



Instytut Uprawy
Nawożenia i Gleboznawstwa
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HR EXCELLENCE IN RESEARCH

**XI KONFERENCJA NAUKOWA
POLSKIEGO TOWARZYSTWA AGRONOMICZNEGO**

**WSPÓŁCZESNE WYZWANIA DLA ROLNICTWA
PERSPEKTYWY I KIERUNKI ROZWOJU**

STRESZCZENIA REFERATÓW I POSTERÓW



Puławy, 17–19 września 2025

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**Współczesne wyzwania dla rolnictwa
– perspektywy i kierunki rozwoju**

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THE EFFECT OF MINERAL FERTILIZATION AND PLANT DENSITY ON CORN PRODUCTIVITY

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In the context of global climate change, ensuring sustainable grain production is crucial for food security. In this regard, special attention should be paid to the selection of appropriate species composition of crops and improvement of elements of their cultivation technology to enhance the conditions for plant growth and development and obtain a stable harvest with high-quality indicators. In the group of cereals, corn (*Zea mays* L.) is a leader in terms of global grain production, which exceeds 1 billion tons per year.

The key factors that determine the level of corn grain production are the mineral nutrition of plants and their number per unit area. Scientists note that thickening the crop to a certain limit can improve PAR interception due to rapid crown closure and increased LAI and is one of the simplest ways to increase corn yields.

The study of the effect of plant density and the application of macro- and microelements was conducted on the field of the state enterprise “Stepne Research Farm of the Institute of Pig Breeding and Agro-Industrial Production of NAAS” in 2022-2024 years. The factors studied in the research were: different levels of plant supply with mineral nutrients $N_{50}P_{80}K_{75}$, $N_{50}P_{80}K_{75}$ + microfertilizer Orakul multykompleks (2,0 л ha⁻¹); plant density 55, 65, 75, 85 thousands per ha. The mid-season corn hybrid DM Skarb (FAO 330) was studied in the experiment.

The aim of the study was to determine the effect of mineral fertilization and sowing density on the corn productivity.

The results of the study showed a positive effect of the studied factors on the formation of corn plant habitus. Thus, in the variants of mineral fertilizer application, the values of this indicator were higher than in the variants where fertilization was not carried out by 1.06-5.03%. The combination of mineral fertilizers and foliar application of microfertilizer contributed to an increase in the height of maize plants by 2.93-6.06%. An increase in plant height was also noted in the variants of crop thickening, but this phenomenon was mainly due to increased cenotic interaction between plants.

Photosynthesis, which produces energy-rich and chemically diverse organic compounds from simple substances, is a fundamental process for plant productivity. The intensity, duration and productivity of photosynthesis is determined by the size of the leaf surface, which varies depending on the morphological parameters of the plants. The application of mineral fertilizers improved the conditions for the formation of the leaf surface of crops. The values of leaf surface area in the variants of $N_{50}P_{80}K_{75}$ application increased depending on the density of plants by 2.70-3.30 thousand m² ha⁻¹ compared to the variants where mineral fertilization was not carried out. In the variants of combining the application of mineral fertilizers and foliar application of plants with microfertilizer, the increase in the values of this indicator relative to the control was at the level of 12.0-14.6%.

The corn plant leaf surface formation conditions were most favorable under the complex application of macro and micronutrient fertilizers in crops with a plant density of 75 thousands per ha. In general, in the experiment, the highest leaf area of individual plants was most developed in crops with their number of plants per 1 ha was 55 thousand. In variants of increasing the number of plants to 75 thousands per ha, the leaf area of individual plants decreased, but in crops this decrease was compensated by an increase in their number per unit area. Therefore, the size of the leaf surface of crops increased with the growth of the number of plants in them from 55 to 75 thousands per ha. In crops with a plant density of 85 thousands per ha, the decrease in the size of the leaf surface of individual plants was no longer compensated by their number, so the size of their leaf surface was generally smaller.

The results of the research showed an increase in the yield of corn grain as the crops thickened to 75 thousand plants per ha. It was the highest in the variant of complex application of macro and micronutrient fertilizers. The application of $N_{50}P_{80}K_{75}$ provided an increase in grain yield relative to the variants where this agricultural practice was not applied by 0.22-0.30 t ha⁻¹, depending on the sowing density. In the variants of combining mineral fertilizer and foliar application with microfertilizer, the value of this indicator in crops with different thickening increased by 0.49-0.63 t ha⁻¹ compared to the variants where macro- and microfertilizers were not applied.