ON THE TRIPLOIDY OF *CROCUS SATIVUS*, L. AND ITS HIGH STERILITY

By

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Saffron, *Crocus sativus*, L., has long been cultivated as a medical and an ornamental herb. Its high sterility, however, is conspicuous; in this connection KARSTEN said "Die Blüten sind steril, wenn sie nicht mit wilder Formen Pollen bestäubt werden" in STRASBURGER's Lehrbuch der Botanik. Studying the cytology of some flowering *Crocus*, the idea came to me that the sterility of Saffron may be due to karyological abnormality. With this in mind, I have chiefly studied the chromosome behavior in the meiosis of the P.M.C. with regard to its high sterility.

MATERIAL AND METHOD

Some forms of Saffron were collected from a nursery and cultivated in pots containing sand. For the fixative of the root-tip cells, NAVASCHIN's fluid was used. Sections were cut 13–14 micra in thickness and stained with HEIDENHAIN's iron-alum hæmatoxylin. BELLING's iron-aceto-carmin was exclusively employed for the study of the microsporogenesis.

EXPERIMENTAL RESULTS

As I have already reported (KARASAWA 1932), a polyploid series having eight haploid number was observed in some *Crocus* plants including Saffron. As reported by HIMMERBAUR (1926), MORINAGA and FUKUSHIMA (1931), in the root-tip cells of Saffron,¹⁾ we count twenty-four somatic chromosomes (Fig. 1), i.e., three times as many as eight basic chromosomes. At the metaphase of the heterotypic division, eight trivalent chromosomes were counted (Figs. 2 and 3). Shortly after, these trivalent chromosomes undergo longitudinal splitting (Fig. 4). When all trivalent chromosomes succeed in their longitudinal splitting, the total number of the chromosomal elements should be forty-eight (Fig. 5), twice as many as the somatic

1) MATHIER counted fifteen somatic chromosomes in *Crocus sativus*, var. *Elwesii*.

Explanation of Figures

- Fig. 1. Polar view of a somatic equatorial plate, showing 24 chromosomes. $\times 1000$.
 Figs. 2 and 3. Side view of eight trivalent chromosomes. $\times 1000$.
 Fig. 4. Side view of the split trivalent chromosomes, forming six chromosomal elements. $\times 1000$.
 Fig. 5. Side view of an irregular distribution of 48 chromosomal elements. $\times 1000$.
 Fig. 6. Pollen-tetrad, triad, dyad, and supernumerary microspores in the P.M.C.. $\times 350$.

All the figures, except Fig. 1, were drawn from the smear preparations with the aid of ZEISS camera lucida.

chromosome number.

As the result of an irregular division, there are frequently formed unequal tetrads, triads, dyads and supernumerary microspores from the P.M.C. (Fig. 6). The resulting pollen, however, were germinated on ten percent saccharose-agar medium. About half the number of the pollen germinated very well, showing long germinal tubes, while the remaining pollen did not germinate. This germination, however, seems to be non-functional, because the mature pollen may have no complete chromosomal set or genome.

GENERAL REMARKS

Saffron is a triploid *Crocus*, having twenty-four somatic chromosomes, i.e., three times as many as the eight basic chromosomes. Its high sterility is due to irregular meiosis. The complete trivalent combinations of chromosomes at the metaphase of the heterotypic division indicate that Saffron is an autotriploid plant derived from a diploid *Crocus*.

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