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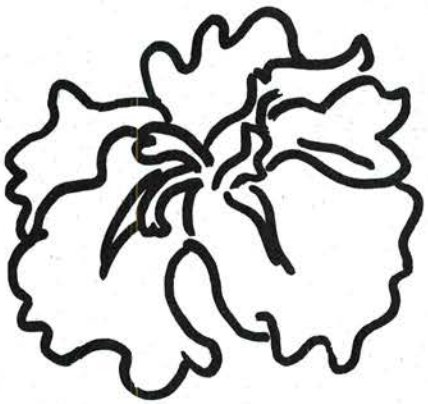

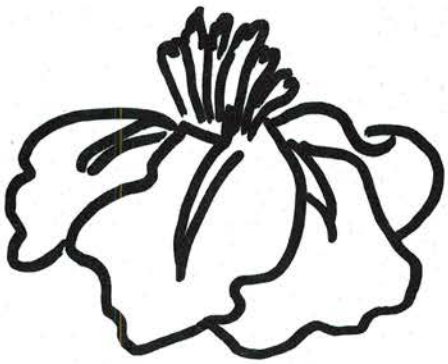

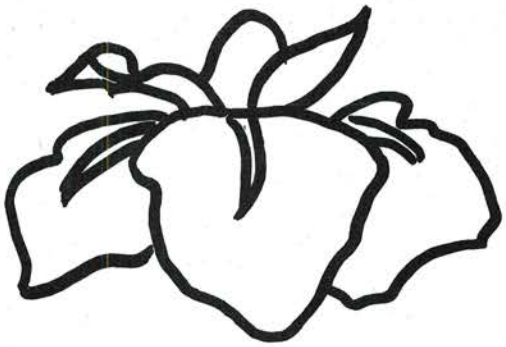

THE REVIEW

OF THE SOCIETY FOR JAPANESE IRISES

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OF

THE SOCIETY FOR JAPANESE IRISES

Volume 5, Number 1 April, 1968

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FROM THE PRESIDENT'S DESK

A review of this Society's activities for the past year indicates many worthwhile accomplishments. This publication continues to be a pacesetter with outstanding articles that can be found nowhere else. Our new Editor is to be congratulated and encouraged for his enterprise.

The publication of a Check List depleted our treasury but has proved to be a service much appreciated by both judges and breeders. Additional copies are still available from our Secretary for $1.00 each. Future sales may help to cover the cost of this project.

It was disappointing to learn that the Japanese Iris Show which we had publicized to take place at Portland, Oregon, was canceled. The annual show has been one of the highlights of our year. We hope it will be continued wherever there are enough growers to make a show possible.

Other setbacks have included the hospitalization of three of our officers. We are happy to report that all are well again.

This year we need to work to build up our membership. Financially we are just about holding our own. An increase in income would make it possible to offer more benefits to all of our members.

The AIS Judge's Handbook is to be revised in the near future. Errors made in the first publication on our judging standards will be corrected. Additional suggestions will be welcomed at this time.

We are pleased to announce that Eugene Wagner has agreed to serve as Chairman for Arts and Educational Exhibits at the 1969 AIS Convention in Milwaukee, Wisconsin. If you are gifted with artistic talents, work the Japanese iris into your designs and plan to exhibit your crafts in this unusual show.

A very fine meeting is being planned for everyone interested in Japanese irises who attends the AIS Convention in Berkeley, California. The Executive Room at the Claremont Hotel has been reserved for us on Monday morning, April 29th at 10:30 AM. Do plan to attend.

Hopefully, 1968 will be the best year yet for Japanese iris bloom--everywhere.

Eleanor Westmeyer

STUDIES OF THE GENUS IRIS IN JAPAN, ESPECIALLY CYTOTAXONOMY OF THE GENUS AND BREEDING OF IRIS ENSATA THUNBERG

by

DR. KOZI TOMINO

Reported by the Editor of The Review

In W.A.Payne's account of his recent trip to Japan in the previous issue of The Review he reported meeting "Dr. Kozi Tomino who is the foremost hybridizer of the Ise type of Japanese iris and whose research and published work on the iris species of Japan and breeding of Japanese iris is well and favorably known in his country".

This report is based on a booklet bearing the above title and the notation :Reprinted from the Bulletin of the Liberal Arts Department, Mie University. No. 28 Tsu, Japan, February,1963. The booklet consists of59 pages of text, six of photographs of species chromosomes and cell divisions, one of early bud sections, one of sketches showing "Successive stages of Flower Development of I. ensata var. ensata", one of photographs of "Development of Flower Primordium in the Iris Species", one of"Pollen Grains of I. ensata var. ensata" and one containing four photographs of Ise type varieties.

Dr. Tomino prefers to use the description Iris ensata Thunberg var. spontanea in place of the description American growers are used to using: Iris kaempferi Siebold. He also prefers to describe the garden varieties as Iris ensata var. ensata.

The booklet is printed in Japanese. However, titles, figures, and tables (with one exception), species names, type names and variety names are given in both Japanese and English. All figures are Arabic. The booklet concludes with a two-page summary in English.

Because of English being used in the vital parts of the work, it is possible to make this report without translation except for Table 3 which has been translated by an American Japanese. Tables and figures are reproduced essentially in their original form. In the tables it should be noted that the author uses "varieties" not only with reference to hybrid garden varieties as in the United States but also to types (Tokyo, Kumamoto and Ise).

Parts of the studies are highly scientific. They have been briefly described for readers who would like to refer to the original articles. Parts of general interest or of use to hybridizers are reproduced or reported in detail. A reader who does not know the nature of standard deviation, karyotype, centromere, etc, is advised not to get the dictionary. (Just get the weeds). Those are esoteric words. Esoteric means if you don't know it's no use asking questions.

The booklet consists of the following four sections:

1. Taxonomy and distribution of iris species found in Japan.
2. Origin, history and morphology of garden varieties (types) of I. ensata.
3. Cytology of iris species found in Japan.
4. Growing and breeding of I. ensata var. ensata.

Section 1, Taxonomy and distribution of iris species found in Japan.

See Table 1 (next page), Table 2 (below) and Summary.

Table 2, Classification of the genus Iris Linn. in Japan.

Section Spathula Tausch, emend. Lawrence.
I. Subsection Apagon Benth.
Series Sibiricae (Diels) Lawr.
Iris sanguinea Horneman (= Iris sibirica Thunb.)
Iris sanguinea Hornem. var. albiflora (Makino) Tomino
Iris sanguinea Hornem. var. pumila (Makino) Tomino

Series Chinensis (Diels) Lawr.
Iris Rossi Baker

Series Laevigatae (Diels) Lawr.
Iris ensata Thunberg var. ensata (=Iris kaempferi Sieb.)
Iris ensata Thunberg var. spontanea (Makino) Makai
Iris laevigata Fischer
Iris laevigata Fischer form albopurpurea Makino
Iris laevigata Fischer form leucanthum Makino

Series tripetalae (Diels) Lawr.
Iris setosa Pallas
Iris setosa Pal. var. hondoensis Honda

II. Subsection Evansia Benth.
Iris Gracilipes A. Gray
Iris japonica Thunberg

Section 2, Origin, history and morphology of garden varieties (types) of I. ensata.

See Figure 1 (Page 9), Figure 2 (converted to table below), Figure 3 (Page 11), Table 3 (Pages 6, 7 and 8), Table 4 (Page 10) and Table 4-11 (Page 11).

Figure 2, (Converted to table), Comparison of the three local types in length of flower stalk and leaf.

Type	Length, flower stalk, cm.	Length, leaf. cm.
Kumamoto	76	66
Tokyo	83	72
Ise	66	68

Table 1, Morphological Characteristics of the Iris Species in Japan

Species	Length, Flower Stalk. (cm)	Leaf Length (cm)	blade Width (cm)	Flower Dia. (cm)	Outer Perianth Length (cm)	Outer Perianth Width (cm)	Inner Perianth Length	Inner Perianth Width	Spathe Length (cm)	No. of Flowers on stalk.	Flower color	Flowering Period
I. Rossi	7.5	28.8	0.4	4.2	3.5	1.2	1.6	0.6	2.2	1	Purple	Early April
I. Gracilipes	16.2	20.2	0.6	3.5	2.4	1.3	1.9	0.6	1.3	3-5	Light purple with orange-yellow spots at the base of outer perianth.	Mid-May
I. japonica	48.1	45.5	4.0	5.6	3.2	2.1	3.1	1.3	3.6	Many	White with bluish purple veins and orange-yellow ridges.	Mid-April to early May
I. setosa	37.1	21.9	1.5	10.2	5.7	4.2	0.9	0.5	3.5	5-6	Purple with brown net-like spots at the base of the perianth	Mid-May
I. setosa var hondoensis	59.8	60.2	2.9	12.3	9.2	4.4	2.6	0.6	7.4	3	Deep purple with net-like spots at the base of outer perianth.	Late May
I. laevigata	58.2	52.5	3.7	13.8	10.1	4.5	7.4	1.6	6.8	3	Purple	Mid-May
I. Laev. form albopurpurea	58.2	54.4	1.8	13.2	8.4	3.6	6.7	1.3	6.0	2	White with purple spots	"
I. laev. form leucanthum	55.8	55.2	1.8	10.5	8.1	3.4	5.4	1.5	9.0	2	White	"
I. sanguinea	62.0	61.3	1.1	11.8	5.6	2.2	5.6	1.2	7.0	2	Bluish purple with net-like spots at the base of outer perianth	"
I. sanguinea var. albiflora	61.3	60.2	1.1	6.7	4.4	2.6	3.6	1.2	5.5	2	White	"
I. sanguinea var. pumila	15.2	19.9	1.3	7.2	4.6	2.8	4.1	0.9	3.7	2	Purple or white	"
I. ensata var. spontanea	75.5	62.2	1.2	11.3	7.8	4.4	3.4	0.8	4.2	2	Reddish purple	Mid-June
I. ensata var. ensata	82.7	86.3	2.0	17.6	10.2	9.6	5.9	2.7	6.5	2-3	Various kinds	June

Table 3. Chronological Table of Iris ensata var. ensata

Year	The Tokyo type	The Kumamoto type	The Ise type
1661	Mytsutomo Togugawa studied iris gardens in Toyama villa		
1673	Outline of Flower Garden was published (1681) which classified the flowers by color and described method of cultivation.		
1688	Kadan-chikin-sho (Concise Flower Gardening) was published (1694) which described eight varieties of hanashobu.		
1704	Revised edition of Kadan-chikin-sho was published which described more than 40 varieties.		
1772	Sakinga Shoo*Matsudaira was born in Edo** in 1773. He later became a high-salaried Samurai. He enjoyed horticulture very much and was called the father of hanashobu improvement.		Sadagoro Yoshii was born in 1776. He liked horticulture and was said to be the originator of the Ise type. The Ise varieties have been produced by crossing cultivated varieties with other cultivated varieties or with the wild species.
1781	Matsudaira's father obtained a hana-ayame (species) from Shinshu, planted seeds from the plant, but obtained no variation.		
1789	Shirakawa Rakuo grew some hanashobu. Matsudaira obtained seeds of eight varieties from Iyo Matsuyama and obtained new colors and forms. He produced six-petaled flowers for the first time.		

*Pronounced Sho-o to rhyme with Tokyo. It is a title indicating great respect.

**The old name for Tokyo.

1801 Matsudaira gave some hanashobu to Rokosaburo Mannen and a farmer named Izaemon who started their cultivation at Horikiri.

1804 Izaemon's son succeeded him and enlarged and improved his collection.

1818 Matsudaira obtained hanashobu seed and produced six-petaled flowers for the second time. He moved from Tokyo to Kyoto and continued improving his flowers. He dedicated the best one to the Emperor and this stimulated the culture in the western districts.

Saikichi Noguchi was born in Matsusaka. He was given hanashobu from Yoshii.

1830 Lord Owari was impressed with the flowers at Horikiri and considered them to be the best in Japan.

Lord Higo asked Matsudaira to give him some hanashobu and started their cultivation in 1841.

1844 Matsudaira completed his book Hanakagami (Flower Mirror) in 1845.

1848 Matsudaira published the Hanashobu Cultivation Record.

Matsudaira dedicated the book and flower to Lord Higo.

1854 Matsudaira died in Edo in 1856. He left more than 200 varieties of hanashobu.

Yoshii died in 1859. His son, Kichinojo, succeeded him and gave the flowers to Noguchi.

1860

Kenjiro Izeki was born and became a grower of Ise hanashobu.

Table 3, Chronological Table of Iris ensata var ensata, cont'd.

Year	The Tokyo type	The Kumamoto type	The Ise type
1868	The hanashobu garden at Horikiri was named Shoko-en and they exported the first hanashobu to the United States in 1877. Yotsugi-Yoshino-En (garden) was improved in 1887. The Yoyogi garden (now the inner garden of the Meiji Shrine) was enlarged to take a hanashobu garden. An exhibit of hanashobu was held in Tokyo in 1902. The Experimental Laboratory of the Kanagawa Prefecture started a hanashobu garden in 1910 and developed more than 300 varieties.	A society named Karen-Mangetsu-Kai was formed in 1886. It was reorganized and strengthened in 1893 to improve the hanashobu.	Mankichi Tsuyoshigawa, a nephew of Izeki, started cultivation of the Ise type. Taisuki Hirode also started in 1907. Sukeichi Miyagawa, Head of the Mie Prefectural Agricultural Laboratory also worked to improve the hana shobu and used the name Ise for the first time. Noguchi died in 1910.
1912	Manabu Miyoshi published Hanashobu Illustrated in 1921.	Nobutsune Nishida (1862-1938) retired from Manetsu-Kai but worked individually to collect and distribute hanashobu. In 1914 the name was changed from Higo hanashobu to Kumamoto hanashobu. Nishida moved to Yokohama and opened a garden (Shuho-en) there in 1923. He died in 1938.	
1926	Dr. G.M.Reed visited Japan from the United States (1930). The Japan Iris Society was formed in 1931. Horikiri Shoko En (garden) was designated as National property in 1933		Kensaburo Nagabayashi died in 1937. His plants were distributed throughout the Matsusaka district. Izeki died in 1914. Yoshikawa died in 1941 leaving more than 100 varieties In 1952 the Ise varieties were designated a National flower.

Figure 1, The origin and history of the garden varieties of I. ensata. Dotted lines indicate the presumed path of breeding sources and solid lines the paths verified by early described records.

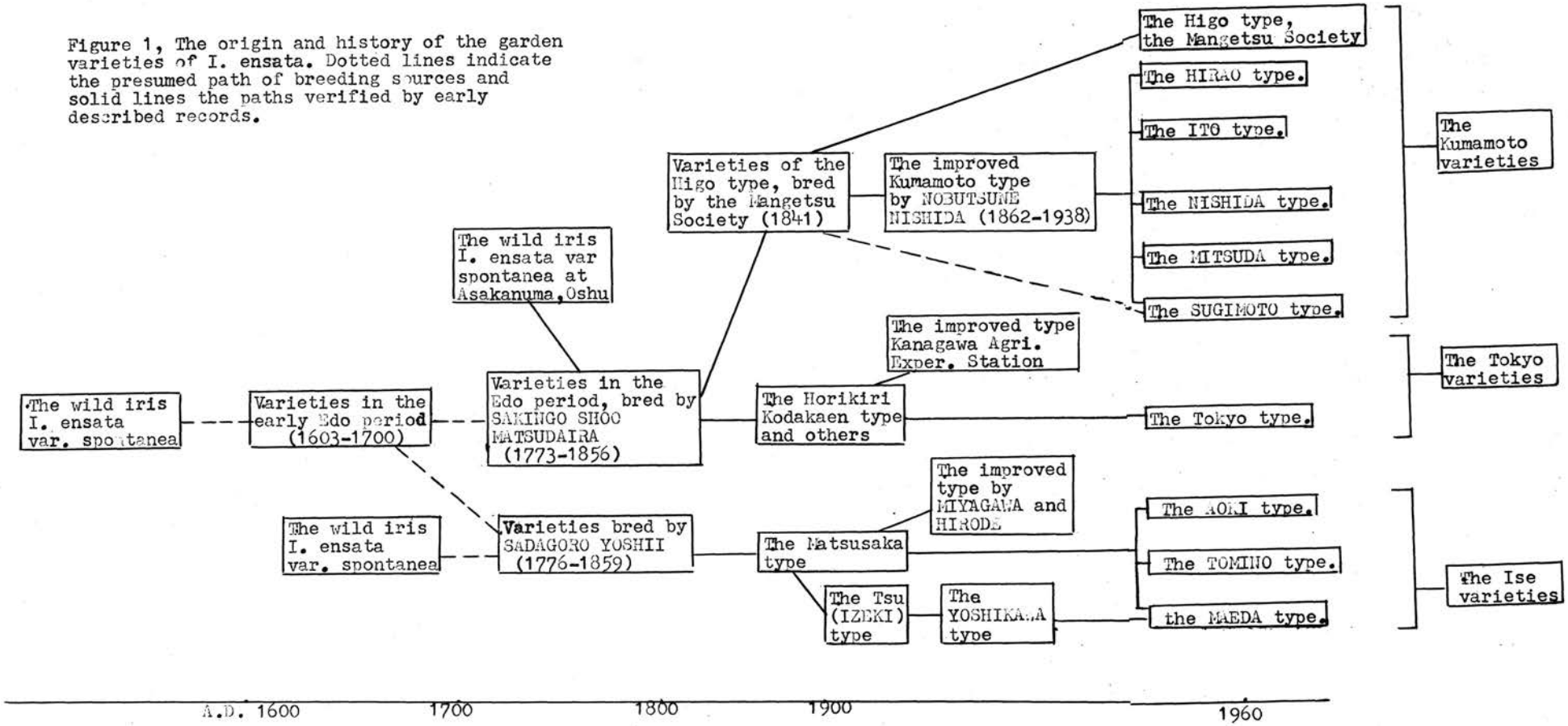


Table 4, Morphological comparison of the Tokyo, Kumamoto and Ise varieties.
(All measurements in centimeters)

Variety	Mean	Standard Deviation	Range
Length of flower stalk			
Tokyo	83.1	±13.91	30.4-85.8
Kumamoto	75.7	±13.17	75.2-78.9
Ise	66.0	±14.80	62.8-69.2
Length of leaf blade			
Tokyo	71.1	±12.44	68.7-73.5
Kumamoto	66.0	±12.70	62.9-69.1
Ise	67.5	±12.96	64.7-70.3
Width of leaf blade			
Tokyo	1.6	±0.33	1.6-1.7
Kumamoto	1.9	±0.39	1.8-2.0
Ise	1.6	±0.33	1.6-1.7
Diameter of flower			
Tokyo	16.5	±2.44	16.0-17.0
Kumamoto	19.4	±2.30	18.8-19.9
Ise	15.9	±2.34	15.4-16.4
Length of outer perianth			
Tokyo	9.9	±1.33	9.6-10.1
Kumamoto	10.9	±1.17	10.6-11.2
Ise	10.2	±1.20	9.9-10.4

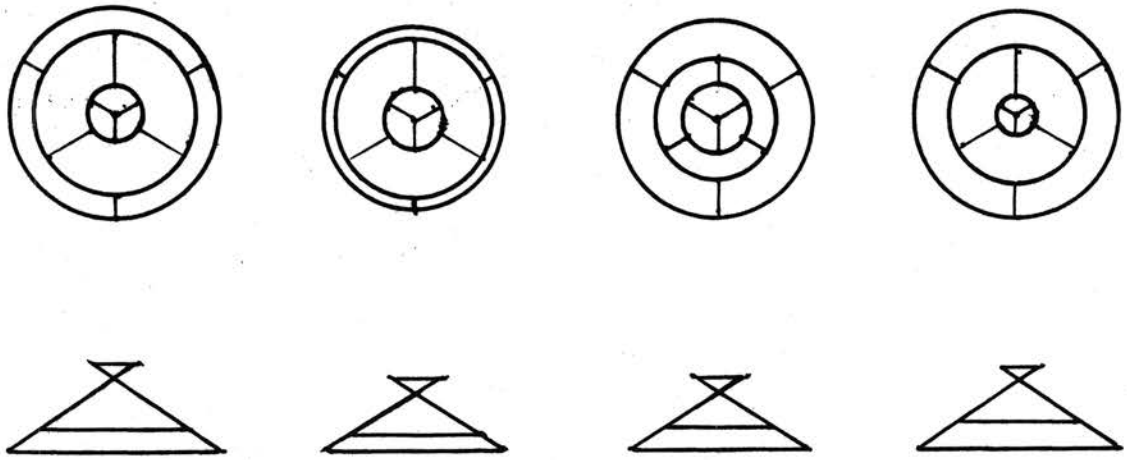
Variety	Mean	Standard Deviation	Range
Width of outer perianth			
Tokyo	8.1	±1.74	7.8-8.5
Kumamoto	10.3	±1.34	9.9-10.6
Ise	8.9	±1.17	8.6-9.1
Length of inner perianth			
Tokyo, 6 petal	8.3	±1.24	7.9-8.6
Tokyo, 3 petal	5.8	±0.93	5.5-6.0
Kumamoto, 6 pet.	9.1	±1.27	8.8-9.4
Ise, 3 petal	6.3	±1.22	6.1-6.6
Width of inner perianth			
Tokyo 6 pet.	5.8	±1.30	5.4-6.1
Tokyo 3 pet.	2.1	±0.82	1.9-2.4
Kumamoto 6 pet.	7.8	±1.20	7.5-8.1
Ise 3 pet.	2.6	±0.60	2.5-2.7
Length of crest			
Tokyo	2.8	±0.49	2.6-2.9
Kumamoto	2.1	±0.54	1.9-2.2
Ise	1.6	±0.51	1.4-1.8

* * * * * * * * * * * * * * * * *

Degree of reflex in outer perianth indicated by the angle of the perianth and stalk.

Type	Mean depth of reflexed perianth/mean length of outer perianth	Mean angle between outer perianth and stalk, degrees.
Tokyo	5.3/9.9	57°38'
Kumamoto	6.3/10.9	54°42'
Ise	6.4/10.2	50°24'

Figure 3. Diagram showing the flower types in I. ensata var. ensata.



Kumamoto type 6 petal | Tokyo type 6 petal | Tokyo type 3 petal | Ise type 3 petal

Outer perianths are represented in the top views by outer circles, inner perianths by the middle circles and crests by the inner circles. The triangles represent the side views of the perianths and crests.

Table 4-11, Flowering dates of the three local varieties (types).

Variety	June 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Tokyo	1	2	0	2	1	5	4	5	3	7	5	7*	6	1	3	4
Kumamoto	0	0	0	0	0	0	0	0	0	0	1	2	3	2	7	12*
Ise	1	1	0	3	1	7	0	1	9	7	27*	1	1	0	0	1

Variety	June 17	18	19	20	21	22	23	24	Total number of garden varieties
Tokyo	1	1	0	0	0	0	0	0	58
Kumamoto	4	4	3	3	3	0	2	1	47
Ise	0	0	0	5	2	0	0	0	76

* Mode of frequency

Section 3. Cytology of iris species found in Japan.

Only Tables 5 and 6 are reproduced (see page 13). Tables 7-20 and Figures 4-23 are not reproduced because they probably are of interest only to cytologists.

Each of the tables listed following this paragraph lists the chromosomes of the respective species by number, gives the overall length in microns of each chromosome and each portion of each chromosome and the position of the centromere in each chromosome.

Table 7	I. Rossi
" 8	I. gracilipes
" 9	I. japonica
" 10	I. setosa
" 11	I. setosa var hondoensis
" 12	I. laevigata
" 13	I. sanguinea
" 14	I. ensata var. spontanea (from Hokkaido)
" 15	I. ensata var. spontanea (from Saiku, Mie Prefecture)
" 17	Kuon-no-yuki (Garden variety of I. ensata var. ensata).
" 18	Ochibagoromo (Garden variety of heteroploid I. ensata var. ensata)

Likewise Figures 4 through 13 give sketches of chromosomes on which each of theabove tables is based. The sketches are made from the photographs found at the end of the Bulletin.

Table 16, Chromosome numbers of garden varieties of I. ensata var. ensata, states that thirteen named and 58 unnamed Tokyo type varieties were found to have a 2n chromosome number of 24. The same is true for 13 named and 60 unnamed varieties of the Kumamoto type and 13 named and 72 unnamed of the Ise type. However, twenty-two named Ise varieties were found to have a chromosome number of 25.

Table 19, Characteristics of karyotypes in the iris species, combines and compares much of the data given in Tables 7 through 15, 17 and 18.

Figures 14 through 23 show the chromosomes for each of the species and varieties previously discussed arranged according to lengths and in pairs where applicable.

Karyotype formulae for the same species and varieties are given on pages 29 and 30.

Table 20 gives the number of microspores at the stage of pollen tetrad formation in the variety Ochibagoromo of I. ensata var. ensata (2n=25).

Table 5, Number of sources of iris species and garden varieties of I. ensata var. ensata.

Species	Locality and number of sources	
I. Rossi	Ehime (1), Oita (1)	2
I. gracilipes	Tochigi (1), Osaka (1), Fukui (1)	3
I. japonica	Mie (7), Aichi (4), Iwate (1), Toyama (1)	13
I. setosa	Oze (1), Krigamine (1), Hokkaido (2)	4
I. laevigata	Aichi (3), Mie (2), Tokyo (2), Osaka (1), Kyoto (1), Yamanashi (1)	9
I. sanguinea	Aichi (1), Mie (7), Shizuoka (1), Tochigi (1), Tokyo (1), Fukuoka (1), Osala (1)	13
I. ensata var spontanea	Hokkaido (1), Iwate (1), Tochigi (2), Ibaragi (1), Aichi (1), Shizuoka (2), Mie (3), Fukushima (1)	12
Garden varieties of I. ensata var. ensata	Garden of Ise Shrine (81), Nagoya Tsurumai Park (49), Mie University (149)	279

Table 6, Chromosome numbers of the iris species in Japan.

Species	n	2n	Author
I. Rossi Baker	-	32	Kurita '40
	-	32	Tomino
I. gracilipes A. Gray	18	36	Kazao '29
	-	36	Simonet '34
	-	36	Tomino
I. japonica Thunb.	-	54	Kazao '29
	-	34	Yasui '39
	-	54	" "
	-	54	Tomino
I. setosa Pall.	-	38	Simonet '34
	-	38	Tomino
	-	39	"
Var. hondoensis Honda	-	53	"
I. laevigata	16	32	Kazao '29
form. albopurpurea Makino	-	32	Tomino
form. leucanthum Makino	-	32	"
I. sanguinea Hornem.	14	28	Kazao '29
	-	28	Sakai '52
	14	28	Tomino
var. albiflora (Makino) Tomino	-	28	"
var. pumila (Makino) Tomino	-	28	"
I. ensata Thunb. var. spontanea (Makino) Nakai	12	24	Kazao '29
	12	24	Tomino
var. ensata	12	24	Kazao '29
	12	24	Tomino
	-	25	"

Section 4, Growing and breeding of I. ensata var. ensata.

Table 21, Pollen fertility and germination per cent in the varieties of I. ensata var. ensata.

	No. of Pollens	Pollen Fertility %	Germination test in medium		
			Pollens Examined	Pollens Germinated	Germination %
Asahimaru (2n=24)	118	93.22	105	49	46.67
Ochibagoromo (2n=25)	160	19.38	170	0	0.0
Daio (2n=25)	284	58.45	165	26	15.76
Usugesho (2n=25)	424	66.74	296	40	13.51

(Editor's note: Methods used in determining above results are not available without translation at least)

Table 22, Pollen fertility in the heteroploid varieties (2n=25) of I. ensata var. ensata, gives numbers of pollens observed, per cent fertility and other observations on twenty named varieties. Fertility ranged from 9.38% to 82.04% with an average of about 40%.

Table 23, Growth and floral development of I. ensata var. ensata gives data over the period of February 25 to May 30 for number of leaves, plant height, length of flower stalk, length of flower bud and stage of floral development of unspecified varieties. See Table 24.

Table 24, Differentiating stages of flower in I. ensata var. ensata. Three specimens were examined each week from February 25 to May 30. The following table has been made from Table 24 and gives the earliest date of three observations of each stage instead of a date for each observation. The ranges for each of the stages in Table 24 are not more than one week.

Stage	Date of first of three observations
No differentiation	2/25
Initial primordium	3/1
Spathe primordia	3/8
Outer perianth primordia	4/5
Stamen primordia	4/12
Inner perianth primordia	4/19
Pistil primordia	4/19
Pollen formation	5/10
Ovule formation	5/24
Blooming	5/30

Figure 25, Different periods in developing flower in the iris species. Solid line indicates growing period without differentiation at shoot apex, dotted line the period in which flower primordium forms and develops, and interrupted line the blooming period.

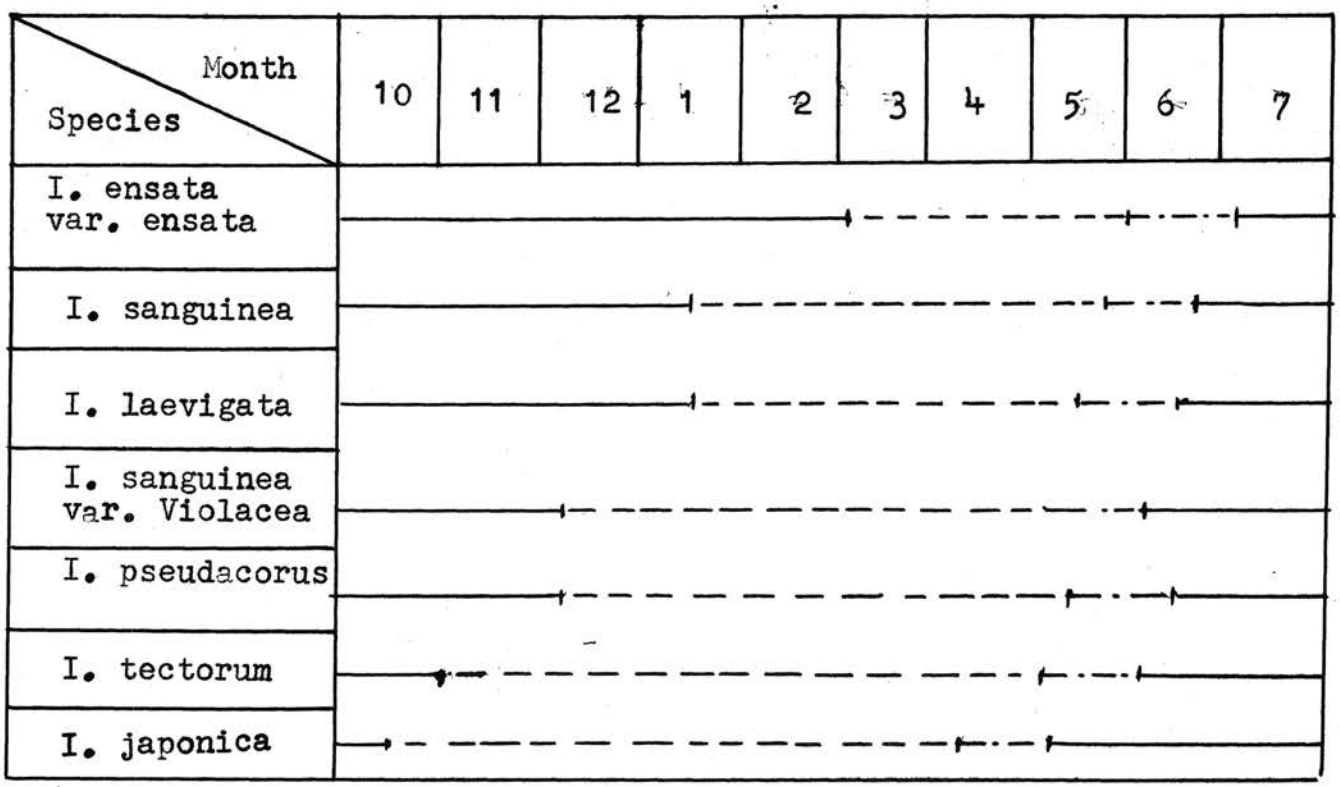


Table 25 gives sizes in microns of pollen grains in I. ensata var. ensata and I. ensata var. spontanea.

Table 26, Pollen fertility and size in I. ensata var. spontanea and the garden varieties of I. ensata var. ensata, covers 55 Kumamoto varieties, 14 Ise varieties, 4 Tokyo varieties and six specimens of I. ensata var. spontanea.

Table 27 gives per cent and size of giant pollens in sixteen garden varieties of I. ensata var. ensata.

Table 28 gives germination abilities of pollen soaked in water for periods up to ten minutes for seven varieties. In four no germination was observed after two minutes soaking, in one none after three minutes and in the other two almost none after ten minutes.

Table 29 gives germination ability of pollens stored in a moist chamber. The humidity is not specified. For three varieties the germination percentages 77.9, 46.8 and 41.7 respectively after 30 minutes treatment. After two hours treatment the percentages in the same order were 53.0, 64.0 and 47.7. After ten hours they were 8.7, 14.9 and 0.0. After 65 hours they were 5.8, 9.8 and 0.0.

Table 30 gives germination test results with pollen moistened by rain on three varieties. They showed percentages of 5.9, 5.1 and 0.0 compared respectively with control percentages of 51.5, 62.3 and 68.6.

Table 31, Fruit setting and seed fertility in self- and cross-pollination in I. ensata var. ensata.

Pollination	No. of poll'd flowers	No. of fruits set	Fruit setting %	Seeds per capsule			Ave. no of seeds per flower pollinated
				Max.	Min.	Ave.	
Self	38	14	36.8	76	1	32.8	12.0
Cross	43	17	37.2	71	5	32.2	12.7
Control	16	4	25.0	65	3	38.3	9.6

All pollinations used for these tables were performed by hand. Self pollination means both parents were of same variety. Cross-pollination means parents were of different varieties. No information is available on what distinguised the controls from the others.

Figure 26 shows a side view of two pistils of I. ensata to illustrate the positions of mature and immature stigmas. The immature stigma points above the horizontal while the immature drops below.

Table 32, Fruit setting in pollination with stigma and pollens at different stages of maturity.

Pollen taken		Pistil--1 day before blooming		Day of blooming		2 days after blooming		3 days after blooming	
		No. of flowers pollinated	No. of fruits set	No. of flowers pollinated	No. of fruits set	No. of flowers pollinated	No. of fruits set	No. of flowers pollinated	No. of fruits set
1 day before blooming	(1)	5	0	5	3	7	4	5	3
	(2)	15	0	15	4	15	4	15	2
Day of blooming	(1)	12	1	25	7	20	4	4	1
	(2)	15	1	15	11	15	12	15	3

Table 33, Self- and cross-pollination with mature and immature pistils, reports obtaining 4.1 seeds per flower with self-pollination and 23.5 seeds per flower using cross-pollination on flowers with upright stigmas. Using flowers with reflexed stigmas the yield was increased to 28.3 seeds per flower using self-pollination and 30.1 using cross pollination.

Table 34 reports that when using flowers with upright stigmas 9 out of 11 flowers (81.8%) bore fruit in a field control group and 4 out of 12 (33.3%) bore fruit in a group of potted plants. Using flowers with reflexed stigmas 11 out of 13 (84.6%) of the field control group bore fruit and 7 out of 11 (63.6%) in a group of potted plants.

Table 35, Fruit setting and fertility in pollinating pistils different in maturity with stored pollens.

Pollination	Stigma	No. of flowers pollinated	No. of fruits set	Fruit setting, %	Ave. No. of seeds per capsule	Ave. No. of seeds per flower
With fresh pollens on day of blooming	Immature	11	8	72.7	38.7	28.1
	Mature	16	14	87.5	44.5	38.8
Pollens stored one day	Immature	10	8	80.0	18.5	14.8
	Mature	14	12	85.7	37.3	31.9
Pollens stored two days	Immature	12	8	66.7	37.5	21.0
	Mature	16	13	81.3	33.5	27.0
Pollens stored three days	Immature	14	9	64.3	26.5	17.0
	Mature	13	7	53.8	49.3	26.5
Pollens stored five days	Immature	10	4	40.0	15.5	6.2
	Mature	14	6	42.5	27.8	11.9

Table 36, Fruit setting and fertility in pollinating with stored pollen.

With fresh pollens on day of blooming	12	9	75.0	29.0	21.7
Pollen stored eight days	12	5	41.7	51.2	21.3
Pollen stored fifteen days	12	1	8.3	11.0	0.91

Table 37, Fruit setting and fertility in crossing with stored pollens.

With fresh pollens on day of blooming	42	30	71.5	45.1	32.2
Pollen stored three days	34	26	76.5	40.4	30.9
Pollen stored eight days	31	17	54.8	27.0	14.8

Table 39 lists fifty new garden varieties of I. ensata and gives their parentages, characteristics and years bred.

Table 38, Results of inter- and intraspecific crosses of the iris species.

Parents		No. of poll'd flowers	No. of fruits set	Fruit set'g %	Total No. of seeds	No. of seeds per capsule
Maternal	Paternal					
I. pseudacorus	I. ensata	10	4	40.0	15	3.7
	I. laevigata	13	6	46.1	333	55.5
	I. sanguinea violacea	8	2	25.0	6	3.0
I. laevigata	I. sanguinea (spotted)	8	4	50.0	71	17.7
	I. fulva	3	1	33.3	23	23.0
	I. ensata	3	1	33.3	8	8.0
	I. pseudacorus	3	1	33.3	81	81.0
	I. hollandica	4	0	0.0	0	0.0
I. sanguinea (spotted)	I. fulva	6	0	0.0	0	0.0
	I. ochroleuca	3	1	33.3	27	27.0
	I. sanguinea var. pumila(purple)	3	3	100.0	117	39.0
I. sanguinea var. pumila (purple)	I. sanguinea var pumila (white)	2	2	100.0	204	102.0
	I. sanguinea	4	4	100.0	326	81.5
	I. fulva	5	0	0.0	0	0.0
I. sanguinea var. violacea	I. laevigata	6	4	66.6	193	48.2
	I. pseudacorus	10	2	20.0	45	22.5
I. ochroleuca	I. fulva	4	0	0.0	0	0.0
I. hollandica	I. tectorum	8	0	0.0	0	0.0
	I. laevigata	5	0	0.0	0	0.0
	I. sanguinea var. violacae	4	0	0.0	0	0.0
I. ensata	I. laevigata	10	0	0.0	0	0.0
	I. pseudacorus	14	2	14.2	12	6.0
	I. fulva	6	0	0.0	0	0.0

Summary

I. Taxonomy and distribution

(1) The part of the present work was devoted to the study of Japanese IRIS species. The comparative geographical distribution, morphological characteristics and karyotypes of these species gave a basis to define a classification of the genus IRIS. After the survey of the work, the author acknowledged seven species including five varieties and two forms in Japan (Tables 1 and 2).

(2)I. SANGUINEA, I. LAEVIGATA and I. ENSATA var. SPONTANEA have a southern limit to Japan, showing a wide distribution in Korea, northern China and Siberia. I. ROSSI has a distribution in Korea and is occasionally found at limited localities in Japan, while I. ENSATA distributes commonly over all of the areas. I. SETOSA has its habitation in northern China, northeastern Siberia as well as in Japan, extending into Alaska and the east coast of North America. Both I. GRACILIPES and I. JAPONICA are the native species in Japan.

II. Cultivation and Garden Varieties

The earliest publication for cultivation of irises is "Kadan Komoku" (Descriptions of Japanese Flowers) written by Motokatsu Mizuno in 1681, in which I. SANGUINEA and I. LAEVIGATA are first introduced as favorable garden plants. However, little progress was made in breeding these irises down to the present time. I. ROSSI, I. SETOSA, I. SETOSA var. HONDOENSIS, I. GRACILIPES and I. JAPONICA are wild species and the earlier records of the cultivation of these irises are very rare. An important iris I. ENSATA var. ENSATA had its origin in the wild iris, I. ENSATA var. SPONTANEA, and was cultivated in the 17th century. Since then, various worthwhile varieties have been produced by horticulturists. These varieties are considered to be grouped into two groups: (1) those bred in the early Edo period (1603-1700) and (2) and those bred in the late Edo period (1800-1867). Sakinga Matsudaira (1773-1856) contributed to the breeding of the varieties of the second group, which were important breeding materials in establishing the modern iris varieties. They have been bred independently or dependently at the three distinct regions: Tokyo (Edo), Kumamoto (Higo), and Mie (Ise). The origin, history and interrelationship of the three types are discussed and summarized in tabular form in Figure 1.

III. Cytology

(1) Counts of chromosome numbers were made for 335 accessions of I. ROSSI, I. GRACILIPES, I. JAPONICA, I. SETOSA, I. LAEVIGATA, I. SANGUINEA, I. ENSATA var. SPONTANEA and I. ENSATA var. ENSATA. Furthermore the comparative karyotype analysis of these species was carried out. Basic chromosome numbers of the Japanese IRIS are 12,14, 16,18, and 19. There was no polyploidy between or within species.

Heteroploid plants of 2n=39 were found in I. SETOSA, and 2n=53 in I. SETOSA var. HONDOENSIS, and2n=25 in 22 varieties of the Ise type of I. ENSATA var. ENSATA. Heteroploidy seems to play a significant role in the building of the Ise varieties. Chromosomes showed,as a rule, a continuous variation in size. The longest chromosome has a median or submedian constriction, and karyotypes of I. SETOSA, I. LAEVIGATA and I. SANGUINEA have a pair of SAT-

chromosomes. Karyotypes of the IRIS species were divided principally into three types based on the morphology of the chromosomes: the type A in I. ROSSI, I. GRACILIPES and I. JAPONICA; the type B in I. SETOSA, I. LAEVIGATA AND I. SANGUINEA; the type C in I. ENSATA var. SPONTANEA and garden varieties of I. ENSATA var. ensata. Karyotype formulae of these seven species were presented.

(2) Meiotic division was normal in PMCs in both I. SANGUINEA (2n=28) and I. ENSATA (2n=24). Some heteroploid varieties were male sterile and showed degeneration of stamens. The heteroploid varieties had irregular meiosis. Lagging chromosomes were frequently seen in anaphase I. Most frequent PMCs showed the chromosome configuration of $9_{II}+7_{I}$ or $8_{II}+9_{I}$ in metaphase I. The daughter separated as a normal way in the second division. The lagging chromosomes formed extra nuclei. As a result number of microspores varied from 2 to 11 at the stage of tetrad formation. Pollen grains varied in size and were almost sterile.

IV. Flowering

(1) The flower bud differentiation of I. ENSATA begins early in March at any locations of the Mie Prefecture, while the flower buds initiate from October to January in I. SANGUINEA, I. LAEVIGATA, I. PSEUDACORUS, I. SANGUINEA var. VIOLACEA, I. TECTORUM and I. JAPONICA. Successively, development of flower buds is accelerated under a long day condition.

(2) In the process of flower bud differentiation, an initial primordium first differentiates spathes and develops outer perianths, stamens, inner perianths and pistil successively.

(3) The degree of pollen fertility ranged from 19 to 98 per cent in the garden varieties of I. ENSATA. A few giant pollen grains were observed in 16 varieties of I. ENSATA var. ENSATA.

(4) Germination was extremely inhibited when pollens were soaked in water three minutes. Germination per cent of pollen decreased markedly in the saturated moist chamber when pollens were kept over ten hours. Pollen grains in the rain were easy to lose their vitality. Longevity of the pollen was about eight days at the room temperature.

(5) Mature stigma reflexing at the base of crests are ready to receive pollen. In normal diploid I. ENSATA, seed fertility in self-pollination was as high as in cross-pollination.

V. Interspecific Hybridization and Breeding

(1) Twenty three interspecific crosses were attempted. A few hybrids were obtained in the crosses of I. SANGUINEA var. PUMILA x I. SANGUINEA, I. PSEUDACORUS x I. LAEVIGATA, I. LAEVIGATA x I. SANGUINEA, AND I. SANGUINEA var. VIOLACAE x I. LAEVIGATA. The cross of I. PSEUDACORUS with I. ENSATA as a paternal parent was successful, but no seed obtained I. ENSATA was used as the maternal parent.

(2) Fifty new varieties of the Ise type have been established mainly from crosses between the valuable Ise varieties and partly from the crosses between the Ise varieties and the Kumamoto varieties (Table 39).

JAPANESE IRIS PHILATELICS

The January, 1968, issue of the Bulletin of the AIS contains an article starting on page 69 on Irisphilatelics by Ralph Geyer. In the upper right corner of page 73 is a rogue's gallery reproduction of a Japanese stamp, Scott No. 717, the flowers of which may be presumed to be Japanese irises.

A specimen of the stamp with two others of the same series came to the Editor last year. One of the others pictured a tree peony and the other a large yellow chrysanthemum. All three were of unusual beauty.

The white flower on the stamp has delicate, rather faint, veining. The purple flower behind it has the same form. Both have tall,narrow, spoon-shaped standards of the same color as the falls. One might estimate that the standards would be one and a half inches tall. The purple iris has a long yellow signal patch on the under side of a fall. The white iris has a typical signal patch on the upper side of a fall.

Your Editor was willing to overlook the signal patch on the under side of a petal. The flowers areso beautiful and the design so excellent that he was inclined to copy it on the cover of The Review.

To get more background on the flowers illustrated, Dr. Hirao was asked for information on the varieties shown. His answer is as follows:

> "You asked the names of the two irises, but I regret I am not able to give them to you. I am sure the painter must have done it basing it on his imagination. The picture is not a sketch of actual flowers. We have old Edo white singles such as Hatsu-shimo, Sanono-watashi, Tsuruno-kegoromo, etc, but none of them is identical. These narrow but erect standards are seldom seen on Japs here. I know of a few varieties with this type of standards but they are different in both color and shape of falls from those on the stamp. My impression is that it is not unlike Marx's Great White Heron but naturally they cannot be identical. It may also resemble a white form of wild Iris Kaempferi based on its overall appearance but it cannot be this with such prominent style arms as are seen in the stamp. I note that the tips of the style arms reflect upwards and are not too small which characteristics have not been found in a variety with erect standards so far. My conclusion is that the white one in the stamp does not exist. The purple one is more like the wild Iris Kaempferi, or I dare say, it is more like the English iris! Wild iris Kaempferi differ slightly depending on localities where found. Generally the falls are more drooping and the flower never has the flap at the terminal of the style arm."

It is still a beautiful stamp and, in spite of a nit-picking Editor's curiosity, will make plenty of people think a Japanese iris is a beautiful flower.

JAPANESE NAMES

In the April, 1967, issue of The Review we presented a list of Japanese names of Japanese irises with English translations. We hedged on the quality of the translation and it is well that we did.

For Kongo San we gave "Golden (?) Mountain". The question mark was ours. The translation was amde by a Japanese attending college in this country. We could not quite believe that a dark blue flower could be named Golden Mountain.

We are thankful to Akira Horinaka who,in a letter to Art Hazzard, clears up the question. He writes:"Ordinarilly the names of Japanese irises have two meanings- one is the literal translation and the other a free translation. For example Kongo San (in The Review for April, 1967) does not mean Golden Mountain. Mt. Kongo is one of the mountains located in the Nara Prefecture".He explains that the literal translation, which should not be used, would be based on Kon meaning gold, Go meaning strength, Kongo also meaning strength and San meaning mountain.

Mr. Horinaka adds: "Mai Ohgi means fan for Japanese dancing, not Dancing Fan."

In a letter to the Editor, Mr. Horinaka gives the following comments on names.

"Our dealers in Japanese irises give the name arbitrarily or name a certain variety after another variety for their trade. They are so numerous that we are confused. The following varieties are unknown in our country so far as I know:

Murasaki	means purple	Wakamusha	A younger warrior
Fukamurasaki	" deep purple	Yamabiko	Echo
Fumetsu	Immortality	Kuro Komo	Dark Clouds
Reijin No Koi	A beauty in love	Oe Yama	Mt. Oe
Shimpi	Mystery		

"The following varieties are famous:

Shusho	Praiseworthy (Not same as Zuisho)
Gekko	Moonlight
Basho no Iori	Solitary abode in which Basho Matsua had lived. He is a famous writer of the 17 syllable Japanese poems.

"The following varieties are iris species:

Kakitsubata	I. laevigata Fischer
Ayame	I. sanguinea Horneman. Our botanists have used I. Nertshinskia and I. Siberica L. var Orientalis Maxim.
Ehime Ayame	I. Rossi Baker
Neji Ayame	I. ensata Thunberg
No Kakitsubata	I. ruthenica Ker-Gawler
Hiogi Ayame	I. setosa Pallas
Shaga	I. japonica
Hime Shaga	I. gracilipes A. Gray
Ichihatsu	I. Tectorum Maxim"

DISEASES AND PESTS

Robins 4 and 6 on recent flights have sketched what appears to be a good national picture of Japanese iris diseases and pests.

Gene Wagner, Newark, Ohio, reports "a few plants with blight, one with pineappling" apparently what has also been called "the twist". Edith Cleaves, San Jose, California, reports"only weeds". "Skipper" Thaxter, Nehalim, Oregon, reports only two local pests: earwigs and slugs, Ruby Cantrell, Neosho, Mo., only wheat straw rust. Isabelle Du Jardin "has had blight in older established plants". Eleanor Westmeyer, Stamford, Conn., says: "Iris borers worst problem." She drenches the crown of each plant early in spring with Chlordane to take care of thrips, red spiders and borers. She reports that the iris snout beetle is a pest some seasons. It punctures the bloom and the larvae ruin seed pods. She has also found that the Verbena bud moth also causes some loss of seeds. Bee Warburton, Westboro, Mass., complains of blight. Her suggested solution is to line out single shoots immediately after blooming and giving them the "TLC (tender loving care?) of individual seedlings, with watering and special feeding.

AGRIMYCIN

A copy of thearticle on Japanese iris "Blight" in the October, 1967, issue of The Review was sent to the manufacturer of Agrimycin for comments. The following remarks were received in answer. Agrimycin's "apparent ineffectiveness in drenching applications is probably due to the instability of the active ingredients in the soil. This effect has been demonstrated by many investigators over the course of years". "Agrimycin 100..... is being replaced by Agrimycin 17. This product contains 17% streptomycin activity and on the basis of available information should be as effectve as Agrimycin 100 in controlling a number of plant bacterial diseases". Agrimycin 100 contained 15% streptomycin.

W.A.Payne

W.A.Payne is planning on being in Terre Haute during the 1968 blooming season which usually runs from about June 10 to 25. Persons interested are advised to get in touch with the Editor later.

P.S.

Persons interested in learning more about microspores and tetrad formation, and other esoteric as well as non-esoteric things about pollen, will be interested in reading an article on Pollen in the April, 1968, issue of Scientific American.