

Marker-based development of wheat near-isogenic and substitution lines with high anthocyanin content in grains

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Bread wheat (*Triticum aestivum* L., $2n = 6x = 42$, BBAADD) is one of the most important cereal crop. Today there is increasing interest in production of wheat with high anthocyanin content in grain, as a source of functional foods. Anthocyanins can be produced in wheat grain either in pericarp (under control of genes *Pp*) or in aleurone (*Ba*). Previously, on the genetic background of Saratovskaya 29 cultivar we developed a set of near-isogenic lines having different combinations of anthocyanin biosynthesis regulatory genes *Pp-A1*, *Pp-D1* and *Pp3* as well as a blue-grained substitution line (BC₇ progeny) carrying the wheatgrass (*Agropyron elongatum* Host.) *Ba* genes. Chromosome C-banding, FISH and microsatellite analysis showed substitution of wheat chromosome 4D by *Ag. elongatum* chromosome 4Ag. The line was designed 'S29(*Ag. elongatum* 4Ag(4D))'. We constructed diagnostic markers for the dominant alleles of *Pp3* (*TaMyc1*) inherited from purple wheat and *Ba* (*ThMyc4E*) inherited from *Ag. elongatum*. The markers together with microsatellites linked to these genes were used for selection of plants with dominant alleles at the *Pp* and *Ba* loci. In the F₂ progeny, obtained after crossing the blue- with the purple-grained lines, in addition to deep purple-grained plants with the dominant alleles of the *Pp-1*, *Pp3* and *Ba* (4Ag/4D) genes, blue-grained plants with hairy leaves (*Hl* gene is localized in 4BL) were found. FISH and molecular marker analysis of these plants confirmed the substitution 4Ag/4B. The line was designed 'S29(*Ag. elongatum* 4Ag(4B))'. By crossing the new line with the purple-grained line, deep purple-grained plants with dominant alleles *Pp-1*, *Pp3* and *Ba* (4Ag/4B) in one genome were obtained. The substitution and isogenic lines and the allele-specific markers designed in the study can be applied for accelerated obtaining wheat with high anthocyanins content in grains.

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