**
- b † **Queen Emma**
- C c " **Flavia**
- B d " **Mary**
- C d † " **of May**
- d " **Victoria**
- c ***Racine**

NAME OF VARIETY

- c *Rakan
- C Ramapo
- A c **Rangoon**
- c *Raphael
- b *R. C. Rose
- d **Red Cloud**
- B c **Red Riding Hood**
- B c **Regale**
- c *Rembrandt
- d Reine de Belges
- B c *Reticulata superba
- B **Rev. C. H. Demetrio**
- Rev. S. H. Smith**
- c *Rev. Wurtelle
- B c **Ricardi x Siberica**
- Riva**
- B d **Rollandiana**
- c *Romeo
- d † **Rose Unique**
- Royal Purple**
- B **Ruberissima**
- C **Rupert**
- c *Salvatori
- B c **Sambucina**
- B c ***Sapphire, DB**
- c ***Sappho**
- Sapphrino**
- Sarabande**
- B b **Sarah**
- c ***Sarpedon**
- b ***Scott**
- A c ***setosa**
- C c † **Sherbert**
- B c **Sherwin-Wright**
- B b **sibirica**
- * " **alba**
- A b " **Baxteri**
- a " **Mme. Butterfly**
- " " **Snow Queen**
- a * " **Sunnybrook**
- " " **violacea**
- Sincerity**
- c ***Sirene**
- d **Socrates**
- B b ***Socrates x lutescens**
- Sorrel**
- c ***Soliman**
- c ***Soeur Superieure Albert**
- b ***Souv. de Colombier**
- B b **Speciosa**
- B d ***Spectabilis**
- A a **Statellae**
- c ***Steepway**
- A a **Stenophylla**
- A c ***Stewart**
- c † **St. Clair**

NAME OF VARIETY

- c ***Susan Bliss**
- . b ***Sunking**
- Sunrise**
- b ***Sybil**
- c ***Sylphide**
- d **Sympathy**
- c ***Tamar**
- Tamerlan**
- b ***Tarquin**
- B a **Tectorum**
- B c ***Tecumseh**
- A c **tenax**
- c ***Tendresse**
- b ***Terias**
- A c **Theresita**
- b ***Thesis**
- c ***Thetis**
- C d ***Thora**
- C c ***Titus**
- b ***Toreador**
- Trantlieb**
- a ***True Blue**
- C c **Ute Chief**
- B c ***Van Obscura**
- c **Valera**
- A c. **Verbena**
- A **versicolor**
- A **Versicolor Columbia**
- A **Versicolor Columnae**
- A a **Versicolor Fosteri**
- A **Versicolor rosea**
- b ***Victorine**
- Victory**
- d ***Victor Verdier**
- c ***Vierge Marie**
- c ***Viel d'Or**
- C b ***Villereal**
- d **Viola**
- c ***Violet Episcopal**
- C c " **Queen**
- c ***Virginia**
- C **Virginia Moore**
- c ***Virginie**
- d **Vonte Celeste**
- c ***Walhalla**
- B d **Walueriana**
- B c **Walter Scott**
- b † **Whiffenpoof**
- A d ***Whim**
- C ***White Knight**
- A a **William Marshall**
- a * " **Sanders**
- c ***Willie Barr**
- d **Zephyr**
- C c **Zua**
- C c **Zwanenburg**
- B c **Williamson 192-D**



Plate IV.—Some of the capsules produced in the pollinations reported in table II. Varieties that are highly fruitful will produce such capsules as these provided they are properly pollinated with good pollen and provided that incidental conditions are favorable to the development of fruit and seeds.

The above list includes over 500 varieties. Of these more than half are known to be able to produce capsules and seed; many of the others named are evidently incapable of yielding seed to any sort of pollination.

Of the more than 400 varieties whose pollen was examined and tested for germination only 33 had excellent pollen (Class a). A low (fair) percentage of germination was obtained from 86 varieties (Class b). There were 226 varieties whose pollen appears to be good but which did not germinate in the cultures (Class c). There were 68 varieties in this list which have anthers more or less imperfectly developed and which yielded very little or even no pollen. Pollen sterility appears to be very general among the irises.

Of the varieties listed in the table 1, 172 were studied both as to ability to produce seed and as to potency of pollen. The summary of these in respect to the classes made is as follows: Aa, 14 varieties; Ab, 8; Ac, 16; Ad, 7; Ba, 8; Bb, 13; Bc, 37; Bd, 8; Ca, 2; Cb, 15; Cc, 35; and Cd, 9. Thus of these, 22 varieties are more or less potent both as seed and pollen parents (Classes Aa and Ab) and the varieties sterile both ways (Cc and Cd) number 44.

TABLE II.
RECORDS FOR HAND POLLINATIONS

In this table the variety which served as the seed parent is named first and the variety used as pollen parent named second. The classes assigned to the varieties (A, B or C and a, b, c, or d) follow in the same order. The number of flowers pollinated is given.

In the column of "results" a blank space indicates complete failure for every flower pollinated, in that capsules did not start to develop. The number of capsules obtained is given; numbers in bold indicate well-formed fruits with presumably viable seeds, and numbers in ordinary type indicate small, poorly developed, and seedless capsules.

VARIETIES CROSSED		Classes to which Varieties belong		No. of flowers pollinated	Results
Seed parent	Pollen parent	Seed parent	Pollen parent		
Albert Victor, selfed					
	x My Lady	A	b	2	1
	x Wm. Marshall	A	a	1	1
	x Brionense	A	a	1	1
	x Haydee	A	c	1	1
	x Esmeralda	A	a	1	1
	x Queen of May	A	c	2	1
	x Plumeri	C	c	2	
	x Lavendulacae	A	b	2	
Alfred Fiddler, selfed					
	x Walter Scott	C	c	2	
	x Hiawatha	C	c	1	
	x Honorable	A	b	1	
	x Wm. Marshall	C	c	3	
	x Wm. Marshall	C	a	2	
Alice, selfed					
	x Mrs. J. L. Curtis	C	c	2	
	x Mrs. Geo. Darwin	C	c	2	
	x Australis	C	c	1	
	x Rollandiana	C	c	1	
		C	c		

VARIETIES CROSSED		Classes to which Varieties belong		No. of flowers pollinated	Results
Seed parent	Pollen parent	Seed parent	Pollen parent		
Alpin	selfed	A	c	2	1
	x (Ricardi x Sibirica)	A	c	1	
Amas,	selfed	B	a	2	
	x Verbena	B	c	1	
	x King Humbert	B	c	1	
	x King Christian	B	c	1	
	x Red Riding Hood	B	c	1	
	x Queen of May	B	b	1	
	x Wm. Marshall	B	a	1	1
	x Lavendulacea	B	b	1	
	x Mandraliscae	B	a	1	
Ambassadeur	x Clarissa	C	a	2	
	x My Lady	C	a	1	
	x Parc de Neuilly	C	b	1	
Anton Mauve,	selfed (Dutch)	A	b	2	
	x Hobbema	A	a	1	1
	x Hartz	A	a	1	1
	x tectorum	A	a	1	
Archeveque,	selfed	C	a	1	
	x Wm. Marshall	C	a	1	
Argus	x Ramapo	C	c	2	
	x Parc de Neuilly	C	b	2	
	x My Lady	C	a	1	
	x Honorable	C	c	2	
	x Mrs. J. L. Curtis	C	c	2	
	x Mephistopheles	C	c	1	
Aurea maculata,	selfed	B	c	9	
	x Bluestone	B	c	1	
	x Chamaeiris	B	c	1	
Australis,	selfed	C	c	1	
	x Flavalba	C	c	2	
	x Mrs. Geo. Darwin	C	c	1	
	x Eldorado	C	c	1	
	x Dandy	C	c	1	
Autocrat	x Clarissa	C	a	1	
	x Wm. Marshall	C	a	2	
	x Lavendulacea	C	b	1	
Avenir,	selfed	B	c	3	1
	x Mme. Patti	B	c	2	
	x Rangoon	B	c	2	
	x Wm. Marshall	B	a	2	1
	x C. P. Connell	B	b	2	1
	x Plumeri	B	c	1	
	x Lavater	B	a	2	2
Azure,	selfed	B	c	2	
	x chamaeiris	B	c	1	
	x Amas	B	a	2	1
	x King Humbert	B	c	1	
	x Herant	B	a	1	

VARIETIES CROSSED		Classes to which Varieties belong		No. of flowers pollinated	Results
Seed parent	Pollen parent	Seed parent	Pollen parent		
Benacensis, selfed		C	?	1	
x Le Mesge		C	c	2	
x gracilis		C	a	2	
x Gorgeous		C	b	1	
x Statellae		C	a	1	
x King Christian		C	c	1	
x (Ricardi x sibirica)		C	c	1	
Berlioz, selfed		B	b	5	
x cristata		B	a	1	
x Bridesmaid		B	c	1	
x Fiancee		B	c	1	
Bluebeard, selfed		A	c	8	2
x Lobelia		A	a	1	1
x Zwanenburg		A	c	2	
x Nudicaulis		A	c	1	
Blue Boy, selfed		C	a	3	
x chamaeiris		C	c	1	
x (Ricardi x sibirica)		C	c	1	
x Amas		C	a	1	
x cristata		C	a	1	
x Azure		C	c	2	
x Herant		C	a	2	
Blue Jay, selfed		B	c	1	
x Mrs. G. Darwin		B	c	2	
x Eldorado		B	c	2	
x Helvetia		B	c	2	
x Walter Scott		B	c	1	1
Blue Lagoon, selfed		C	?	1	
x Wm. Marshall		C	a	1	
x Virginia Moore		C	c	1	
x My Lady		C	a	1	
x Honorabile		C	c	1	
Bluestone, selfed		A	c	4	
x aurea maculata		A	b	2	2
x Rupert		A	b	1	
Bluet x My Lady		A	a	2	
x Rangoon		A	c	2	
x Mandraliscae		A	a	1	1
x Herant		A	a	2	2
x Gov. Hughes		A	b	2	2
x Walneriana		A	b	1	
Bride, selfed		B	c	4	
x Cyanea		B	a	1	1
x Marocain		B	b	1	1
x Bluestone		B	c	1	1
Bridesmaid DB, selfed		A	c	7	
x Floribunda		A	a	5	4
x pumila		A	b	2	2
“ alba		A	b	2	

VARIETIES CROSSED		Classes to which Varieties belong		No. of flowers pollinated	Results
Seed parent	Pollen parent	Seed parent	Pollen parent		
Bridesmaid DB, (cont.)					
	x Le Mesge	A	b	1	1
	x Blue Beard	A	c	1	1
	x Fritjof	A	b	1	
	x Fontarabie	A	c	1	
	x germanica	A	c	1	
	x Statellae	A	a	2	
	x cengialti	A	d	2	re se re
	x Cyanea	A	a	2	re se re
	x Silver King	A	b	2	
	x Helge	A	c	3	
	x Lavendulacea	A	b	3	2
	x cengialti purpurea	A	a	1	1
	x Florentina	A	c	3	
Brionense, selfed					
	x Clarissa	A	a	1	
	x My Lady	A	a	2	1
	x Albert Victor	A	b	2	1
Bronze Lady, selfed					
	x verbena	C	c	1	
Butterfly, selfed					
	x Margaret	A	c	1	
	x lutescens	A	a	2	1
C. A. Pfeiffer, selfed					
	x My Lady	C	c	2	
	x Helvetia	C	a	2	
		C	c	1	
Caterina, selfed					
	x Harriet	B	c	1	
	x Clarissa	B	a	1	
Celeste x Purple-and-Gold					
	x Gov. Hughes	B	a	2	1
	x Whim	B	b	1	
	x Rangoon	B	c	1	
	x Sambucina	B	c	2	
	x Florentina	B	c	2	
	x Macilla	B	c	4	
	x Herant	B	a	2	1
	x Helvetia	B	a	2	
	x Princess Beatrice	B	c	2	1
	x cengialti	B	b	2	2
	x My Lady	B	d	2	
	x Nothing	B	a	2	
	x Queen of May	B	c	2	
	x Delicata	B	b	2	
	x Purdys Blue	B	a	1	
Cella, selfed					
	x Wm. Marshall	A	a	1	1
	x Queen of May	A	b	1	
	x My Lady	A	a	1	



Plate V.—In respect to its general behavior the variety Ingeborg was classed as feebly fruitful. It yielded one good capsule (see tag No. 6 above) to pollen of *Excelsa* but failed completely to the good pollen of *Cyanea* (see tag 4), *Floribunda*, *Statellae* and *Amas* (see record in table II). Two flowers carefully selfed failed to yield fruit but the laboratory study showed the pollen to be so poor that such failures are to be expected.

VARIETIES CROSSED
Seed parent Pollen parent

Classes to which
Varieties belong
Seed parent Pollen parent

No. of
flowers
pollinated

Results

Seed parent	Pollen parent	Classes to which Varieties belong	No. of flowers pollinated	Results
		Seed parent Pollen parent		
Cengialti, selfed		A d	4	to
x Helge		A c	2	
x Florentina		A c	4	
x Bridesmaid		A c	3	to to
x Lavendulacea		A b	4	to to
x Statellae		A a	3	
x Sambucina		A c	2	
x tectorum		A a	2	
x Princess Beatriee		A b	2	to
x Helvetia		A c	1	
x Clarissa		A a	2	to
x Wm. Marshall		A a	1	
x My Lady		A a	2	1
cengialti purpurea, selfed		A a	3	
x Fritjof		A b	1	1
x Herant		A a	1	
x Macilla		A a	2	1
x Amas		A a	1	
x Sherwin Wright		A c	1	
x Florentina		A c	1	
x Red Riding Hood		A c	1	
chamaeiris, selfed		C c	2	
chamaeiris Delicata x pumila		A b	1	1
Chester Hunt x Clarissa		B a	2	
x Japanesque		B c	1	
x Flavalba		B c	2	
x Regale		B c	2	
x Fairy		B c	1	
x Isolene		B b	1	
x Australis		B c	1	
x Dandy		B c	1	1
x Wm. Marshall		B a	1	
x Honorabile		B c	2	
x Walter Scott		B c	1	
Citrea, selfed		C c	1	
Clarissa, selfed		C a	2	
x Speciosa		C b	1	
x Wm. Marshall		C a	1	
Clio, selfed		B c	1	
x Ute Chief		B a	1	1
x Clarissa		B c	1	
x Violet Queen		B c	1	
Coerulea, selfed		A c	1	1
x Gorgeous		A b	1	
Colduchat, selfed		B ?	3	
x Blue Boy		B a	2	
x King Humbert		B c	2	
x Amas		B a	1	
x Verbena		B c	2	1
C. P. Connell, selfed		B b	1	
		C		

VARIETIES CROSSED		Classes to which Varieties belong		No. of flowers pollinated	Results
Seed parent	Pollen parent	Seed parent	Pollen parent		
Corrida	x My Lady	B	a	1	
	x Lohengrin	B	b	1	
cristata, selfed		B	a	28	13
	x Bridesmaid DB.	B	c	2	
	x pumila	B	b	2	
	x Floribunda	B	a	2	
	x gracilipes	B	a	3	
	x ensata	B	a	2	
	x tectorum alba	B	a	1	1
Crusader, selfed		A	a	2	1
	x Ute Chief	A	c	2	1
	x Florence Wells	A	c	1	
	x My Lady	A	a	2	1
	x Fairy	A	c	1	
Curiosa, selfed		A	b	2	2
Cyanea, selfed		A	a	6	2
	x Statellae	A	a	2	1
	x Bridesmaid	A	c	5	1
	x Floribunda	A	a	3	2
	x Excelsa	A	b	2	2
	x Florentina	A	c	4	
	x Eclipse	A	c	1	1
Daisy Hill	x Prestige	A	c	2	
	x Wm. Marshall	A	a	2	2
	x My Lady	A	a	2	2
	x Clarissa	A	a	2	2
	x Queen of May	A	b	2	2
	x Lugarda	A	c	2	2
	x Arabesque	A	c	2	1
Dandy, selfed		C	c	1	
	x My Lady	C	a	1	
	x Hector	C	c	1	
	x Mephistopheles	C	c	1	
	x Honorable	C	c	1	
	x Mrs. J. L. Curtis	C	c	1	
Dawn	x Verbena	A	c	1	1
	x Wm. Marshall	A	a	1	1
	x Albert Victor	A	b	1	
	x Dandy	A	c	1	
	x Blue Jay	A	c	1	
Delicata TB, selfed		C	a	2	
	x Clarissa	C	a	2	
	x Regale	C	c	2	
	x Fairy	C	c	2	
	x Harriet	C	c	2	
Delicata, DB, selfed		B	c	3	
	x Berlioz	B	b	1	1
	x pumila	B	b	1	1

VARIETIES CROSSED
Seed parent Pollen parent

Classes to which
Varieties belong
Seed parent Pollen parent

No. of
flowers
pollinated Results

Seed parent	Pollen parent	Classes to which Varieties belong	No. of flowers pollinated	Results
		Seed parent Pollen parent		
Diane	x My Lady	A a	2	10
	x Blue Boy	A a	1	1
	x Lohengrin	A b	2	1
	x Clarissa	A a	2	10
	x Crusader	A a	2	
	x Hilda	A c	1	
	x Clio	A a	1	
Dr. Bernice	x Honorable	B c	2	
	x Queen Victoria	B c	2	
	x Wm. Marshall	B a	2	
	x Gadstone	B c	2	
	x Mrs. G. Darwin	B c	2	
	x Mrs. J. L. Curtis	B c	1	
	x Ramapo	B c	1	
Eclipse, selfed		C c	2	
	x Oriental DB.	C c	1	
	x (Socrates x Lutescens)	C c	1	
	x King Humbert	C c	1	
	x Cyanea	C a	1	
Edouard Michel, selfed		C c	1	
Eldorado, selfed		C c	1	
	x C. P. Connell	C b	1	
	x Hector	C c	1	1
ensata, selfed		B a	1	
	x cristata	B a	2	
	x Hookeri	B a	2	
	x Hoogiana	B b	1	
	x versicolor	B b	1	
Esmeralda, selfed		A a	2	9
	x Naushon	A c	1	1
	x Wm. Marshall	A a	2	1
	x Nothung	A c	2	1
	x Queen of May	A b	1	1
Etta, selfed		B b	2	
	x Bridesmaid	B c	6	1
	x Floribunda	B a	5	1
	x Statellae	B a	2	
	x Cyanea	B a	2	
	x Excelsa	B b	2	
	x germanica	B c	2	
	x Florentina	B c	5	
	x Lavendulacea	B b	2	
	x Gerda	B c	1	
	x Fritjof	B b	1	
		B b	2	
Excelsa, selfed		C c	1	
Faith, selfed		C c	1	
Fairy, selfed		B c	1	9
	x Sherbert	B c	2	
	x Isolene	B c	1	

VARIETIES CROSSED		Classes to which Varieties belong		No. of flowers pollinated	Results
Seed parent	Pollen parent	Seed parent	Pollen parent		
Fairy, (cont.)					
	x Mrs. G. Darwin	B	c	1	
	x Hiawatha	B	c	1	
	x Walter Scott	B	a	1	
Fiancee (Bride), selfed		B	c	2	
	x Statellae	B	a	1	
	x pumila	B	b	1	1
	x Zua	B	c	1	
Flavalba, selfed		C	c	1	
	x Alice	C	c	2	
	x Mrs. J. L. Curtis	C	c	1	
	x Rollandiana	C	c	1	
Florence Wells, selfed		B	c	2	
	x My Lady	B	a	1	
	x Clarissa	B	a	2	
	x Mandralisca	B	a	2	2
Florentina, selfed		C	c	12	
	x Ingeborg	C	c	2	
	x Bridesmaid	C	c	2	
	x Etta	C	b	2	
	x cengialti	C	d	4	
	x Princess Beatrice	C	b	4	
	x Lavendulacea	C	b	5	
	x germanica	C	c	2	
	x Statellae	C	a	3	
	x cengialti purpurea	C	a	3	
	x Sambucina	C	c	2	
Floribunda, selfed		A	a	6	3
	x numila	A	b	2	
	x Cyanea	A	a	1	
	x Gracilis	A	a	1	
	x Bluebeard	A	c	1	
	x Gerda	A	c	1	
	x Coerulea	A	c	1	1
	x Statellae	A	a	2	
	x Florentina	A	c	3	3
	x germanica	A	c	2	1
Fontarabie, selfed		C	c	3	
	x Etta	C	b	1	
	x Floribunda	C	a	1	1
	x Fritjof	C	b	1	
Fritjof, selfed		C	b	1	
	x Lohengrin	C	b	1	
	x Clarissa	C	a	1	
	x Rangoon	C	c	1	
	x Princess of Wales	C	c	1	
Gerda, selfed		B	c	1	
	x Bridesmaid	B	c	1	1
	x Etta	B	b	1	
	x Delicata	B	c	1	



Plate VI.—The variety *Bluet* produced fine capsules (see tag 8 above) when viable pollen was used in cross-pollination. When poor pollen of *Rangoon* was used there was only complete failure of pod development (see tag No. 4). The pollen of *Bluet* is so poor that it is worthless for any pollination. This variety is a good example of a variety that is highly fruitful but pollen sterile.

VARIETIES CROSSED		Classes to which Varieties belong		No. of flowers pollinated	Results
Seed parent	Pollen parent	Seed parent	Pollen parent		
germanica,	selfed	B	c	3	1
	x pumila	B	b	2	
	x Red Riding Hood	B	c	1	
	x Fontarabie	B	c	2	
	x Fritjof	B	b	2	
	x Le Mesge	B	c	1	
	x Floribunda	B	a	3	3
	x Bridesmaid	B	c	2	1
	x Statellae	B	a	2	
	x Florentina	B	c	7	
	x Etta	B	b	2	2
	x cengialti	B	b	2	1
	x Cyanea	B	a	1	
	x Verbena	B	c	3	
	x Lavendulacea	B	b	2	1
	x germanica alba	B	c	2	
	x tectorum	B	a	2	
	x Celeste	B	c	3	
	x Princess Beatrice	B	b	1	1
germanica alba	x Cyanea	B	a	1	1
	x Bridesmaid	B	c	1	
	x Floribunda	B	a	2	
	x Statellae	B	a	1	
	x Lavendulacea	B	b	1	
	x cengialti	B	d	1	
	x Etta	B	b	1	
	x Florentina	B	c	1	
	x My Lady	B	a	2	
germanica Mecena,	selfed	C	c	2	
Gertrude	x Amas	A	a	3	
	x Verbena	A	c	2	
	x Herant	A	c	2	
	x Gov. Hughes	A	a	2	
	x Regale	A	b	2	
	x Whim	A	c	2	
	x Mrs. Sanford	A	c	1	
	x Walneriana	A	c	2	
	x Delicata	A	a	2	1
	x Nibelungen	A	a	1	1
	x Queen Mary	A	a	2	2
Gorgeous,	selfed	A	c	1	
Gracilis,	selfed	C	b	1	
	x Etta	A	a	2	
	x Floribunda	A	b	1	1
	x Cyanea	A	a	1	1
gracilipes,	selfed	A	a	1	1
	x cristata	B	a	2	1
	x versicolor	B	a	3	1
	x Hoogiana	B	b	2	
	x Halophylla	B	b	3	1
	x Celeste	B	c	2	1
		B	c	2	

VARIETIES CROSSED		Classes to which Varieties belong		No. of flowers pollinated	Results
Seed parent	Pollen parent	Seed parent	Pollen parent		
Grandee, selfed		C	?	5	
x Bridesmaid		C	c	1	
x Delicata		C	c	1	
x Excelsa		C	b	1	
x Aurea maculata		C	b	1	
Hakador x Speciosa		C	b	1	
x Theresita		C	c	2	
x Helvetia		C	c	1	
Harriet Presby, selfed		C	c	1	
x Wm. Marshall		C	a	1	
Hartz, selfed (Dutch)		A	a	1	
x Hobbema		A	a	1	
x Anton Mauve		A	b	1	
Hector x Honorabile		C	c	2	
x Walter Scott		C	a	2	
x Hiawatha		C	c	1	
Helge x Floribunda		B	a	1	1
Helvetia, selfed		C	c	1	
x Isolene		C	c	1	
x Clarissa		C	a	1	
Herant, selfed		B	a	3	
x Purple-and-Gold		B	a	2	
x My Lady		B	a	1	
x Rangoon		B	c	1	
x Mandraliscae		B	a	1	
x Walneriana		B	b	1	
x Delicata		B	a	1	
x Floribunda		B	a	1	1
x Gov. Hughes		B	b	2	1
x Nibelungen		B	a	2	1
Hestionis, selfed		C	?	1	
x Regale		C	c	1	
x Wm. Marshall		C	a	1	
x Flavalba		C	c	1	
Hiawatha, selfed		A	c	2	
x Walter Scott		A	c	2	2
x Alfred Fiddler		A	c	2	2
x Honorabile		A	c	2	1, 1
x Blue Jay		A	c	2	
Hilda, selfed		B	c	1	
x Walneriana		B	b	1	
x My Lady		B	a	1	1
Hobbema, selfed (Dutch)		A	a	1	
x Anton Mauve		A	b	1	1
Halophylla, selfed		B	a	2	2
x tectorum		B	c	2	
Honorabile, selfed		B	c	2	
x Hector		B	c	2	
x Parc de Neuilly		B	b	2	

VARIETIES CROSSED		Classes to which Varieties belong		No. of flowers pollinated	Results
Seed parent	Pollen parent	Seed parent	Pollen parent		
Honorabile, (cont.)					
	x Mrs. J. C. Curtis	B	c	2	
	x Mlle. Patti	B	c	2	
	x Rollandiana	B	c	3	
	x Blue Jay	B	c	1	
	x Wm. Marshall	B	a	2	1
	x Hiawatha	B	c	3	1
	x Alfred Fiddler	B	c	2	1
	x Walter Scott	B	c	3	3
Hookeri, selfed					
	x ensata	B	a	2	1
	x gracilipes	B	a	2	
Ingeborg, selfed					
	x Cyanea	B	a	1	
	x Floribunda	B	a	1	
	x Excelsa	B	b	1	1
	x Statellae	B	a	1	
	x Verbena	B	c	1	
	x Amas	B	a	1	
Isolene, selfed					
	x Lohengrin	C	c	2	
	x Violet Queen	C	c	2	
	x Caterina	C	c	2	
	x Clarissa	C	a	2	
	x Flavalba	C	c	2	
Ivorine					
	x Fritjof	B	b	1	
	x pumila	B	b	1	
	x Gorgeous	B	b	1	
	x Floribunda	B	a	1	1
	x Excelsa	B	b	1	1
Japanesque, selfed					
	x Wm. Marshall	C	a	1	
King Christian, selfed					
	x Pacquitta	C	c	5	
	x Florentina	C	c	2	
	x cengialti	C	d	1	
	x Bridesmaid	C	c	1	
	x Mme. Boulet	C	c	2	
	x King George V.	C	c	2	
	x Verbena	C	c	1	1
King Humbert, selfed					
	x Bridesmaid	B	c	4	1
	x Etta	B	c	1	
	x Etta	B	b	4	
	x Fritjof	B	b	2	
	x Statellae	B	a	1	
	x King Christian	B	c	2	
	x Kochi	B	c	2	
	x Sherwin Wright	B	c	1	
	x Verbena	B	c	1	
	x King George V	B	c	1	
	x Floribunda	B	a	1	
	x Cyanea	B	a	3	1,1

VARIETIES CROSSED		Classes to which Varieties belong		No. of flowers pollinated	Results
Seed parent	Pollen parent	Seed parent	Pollen parent		
Kochi, selfed		C	c	3	
x Wm. Marshall		C	a	1	
Languedoc, selfed		B	c	1	
x Bridesmaid		B	c	1	
x King Humbert		B	c	1	
x Excelsa		B	b	1	
x Queen Flavia		B	c	1	1
x Cyanea		B	a	1	1
x Helge		B	c	1	
Lavendulacea, selfed		C	b	5	
x Verbena		C	c	2	
x Bridesmaid		C	c	2	
x germanica alba		C	c	1	
x My Lady		C	a	2	
x Amas		C	a	2	
x Walneriana		C	b	1	
x Delicata		C	a	1	
Le Mesge, selfed		B	c	2	
x Amas		B	a	2	
x Fontarabie		B	c	1	
x Herant		B	a	2	1
Leverrier x Clarissa		C	a	2	
x Speciosa		C	b	1	
x Lohengrin		C	b	2	
x Margaret Moor		C	c	2	
x Fairy		C	c	1	
x Donna Maria		C	c	1	
x Mandraliscae		C	a	1	
Lobelia, selfed		B	b	5	1
x Bluebeard		B	c	2	1
x Alpin		B	c	1	
x Languedoc		B	c	1	
x Coerulea		B	c	1	1
Lohengrin, selfed		B	b	2	
x Isoline		B	c	2	
x Mrs. Cowley		B	b	2	
x Clio		B	a	1	
x Khedive		B	b	2	
x Florence Wells		B	c	2	
x Crusader		B	a	2	1, 1
Loppio x My Lady		C	a	1	
Lugarda, selfed		B	a	1	
x Brionense		B	a	1	
x Wm. Marshall		B	a	1	1
x Esmeralda		B	a	1	
Lutescens selfed		B	a	1	
x Floribunda		B	a	1	
x Bluestone		B	c	1	1

VARIETIES CROSSED		Classes to which Varieties belong		No. of flowers pollinated	Results
Seed parent	Pollen parent	Seed parent	Pollen parent		
Macilla, selfed		B	a	1	
x Clarissa		B	a	1	
x Isolene		B	c	1	
x Herant		B	a	1	1
Malvina, selfed		C	c	3	
Mandraliscae, selfed		A	a	4	
x Mrs. Sanford		A	c	2	
x Walneriana		A	b	2	
x Mme. Patti		A	c	2	
x Donna Maria		A	c	2	
x My Lady		A	a	3	2
x Amas		A	a	2	
x Regale		A	c	2	
x Wm. Marshall		A	a	2	
x Clarissa		A	a	2	1
x Parc de Neuilly		A	b	2	
Margaret, selfed		A	a	1	
x Butterfly		A	b	1	1
Marocain x Aurea maculata		C	b	1	
Mary Gray, selfed		A	a	1	1
Marvar, selfed		C	c	2	
x Rangoon		C	c	2	
x Wm. Marshall		C	a	1	
x Lugarda		C	c	1	
x Naushon		C	c	1	
x Avenir		C	c	1	
x Walneriana		C	b	2	
x Mme. Patti		C	e	1	
x Albert Victor		C	b	2	
x Ruberissima		C	b	2	
x Virginia Moore		C	c	2	
Mazarin, selfed		C	?	2	
x Zwanenburg		C	e	1	
Mephistopheles selfed		C	c	2	
x Wm. Marshall		C	a	2	
x Mrs. J. L. Curtis		C	a	2	
x Dandy		C	c	1	
x Dawn		C	c	1	
x Fairy		C	c	1	
x Blue Jay		C	c	1	
Milton, selfed		C	?	2	
Mme. de Sevigne, selfed		B	c	1	1
x Wm. Marshall		B	a	1	
Mrs. G. Darwin, selfed		C	c	2	
x Sherbert		C	c	2	
x Mrs. Curtis		C	c	2	
x Eldorado		C	a	1	
x Blue Jay		C	c	1	
x Dandy		C	c	2	
x Flavalba		C	c	2	

VARIETIES CROSSED		Classes to which Varieties belong		No. of flowers pollinated	Results
Seed parent	Pollen parent	Seed parent	Pollen parent		
Mrs. J. L. Curtis, selfed		C	c	2	
	x Mrs. Darwin	C	c	2	
	x Flavaalba	C	c	1	
	x Rollandiana	C	c	2	
	x Hector	C	c	2	
	x Australis	C	c	1	
	x Eldorado	C	c	1	
	x Blue Jay	C	c	1	
My Lady, selfed		B	a	3	
	x Herant	B	a	2	
	x Regale	B	b	1	
	x Speciosa	B	b	1	
	x Whim	B	c	1	
	x Wm. Marshall	B	a	2	
	x Amas	B	a	2	1
Naushon, selfed		C	c	2	
	x Queen of May	C	b	2	
	x Wm. Marshall	C	a	2	
	x Prestige	C	c	1	
	x Esmeralda	C	a	2	
	x Haydee	C	c	1	
	x Avenir	C	c	1	
	x Mme. Patti	C	c	1	
	x C. P. Connell	C	b	2	
	x Rangoon	C	c	1	
Nothung, selfed		B	c	3	
	x Stenophylla	B	b	2	
	x Kochi	B	c	2	
	x Plumeri	B	c	1	
	x Albert Victor	B	b	2	
	x Pacquitta	B	c	2	
	x Prestige	B	c	2	
	x Sarah	B	c	2	
	x Mandrallscae	B	a	2	1, 1
	x Wm. Marshall	B	a	2	1
Nudicaulis selfed		B	c	3	
	x Cyanea	B	a	1	
	x Fritjof	B	b	1	
	x Helge	B	c	1	
	x Bridesmaid	B	c	1	
	x Florlbunda	B	a	1	1
Oldenbarneveld, selfed		C	?	1	
	x Fairy	C	c	1	
	x Clarissa	C	a	1	
Oriental, DB, selfed		C	c	1	
	x Citrea	C	c	1	
	x Eclipse	C	c	1	
Pacquita, selfed		C	c	2	
	x King Christian	C	c	1	
	x Sarah	C	c	1	
	x Wm. Marshall	C	a	1	

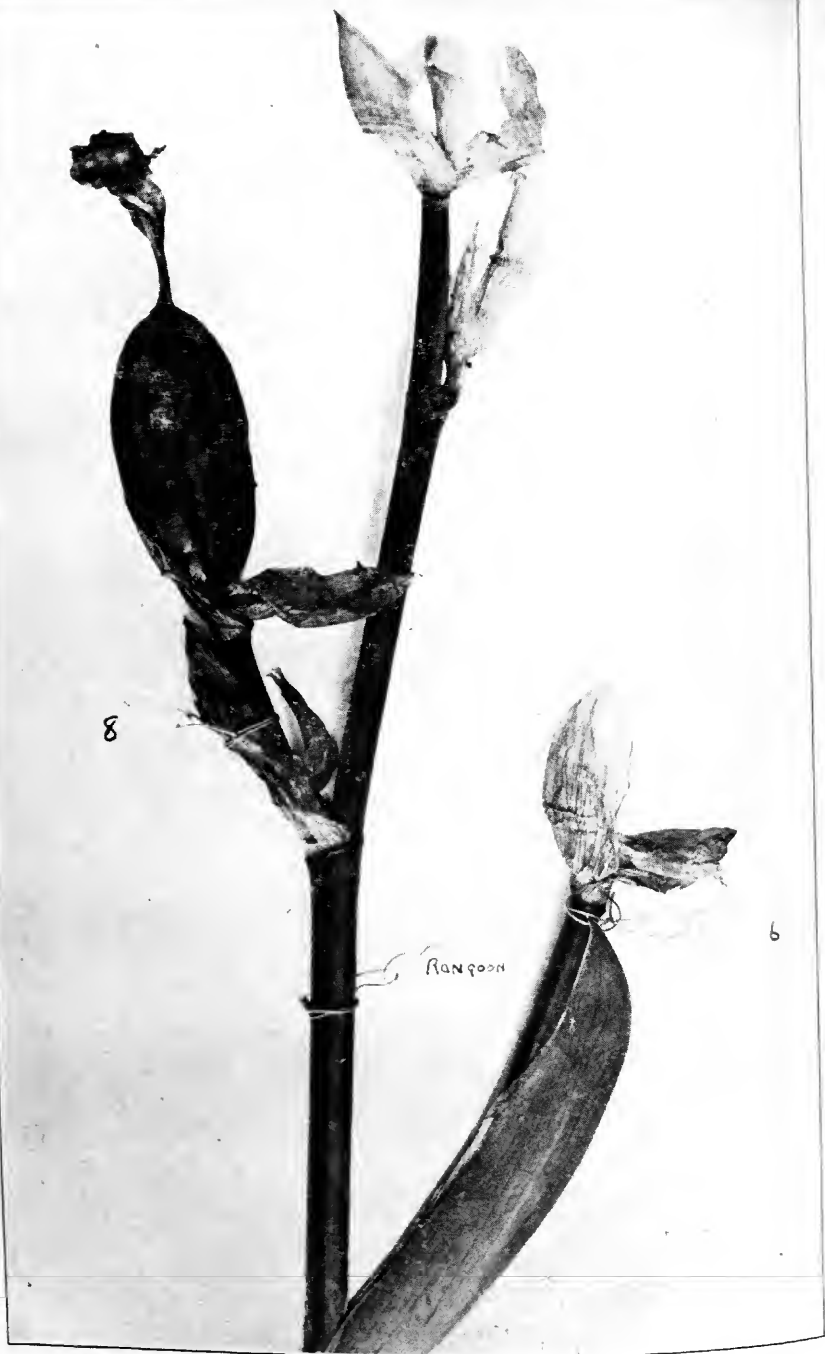


Plate VII.—The variety Rangoon is able to produce fine capsules when its flowers are properly cross-pollinated with varieties which have good pollen such as My lady (see tag 8 above). Of two flowers crossed with pollen of Amas, which has excellent pollen, one was a failure (see tag 6 above) due apparently to incidental factors. The record of Rangoon given in table II shows that this variety is highly fruitful. Its pollen is poor and does not

VARIETIES CROSSED		Classes to which Varieties belong		No. of flowers pollinated	Results
Seed parent	Pollen parent	Seed parent	Pollen parent		
Pauline, selfed		B	a	1	
x Clarissa		B	a	1	1
Plumeri, selfed		B	c	1	
x Sarah		B	c	1	
x Wm. Marshall		B	a	1	1
x Kochi		B	c	1	
x Nothung		B	c	1	
x Mme. Patti		B	c	1	
x Rangoon		B	c	1	
x C. P. Connell		B	b	1	
x Lavater		B	a	1	
Prestige, x Esmeralda		B	a	2	
x Lavendulacea		B	b	2	
x Wm. Marshall		B	a	2	
x Stenophylla		B	b	1	
x Haydee		B	c	1	
x Lugarda		B	c	1	
x Mandraliscae		B	a	2	1
x Nothung		B	c	2	1
Princess Beatrice selfed		B	b	3	
x Sambucina		B	c	2	
x Floribunda		B	a	1	
x Rangoon		B	c	2	
x Florentina		B	c	2	
x Lavendulacea		B	b	2	
x Plumeri		B	c	1	
x Nothung		B	c	2	
x Naushon		B	c	2	
x cengialti		B	d	2	
x Haydee		B	c	2	1
x Lugarda		B	c	2	1
Princess of Wales, selfed		B	c	2	
x Zua		B	c	1	
x Fairy		B	c	2	
x Isolene		B	c	2	
x Edouard Michel		B	c	1	
x Mrs. Cowley		B	b	2	
x Rangoon		B	c	2	
x Violet Queen		B	c	1	
x Lohengrin		B	b	2	2
x Mandraliscae		B	a	2	2
x Clio		B	a	1	1
x Khedive		B	b	2	1
x Hilda		B	c	1	1
Pseudacorus, selfed		A	a	1	1
x versicolor		A	b	1	1
pumila, selfed		A	b	7	1
x Aurea maculata		A	b	3	2
x germanica		A	c	6	1
x Floribunda		A	a	2	2

germinate in artificial culture and does not result in fruit and seed when used for self-pollination or for crossing on such highly fruitful varieties as Bluet and Celeste.

In seed breeding work, Rangoon can be used with success as a seed parent but not as a pollen parent.

VARIETIES CROSSED		Classes to which Varieties belong		No. of flowers pollinated	Results
Seed parent	Pollen parent	Seed parent	Pollen parent		
pumila, (cont.)					
x Lutescens		A	a	1	1
x Gorgeous		A	b	1	1
x Coerulea		A	c	1	1
x Bluebeard		A	c	1	1
x pumila alba		A	b	2	1
x Cyanea		A	a	1	
x King Christian		A	c	1	
x (Socrates x Lutescens)		A	c	2	
x Bluestone		A	c	1	
x Gerda		A	c	1	
x Fritjof		A	b	1	
x Le Mesge		A	c	1	
x Princess of Wales		A	c	1	
x Fontarabie		A	c	2	
x Red Riding Hood		A	c	2	
x Statellae		A	a	3	
x Helge		A	c	2	
pumila alba, selfed					
x Bridesmaid		C	c	1	
x cristata		C	a	1	
Purdys Blue x Wm. Marshall					
Purple-and-Gold, selfed		A	a	1	1
x Herant		A	a	1	1
x Amas		A	a	1	1
Purpurascens, selfed					
x versicolor Columnae		A	b	1	1
x sibirica		A	b	1	1
Queen Flavia, selfed					
x Fritjof		C	b	3	
x Floribunda		C	a	1	
x Blue Boy		C	a	2	
x germanica		C	c	1	
x Red Riding Hood		C	c	1	
x Amas		C	a	3	
x Verbena		C	b	1	
x Princess Beatrice		C	b	1	
x King Humbert		C	c	1	
x Fontarabie		C	c	1	1
x Lavendulacea		C	b	1	1
Queen Mary					
x Macilla		B	a	2	1, 1
x Herant		B	a	2	1, 1
x Helvetia		B	c	2	1, 1
x Purple-and-Gold		B	a	1	1
x Augustissima		B	c	1	
x Mandalisca		B	a	2	
Queen of May, selfed					
x Albert Victor		C	b	1	
x Hector		C	b	1	
x Wm. Marshall		C	c	1	
		C	a	1	

VARIETIES CROSSED		Classes to which Varieties belong		No. of flowers Pollinated	Results
Seed parent	Pollen parent	Seed parent	Pollen parent		
Ramapo, selfed		C	c	1	
x Hector		C	c	1	
x Wm. Marshall		C	a	2	
x Parc de Neuilly		C	b	1	
x Honorable		C	c	2	
x Mrs. G. Darwin		C	c	1	
Rangoon, selfed		A	c	2	
x Herant		A	a	2	1
x Amas		A	a	2	1
x Purple-and-Gold		A	a	1	1
x My Lady		A	a	2	2
x Mandraliscae		A	a	1	1
Red Riding Hood, selfed		B	c	2	
x Sherwin Wright		B	c	1	
x King Christian		B	c	3	
x Fritjof		B	b	1	
x King Humbert		B	c	1	
x Herant		B	a	2	1
Regale, selfed		B	c	3	
x C. A. Pfeiffer		B	c	2	
x My Lady		B	a	2	2
x Helvetia		B	c	1	1
x Flavalba		B	c	2	1
(Ricardi x sibirica), selfed		B	c	1	
x Verbena		B	c	2	
x King Humbert		B	c	1	1
x Sherwin Wright		B	c	1	1
Rollandiana, selfed		B	c	2	
x Fairy		B	b	2	
x Honorable		B	c	2	
x Walter Scott		B	c	2	1
Rupert, selfed		C	b	1	
x Oriental DB.		C	c	1	
Sapphire, selfed DB.		B	?	2	1
x Gerda		B	c	1	
Sarah x Wm. Marshall		B	a	1	1
x Clarissa		B	a	1	
setosa, selfed		A	a	1	1
x versicolor Fosteri		A	b	1	1
Sherbert, selfed		C	c	1	
x C. P. Connell		C	c	1	
Sherwin Wright, selfed		B	b	2	
x Albert Victor		B	b	2	
x Virginia Moore		B	c	1	
x Wm. Marshall		B	a	2	
x Walneriana		B	a	1	
x Ruberissima		B	b	2	1
sibirica, selfed		B	b	3	2
x versicolor		B	b	2	

VARIETIES CROSSED		Classes to which Varieties belong		No. of flowers pollinated	Results
Seed parent	Pollen parent	Seed parent	Pollen parent		
(Socrates x Lutescens) selfed		B	b	4	1
Speciosa, selfed		B	b	1	1
Spectabilis x Crusader		B	a	3	2
x Mandraliscae		B	a	2	1
x Mary Gray		B	a	1	1
x Arabesque		B	c	1	
x Lohengrin		B	b	2	
x Isolene		B	c	2	
x Florence Wells		B	c	2	
x Clarissa		B	a	1	
x Wm. Marshall		B	a	2	
x Verbena		B	c	2	
x My Lady		B	a	2	
x Pauline		B	a	1	
x Queen of May		B	b	1	
x Mme. de Sevigne		B	c	2	
x Theresita		B	c	2	
x Fairy		B	c	2	
x Speciosa		B	b	2	
x Mrs. Geo. Darwin		B	c	1	
x Falvalba		B	c	1	
Statellae, selfed		A	a	5	
x Bridesmaid		A	c	2	
x tectorum		A	a	1	
x Florentina		A	c	1	
x Floribunda		A	a	3	1
x cengialti purpurea		A	a	3	3
x Lavendulacea		A	b	2	2
Stenophylla x Haydee		A	c	1	
x Wm. Marshall		A	a	1	1
tectorum, selfed		B	a	3	1
x Halophylla		B	c	2	1
x ensata biglumis		B	b	1	
x versicolor rosea		B	b	2	
x sibirica Baxteri		B	b	1	
Tecumseh, selfed		B		1	
x Marvar		B	c	1	
x Lavendulacea		B	b	1	
x Mrs. Geo. Darwin		B	c	1	
x Wm. Marshall		B	a	1	1
tenax, selfed		A	c	1	
x Halophylla		A	c	1	
Theresita, selfed		A	c	1	
x C. A. Pfeiffer		A	c	2	
x Wm. Marshall		A	a	2	1
Thora x Wm. Marshall		C	a	2	
x Dandy		C	c	2	
x Mrs. Geo. Darwin		C	c	2	
x Honorable		C	c	2	
x Ramapo		C	c	2	

VARIETIES CROSSED		Classes to which Varieties belong		No. of flowers pollinated	Results
Seed parent	Pollen parent	Seed parent	Pollen parent		
Thora, (cont.)					
	x Mephistopheles	C	c	1	
	x Mrs. J. L. Curtis	C	c	1	
Titus, selfed		C		1	
	x Isolene	C	c	1	
Ute Chief, selfed		C	c	1	
	x Violet Queen	C	c	1	
Van Obscura, selfed		B	c	3	
	x Azure	B	c	1	
	x Herant	B	a	1	
	x Macilla	B	a	1	
	x King Humbert	B	c	1	
	x Red Riding Hood	B	c	1	
	x Amas	B	a	2	1
Verbena, selfed		A	c	6	1
	x Clarissa	A	a	2	
	x Khedive	A	b	2	
	x Fairy	A	c	2	
	x Speciosa	A	b	2	
	x Delicata	A	a	2	10
	x Mrs. Cowley	A	b	2	
versicolor, selfed		A	b	2	1
	x tectorum alba	A	a	1	
	x Anton Mauve	A	b	1	
	x Halophylla	A	c	2	
versicolor Fosterl. selfed		A	b	1	1
	x Halophylla	A	c	2	1
versicolor Columnae, selfed		A	b	1	1
	x purpurascens	A	a	1	1
	x Halophylla	A	c	1	1
versicolor rosea, selfed		A	a	2	10
	x Halophylla	A	c	2	10
	x tectorum	A	a	2	4
	x sibirica	A	b	4	
Villereal, selfed		C	c	2	
Violet Queen, selfed		C	c	1	
	x Blue Boy	C	a	1	
	x My Lady	C	a	1	
	x Lohengrin	C	b	1	
Walneriana, selfed		B	b	2	
	x Clarissa	B	a	3	
	x Wm. Marshall	B	a	4	
	x Mme. Patti	B	c	2	
	x Donna Marla	B	c	2	
	x My Lady	B	a	1	
	x Naushon	B	c	2	
	x Queen of May	B	b	2	
	x Parc de Neuilly	B	b	2	1
	x Esmeralda	B	a	4	10

VARIETIES CROSSED		Classes to which Varieties belong		No. of flowers pollinated	Results
Seed parent	Pollen parent	Seed parent	Pollen parent		
Walter Scott, selfed		B	c	2	
	x Honorable	B	c	3	
	x Alfred Fiddler	B	c	2	
	x Hector	B	c	1	
	x Wm. Marshall	B	a	2	2
	x Hiawatha	B	c	2	1
Whim x Clarissa		A	a	2	1
	x Delicata	A	a	1	1
	x Esmeralda	A	a	1	1
	x Haydee	A	c	2	
	x Lugarda	A	c	2	
	x Verbena	A	c	2	
White Knight x Wm. Marshall		C	a	1	
William Marshall, selfed		A	a	2	2
	x Verbena	A	c	2	2
	x My Lady	A	a	2	2
	x Prestige	A	c	2	2
	x Brionense	A	a	2	2
	x Clarissa	A	a	1	1
	x Esmeralda	A	a	2	2
	x Lavater	A	a	2	1
	x Walneriana	A	a	2	1
	x Mme. Patti	A	c	2	
	x Plumeri	A	c	1	
Zua, selfed		C	c	2	
	(Crossed hundreds of times by E. B. Williamson without success)				
	x (Socrates x Lutescens)	C	b	1	
	x cristata	C	c	1	
	x Queen Flavia	C	c	1	
Zwanenburg, selfed		C	c	3	
	x (Socrates x Lutescens)	C	c	3	
	x Red Riding Hood	C	c	1	
	x Queen Flavia	C	c	1	
	x Gerda	C	c	1	
	x Fiancee	C	c	1	
	x Floribunda	C	a	1	
	x cristata	C	a	1	
The following are unnamed seedlings.					
Williamson 192-D., selfed		B	c	1	
	x Verbena	B	b	1	
	x Lugarda	B	c	1	
	x Pauline	B	a	1	1

In the pollinations reported in the above table 184 varieties were used as seed parents and more than 1500 flowers were hand pollinated. Of these pollinations 26 gave partial success or the development of small seedless pods and 335 resulted in seed consules, many of which were large and well filled with seeds (see plate IV, p. 13).

It is clear that most of the failures in these pollinations were due either to worthless pollen on one side or to impotent and sterile pistile

on the other. When the seed-parent is in class "C" or the pollen parent is in "c" or "d" as described above, failure is to be expected unless the judgment for this classing is inadequate. In general the results of the pollinations indicate that in most cases the varieties are properly classed. In several cases pollen of the "c" class seemed to yield capsules as Bridesmaid x Bluebeard (A x c), but as the flowers could not be bagged and the pollination thus controlled the pods in such cases may have resulted from open cross-pollination.

In several instances pollen of excellent grade (Class a) failed to yield capsules on plants known to be able to produce fruit. In such cases it may be that

(a) the particular pollen used had lost its viability and had so to speak "spoiled," or

(b) that the pollination was not made at the proper time, or

(c) that unfavorable weather conditions may have prevented some process in fertilization or in the development of the capsule, or

(d) that there are inherent incompatibilities in fertilization.

The first three conditions just named are merely errors of manipulation such as are to be expected in any work in breeding plants. They are revealed and overcome by making a larger number of pollinations.

A word should be said regarding incompatibility in fertilization. It is now to be recognized that there are two distinct sorts of such incompatibility.

First, there is the lack of affinity in fertilization that so often exists between two different species. Thus in irises the crosses *cristata* x *floribunda* and *halophylla* x *tectorum* may continually fail because of too wide a difference between the crested and bearded irises or between the beardless and crested groups. This is an old and well-recognized type of sterility recognized as the inability of two different species to hybridize. The studies here reported do not determine the limitations and possibilities of crossing between different species and between different groups of varieties.

But quite a different type of physiological incompatibility frequently exists in plants that are fully hermaphrodite so that the individual seedling or the entire clonal variety developed from it is "self-fruitless". Also cross-incompatibility frequently exists between closely related seedlings or clonal varieties. It is this type of sterility that is frequent in the true lilies (*Lilium*) and in the day-lilies (*Heemerocallis*), in certain fruit crops as apples, cherries and plums and in many other groups of plants.

It is not, however, certain that real incompatibilities of this latter type exist in the irises. Few varieties of irises of the above list are classed as A and a; that is excellent both as a seed and a pollen parent. A glance through the list of table II shows that in most cases such varieties apparently set seed to proper self-pollination. There are a few exceptions to this; in the tests recorded above *cengialti* *purpurea* failed to give capsules to self-pollination of three flowers and for *Stattellae* five flowers failed to selfing. These failures merely suggest self-incompatibility but larger numbers of tests are needed to determine the point.

The results seem to indicate that of the various groups of irises the "Dutch bulbs" (bulbous Dutch irises) were most fruitful both in selfing and in crossing. While the apogons or beardless irises as a group gave numerous pods to their own pollen their use in crosses with varieties of

other groups appear to be less successful. The Evansias or crested irises as a group produced fewer pods than did the apogons even to selfing and to crossing inside the group. The bearded irises only occasionally set seed to their own pollen. In crosses the Early Dwarf and the Tall Bearded varieties were more fertile both as seed and pollen parents than were the Intermediates which are mostly classed as "C".

It is to be emphasized that the above report is a general survey based on one season of work. In most cases the number of pollinations possible to make with the material available is necessarily too low for the results to be considered as final and conclusive. A larger number of pollinations and especially if fully controlled by bagging and if made over a series of years would eliminate quite fully the various incidental conditions which produce fruitlessness and would undoubtedly change some of the pollination relations which were here all failures to successes. A further and more comprehensive study of the germination of pollen would no doubt change somewhat the judgment of pollen for certain varieties here classed as having poor pollen.

In comparing evidence on the setting of fruit by irises obtained by various persons differences in results are to be expected at least for certain varieties. In Miss Sturtevant's published report (Bulletin No. 2, American Iris Society) the varieties Amas and Sarah had not set seed. In the work here reported each of these varieties yielded a capsule containing good seed to cross-pollination with Wm. Marshall but their general behavior was such that they were classed as "feebly fruitful". Also several varieties (Etta, Helge, Ingeborg and Spectabilis) classed by Miss Sturtevant as "sterile" were in the tests at The New York Botanical Garden found to be "feebly fruitful". Some varieties which were entirely fruitless in the tests at the Botanical Garden were found to be "fertile" by Miss Sturtevant (Arabesque, Hector and White Knight are to be mentioned." In all such comparisons positive results, if they involve no errors in the naming of the clonal variety concerned, are to be given preference as indicating what the variety may be able to do.

The survey indicates clearly that in general the clonal varieties of irises fall into the four classes as designated by Miss Sturtevant, namely: (1) varieties highly fertile both as seed and pollen parents, (2) varieties that have only fertile pollen, (3) varieties that are pollen sterile but able to set seed and (4) varieties that are sterile both in pollen and in ability to set seed. Further studies combined with data which growers and breeders of irises can furnish will in the course of time more definitely determine the ability or inability of the different varieties to function as seed or as pollen parents. It is clear that in the cultivated irises sterility involving impotence of pollen or pistils, or of both, is frequent and greatly limits breeding from seed.

Tid-Bits, 8th

The report of Iris Sterilities is the direct result of a contribution of \$200.00 made by the Society to the New York Botanical Garden and the work is done in preparation for the International Conference on Sterilities to be held at the Garden in August, 1926. Dr. A. B. Stout, one of the staff, has personally supervised the project. In July I had the pleasure of visiting him at the "Prop" and found him immersed in hybridizing *Hemerocallis*, lilies, and poplars, surely a curious combination for experiment. As the Yellow lilies are among my hobbies I found real interest in the seedlings and I am more than glad that plans are under weigh for their distribution. The increased range in color was most marked, seedlings varying from a clear cream apricot to a tawny red self the color of the shading that we are familiar with in the tawny day lily, *H. fulva*. I must not, however, let my enthusiasm lead me astray in an iris bulletin.

With the increased interest in iris breeding such a report as this is of practical as well as scientific value in that it tends to limit the number of varieties that are profitable breeders in our gardens. From previous experience we knew that the variety *Amas* rarely, if ever, set seed and now we find that it is feebly fruitful and that a considerable number of other varieties come in the same class. We plan confidently to continue these studies this coming spring and to provide, if practical, accurate tests of the sterility of some of the newer varieties inasmuch as it is among the finest of the new introductions that we are constantly tempted to find parents for still greater improvements.

As Bulletin 14 follows shortly I shall give you only a few short bits of news and leave the wealth of notes for No. 17.

There is, however, one piece of news which I will pass along in advance of its regular publication in the January, 1926, bulletin. For the first time in our brief history you were offered some choice as to what officers you desired to elect. It was a most healthy sign of spirit which we hope to see expressed by two full slates of nominations next year and it brought in a total of 333 ballots, an amazing result when you realize that 50 has been our maximum vote in any one year in the past. Of these 333 ballots 114 were from the Central district where there was a contest for the office of Regional Vice-president. Mrs. Samuel H. Taft received 52 votes, Mrs. Lewis R. Smith 42 votes, and 10 ballots were incorrectly marked and declared illegal by the tellers, Kenneth R. Boy-

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ton, Mrs. Wheeler H. Peckham, and Lewis R. Smith. Inasmuch as Mrs. Taft seemed rather to represent the complete list of officers and hence her re-election might be considered as a vote of confidence in the present management I was naturally pleased.

I found the meeting, by the way, most amusing from a personal point of view and I am wondering if you will share in my amusement. You all read the copy of the Cincinnati resolution enclosed with the ballot and probably noted that there had been some misunderstanding as to the Exhibition policy. In the "whereas" portion leading up to the resolutions, there was considerable reference to the "arbitrary ruling" of the secretary and of course it was my luck to read it all before the meeting. Then, owing to the unavoidable absence of Mr. Scott, I read his report as Treasurer and found myself recommending that Bulletins be published regularly and on time. As you are receiving both the July and the October bulletins in December you can appreciate my predicament. Joking aside, however, I am extremely sorry for the inexcusable delay (it seems as though I have been doing nothing but write members individually that the bulletins were coming some time) and I hope to improve in 1926. I frankly admit that I cannot afford to give nearly as much time to the Society as I could wish for and I sincerely wish some one who could and would put all their energy into the good cause would step out and say "I am the man".

Reminders

Copies of the English Iris Society Bulletin No. 2, forty pages with illustrations, may be obtained from Mr. Scott, at a cost of \$1.00.

This is a notable contribution to iris literature and if both your president and secretary had not written articles for it we might have planned for its general distribution to all members. "Sir Michael Foster and His Irises" by Sir Arthur Hort has been reprinted from our Bulletin No. 3, (now practically out of print). I found "The Cultivation of

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Reglio-cyclus Irises in Kent" by G. N. Bunyard most helpful and the article by Mr. Murrell interesting because of its recommendations. Of American varieties he mentions White Knight, Athene, Shekinah, Virginia Moore, Dream, Seminole, and Afterglow, none of them large flowered to be sure but none unfairly representative of what we can do.

BEARDED IRIS by Austin W. W. Sand, and issued by the New York State College of Agriculture, Ithaca, N. Y., will be forwarded to members shortly in accordance with the agreement entered into in 1921. I understand that additional copies may be obtained from Ithaca. Mr. Sand succeeded Miss Theresa Schindler whose work in descriptions gave us a splendid start for our files, sometime in 1921-22 and in 1924. Mr. Sand based his graduation thesis upon the iris. The present bulletin has been prepared "to meet the needs of the amateur or the skilled gardener who wishes to grow the irises best suited to his environment" and the many illustrations will do much to show the beauty of irises. I was particularly taken by the cuts showing how to hybridize an iris despite the fact that I am not in favor of removing the falls as they, if not removed, tend to shrivel and thus, to an extent, protect the styles during the process of impregnation. The pictures of "divisions" and diseases are also illuminating. I was glad to find that Mr. Sand suggests that big divisions do not necessarily imply better bloom but I was sorry that so little had been added to our treatment of diseases, although he kindly points out that the iris is subject to the same parasite responsible for the "black rot" of hyacinths and other bulbs. Mr. Sand also makes the first full report of the "verbena bud moth" as an enemy to iris. For the last few years Miss Sturtevant has found it necessary to bag every pod to protect it from this new pest and it seems (on a small scale) a more satisfactory solution than spraying.

The lists of irises selected for fragrance, quality, etc., are of distinct value to the beginner and reveal that the author has made the most of his visits to other gardens' as well as drawing from his study of the Test garden. He has also selected well the varieties for description.

In the summer of 1923 Mr. Sand established the planting at Cornell in accordance with the color classification indicated by the use of the terms self, blend, plicata, bicolor, solid or veined on our official data card and reports that the general mass of color effect was much improved and that study was greatly facilitated. This planting together with that of Mr. Wister which is based on our published report of last year should together be carefully studied in the development of our much needed "simple" and adequate classification. Personally, of course, I do not

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think there is any chance of securing a simple classification so great is the range of color and habit and for me, at least, the botanical classification which might be assumed as the result of many years of effort, as the best possible, is still far from easily understandable. How, then can we expect more of a color classification?

Bulletin 112, is not only a credit to its author but extremely interesting from every point of view. It may have been prepared for the amateur, but I, for one, will find it valuable for reference in its adequate handling of many subjects. It is also gratifying to find that the Society is given credit for so much work in irises.

Details of the \$100 Prize offered by Mr. Robert Wayman for the best un-introduced Tall Bearded Iris rating over 9.0 will be found in No. 15, page 40.

Growers should note that registrations and introductions for the year 1925 are published as early as possible in January. A Membership List, Dec. 31, 1925 will also be published early in 1926.

Plans for the spring exhibits, meetings, or field days should be underweigh in order to procure prompt authorization and attention.

Annual dues are almost due but why not make it a three year membership?

R. S. STURTEVANT
Editor

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