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RP-277

Expression of parental histone genes in the intergeneric hybrid *Triticale hexaploide*

Triticale hexaploide, the intergeneric hybrid resulting from the cross of diploid rye (*Secale cereale*) and tetraploid wheat (*Triticum durum*), offers a unique opportunity for the study of the expression of genes which are derived from two dissimilar organisms but exist together in the same cells. I have investigated the expression of histone genes in triticale because the histones are an extensively studied class of proteins with individual components which range from being highly conservative in an evolutionary sense to being probably species specific. For example, the sequence of histone F2a1 from peas and cows differs in only two of 102 amino acids[1], whereas different species of sea urchin have F1 histones of different electrophoretic mobilities[2]. I have found that in wheat, rye and triticale the evolutionarily conservative histones seem to be identical. There are, however, differences in the F1 histones of wheat and rye, and the gene for one of the wheat F1 histones is not expressed in the hybrid triticale.

Histones were extracted from dark-grown coleoptiles of triticale and from the rye and wheat parents as previously described[3], and were analysed electrophoretically on short and long one-dimensional gels by the method of Panyim and Chalkley[4] and on a new two-dimensional electrophoretic system.

Not surprisingly, considering the relatively close phylogenetic positions of wheat and rye, the highly evolutionarily conservative histones (F2a1 and F3) and the moderately conservative histones (F2b and F2a2) from all three organisms appeared identical on both one and two-

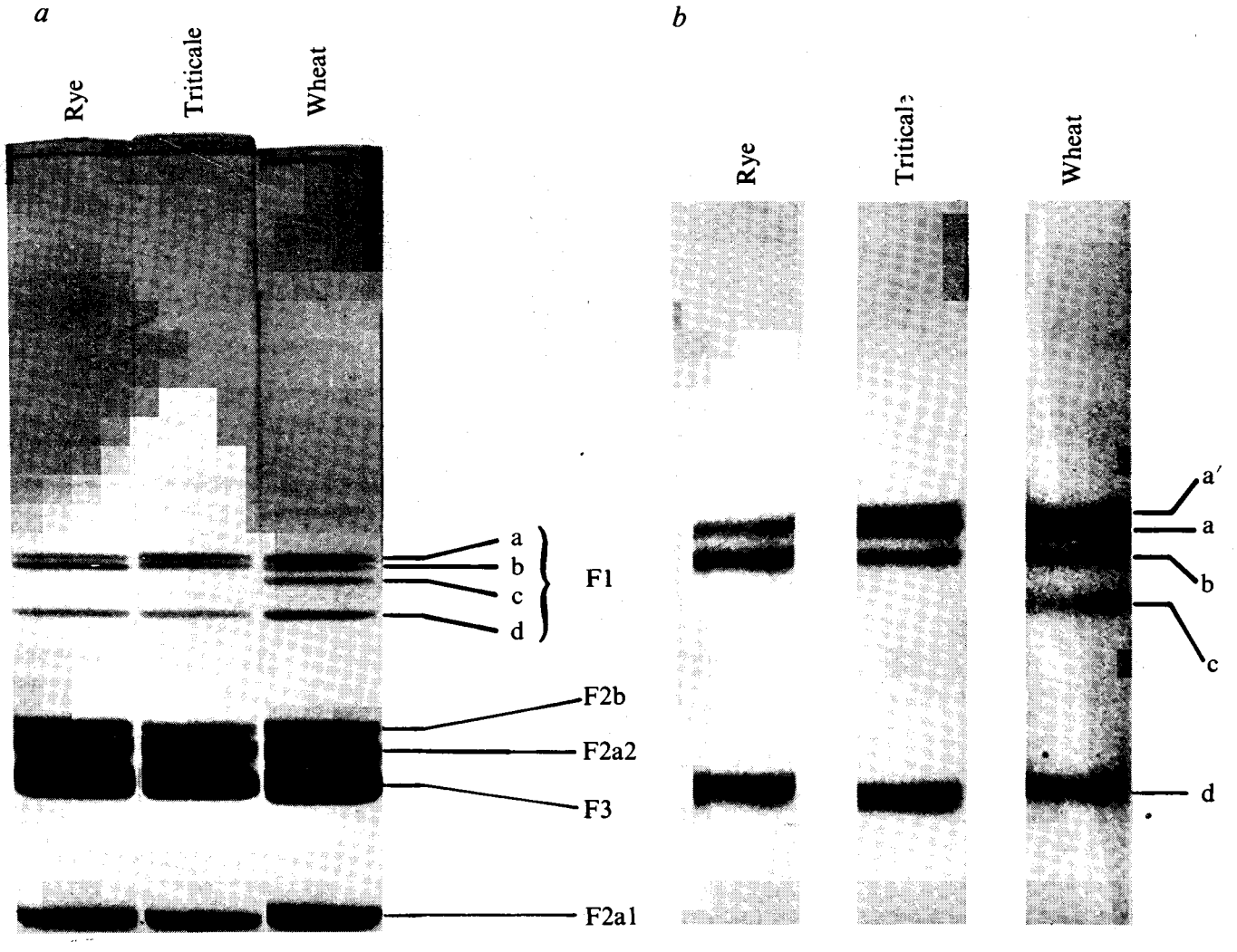

Fig. 1 *a*, Electrophoresis of wheat, rye and triticale whole histones on short gels by the method of Panyim and Chalkley[4]. The 10-cm gels were run for 4 h at room temperature, 2 mA per gel, then stained with amido black and destained by diffusion. All three species have histones F1a, b and d. The wheat-specific F1c is not expressed in the hybrid. The remaining histone fractions appear to be identical in all three plants. They have been named according to the nomenclature of Johns[5] and identified by their fractionation properties, susceptibility to ferric chloride destaining and comparative mobility in one- and two-dimensional electrophoresis (manuscript in preparation). In this electrophoretic system the plant F2b and F2a2 histones have lower electrophoretic mobilities than histone F3 whereas histones F2b and F2a2 of mammals have greater electrophoretic mobility than histone F3 (ref. 3). *b*, Electrophoresis of wheat, rye and triticale F1 histones on long gels. The gels are of the same composition as the short gels in *a*, but are 20 cm long and were run at 0.75 mA per gel for 50 h at 2 °C. Other histone fractions have run off the gel, and only the portion of the gel containing the F1 histones is shown. Rye histones appear the same as in short gels but are separated further. F1a has been resolved into two bands in wheat and triticale, the slower of which has been labelled F1a′. The wheat-specific F1c is not expressed in the hybrid.

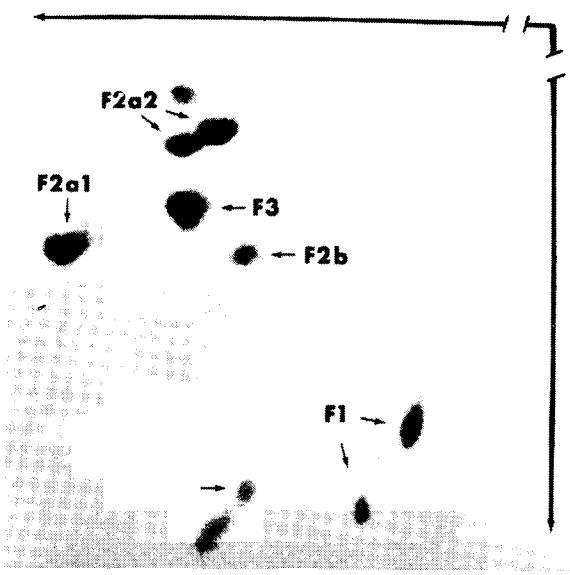

Fig. 2 Two-dimensional gel of triticale whole histone. Separation in the first dimension (right to left) was on acetic acid–urea gels according to Panyim and Chalkley[4]. The second dimension (top to bottom) was of the same composition but included 1% Triton X-100. The patterns for rye and wheat are identical except for the F1 histones. The rapidly moving, arrowed but unlabelled spots are probably histones which have not bound the Triton[6].

dimensional gels (Figs 1 and 2). The only differences were in the F1 (lysine-rich) histones.

On short gels wheat F1 histones were resolved into four distinct bands, F1a, b, c and d. Long gels further resolved wheat F1a into two electrophoretic bands, the slower of which I have called F1a′. This heterogeneity of wheat histone is not due to phosphorylation since treatment of the isolated F1 fraction with alkaline phosphatase by the procedure of Sherod *et al.*[7] did not affect the electrophoretic mobilities of the subfractions. Rye has only three F1 histones as resolved on both long and short gels. These have identical electrophoretic mobilities (as shown by electrophoresis of mixed samples of wheat and rye on long gels) to histones F1a, b and d (that is, rye histones are the same as wheat histones except that F1c and F1a′ are lacking).

In the hybrid triticale the genes for histones F1a, b and d are expressed as is the gene for the wheat-specific F1a′. Even greatly overloaded gels, however, show no trace of the wheat-specific F1c histone.

The reason for the lack of expression of the wheat F1c gene is unknown, although it is not due to the loss of any whole chromosomes. Root tip squashes reveal the entire $2n$ complement of 28 chromosomes derived from wheat and 14 derived from rye, in the hybrid.

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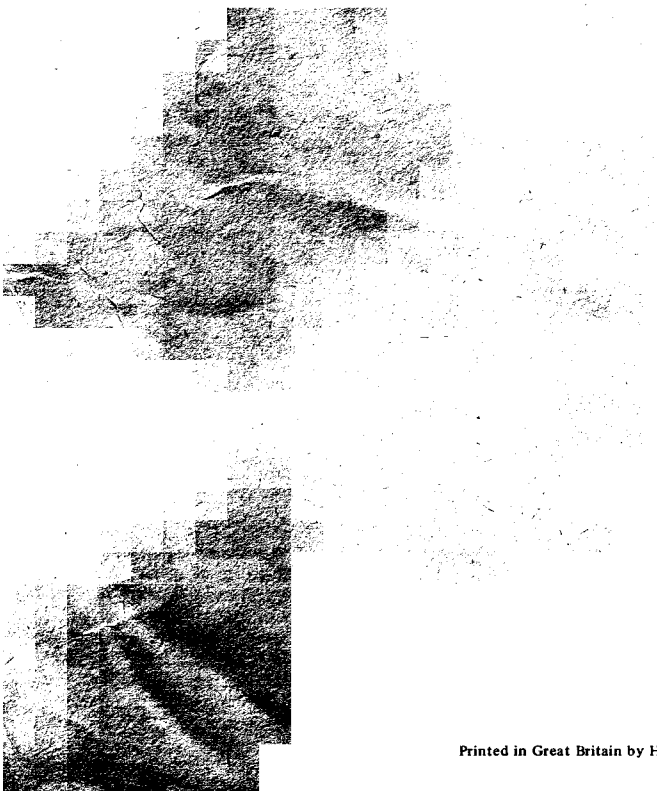

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