Cytological Disorders in Hexaploid Triticale (*Triticosecale* Wittmack): Association and stability between two indexes

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Accepted July 26, 1995

Hexaploid triticale (*Triticosecale* Wittmack) is a man developed allopolyploid; like most intergeneric polyploids it exhibit irregular meiosis. This crop has been cytologically well studied considering meiotic irregularities as a whole (Falcao *et al.* 1981, Martin 1989, Ochoa de Suárez *et al.* 1987); specially for the important role they may play on fertility (Szpiniak de Ferreira 1983); as well as its cytological stability at both varietal and intravarietal levels (Manero de Zumelzú *et al.* 1992).

Among the parameters used to identify cytologically triticales, meiotic index (MI) (Szpiniak de Ferreira 1983) and rate of healthy microspores (without micronuclei) (Martin 1989), or post-tetrades index (PTI) as it will be known from now, are two of the several cytological parameters used to characterize triticale.

According to bibliography both would be equally suitable to cytological characterization of varieties or experimental triticale strains.

The purpose to this study was to define the degree of association between MI and PTI and to determine their stability.

Material and methods

Two hexaploid triticale varieties, Don Frank (DF) and Jenkins TA 203 (J), were intravariety investigated, both appeared cytologically stable through the years. DF displays constant high values of cytological health whereas J shows low values (Manero de Zumelzú *et al.* 1992).

Studies were carried out on eight sublines, four for each of the two varieties studied. The materials were cultivated during the 1989–1990 period in the Experimental Farm of the Facultad de Ciencias Agropecuarias–Córdoba–Argentina, according to a completely randomized block design with two repetitions. Two row plots of 1.30 m long, 0.20 m apart and using seeding rate of 100 seeds m² were used. Four or five plants per plot were analyzed removing their principal spikes to estimate MI and PTI indexes, recording 50 and 200 tetrades and microspores respectively. Abnormal tetrades are those in which, at least, one cell contain micronuclei. The immature spikes were collected and treated according to the technique of Ochoa de Suárez *et al.* (1987). Correlation coefficients between sublines within varieties for the two years were estimated.

Results and discussion

Normal and abnormal tetrades and microspores are showed in Figs. 1, 2, and 3. Significant positive correlations ($p \leq 0.01$) between MI and PTI indexes during the two years for Don Frank variety (1989, $r = 0.99$; 1990, $r = 0.96$) were observed; however, not for Jenkins TA 203

Figs. 1-3. 1, Normal tetrad in hexaploid triticale. 2, Abnormal tetrad in hexaploid triticale. Two cells within the tetrad contain micronuclei. 3, One normal and one abnormal microspores in hexaploid triticale.

Figs. 4-5. 4, Range of variation of the Meiotic Index (MI) and Post-Tetrades Index (PTI) as media percentage (=100) for Don Frank's (DF) sublines evaluated during 1989/90. □=MI, ■=PTI. 5, Range of variation of the Meiotic Index (MI) and Post-Tetrades Index (PTI) as media percentage (=100) for Jenkins's TA 203 (J) sublines evaluated during 1989/90. □=MI, ■=PTI.

variety. When each one was cytologically characterized through the corresponding sublines (Figs. 4, 5), a higher range of variation for MI when compared with PTI was observed.

Based on correlation coefficients between MI and PTI indexes it is not possible to confirm that both are indistincts to identify cytologically hexaploid triticale varieties, since a dissociation between them was observed within the most irregular variety (J).

Intravarietal characterization (as regards varietal media) in J variety through the use PTI indicates that this index would be more efficient than MI to carry out intravarietal selection based on cytological characters taking account that sensitivity to the environment was higher for MI when compared with PTI.

PTI is an index that should be taken into account not only for triticale varieties (of similar patterns of behaviour to J) but also with those intergeneric hybrids product of artificial crossings, a process by which two or more different genomes are incorporated to the same organism.

Summary

Cytologic heterogeneity of triticale (*Triticosecale* Wittmack) has been well studied at both varietal and intravarietal levels. The aim of this work was to determine the degree of association between meiotic index (MI) or percentage of normal tetrads and post-tetrads

index (PTI), namely percentage of abnormal microspores. Eight hexaploid triticale sublines from two different varieties, Don Frank (DF) and Jenkins TA 203 (J) were evaluated during two years. Statistical analysis showed a dissociation between indexes in J variety. PTI index would be most suitable for intravarietal selection based on cytological aspects.

Key words: Hexaploid triticale, meiotic index, tetrades, post-tetrades index, microspores.

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