Opuntia Ficus-Indica: Chromosome Races and Origins

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Ivor Crook's account of the possible domestication of this iconic prickly pear complements the story concerning its cytology. A little juggling with mathematics is all that is needed to piece together the various ideas thrown up to resolve its ancestry.

Reported chromosome counts for Opuntia ficus-indica (or under its synonymic name O. Opuntia) are mostly 2n = 8x = 88 for plants from Mexico, California and Arizona, 2n = 4x = 44 from Arizona and Texas and one count of 2n = 2x = 22 from Spain (see Pinkava & McLeod 1971). There are also hybrids, as for example O. ficus-indica (8x) x O. phaeacantha (6x) giving the expected count of 2n = 77 (heptaploid).

The octoploid O. ficus-indica is probably of hybrid origin, involving as wild ancestors perhaps O. streptacantha, reported as a diploid, 2x, and octoploid, 8x, with O. tomentosa which can be tetraploid, 4x, or octoploid, 8x. Thus we are reminded here of a situation resembling that of the bread wheats (Simmonds 1976) where a build-up of genomes by polyploidy created today's hexaploids from three diploid ancestors. In cytological terms the occurrence of trivalents and tetravalents in the octoploid led Carpio in 1952 to declare Opuntia ficus-indica as an allopolyploid derived from two species with 44 chromosomes.

Whatever species, living or extinct, combined forces in the past, further changes took place as man selected and spread the plants throughout the tropics. So our name Opuntia ficus-indica in effect covers a species complex (aggregate species) composed of cytotypes (chromosome races) at different polyploid levels. Intercrossing that resulted in odd polyploid levels (3x, 5x, 7x) would probably have been eliminated through sterility or at least a poorer set of fruits than in even polyploids. For the present it is best to stick to cultivar names for clones most favoured, rather than attempt a botanical breakdown into species, subspecies, varieties and so on. The future lies in DNA sequencing, and a fine start has been made in South Africa in a study of 38 clones of O. ficus-indica in cultivation

(Mashope et al. 2011). This relates genetic diversity to recognisable differences in habit, and the tabulated results will assuredly be of use to breeders of future improved cultivars.

References.

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