

Studies on *Pharbitis Nil*, CHOIS. II Chromosome Number

Contributions to Cytology and Genetics from the Departments of
Plant Morphology and of Genetics, Botanical Institute,
Faculty of Science, Tokyo Imperial University. No. 77

by

Kono Yasui

With three Text-Figures

It is said that 'Asagao' (Japanese morning glory), *Pharbitis Nil*, CHOIS. was introduced into this country about 1200 years ago. And in Bunka-Bunsei Period (about 120 years ago) it became popular as a summer flower and quite numerous strains were cultivated, among which many recessive and a few dominant characters were known, and even some linkage relations, to express in modern terms, among these characters have been recognized by some cultivators who kept these facts as secret and utilized for the production of required forms. Recently with the development of science of Genetics, the extensive breeding experiments on several strains of this plant have been carried on by a number of investigators and various results of their studies were published. The cytological side of study on these different strains were, however, left untouched, except ISHIKAWA'S statement on the chromosome number based on OHGA'S observation¹⁾.

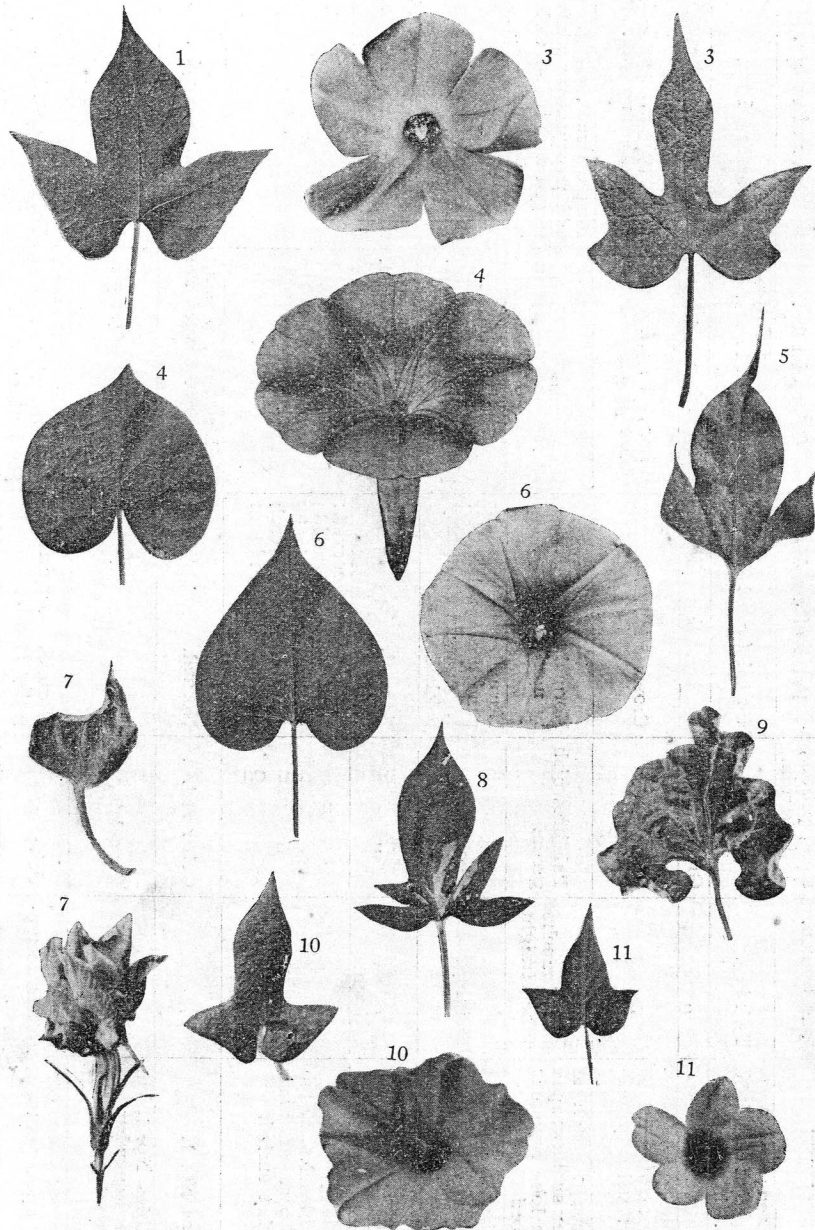
Present writer has kept number of strains of this plant since more than ten years, of which eleven strains described below served as materials for the present contribution. For fixation and staining of the pollen mother cells, which were the chief material of study, was used iron aceto-carmin.

Descriptions

EXTERNAL CHARACTERS OF THE ELEVEN STRAINS OF *Pharbitis Nil*. Chief diagnostic characters of each strain used are given in Table I.

CHROMOSOMES AND POLLEN GRAINS. Text-Fig. II, 1, 2, 4, 6, 8,

1) ISHIKAWA, M. Addenda to "A list of the number of chromosomes." (Bot. Mag. Tokyo, vol. 30. 1916.) Bot. Mag. Tokyo. Vol. 31, No. 1. Extra page. 1917.



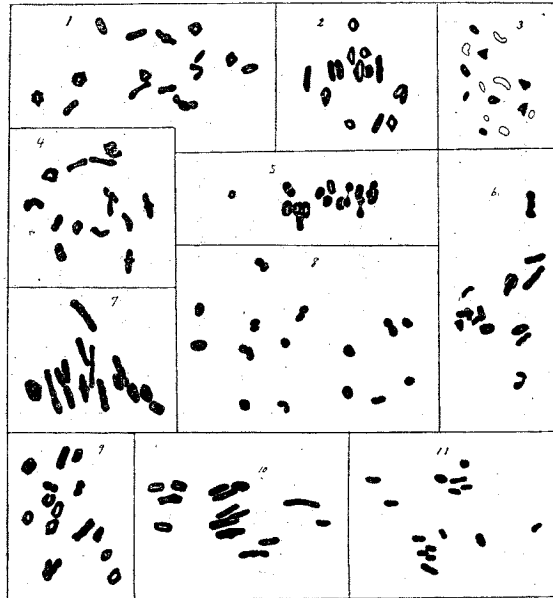
Text—Fig. I. All figures, except the flower of fig. 4, are photographs from nature, reduced to 2/3. The flower of fig. 4 is a sketch, ca. 2/3. The number annexed to each leaf and flower in the figure corresponds to that of the cultivated strains of *Pharbitis Nil*.

Table I

No.	Cotyledon.	Habit of stem and branch.	Color of the sunny side of stem, petiole, leaf margin.	Flower.		
				Form of corolla.	Color of tube.	Color of crown.
No. 1	Two-lobed; base cordate; apex of each lobe obtuse.	Twining.	Ocher red.	Normal (funnel-shaped).	Pale phlox pink, passing into white toward the bottom.	Pale aniline lilac.
No. 2	"	"	Green.	"	Yellowish white.	White.
No. 3	Two-lobed; base cordate; apex of each lobe obtuse; veins prominent.	"	Ocher red.	Crown 5-lobed.	White, tinged with phlox pink.	Phlox purple, irregularly rimmed with white.
No. 4	Two-lobed; notch at the apex shallow; apex of each lobe rounded; base cordate.	Twining, some branches rather straight.	Pale brownish green.	Normal, petals generally more than 5.	"	Purple (true), radiating and passing into white. tinged with bluish violet toward the margin.
No. 5	Resembles No. 1, but with somewhat wavy surface.	Twining.	Chocolate.	Normal, but not expanded so much as No. 1, margin slightly toothed.	Upper part pale phlox pink, lower part white.	Spectrum violet.
No. 6	Same as No. 1.	"	"	Normal.	Light mallow purple.	Deep blue-violet, irregularly rimmed with white.
No. 7	Resembles No. 1, but distal part of blade somewhat curled.	"	"	5-lobed, lobes curved; with a folded outside appendage on the tube forming part of each petal. ('Shishi' in Japanese.)	"	"
No. 8	Same as No. 1.	"	Ocher red.	Normal.	Mallow pink, passing into white toward the bottom.	Rhodamine purple.
No. 9	Resembles No. 1, but petiole somewhat expanded toward the lamina.	"	Chocolate.	"	Light mallow purple.	Bluish violet.
No. 10	Two-lobed; base cordate; apex obtuse; thick.	Stout, but rather decumbent.	Ocher red.	Normal, margin slightly lobed.	Pale phlox pink, passing into white toward the bottom.	Pale aniline lilac.
No. 11	Two-lobed; notch at the apex shallow; apex of each lobe somewhat rounded.	Dwarf, somewhat erect.	Green.	Crown 5-lobed; lobes roundish.	Mallow pink, with sharp boundary line.	White.

Table I (continued)

No.	Leaf.						Diagnosis of each strain in Japanese.
	Color.	Shape.	Apex.	Base.			
No. 1	Yellowish green.	Palmately 3-lobed.	Acuminate.	Cordate.		Ki (yellow), nami (common surface character) tsuné-ha (ordinary shaped).	
No. 2	Green.	"	"	"		A-o (green), nami, tsuné-ha.	
No. 3	"	Palmately 3-5 lobed, veins prominent.	"	"		A-o, tatsita (maple leaf shaped).	
No. 4	"	Entire, cordate, length of midrib shorter than breadth of blade.	Abruptly pointed.	"		A-o, a-o-i (wild ginger leaf shaped).	
No. 5	"	Palmately 3-lobed, lower part of lateral lobes revolute.	Acuminate.	Acute, basal half outside. the midvein of lateral lobes undeveloped.		A-o, nanten (Nandina leaf shaped).	
No. 6	"	Entire, cordate, length of midrib longer than the breadth of lamina.	"	Cordate.		A-o, maruba (round leaf), nami.	
No. 7	"	Entire, cordate, slightly pitted, involute.	"	"		A-o, maruba, kikusui (involutely grasping or somewhat cup shaped).	
No. 8	Green, with white variegation.	Palmately 3-5 lobed, side lobes particularly smaller than the middle one.	"	"		A-o, suisho-fu (white variegated), kagéro-ba (dragon fly shaped leaf).	
No. 9	Yellowish green.	Somewhat irregularly heart-shaped, entire, sinuate; petiole wedge-shaped, expanding toward the base.	"	"		Ki, maruba, rinpu (sinuated surface and wedge-shaped petiole, expanding toward the lamina).	
No. 10	"	Palmately 3-5 lobed, surface pitted.	"	"		Ki, uzu (indicating eddy character of whirled overlapping leaf base), kagéro-ba.	
No. 11	Green.	Palmately 3-lobed.	"	"		A-o, tsubamé, (swallow, indicating the shape of leaf which reminds of a flying swallow).	



Text-Fig. II. The numbers of individual figures correspond to those of the cultivated strains of *Pharbitis Nil* in Table I. All figures show stages of meiotic divisions of pollen mother cells. $\times 850$.

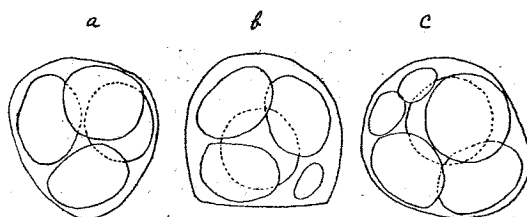
9 show 15 gemini in diakinesis, and figures 1 and 9 show 5 ring-shaped, 2 curved, 2 larger ones slightly constricted at two parts, and one larger and 5 smaller rod shaped gemini, while in fig. II, 4, 4 ring-shaped, 2 curved, 2 larger ones slightly constricted at two parts, 2 rod like ones with a small process on each side at the middle part of the body, and one larger and 4 smaller rod like gemini. But, whether such dissimilarity of shapes of gemini between fig. 4 and other two (figs. 1 and 9) is a constant one or not, is not certain at present.

Text-Fig. II, 5, 7, 10, and 11 show the 15 pairs of chromosomes in metaphase of the first division of meiosis. It is specially noted that the chromosomes in fig. II, 11 (strain No. 11) are smaller in size in comparison to those of other figures.

Text-Fig. II, 3 shows 15 haploid chromosomes in preparation for the second division of meiosis. Here different sizes and shapes of chromosomes are seen.

The similarities of shape and size of individual chromosomes among the strains Nos. 2, 3, 5, 6, 7, 8, 10, and 11 were not determined, as it was not possible to get materials of the exactly same stage, although difference of size and shape among individual chromosomes in one and the same strain was observed in all strains.

As a rule, divisions in the pollen mother cells occur regularly so



Text-Fig. III. The pollen mother cells of the strain No. 6.
a, normal; b and c, abnormal pollen mother cells. $\times 230$.

far as the present observations go. However, in almost all strains one of two mother cells of some anthers showed generally one but sometimes 2 dwarf grains in addition to 4 large normal pollen grains, as shown in Text-Fig. III; (a) shows one of the normal pollen mother cells in an anther of the strain No. 6 in which 48 pollen mother cells were developed; b is one of two abnormal mother cells and c is the other. Also, in an anther of the strain No. 7 ('Shishi') a giant and a dumb-bell-shaped pollen grains were observed among other normal grains.

Summary

In 11 strains of *Pharbitis Nil*, CHOIS., chief diagnostic characters have been given.

Notwithstanding the considerable external differences shown in these 11 strains, the haploid chromosome number of each strain, as determined in the pollen mother cells, is invariably 15.

Several different shapes and sizes of chromosomes were observed in all strains examined.

In concluding the writer wishes to express her best thanks to Em. Prof. K. FUJII, under whose direction the present studies have been undertaken since 1915, for his kind advise.

Botanical Institute, Faculty of Science,
Tokyo Imperial University