10. Genetic Experiments with *Cosmos*. II.

By Kiichi MIYAKE, Yoshitaka IMAI and Kiyoo TABUCHI.

Botanical Institute, Faculty of Agriculture, Tokyo Imperial University.

(Comm. by S. IKENO, M.I.A., Jan. 12, 1934.)

Studying the genetics of *Cosmos bipinnatus*, Cav., the writers found eight genes affecting the flower pattern, the flower form and the pollen colour as well as the flower colour.¹⁾ In the present article are added

Fig. 1. Apetalous flowers.

1) Journ. Coll. Agric., Imp. Univ. Tokyo, Vol. 9, No. 2, 1927.

to them the newly determined three genes manifesting an apetalody of the flower, a double capitulum and a long style.

The capitulum of the cosmos has eight ligulae of a conspicuous size, otherwise consisting of small tubular flowers. An abnormal flower which is commonly called apetalous has no such ligulate or ray flowers, the capitulum comprising of only disk flowers (Fig. 1). In the apetalous flower the ligulae remained of a tubular form. On selfing, apetalous flowers bred true to the type. Actually the writers obtained 226 plants bearing apetalous flowers in their offspring. Normal being dominant to the apetalous condition, the F_1 hybrids obtained in both reciprocal crossings bore normal flowers. In F_2 , apetalous flowers reappeared in a

Fig. 2. Double flowers.

recessive ratio, the data obtained being shown as follows :

	Normal	Apetalous	Total
Observed	416	133	549
Expected	411.75	137.25	549

On backcrossing the F_1 plants to the recessive, the following result was recorded.

	Normal	Apetalous	Total
Observed	121	142	263
Expected	131.5	131.5	263

From these figures the writers came to the conclusion that the apetalous condition is monogenic recessive to the normal.

The double flowers (Fig. 2) are sometimes cultivated in our gardens. According to the catalogues published by seedmen, the double cosmos does not breed true to the doubleness, giving the expected plants in about half of the offspring. A close examination of the double flowers can distinguish several forms differing in some respects. The disk flowers of a capitulum are changed to the ligulae in the ordinary double cosmos. The flowers have abortive staminate organs, but sometimes these are absent. Therefore they produce, in general, seeds by getting pollen from the other singles by the aid of insects in nature. Artificial pollination gave the following result :

	Double	Single	Total
Observed	357	367	724
Expected	362	362	724

From the data, together with the fact that the single flowers thus appeared did not produce any doubles when they were bred with each other, it may be concluded that the doubleness is simple dominant to the singleness in inheritance. The variability observed in the double cosmos is one of the problems under investigation.

Rarely flowers with long styles (Fig. 3) are found in the writers' culture. Though the abnormality may be less conspicuous, the characteristic is definitely marked in the flowers carrying the gene long-style. The syngenesious anthers are imperfect in

Fig. 3.

Semi-diagrammatic drawing of a long-styled disk flower (right) compared with a normal one (left).

development, containing less pollen, and do not protrude above the disk flowers, the condition of which makes evident the protruded long styles. Owing to the fact that the character is recessive to the normal, the long-styled flowers were segregated from the normal hybrids in a recessive ratio, the data being presented as follows :

	Normal	Long style	Total
Observed.....	43	13	56
Expected.....	42	14	56

Though the number observed is small, the monogenic recessiveness of the long-styled condition to the normal is clear.

Including the former results, the writers, therefore, have determined eleven genes in the analysis of this plant.

The expenses of present investigation were partly defrayed by a grant from the Imperial Academy, to which the writers wish to express their hearty thanks.