UDC 633.1:631.5

Osypenko O.M.
Master's degree student,
Sokolovska I.M.
Ph.D., Associate Professor of the Department of Crop Production and Agroengineering,
Kherson State Agrarian and Economic University

RESEARCH ON THE IMPACT OF SOWING DATES AND FERTILIZER APPLICATION RATES ON SPECIFIC PRODUCTIVITY INDICATORS OF MAIZE UNDER THE CONDITIONS OF THE NORTHERN STEPPE OF UKRAINE

In addressing the crucial issue of further increasing grain production, a significant role is played by one of the most productive cereal crops with diverse applications – maize. Alongside its high forage advantages, maize is an important food product. In recent years, maize has ranked first among the main cereal crops in global grain production [1, 2].

Interest in maize arises not only from its value as a forage and grain crop but also as a crop that can be widely used for producing food products and raw materials for industry under modern conditions. The grain, stalks, cob husks, and inflorescences of maize are components from which over 2,500 types of products and materials are derived. For food purposes, dent, flint, and waxy maize are utilized, but the most valuable varieties are considered to be the so-called food subtypes – flint and sweet corn.

The potential yield of the best hybrids of this crop exceeds 10 tons of grain per hectare, while sweet corn can yield up to 15-20 tons per hectare.

Increasing maize grain production is planned through intensive cultivation factors – planting after the best predecessors, employing an advanced system of primary and pre-sowing soil treatment, rational use of mineral and organic fertilizers, comprehensive combinations of agronomic and chemical measures to combat weeds, pests, and diseases, as well as timely and quality harvesting of grain and seeds [3, 4].

Key factors determining maize yield levels include sowing dates and variety selection, particularly soil fertility, temperature regime, and precipitation. Sowing dates play a decisive role in maximizing maize yield and grain quality since delays in sowing can lead to a linear decrease in grain yield. It is also asserted that early spring planting is optimal and more effective, while delays in sowing lead to reduced maize grain yield [5, 6]. Research conducted under conditions of insufficient moisture in the northern Steppe of Ukraine revealed that the field germination of seeds largely depended on the reaction of maize hybrids to sowing dates across different fertilization backgrounds.

The reserves of productive moisture in the soil layer of 0-20 cm at the time of maize sowing in the experiment decreased from 26-32 mm in early sowings to 12-24 mm in later ones. More noticeable changes at the time of sowing occurred in the upper 10 cm soil layer – from 10-15 mm to 5-9 mm respectively. Such conditions generally contributed to the development of the root system of maize plants, their absorption of nutrients from the soil, and plant development at initial stages, especially in early and optimally-timed sowings.

The field germination of maize hybrids seeds depended more on the soil temperature at the time of sowing in early sowings than in late sowings, especially with increased fertilizer application rates. On average across sowing dates, the highest field germination rate – 89.3% – was observed in sowings made on April 26, while sowings made 10 days earlier had lower rates on average by 2.4 %. In the April 26 sowing, there was a tendency for a 0.5% decrease in field germination under $N_{90}P_{45}K_{45}$ compared to the unfertilized background.

Field germination rates were significantly influenced by the seed germination ability of specific maize hybrids depending on growing conditions. More uniform maize emergence was recorded for sowings on April 17 compared to the later sowing date, which was attributed to low field germination of the mid-maturing hybrid Storm for both sowing dates.

Under $N_{60}P_{30}K_{30}$ fertilization at the April 17 sowing, our experiments noted an increase in seed germination rates for all hybrids except for the mid-maturing hybrid

Storm. On average, compared to the variant without fertilizers (germination rate of 83.0%), seed germination increased to 83.6%. The hybrid DB Varta reacted most significantly to growing conditions, with a seed germination increase of 3.1%, while in the Storm hybrid, this rate decreased by 3.4%. Delaying sowing by 10 days resulted in an average increase in seed germination rates to 85.7%. At the maximum fertilizer application rate in our experiment, $N_{90}P_{45}K_{45}$, during early sowing, the increase in the number of germinated seeds for all studied hybrids was the highest – 83.9 %, an increase of 0.9 % compared to the unfertilized variant and 0.3% compared to the $N_{60}P_{30}K_{30}$ variant. At the optimally recommended sowing date, the amount of fertilizer did not significantly affect emergence activity. The highest field germination rates for maize seeds in the experiment – 89.3 %, 88.6%, and 87.5% - was achieved with the mid-maturing hybrid DB Varta across different fertilization backgrounds.

Thus, the more optimal conditions for germination and the initial growth and development of maize plants in 2024 were predominantly established for sowings on April 26, with an average seed germination rate of 85.9%, while for sowings on April 17, it was 83.5 %. For early sowing on April 17, an increase in the rate of mineral fertilizer application contributed to a significant increase in maize seed germination rates, from 83.0 % to 83.9 %. Conversely, at the optimally recommended sowing date for the Northern Steppe, April 26, an increase in the background of mineral nutrition led to a decrease in the number of germinated seeds, from 86.2% without fertilizers to 85.7% with their use. The mid-early maturity group hybrids had higher seed germination rates, with hybrid Zapovit 260 at 86.1% and hybrid DB Varta at 86.5%. The hybrids Storm and DN Veld of the medium maturity group had germination rates of 82.0% and 84.0%, respectively.

References

1. Sidyakina O.V., Ivaniv O.O. Current state and prospects for maize grain production. Tavriysky Scientific Bulletin No. 130. 2023. *Agriculture, Plant Growing, Vegetable Growing, and Melon Growing*. P. 225-234. https://doi.org/10.32851/2226-0099.2023.130.33

2. Semenda D.K., Semenda O.V., Semenda O.V. Current state and ways to increase the economic efficiency of maize grain production. *Agro World*. No. 3. 2020. P. 43-49. https://doi.org/10.32702/2306$6792.2020.3.43

3. Len O.I., Totsky V.M., Gangur V.V., Yaremko L.S. The impact of fertilization systems and primary soil cultivation on the productivity of maize hybrids. *Scientific Progress & Innovations*, 2021(2), 52-58. https://doi.org/10.31210/visnyk2021.02.06

4. Biswas D.K., Ma B.L. Effect of nitrogen rate and fertilizer nitrogen source on physiology, yield, grain quality, and nitrogen use efficiency in corn. *Can J Plant Sci*. 2016. Vol. 403. Pp. 392–403. https://doi.org/10.1139/cjps-2015-0186

5. Kluger D.M., Owen A.B., Lobell D.B. Combining randomized field experiments with observational satellite data to assess the benefits of crop rotations on yields. *Environ. Res. Lett*. 2022. 17 044066. https://doi.org/10.1088/1748-9326/ac6083

6. Barabolyia O.V., Kosenko I.V. The impact of sowing dates on maize yield. Scientific Progress & Innovations, 27(1), 2024. Pp. 41-46. https://doi.org/10.31210/spi2024.27.01.07

УДК 631.547:635.657:631.81

Волкова Н.Е.

д. б. н., с. н. с., г. н. с.,

Інститут кліматично орієнтованого сільського господарства НААН

Мороз Г.Б.

к. геогр. н., завідувач лабораторії,

«Balkany lab» СФГ «Балкани»

ВПЛИВ ОСНОВНИХ ЕЛЕМЕНТІВ ЖИВЛЕННЯ НА РІСТ І РОЗВИТОК НУТУ

Важливою бобовою культурою є нут, який може забезпечити основними