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Effect of zinc deficiency on wheat plants with different allele status of the *Gpc-B1* gene

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Abstract: In bread wheat, grain protein content (GPC) is an important grain quality trait. An approach to increasing GPC in durum and bread wheat has been to transfer genes from related species. *Triticum turgidum* L. var. *dicoccoides* has been a useful source of genes for high GPC in wheat. Previously, it was found that the *Gpc-B1* gene plays a key role not only in protein accumulation in grain but also involved in regulation of zinc (Zn) content in plants. Zn nutritional defect or over-absorption is linked to a large number of diseases. The increase in Zn concentration in wheat grain and the edible parts of other cereal crops through agronomic intervention or genetic selection is a strategy to mitigate micronutrient malnutrition. Therefore, the present study was conducted to investigate the effect of Zn deficiency on growth parameters and grain production of wheat with different *Gpc-B1* allele status. The effect of zinc deficiency on the flag leaf area, chlorophylls content, spike size, grains amount and Zn content in grains in wheat plants with different *Gpc-B1* gene allele status were studied. Introgressive lines were created by crossing of *T. aestivum* var. Festivalnaya and *T. dicoccoides*. Functionally active (f. a.) alleles of the *Gpc-B1* gene were identified in *T. diccocoides* and introgressive line 15-7-1 whereas *T. aestivum* var. Festivalnaya and line 15-7-2 had non-functional (n-f. a.) alleles. Wheat seeds were sown in pots containing 5 kg of sand. One part of pots irrigated by Hoagland solution with micronutrients addition, another part of pots irrigated by solution without adding Zn. According our results, *T. dicoccoides* had an increase in flag leaf area, spike length and dry weight as well as in grain number and grain yield per a spike under Zn deficiency. Moreover, wheat lines with f. a. of *Gpc-B1* gene had higher chlorophylls content compare to wheat plants with n-f. a. of *Gpc-B1* gene. It was also found that under Zn deficiency the Zn concentration in grains was higher in plants with functional allele of the *Gpc-B1* gene, compare with plants with non-functional *Gpc-B1* gene allele. These results showed that wheat with functional allele of the *Gpc-B1* gene growing under Zn deficiency capable for grain production with sufficient Zn concentration without decrease in yield.

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