A Diploid Population of *Poa annua* L. from Australia[1]

In the course of genetic and environmental studies of populations of *P. annua* from New Guinea, mainland Australia and Macquarie Island, we found a population in the You Yangs State Forest Reserve, Victoria (45 miles south west of Melbourne), which deviates markedly from the others. The plants are strictly annual and grow only from May to late November (winter-spring). They have smaller leaves and panicles, fewer florets per spikelet and the seeds show a marked degree of dormancy. Cytological studies of this population show $2n = 14$ chromosomes. The chromosomes invariably pair to give 7 normal bivalents at Metaphase I of meiosis (Figure).

NANNFELDT[2] proposed that *P. annua* ($2n = 28$) is an allotetraploid derived from a natural cross between *Poa supina* Schrad. and *Poa infirma* H.B.K. (*P. exilis* (Tomm.) Murb.), both of which are diploid ($2n = 14$). The karyotypes of these consist of one pair of long chromosomes (A), with a secondary constriction in the longer arm, known as the SAT chromosome; a shorter pair (B); a pair of medium length (C) and 4 pairs of small chromosomes. *P. supina* has slightly smaller chromosomes than *P. infirma*. Morphologically *P. annua* is intermediate between the 2 diploid species. If *P. annua* is an allotetraploid as proposed, it should possess 4A, 4B, 4C and 16 small chromosomes. However, the karyotypic studies by KOSHY[3] did not confirm NANNFELDT's hypothesis. In root tip mitoses only chromosomes I, II and XIV could be positively identified. No SAT chromosomes were found and there was no counterpart for the smallest chromosome (XIV) in either of the 2 diploids.

Both artificial hybrids *P. annua* × *infirma* and *P. annua* × *supina* show 21 chromosomes with 7 bivalents and 7 univalents at meiosis in pollen mother cells[4,5]. TUTIN[5] synthesized a tetraploid *P. infirma* × *supina* in which the meiosis of the majority of pollen mother cells was normal, but in a few cases a single quadrivalent was observed. Therefore, a high degree of homology between the genome of *P. annua* and those of the putative parents would appear to exist.

HOVIN[6] reported four 14-chromosome accessions of *P. annua* from California (USA). He considered them to be haploids derived from an amphidiploid species and called them 'amphihaploids'. Chromosome studies of pollen mother cells revealed no structural differences between them, although there was variation in the extent of bivalent formation. The mean number of bivalents per pollen mother cell for all accessions was less than 3. He concluded that there was sufficient chromosome pairing to infer the presence of homologous chromosome segments between the parent genomes of *P. annua*.

In the light of the putative origin of *P. annua*, since the 28-chromosome form usually has 14 bivalents at meiosis, one would not expect to find 7 bivalents in a derived 14-chromosome form. It seems likely, therefore, that the 2 parent genomes have become homologous for long regions of chromosome during their long association in the genome of *P. annua* or, alternatively, *P. annua* did not arise as an allotetraploid, but is in fact an autotetraploid. In view of the fact that the chiasma frequency is quite high[6,7], the lack of quadrivalents in the 28-chromosome form would seem to refute the latter hypothesis, unless there has been a mutation which controls bivalent formation, similar to the '5B system' of wheat[8,9]. The You Yangs population may be morphologically similar to the 14-chromosome accessions of HOVIN[6], but cytologically it differs in the increased number of bivalents per pollen mother cell. HOVIN found that higher temperatures increased the number of bivalents, but this was interpreted to represent non-homologous chromosome associations. The regularity of bivalent formation in the You Yangs population implies homologous pairing. This population may have been introduced to Australia independently of the tetraploid or it may have arisen from existing tetraploid populations of *P. annua* in Victoria.

On the available evidence it seems preferable to regard the You Yangs population as diploid rather than 'amphihaploid', at least until it can be established whether *P. annua* is an auto- or an allo-tetraploid. Further work on this population may help to solve the problem.

Résumé. On décrit une population diploide de *Poa annua* L. d'Australie. Elle se montre différente des «amphihaploides» qui ont été trouvées en Californie. La signification de cette population en rapport avec l'origine supposée de *P. annua* est considerée.

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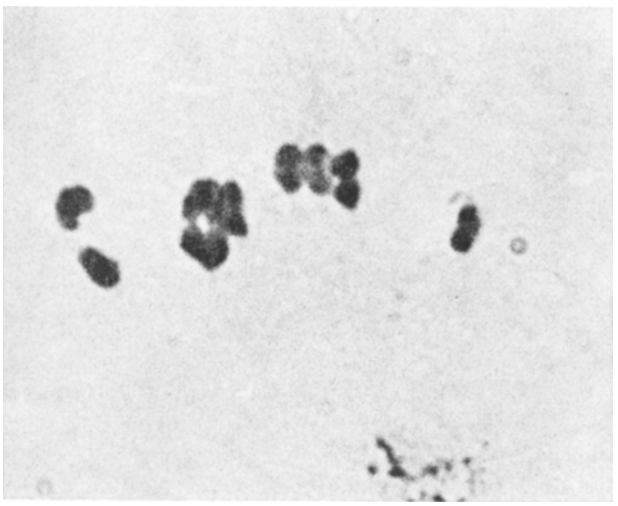

Meiosis in You Yangs Population, × 1000.

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