IMPACT OF MICROELEMENTS ON THE GROWTH, DEVELOPMENT AND CROP PRODUCTIVITY OF WINTER BARLEY

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Ukraine, as well as in the global crop production, grain crops occupy the largest acreages that illustrates their exceptional significance.

Winter barley is a valuable food, forage and industrial crop. Its grains are used for cooking food (dry breakfasts, cereals, soups, bakery mixtures, baby nutrition), the extracts from barley malt have dietary and medicinal properties. Barley grains are widely used as fodder in cattle breeding, for example, when fattening pigs or in diets of cattle and poultry.

One of the factors reducing the yields of winter barley in Ukraine over the past years is the unpredictability of weather conditions, which is associated with global climate changes worldwide. At the same time, under conditions of the unfavourable climate changes expressed in sharp air temperature drops and low precipitation, meeting the requirements of cultivation technologies of winter wheat, in particular scientifically substantiated application of mineral fertilizers, plays a significant role in the formation of the yield

In addition to applying the most important macroelements, winter barley responds well to the application of microelements: boron, molybdenum, cobalt, etc., therefore, the use of different microfertilizers for increasing the crop productivity and improving the grain quality attracts the attention of many researchers.

Microelements are those chemical elements, which are necessary for normal vital activity of the plant organism, but used in small quantities in comparison with basic nutrients. However, the lack of iron, boron, cobalt, zinc, copper does not lead to the destruction of plants and is often determined at the crops too late, but it is the reason of slowing down the biochemical and physiological processes and decreasing their coordination that results in reducing the yield and worsening its quality.

Among the spiked cereals barley is the most fastidious to the lack of copper and boron, also, we can often observe the lack of manganese on alkali soils. The need for microelements in barley cultivation rises when applying increased rates of phosphorus and potassium. This is due to the fact that when using high doses of phosphorus the availability of zinc decreases, in the case of applying high doses of potassium in barley cultivation the availability of boron decreases.

Manganese has been associated with disease control in numerous investigations. It has a direct inhibitory effect on fungi growth, especially powdery mildew, as well as being involved in lignin and suberin production giving plant cells more physical resistance to infection. But manganese deficient plants have a poor ability to metabolise nitrogen giving an accumulation of nitrate nitrogen in the leaf. This acts as a food source for such diseases as rusts and mildew.

Copper is an essential microelement for winter barley, the lack of which coincides with the lack of zinc, and on sandy soils – with magnesium deficiency. The characteristic feature of the action of copper is the fact that this microelement

increases the resistance of plants to fungal and bacterial diseases, i.e. reduces the disease incidence of grain crops with different types of brand, increases the plant resistance to brown spotting.

Application of cobalt in the form of fertilizer for winter barley crops also increases the yielding capacity, because the favourable conditions for breathing and energy metabolism as well as for protein biosynthesis in nucleic acids are created due to the positive impact.

In addition to the impact on grain yield of winter barley microelements also influence its structure. According to the research the application of zinc, copper, manganese and boron has increased the Thousand Grain Weight (TGW) of barley, improved seed germination, general and productive tillering, the resistance to unfavourable conditions.

According to the form of nutrients, micro fertilizers are subdivided into the mineral form and chelate one. The elements of complex fertilizers in the mineral form do not differ from those contained in the simple salts, that is why such fertilizers can be called a mixture of simple salts.

The most expensive fertilizers are those that contain items in the chelate form: «Hydrofert», «Multiboron», «Basfoliar», «Solubor DF», «Alpha Grow», «Ecolist», «Valagro EDTA mix», «Plantafon». The fertilizers of this class are also called special.

The term «chelate» (the Engl. word chelate from the Greek cilh – chela) is adopted to denote the cyclic structures that are formed as a result of cation's joining two or more donor atoms which belong to a single molecule. At the same time chelates are a biologically active form of microelement, which represents a chelate complex of metal ion with organic acid.

The organic acid, the chelates contain, significantly increases the solubility of microelement ion in the solutions, transports the microelement ion into the plant body, protects the microelement ion from the transformation of both physical and chemical nature, promotes the rapid involvement of the microelement ion into the biochemical processes in the plant body.

The compounds of macro-and microelements in the chelate form have a high stableness in the solutions, which prevents the risk of side effects between different elements. In addition, the chelate compounds are similar to organic ones in their form (in particular, chlorophyll and hemoglobin are chelates), which promotes the fast absorption and digestion of nutrients by the plants and a higher efficiency of fertilizers.

Chelates of micro elements are compatible with the application of protection means and do not give the sediment in the tank mixtures. The efficiency of chelates is 10-15 times higher than of the efficiency of the corresponding sulfates of minerals. For example, the assimilation of chelate form of phosphorus by grain crops is 4 times higher than that of its mineral analogue. The coefficient of efficiency of the fertilizers of the above mentioned class under irrigation exceeds 75%, and their rapid assimilation makes it possible to flexibly manage the process of plant development, besides, the elements in the chelate form can be also assimilated under conditions of adverse temperatures.