Positive effect of application of "Rizoagrin" on the barley production process in the North

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Key message. The treatment of barley seeds by the nitrogen-fixing rhizobacteria had a positive effect on photosynthetic productivity and grain yield in northern condition (Komi Republic).

Keywords: *Agrobacterium radiobacter*, barley, production process, yield

Biological nitrogen fixation is an environmentally friendly and effective way to improve the supply the agricultural plants by the nitrogen, especially on soils with low natural fertility. The aim of our work was to study the effect of biological product containing the associative nitrogen-fixing rhizobacteria on the growth and photosynthetic productivity of barley cultivated in the Central agro-climatic region of the Komi Republic. Barley seeds (variety Andrey of Zonal North-East Agricultural Research Institute selection) were treated with rizoagrin (*Agrobacterium radiobacter*) before sowing. Seed treatment was performed on the day of sowing at the rate of 600 g bioproduct /ha. Seeds were sown manually on the plots of 12 m² in 4-fold repetition. The seeding rate was 500 germinating seeds/m². Untreated plants served as control. Inoculation of barley seeds with *Agrobacterium radiobacter* stimulated the shoot formation. The productive tillering capacity of barley increased by 30% and averaged 2.7 shoots/plant. The treated plants were characterized by better development of the leaf surface and pigment accumulation. In the tillering and earing phase, the chlorophyll content in the leaves of the treated plants was accordingly 15 and 33% higher than in the control ones. The chlorophyll content correlated with the nitrogen content in the leaves. The leaves of the treated plants were characterized by a powerful photosynthetic apparatus. The photosynthetic rate of the subflag leaf of treated plants was on average 22.2±4.5 mg CO₂/g DW· h, and in the control it was 30% less. In years with a typical weather conditions of vegetation period the inoculation led to an increase in yield by average of 25% due to increasing in the number of shoots per plant and weight of 1000 grains. Rizoagrin had no significant effect on the protein content in the grain, but it contributed to an increase in the concentration of essential amino acids by 14%. However, treatment with rizoagrin contributed more to the growth of vegetative mass of barley plants than to grain productivity in wetter and cooler growing seasons. Thus, we established that the treatment of barley seeds by rizoagrin biological product before sowing had a positive effect on crop due to improving of the nitrogen nutrition and the physiological processes activity. The cost of seed processing is fully repaid by obtaining additional agricultural products. In general, the results of our experiments indicate the feasibility of using biological products based on associative nitrogen-fixing rhizobacteria on grain crops in the Northern regions.