

OPTIMIZATION OF MINERAL NUTRITION OF MAIZE HYBRIDS ON THE BASIS OF PLANT DIAGNOSTICS

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Relevance. Corn is the leading crop of the national grain economy, the export potential of which directly depends on the increase in the gross volume of grain. Therefore, the establishment of optimal parameters of the culture of basic chemical elements in order to scientifically substantiate and improve cultivation technologies to ensure the formation of high yields of corn grain is an urgent task of agricultural science and practice.

The aim of the study was to establish the peculiarities of nitrogen, phosphorus and potassium accumulation in maize plants in ontogenesis in relation to the yield of hybrids of early and middle-early maturity groups to optimize the mineral nutrition of the crop in the forest-steppe.

Materials and methods of research. The research was conducted during 2016–2019 on dark gray wooded soil using field, chemical, calculation-weight and mathematical-statistical methods.

Research results. It was found that the accumulation of nitrogen, phosphorus and potassium in maize plants is characterized by varietal specificity both within the early-maturing group of hybrids Trubizh SV and Zaislav M, and when comparing each of them with the middle-early hybrid Gidny.

Hybrids Trubizh SV and Zaislav M differed in the content of nitrogen and potassium in plants, and in some stages of development and fertilizer options - and phosphorus. At the same time, the "fertilizer" factor naturally had a greater effect on the accumulation of basic macronutrients in plants than the "hybrid" factor.

Differences in the accumulation of chemical elements in maize plants during the growing season were due directly to the influence of agrochemical load of growing technology and varietal characteristics of hybrids, and in the flowering phase (stage BBCH 65) – additionally the effect of so-called "growth dilution" and dry matter, especially nitrogen.

The Trubizh SV hybrid is distinguished, among others, by its rapid initial growth and accumulation of dry matter, especially with the application of mineral fertilizers. Instead, the crops of hybrids Zaislav M and especially Gidny accumulated biomass more slowly in the initial stages of growth and development. However, before the stage of BBCH 19, the middle-early hybrid Gidny significantly outperformed both early-maturing hybrids in terms of dry matter accumulation, especially when applying high rates of mineral fertilizers $N_{180-240}P_{120}K_{180-240}$ against the background of by-products of the predecessor.

Although among the early-ripening forms with the same duration of the vegetation period the concentration of nitrogen, phosphorus and at the stage of BBCH 19 – potassium, was higher in the plants of the hybrid Zaislav M, this was not realized in the formation of higher yields. On the contrary, in all variants of the experiment, except for the control, there was a tendency to the advantage of the level of yield and its growth from fertilization of the Trubizh SV hybrid, although within the smallest significant difference, and the middle-early hybrid Gidny significantly prevailed over early ripe Trubizh SV and Zaislav M. On average, for all fertilizer variants, the yield of maize of Gidny hybrid was $8,18 \pm 0,71$ t/ha, hybrid Trubizh SV – $7,28 \pm 0,59$, Zaislav M – $7,18 \pm 0,57$ t/ha. The highest yield of hybrid crops was formed with the introduction of $N_{240}P_{120}K_{240}$ on the background of by-products of the predecessor – respectively 12,1; 10,39 and 10,08 t/ha. Here the highest increases of productivity from fertilizer at the level of 8,07; 6,59 and 6,27 t/ha are provided.

All three hybrids studied in the studies were characterized by a high correlation between nitrogen ($r = 0,760-0,934$) and potassium ($r = 0,755-0,943$) as opposed to phosphorus, where in some cases these bonds were of medium strength ($r = 0,334-0,589$) and only partially close ($r = 0,702-0,806$). Thus, the formation of corn

productivity depends least on the concentration of phosphorus in plants for growing crops on dark gray wooded soil.

Conclusions and prospects. Varietal specifics of nitrogen, phosphorus and potassium accumulation by maize plants in ontogenesis were revealed. Among the early-ripening forms, the hybrid Zaislav M is characterized by a higher content of chemical nutrients in plants, and the hybrid Trubizh SV is characterized by genetically determined high efficiency of the use of chemical elements to create a unit of yield. Medium-early high-yielding hybrid Gidny during the growing season has the highest concentration of potassium in plants.

The maximum realization of the productivity potential of corn is achieved with a high agrochemical load of growing technology, which involves the application of mineral fertilizers in the norms $N_{180-240}P_{120}K_{180-240}$ on the background of by-products of the predecessor (winter wheat straw). The highest economic yield of the hybrid Gidny from FAO 280 (11,21–12,10 t/ha of grain) was formed by maize crops with a content of nitrogen at the stage of BBCH 65 – 1,75–1,86%, phosphorus – 0,48–0,60 % and potassium – 2,07–2,09 %. Early-maturing hybrids Trubizh SV and Zaislav M with lower productivity potential provided a yield of 9,56–10,39 t/ha at the concentration of these chemical elements in the flowering phase (BBCH 65) at the level of 1,70–2,01; 0,51–0,56 and 1,74–2,03 %.

The prospects of using plant diagnostics for potassium and nitrogen content to optimize mineral nutrition and predict corn yield for growing on dark gray wooded soil of the Forest-Steppe with a very low level of nitrogen, high and high – potassium and phosphorus.