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Biotechnology of creating violet-colored forms of triticale and their characteristics

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Objective: To make violet-colored forms of spring triticale using biotechnological methods and to characterize them according to qualitative and quantitative traits.
Material and methods: There were studied hybrids of F5–F6 hexaploid spring triticale (× Triticosecale Wittmack) Sadko from the world collection of VIR (k-3927) with a breeding form of emmer (Triticum dicoccum (Schrank) Schuebl.) 27-3/17, characterized by purple grain color and F2–F3 hybrids from complex crosses: (F1 spring soft wheat Purple Feed × facultative diploid rye Korotkostebel'naya 69) × (F4 triticale Sadko × emmer 27-3/17). DNA was extracted from young plant leaves of hybrids of the second (F2) and third (F3) generations, analyzed with an intragenic marker Pp3-diagnostic, developed to gene *Pp3,* and a microsatellite marker closely linked to the *Pp-D1* gene. To clarify the genotype of the hybrids at the DNA level, the intragenic marker Pp3-diagnostic, developed to the *Pp3* gene located on chromosome 2A, and the microsatellite marker Xgwm0046, flanking the *Pp-B1* gene located on the chromosome 7B, were used. Using the markers a PCR procedure and the separation of PCR products in an agarose gel were performed according to the conditions described earlier. Phenological observations and structural analysis of plants were carried out in all generations of the hybrids.
Results: According to the results of the analysis, it was previously established that 4 fertile plants of the hybrid F4 triticale Sadko × emmer 27-3/17 have the genotype *PpB1Pp-B1Pp3Pp3*, therefore, F_5–F_6 generations made by self-pollination are also homozygous for these dominant genes. All the plants had purple grain color. The diversity of plants different in some qualitative and quantitative characteristics is noted. In both F_5 and F_6, along with semi-awned plants, up to 3–5% awnless and 10–15% awned ones were found in populations. The length of the straw was in the range of 75–85 cm on average. There were single plants with the value of this feature 35–50 cm. They were almost or completely sterile. Plants over 130 cm tall were also rare (less than 1%). The grain content of plants in terms of 1 spike was higher in F_6 (1.09–1.39 pcs.) compared with F_5 (0.41–1.00 pcs.). A wide variety of plants in morphological, qualitative and quantitative characteristics was noted in the hybrids F_2 obtained from complex crosses. According to the degree of purple color of the grain, they varied significantly, from zero to intense. The range of variability of plant height was large. The shortest–stemmed plant reached only 42 cm, and the longest-stemmed plant reached 145 cm.
The length of the straw of the shortest plant reached only 42 cm. The length of the long-stemmed plant reached 145 cm. The grain content of the spike of the most fertile plant reached 1.53.
Conclusions: Based on the triticale forms made with the help of biotechnology with purple grain color, carrying homozygous dominant genes controlling this trait, new violet-colored triticale forms with increased grain content and a wide variety of plants in qualitative and quantitative characteristics were obtained.
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