MEIOSIS IN HYBRIDS BETWEEN *LYCOPERSICON ESCULENTUM* AND *SOLANUM PENNELLII* 1)

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Meiotic chromosome cytology was compared between *Solanum pennellii*, *Lycopersicon esculentum*, and the F₁ hybrid. Pachytene chromosomes are very similar in gross morphology, but several of the *S. pennellii* chromosomes were found to have somewhat longer chromatic regions with discrete chromomeres, and darkly staining chromomeres in the achromatic regions.

Little evidence could be found for the existence of rearrangements between chromosomes of the two species. With respect to chromomere pattern, on the other hand, a number of differences were seen. Meiosis in the hybrid is strictly regular. Only size inequalities occur in certain bivalents.

Considering the evidence from chromosome pairing, hybridization compatibility, hybrid fertility, and plant morphology, it is concluded that the phylogenetic relationship is much closer between *S. pennellii* and *L. esculentum* than it is between either one and *S. lycopersicoides*. Attention is called to the present unsatisfactory placement of *S. pennellii* and to the need for revising the taxonomy to place it and *L. esculentum* in the same genus, possibly in the same subgeneric category.

Introduction

A large field of inquiry in the cytogenetics and phylogeny of tomatoes was opened by the discovery and naming of the species *Solanum pennellii* by CORRELL (1958) and by his provident collection of seed for experimental purposes. As demonstrated subsequently (RICK, 1960), this species can be readily hybridized with the cultivated tomato, *Lycopersicon esculentum* Mill., despite the enormous morphological divergence between them. The F₁ hybrids are vigorous and moderately fertile, and they yield F₂ and backcross generations that are mostly vigorous, but of varying fertility. Preliminary examinations showed comparatively little abnormality in meiosis of the F₁. The same study called attention to the paradox of the close genetic

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relationship between the two species and their classification into two different genera.

Investigations have continued with this species hybrid and its derivatives. From results thus far obtained it is clear that significant contributions will be made concerning (1) the nature of the genic hiatus between the parent species, (2) the effects of reciprocal introgression, including the transfer of economic traits from the wild to the cultivated parent, (3) the degree of homology between chromosomes as measured by genetic recombination and preferential pairing, and (4), hopefully, phylogenetic relations between *Solanum* and *Lycopersicon*. Studies of these materials have already elucidated the male sterility determined by genes of *S. pennellii* and cytoplasm of *L. esculentum* (Andersen, 1963), preferential pairing of chromosomes in polyploids of the F1 hybrid (Rick and Khush, 1962), and the relations between self-incompatibility and unilateral compatibility (Hardon, 1962). A thorough understanding of meiotic behavior of F1 *L. esculentum × S. pennellii* is an obvious prerequisite to progress in these investigations. We therefore undertook a detailed cytological examination of the hybrids as a first essential step in the program. Such a study is expedited by the unusually favorable pachytene stage of the tomato.

This investigation was further stimulated by the parallel study made by Menzel (1962) of meiosis in F1 *L. esculentum × S. lycopersicoides* Dun. which, in contrast to the hybrid with *S. pennellii*, is totally sterile. In spite of the complete sterility and reduced pairing at first metaphase, she found that pairing was complete at pachytene except for the chromatic (proximal) regions of four chromosomes and encountered no evidence for large or small structural rearrangements between the parents.

**Materials**

The present study was carried out on F1 hybrids between *S. pennellii* LA716, the original self-fertile accession collected by Dr. Donovan Correll at Atico, Peru, and three stocks of *L. esculentum*: var. Red Cherry, VF-36, and a genetic tester stock (LA13) homozygous for the genes *a, c, d1, l1, r, and y*. Since the cytological details did not differ in hybrids of these and other stocks of the cultivated parent, we con-