

THE RESPONSE OF MAIZE TO BORON, COPPER AND ZINC FERTILISATION IN MONOCULTURE AND SIMPLIFIED TILLAGE CONDITIONS

Summary

Key words: maize, tillage systems, foliar fertilization with B, Cu and Zn

The aim of the study was to determine the cooperation of tillage systems and foliar fertilization with boron, copper and zinc on yields and supply with these microelements of maize grown on medium soils. The following specific objectives were pursued in the research:

- assessment of the effect of three tillage systems (conventional - ploughed; simplified - shallow tillage in spring; zero tillage - direct sowing) in maize monoculture on the response, content and distribution of organic matter and key nutrients in two levels of topsoil (0-12 and 13-24 cm),
- recognition of the impact of tillage systems on maize yields and supply with the most important microelements (boron, copper and zinc),
- determination of the response of maize to foliar fertilisation with boron, copper and zinc.

The research was conducted on the basis of strict field experiments established on the production fields of an agricultural plant specializing in the production of corn grain. A medium-early hybrid maize cultivar LG 2244 (FAO-240) was grown.

The results of soil chemical analysis showed that under conditions of ploughless cultivation, there was an accumulation of fertilizer components and organic matter in the upper soil layer (0-12 cm). These changes were related to the decrease of pH_{Kci} value. In maize plants (leaves, grain and straw) cultivated in these conditions, lower B, Cu and Zn contents were found in comparison with plants from traditional (ploughed) cultivation. Decreasing the content of these elements in grain may mean a deterioration of its quality in terms of consumption and fodder usefulness. Foliar application of B, Cu and Zn significantly increased the content of these components in maize plants. However, it was not possible to obtain a comparative level of copper and zinc content in the grains.

Compared to traditional (ploughed) tillage, the average yields of grain and straw from three years of research in the simplified tillage (shallow spring tillage) decreased respectively by 3.8% and 6.0%, and in the zero tillage (direct sowing) by 16.9 and 14.8%. Foliar fertilization with boron, copper and zinc significantly increased maize yields. The size of yield increases obtained as a result of foliar fertilization with microelements was related to tillage systems and showed a growth direction in ploughless tillage systems, indicating a deepening of the deficiency of these components in these conditions. Therefore, the highest average increases in grain (10.34%) and straw (10.50%) yields in relation to the control treatment (without fertilization with microelements) were found in the treatments with zero tillage.

As a result of the multiple regression analysis, equations with high determination coefficients (R^2) were obtained, in which maize grain and straw yields are the dependent variables. The equations confirm the importance of appropriate zinc, boron and copper content, both in soil and in maize plants, in obtaining high yields.

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