GENOMIC CONSTITUTION OF CEREALS WITH BLUE ALEURONE TRAIT

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BACKGROUND

Anthocyanins are of great importance for human health due to their antioxidant potential. Their content is rather low in common varieties of wheat (*Triticum aestivum* L.). However, elite lines with blue aleurone and introgressed chromatin from wild relatives exhibit significantly increased levels of anthocyanins. There is evidence that the donor of chromosome introgressions has been *Thinopyrum ponticum* (syn. *Agropyron elongatum*). The aim of our study was to characterize genomic constitution of selected wheat genotypes with blue aleurone.

PLANT MATERIAL

In our study we used fourteen genotypes of *Triticum aestivum* L. with blue aleurone (Fig. 1). They were analyzed by genomic *in situ* hybridization (GISH). This specific colouring is caused by presence of antocyanins in aleurone layer of caryopsis (Fig. 2). Next we used an uncultivated species of grass *Th. Ponticum*, which is supposed donor of the blue colouring.


Fig. 1

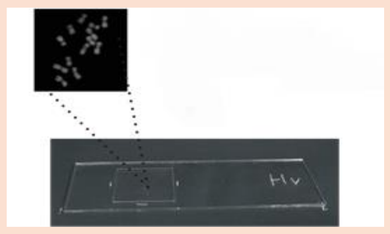

Fig. 2

METHODS

Young root tips were synchronized by iced water, fixed in 3:1 Carnoy I solution in 37°C for 7 days and squashed in 45% acetic acid. Slides with good quality were used for analysis.

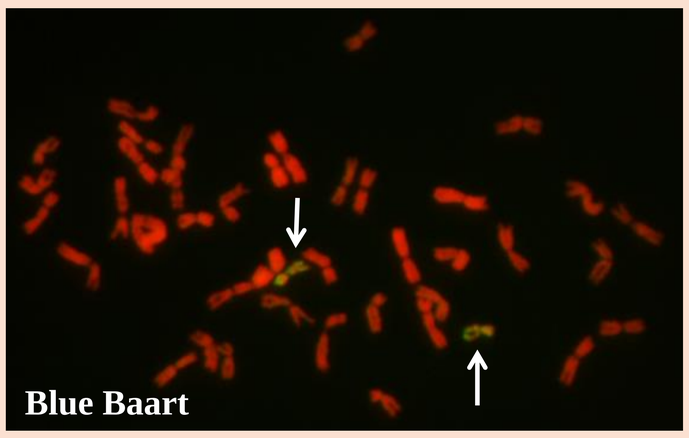
Genomic *in situ* hybridization (GISH) was performed using labelled genomic DNA of *Thinopyrum ponticum* as a probe. The chromosomes were counterstained with DAPI.

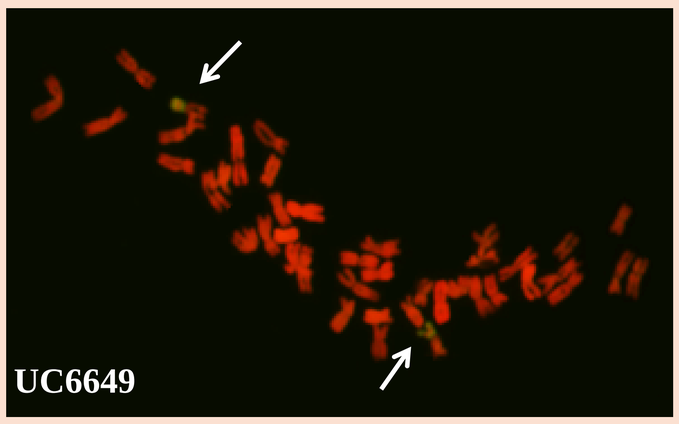
All observations were made on Zeiss Axio Imager Z2 fluorescence microscope equipped by CCD camera.

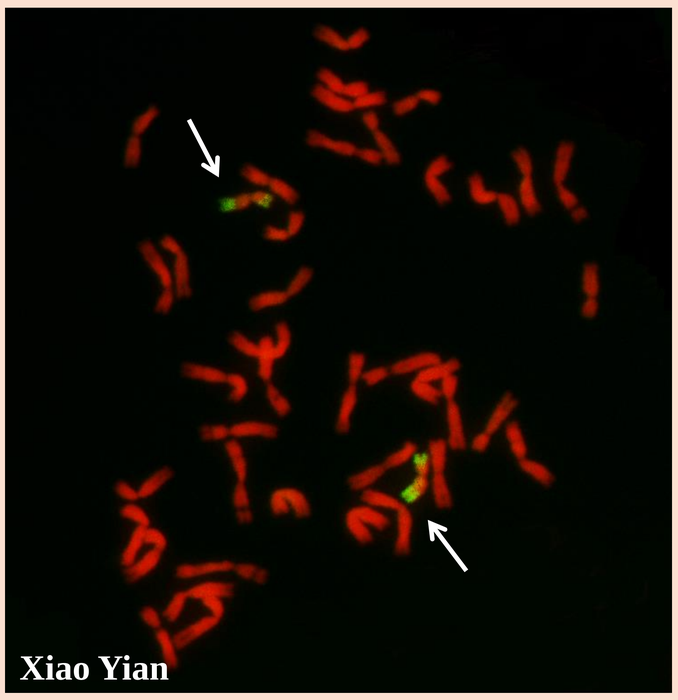


RESULTS

Our results revealed large variation in genomic constitution of blue aleurone wheat genotypes. Out of 14 analyzed lines, 11 lines carried an introgression from *Th. ponticum*. In the remaining three genotypes (cv. Indigo, Skorpion, and line H83-952-1), we were unable to detect any introgressed chromosome segment. Six different types of introgressions were found, ranging from the addition of a telocentric chromosome pair (cv. Blue Norco) to substitution of one chromosome pair (cv. Blue Baart), substitution of complete (homologous) chromosome arms (line UC660-49) and various substitutions of distal parts of chromosome arm(s).


Blue Baart


UC6649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CONCLUSIONS AND FUTURE WORK

Different types of introgressions observed in our work support a hypothesis that the introgressions activate the blue aleurone trait pathway, which is present, but deactivated in common wheat germplasms. In future, we plan to identify wheat chromosome carrying the alien introgression in the current set of wheat with blue aleurone. For fluorescence *in situ* hybridization (FISH) we would like to use total genomic DNA of *Th. ponticum* and repetitive DNA sequences (GAA repeat, *Afa* family) enabling the identification of individual wheat chromosomes. Furthermore, we plan to analyse other grains with blue aleurone trait (barley and Triticale).

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