On the Plant Having $n=5$ Chromosomes in *Portulaca*

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A review of literature concerning cytological studies in *Portulaca* indicates that the basic number of chromosomes in this genus may be 4 and 9. The species which appear to have $x=4$ are *Portulaca* from Springdale, Arkansas ($n=4$), *P. pilosa* ($n=8$), *P. smallii* ($n=8$) and *P. quadrifida* ($n=24$), and those having $x=9$ are *P. grandiflora* ($n=9$), *P. pusilla* ($n=9$), *P. tuberosa* ($n=9$), *P. oleracea* ($n=9$ and 27) and *P. marginata* ($n=9$, 18 and 27). In the course of the investigation on *Portulaca* in our laboratory, however, there was found a strain which has 5 chromosomes in haploid number.

The purpose of this paper is to describe morphological and cytological characteristics of this strain and to discuss on the problem of basic chromosome numbers in *Portulaca*.

The origin of $n=5$ plant

The varieties of garden portulacas cultivated in Japan are divided into two groups. One is an ordinary variety (*Portulaca grandiflora* Hook.) which was introduced to Japan from America about 120 years ago and have since been distributed all over Japan. The other is a special variety named "Jewel" in this country. Saito (1958) suggested that Jewel might have originated from "Parana", a horticultural variety of a famous seed company "Hage und Schmidt". But, it is not clear when and from where this variety came to Japan. The strain which has the number of chromosomes $n=5$ is the variety in question. The seed used for this investigation was obtained from Takii Seed Company in 1956.

Characteristics of $n=5$ *Portulaca*

Most of the morphological characters of $n=5$ *Portulaca*, Jewel, closely resemble those of *Portulaca grandiflora*. They differ from each other only in the following respects. (See Figures 1 and 2.)

(1) All the plants of Jewel have "magenta" flower petals, while a variety of flower color is found in the ordinary *Portulaca* (*P. grandiflora*).

(2) Jewel has single corolla, while *P. grandiflora* shows various flower types ranging from single to double corolla.

(3) Jewel has generally larger flower than *P. grandiflora*.

(4) In Jewel, the stem branches from the base of the main stem, while in *P.*

Fig. 1.

Fig. 1. Flowers of Jewel (center) and *P. grandiflora* (round).

Fig. 2.

Fig. 2. Appearances of Jewel (right) and *P. grandiflora* (left). ca. $\times 4$

grandiflora such branching is not seen.

(5) Jewel has more numerous leaves than *P. grandiflora*.

(6) Jewel is perennial when kept in a glass-house in winter (minimum temperature is $1-2^{\circ}\text{C}$), while *P. grandiflora* is annual.

In addition to the morphological observations mentioned above, a large number of crosses (about 100 reciprocal crosses) were made between Jewel and *P. grandiflora*, but no seed was obtained.

Chromosome number

In this cytological investigation both the mitotic and meiotic division of Jewel and *P. grandiflora* were comparatively examined. The mitotic division was observed in the cells of petals, which had been hydrolized with $1/10$ N HCl solution and stained with aceto-carmin. The chromosomes in the meiosis were observed by an ordinary smear method in PMC.

Figures 3 and 4 show the mitotic division of Jewel and *P. grandiflora* respectively. These figures show that the former has 10 chromosomes and the latter 18. On the other hand, in the meiotic division shown in Figures 5 and 6 we can count 5 chromosomes in Jewel and 9 in *P. grandiflora*. The chromosome number we counted in *P. grandiflora* agrees with the results of Tjebbes (1928), Okura (1933), Blackburn (1934) [see Tischler, 1937], Furusato (1940), Steiner (1944) and Saito (1950).

Discussion

A generic study on the taxonomy of *Portulacaceae* was given by Pax and Hoffmann (1934). They made the classification of genera mainly by the morphology of ovary, number of carpels and number of sepals. They describe that the genus *Portulaca* has ovary with broad base, greater number of carpels than three and two sepals. Jewel and ordinary garden portulacas examined in this investigation have above three characteristics, and therefore it is clear that Jewel belongs to the genus *Portulaca*.

Fig. 3. Mitotic metaphase in Jewel.
 Fig. 4. Mitotic metaphase in *P. grandiflora*.
 Fig. 5. Metaphase I of meiosis in Jewel.
 Fig. 6. Metaphase I of meiosis in *P. grandiflora*.
 Figs. 3~6. ca. $\times 4000$.

On the other hand, we found from the cytological investigation that Jewel has 5 chromosomes in haploid number. This chromosome number is considered to be an additional basic chromosome number in *Portulaca*. Thus, we are led to conceive that *Portulaca* has three kinds of basic chromosome number, i.e., 4, 5, and 9. However, if we take note of the relation $9=4+5$, we may be inclined to assume that the real basic chromosome numbers in *Portulaca* are 4 and 5, although we have no evidence for this assumption. It is thus hoped to investigate this problem in further studies.

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