

Development of spring wheat lines with a reduced period from germination to heading using the marker-assisted selection

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The time of heading of wheat is an important factor that determine the adaptation of plants to environmental conditions. The heading time of spring wheat is determined by genes that control the plant reaction to vernalizing temperatures (*VRN* – vernalization genes), and photoperiod sensitivity (*PPD1* – photoperiod response genes). The different combinations of alleles of these genes result in different heading time. Marker-assisted selection enables to accelerate the development of spring wheat forms, differing in heading time. Using the results of the analysis of the allelic variation of the *VRN* and *PPD1* genes in Siberian spring wheat varieties, we selected the early Tulun 15 variety, with photoperiod insensitive *Ppd-D1a* and rare *Vrn-B3a* allele, associated with early flowering. The cultivar Tulun 15 was crossed with the middle early cultivar Obskaya 2. Using allele-specific primers F_2 generation plants with different combinations of *VRN* and *PPD1* alleles were detected. These plants were divided into four haplotypes. The F_3 generation plants resulted from self-pollination of these plants were sown in the field to study the effect of the haplotypes on the heading time. The time from germination to heading of the plants with different haplotypes was as follows: haplotype 1 (*Vrn-A1a Vrn-B1c vrn-D1 Vrn-B3a Ppd-D1a*) – 34.5 days; haplotype 2 (*Vrn-A1a Vrn-B1c vrn-D1 vrn-B3 Ppd-D1a*) – 37.3 days; haplotype 3 (*Vrn-A1a Vrn-B1c vrn-D1 Vrn-B3a Ppd-D1b*) – 38.0 days; haplotype 4 (*Vrn-A1a Vrn-B1c vrn-D1 vrn-B3 Ppd-D1b*) – 40.3 days; Tulun 15 (*Vrn-A1a Vrn-B1c vrn-D1 Vrn-B3a Ppd-D1a*) – 37.5 days; Obskaya 2 (*Vrn-A1a Vrn-B1c vrn-D1 vrn-B3 Ppd-D1b*) – 42.9. The results obtained demonstrated that *Vrn-B3a* and *Ppd-D1a* alleles accelerate heading of plants with the same allelic composition of *Vrn-A1a*, *Vrn-B1c*, and *vrn-D1* genes in the long day conditions of Novosibirsk region. **Acknowledgements:** The study has been supported by the Budget project 0324-2019-0039.