

Results of a long-term "diploidisation program of autotetraploid barley." W. Friedt, Department of Plant Genetics of the Gesellschaft für Strahlen und Umweltforschung mbH., 8059 Grünbach, FRG.

In a "diploidisation program of autotetraploid barley" it was tried to establish autotetraploid genotypes with diploid-like cytogenetic and physiologic behaviour. It was expected to achieve regular sporogenesis and complete seed set by means of recurrent mutation induction and multiple hybridization (Gaul 1958).

A selected progeny (No. 42) out of the hybridization of five autotetraploid stocks, previously x-ray irradiated up to seven times proved to be highly fertile already in its F_3 generation in 1965. Additional selections since then did not markedly increase the seed set further. Selected lines out of this progeny showed significantly increased seed set in their F_0 to F_{11} generations as compared to the original autotetraploid stocks. In drill-trials all of the selected lines tested overyielded the original autotetraploids. However, their maximum yield was only 67% as compared to the German diploid commercial variety 'Villa' (Friedt 1978a,b, Table 1).

Table 1. Yield components and kernel yield of autotetraploid selected lines as compared to original autotetraploid stocks ($2n=4x=28$).

4x Material	No. florets per spike	No. seeds per spike	Seed Set %	Stand density	TGW g	Kernel Yield, kg
Original stocks (4)	19.7	14.2	72.1	154.3	53.3	1.8
Selected lines (19)	20.2	15.6	77.7	168.6	55.3	2.2

In general, the meiotic regularity of the selected lines was considerably improved in comparison with that of the original autotetraploids (Friedt 1978a, 1979). However, both selected lines and original stocks showed no differences between the seven sets of homologous chromosomes in their tendency to form quadrivalents; i.e., no preferential chromosome pairing was detectable in the material studied.

Quadrivalent orientation proved to be different in selected lines and original material. The lines showed increased occurrence of alternately oriented quadrivalents and a corresponding decrease of linear quadrivalents. The latter are considered to be one of the main causes of irregular chromosome distributions in first meiotic anaphase (AI). Consequently, chromosome segregation in AI was much more regular in the described lines than in the original autotetraploids. For that reason fewer tetrads studied in the lines had micronuclei than in the autotetraploid stocks (Table 2).

Table 2. Meiotic behaviour of selected autotetraploid lines as compared to original autotetraploid stocks ($2n=4x=28$).

4x Material	Metaphase I						Anaphase I		Tetrads	
	PMC	Xta/PMC	I	II	III, IV	PMC	%14:14	No.	% normal	
Original Stocks (4)	1273	26.2	0.1	4.3	0.1	4.8	798	42.2	19486	66.2
Selected Lines (4)	1038	26.2	0.1	4.9	0.1	4.4	562	64.4	9170	78.1

It is concluded that improvement of meiotic divisions in progeny No. 42 is mainly due to genetic control of quadrivalent orientation rather than to cytogenetic "diploidisation". However, the cytological behaviour of the lines studied was not completely stabilized. Moreover, the limited tillering ability of the tetraploid barley remained unchanged. Consequently, even the best tetraploid strains cannot compete with high-yielding diploid varieties at the present time.

References:

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