

### Accessory Chromosomes in *Physalis ixocarpa*

In connection with the cytotaxonomic studies of some species of the genus *Physalis* (Solanaceae), *P. ixocarpa* Brot. was found to have an accessory chromosome in addition to the normal complement of  $2n = 24$ . This chromosome, which has a median centromere and is distinctly smaller than the other chromosomes of this plant (Figure), was observed during mitosis as well as in meiosis. The meiotic studies showed that in a few pollen mother cells the accessory chromosome paired with one of the bivalents to form a trivalent, whereas in majority of cells it remained unpaired and divided already at diakinesis. Although in a few cases it lagged at anaphase I, it could be traced through the second division only rarely. There are no apparent differences in pollen size of the normal plants and those with an accessory chromosome. This is contrary to the observations in *Zea mays* where distinct differences in pollen size have been noted<sup>1</sup>. Out of the 7 species examined only *P. ixocarpa* exhibited the presence of an accessory chromosome.

No seeds were produced when the plant with an accessory chromosome was self-pollinated even though meiosis

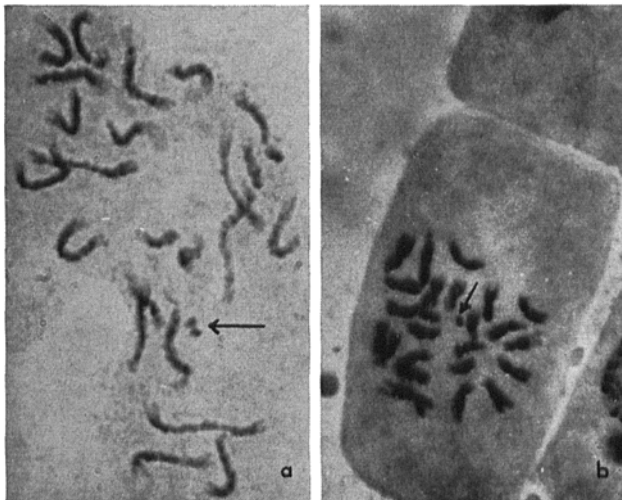
was regular with 12 bivalents at metaphase I. On the other hand, the plants without it were found to be self-fertile. Occasionally, the presence of quadrivalents and anaphase bridges were noticed, but the percentage of such abnormalities was rather low. Presumably this sterility was caused by the accessory chromosome or by genes situated on it, though other possibilities cannot be excluded at present.

In spite of considerable cytogenetical work on several north American species of *Physalis*, including *P. ixocarpa*<sup>2</sup>, the presence of accessory chromosomes have not been reported in any of the species. This is the first record of accessory chromosome in the genus *Physalis*, although they have been encountered in various other genera of Solanaceae<sup>3-5</sup>, as well as many other families. Recent researches and improved techniques in cytology have been useful in understanding the morphology and behavior of the accessory chromosomes better, both in somatic and mitotic preparations<sup>6</sup>. Although their origin and significance has been studied more closely mostly in grasses<sup>7</sup>, much still remains to be known about their behavior in other plants<sup>8</sup>.

**Zusammenfassung.** Das Vorkommen eines Neben-Chromosoms ist zum ersten Mal in der Gattung *Physalis* festgestellt worden. Das kleine Chromosom besitzt ein in der Mitte liegendes Centromer und tritt sowohl bei der Mitose, wie auch bei der Meiose in Erscheinung. Pflanzen mit diesem Chromosom sind steril.

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(a) Early metaphase showing an accessory chromosome with median centromere. (b) Metaphase with an accessory chromosome [ $\times 2500$ ].

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- <sup>3</sup> A. F. BLAKESLEE, J. Hered. 15, 195 (1931).
- <sup>4</sup> M. S. CHENNAVEERAIHAH and D. G. KRISHNAPPA, Nucleus, Calcutta 8, (2), 161 (1965).
- <sup>5</sup> J. W. LESLEY and M. M. LESLEY, Genetics, Princeton 14, 321 (1929).
- <sup>6</sup> E. BATTAGLIA, Caryologia 17, 245 (1964).
- <sup>7</sup> A. MÜNTZING, Hereditas, Suppl. 402 (1949).
- <sup>8</sup> I express my sincere thanks to Professor ÅSKELL LÖVE for advice and encouragement and also to the Director of the Botanical Garden, Copenhagen, Denmark for supplying seed material.

### Physiological Significance of Soil Moisture beyond the Permanent Wilting Percentage

The amount of water available to a plant is determined by the moisture characteristics of the soil, such as field capacity and permanent wilting percentage, often used in connection with upper and lower limits of available soil moisture for plant growth. KIESSELBACH<sup>1</sup> and MAXIMOV<sup>2</sup> observed that drought resistant plants have the peculiarity to utilize the water below the limit of permanent wilting point more economically by entering into a state of permanent wilting. TAYLOR, BLANEY and McLAUGHLIN<sup>3</sup> reported that many species of plants survived for considerable periods in soil drier than the permanent wilting percentage. FURR and REEVE<sup>4</sup> ob-

served that the moisture in the wilting range, while it is unavailable for growth, is available for survival and the proportion of the total available moisture within this range is great enough to be of considerable significance in plant water relations. BRIGGS and SHANTZ<sup>5</sup>, and

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- <sup>5</sup> L. Z. BRIGGS and H. L. SHANTZ, Botan. Gaz. 53, 20 (1912).