

# **THE FORMATION OF BIOMETRIC, BIOCHEMICAL AND PRODUCTIONAL INDICES OF SPRING BARLEY UNDER THE INFLUENCE OF HERBICIDE AND BIOLOGICALLY ACTIVE SUBSTANCES**

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Control system of phytosanitary state of plantings is one of the most important systems, because the efficiency of mineral fertilizers and crop pest and disease protecting agents decreases on excessively weedy fields. At present one of the most economically sound ways of weed control is the application of herbicides. As herbicides belong to xenobiotics it is necessary to specify their effect on cultivated plants. The importance of this issue is increasing each year with the increase of their accumulation in the soil and their impact on crop plants. That is why the study of herbicide impact both on weeds and cultivated plants enables to elaborate ecologically efficient strategies of their use on a larger scale.

Recently the great emphasis is given to the problem of the reduction of negative effect of herbicides on plants and soil by their combined application with biologically active substances. Biologically active substances including plant growth and development regulators enable to influence yield capacity, immune and stress resistance of plants. In addition, plant growth regulators exert a positive influence on the whole complex of physiological-biometrical processes which take place in a plant body: formation and functioning of photosynthetic apparatus, transportation and assimilate distribution, growth, development of the root system and economically valuable organs.

Biologically active substances of natural origin such as AGAT -25K and Agrostimulin belong to the most promising preparations. These preparations can be successfully applied in the mixtures with other chemical substances including herbicides. At the same time the rate of the latter can be considerably reduced. Though the mechanism of the combined application of herbicides and biologically

active substances on physiological-biochemical processes in cultivated plants still needs further investigation. From these considerations the objective of our research is to study the influence of different rates of sulphonylurea herbicide Caliber 75 applied separately or in the mixture with biopreparation AGAT-25K and plant growth regulator Agrostimulin on the physiological-biochemical processes in spring barley (above-ground biomass, leaf area, chlorophyll content), and formation of plantings productivity. This might enable to elaborate the most optimal and environmentally sound tank mixture composition.

The winter barley variety Sobornyj was tested on the trial field of Uman National University of Horticulture in the crop rotation of the chair of biology in 2006-2008. Field tests consisted in the treatment of the plants at the tillering stage with herbicide Caliber 75. The following rates were applied: Caliber 75 water-soluble granules (active substance – methyl, 500 g/kg + tribenuron-methyl, 250g/kg) at the rates of 30; 40; 50; 60; and 70g/ha and its tank mixtures with biopreparation AGAT-25K (active substance – inactivated bacteria *Pseudomonas aureofaciens* H 16 – 2% + bioactive substances of cultural fluid – 38%) at the rate of 20ml/ha and plant growth regulator Agrostimulin (N-oxide-2,6-dimethyl pyridine + Emistim C – bioactive substances of endophyte fungi *Cylindocarpon magesianum* (IMBF – 10004) at the rate of 10ml/ha.

The analysis was conducted in the laboratory environment: the above-ground biomass was defined by weighing, the leaf area was determined by direct method, the sum of chlorophyll a + b was estimated in 100% acetone using spectrophotometer “CPECORD – 2000”, the yield on the trial field was harvested by combine-harvester Sampo – 500 with further conversion into hectares.

The research results show that the application of herbicide Caliber 75 at rates of about 30; 40; 50; 60 and 70 g/ha led to a considerable increase of the above-ground biomass of spring barley and exceeded control of the herbicide rates by 18,6; 38,0; 57,4; and 22,9 % respectively (the test variant without application of preparations). The most significant increase of biomass of spring barley was formed under the application of the same rates of Caliber 75 in mixtures with

AGAT-25K and Agrosimulin and this exceeded control by 48,7; 71,0; 69,2; 59,6; and 30,6%. The largest biomass per one plant of spring barley was formed under the application of Calibre 40 g/ha + AGAT-25K + Agrostimulin mixture, which made up 7,83 g with 4,58 g at control.

While studying the influence of herbicide Caliber 75 applied separately and in the mixture with bioactive preparations on the leaf area we can state that the leaf area was the largest in spring barley when Caliber 75 was applied with AGAT-25K and Agrostimulin. In these test variants the leaf area exceeded by 13,7; 15,3; 1,0; 5,0; and 4,9 square centimeter the corresponding leaf area indices in those tests when Caliber 75 was applied without bioactive substances. Presumably the increase of the above-ground biomass and leaf area of spring barley can be explained by the growth stimulating properties of Agrostimulin which influences permeability of the cell membranes, enhances protein synthesis and mitotic activity of the plants and protective properties of AGAT-25K, which inhibits growth of pathogenic agents and prolongs functional activity of leaf apparatus.

The important index illustrating the vigour of photosynthetic apparatus development is the chlorophyll content. Our research shows that the greatest chlorophyll content was found in the leaves of spring barley in those variants in which Caliber 75 was applied in tank mixtures with bioactive preparations, in particular in variants – Caliber 40 and 50 gr/ha + AGAT-25K + Agrostimulin, where the control was exceeded by 63, 2 and 55,5 %. These data confirm our assumption that under the influence of plant growth regulator the destruction of chlorophyll and proteins is slowed down and thus vital activity of the leaves in ontogenesis is prolonged.

Various planting productivity was formed depending on the influence of tested preparations on physiological-biochemical processes in plants and climatic conditions. The greatest increase of grain of spring barley was received in the variant test when Caliber 75 was applied at the rate of 40g/ha in combination with AGAT-25K and Agrosimulin, this accounted for the additional yield in 2008 in relation to the control 11, 6 dt/ha, in 2006 it was lower and made up 8,0 dt/ha and it

was the lowest in drought season of 2007 and made up 5,3dt/ha. The obtained data coincide with indices of the effect of this mixture on physiological-biochemical processes in the spring barley and show that stress resistance of plants is enhanced under the influence of bioactive substances.

Thus based on the experimental material it may be concluded the following: the herbicide Caliber 75 at the rates of 30-70 g/ha considerably influences the main physiological-biochemical processes in spring barley. The greatest activation of physiological-biochemical processes in the plantings takes place under the influence of Caliber 75 at the rate of 40gr/ha tank mixed with biopreparation AGAT-25K and plant growth regulator Agrostimulin.