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# Peroxidase Isoenzymes in Rye and Diploid, Tetraploid and Hexaploid Wheats

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**Abstract** : Isoenzymes of peroxidase were studied in roots of 72-hour-old seedlings of rye and two diploid, five tetraploid and three hexaploid species of wheat employing horizontal starch gel electrophoresis. There were interspecific differences and some of these could be correlated with specific genome and/or ploidy level.

**Key words** : Peroxidase, isoenzymes, wheats.

Study of isoenzymes plays an increasingly important role in elucidating a number of biological concepts. Among these, isoenzymes of peroxidase have been widely studied because of their high number, greater variability among higher plants, and good results obtained by means of relatively easy and inexpensive technique (Asins and Perez de la Vega, 1985). Comparative study of isoenzymes or proteins have provided additional criteria for characterizing species already defined by conventional methods based on morphological, ecological and cytological observations. In some cases, these biochemical variations have been correlated with morphological variability (Yeh, 1985). The present study was undertaken to find interspecific variation in isoenzymes of peroxidase.

## Material and Methods

Investigations were carried out on *Secale cereale* (EE), two diploid species of wheat - *Triticum aegilopoides* (AA) and *T. orientale* (AA), four tetraploid species of wheat having AABB genome, viz., *T. durum*, *T. dicoccum*, *T. polinicum* and *T. turgidum*, one tetraploid species with AAGG genome, viz., *T. timopheevi*; and three hexaploid species with AABBDD genome, viz., *T. sphaerococcum*, *T. spelta* and *T. vulgare*.

The isoenzymes of peroxidase were studied in roots of 72-hour-old seedlings of the investigated taxa using horizontal starch gel electrophoresis. Potato starch was hydrolyzed using method of Smithies (1955). Tris glycine buffer (0.1 M), pH 7.5, was used as extraction buffer. For electrophoresis, 0.1 M borate glycine buffer, pH 8.2, was used as bridge buffer and 9 parts of 0.1 M Tris glycine buffer, pH 8.2, + 1 part of 0.1 m Tris borate, buffer, pH 8.2, was used as gel buffer. Gels were stained using the method of Brewer and Sing (1970).

## Results and Discussion

Peroxidase isoenzyme bands were observed on both cathodal and anodal side (Fig. 1). In all, there were 18 bands (10 anodal and 8 cathodal). Upadhyay (1968) also observed peroxidase isoenzymes on both cathodal and anodal side in 8-day-old wheat seedling; 10 being anodal and 8 cathodal. Peroxidases are usually characterized by a monogenic control, monomeric behavior and the presence of null alleles (Asins and Perez 1985; Benito *et al.*, 1980; Felder, 1976). Thus, in the present study, it can be inferred that 18 loci for peroxidases are active at the stage of development. There are differences in the number, pattern and intensity of bands on the basis of which the species under study can be biochemically characterized. Besides, there are some differences which can be related with genome and ploidy level. The absence of a band in a particular species means that its locus is either absent or inactive at this stage of development.

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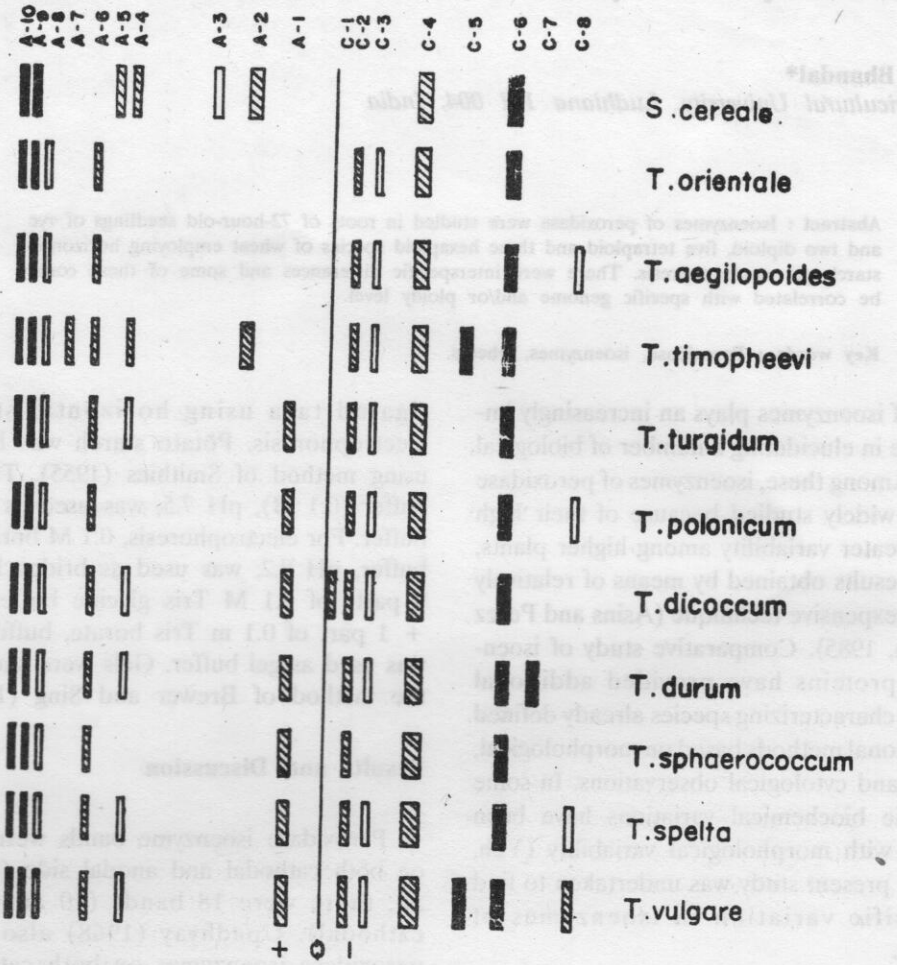


*Fig. 1. Diagramatic representation of banding pattern of isoenzymes of peroxidase in different species from roots of 72-hour-old seedlings.*

Four bands, viz., A-9, A-10, C-4 and C-6 were present in all the investigated taxa indicating that loci for these were present in genome of rye as well as wheat and homoeologous loci in different genomes of wheat had not diverged. Bands A-6, A-8, C-2 and C-3 were absent in rye but were present in all the investigated species of wheats. The common genome in these species of wheats was AA. The loci of these bands, thus, can be related with A genome. Homoeologous loci, if present in B, D or G genomes, had not diverged.

Bands A-3 and A-5 were present in *Secale cereale* alone, band A-7 was present only in *T. timopheevi* and band A-2 was present both in *Secale cereale* and *T. timopheevi* only. The genes for these isoenzymes may be associated with genome E and G or if present in other genomes, were not active at this stage of development in other species studied.

Band A-1 was absent in diploid wheats (AA), rye (EE) and *T. timopheevi* (AAGG) but was present in tetraploid (AABB) and hexaploid

wheats (AABBDD). Thus, its activity can be attributed to at least B genome.

The situation with other bands, especially C-8 and A-4 was not very clear with respect to ploidy level. Band C-8 was present in some of the hexaploid (AABBDD), tetraploid (AABB) and diploid wheats (AA) and the only genome common to all these was A.

Band C-1 was present only in *T. dicoccum*, band C-7 was present only in *T. durum*, and band C-5 was present only in *T. timopheevi* and *T. vulgare*. Such bands along with others help in characterization of different species.

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