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EFFECTIVENESS OF GROWTH REGULATORS AND MICROFERTILISERS IN NUTRITION OF MAIZE IN THE WESTERN FOREST–STEPPE OF UKRAINE

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Topicality. *Fertilisers are one of the most effective means of influencing the yield and quality of maize grain. Along with macroelements (N, P, K), microelements (B, Cu, Fe, Mn, Zn, Mo) play an important role in the formation of maize grain productivity. The need for these elements is small, but they are absolutely necessary for the growth and development of plants. An effective way to provide plants with trace elements during the growing season can be seed treatment and foliar fertilizing, which will contribute to improving the quality of products, increasing yield and economic efficiency of maize cultivation. The use of growth regulators, compound liquid fertilisers is one of the new and promising directions in the agriculture of Ukraine, but little investigated in the conditions of the Western Forest Steppe of Ukraine.* ***Purpose****. To study the influence of growth stimulants and compound microfertilisers on the growth and development of plants, the formation of individual productivity indicators, yield and grain quality of maize in the conditions of the Western Forest-Steppe of Ukraine.* ***Materials and Methods.*** *For 2019–2020, the research was conducted on medium loamy podzolized chernozems. In a two-factor experiment, it was studied: DN Meotyda and DB Khotyn hybrids; growth stimulants (Vympel-K, Vympel-2) and microfertilisers (Oracle seeds, Oracle multicomplex, Oracle colofermin zinc, Oracle colofermin magnesium), which were used for seed treatment or spraying of crops in stages of 3–5 and 7–9 leaves.* ***Results.*** *It was established that the maize plants of the studied hybrids formed a different number of ears in the experimental plots, namely, DN Meotyda – 98–108, DB Khotyn – 93–98 productive ears per 100 plants. Pre-sowing seed treatment and foliar feeding of maize at the early growth stages ensured an increase in grain weight per 1 ear of the early-ripening hybrid DN Meotyda by 7.1–27.2 %, and of the mid-early hybrid DB Khotyn – by 5.5–29.4 %,and 1,000 grains weight by 6.9–12.3 % and 10.5–16.0 %, respectively. The grain yield increased by 8.9–27.6 % in the early-ripening hybrid DN Meotyda, and by 8.7–26.1 % in the mid-early hybrid DB Khotyn.* ***Conclusions.*** *The highest indicators of individual productivity and grain yield are provided by the variant that involves seed treatment: Vympel–K + Oracle seed + Oracle zinc; crop treatment in the stage of 3–5 leaves: Vympel–2 + Oracle phosphorus and in the stage of 7–9 leaves: Vympel–2 + Oracle zinc + Oracle magnesium). The grain weight per 1 ear increases by 27.2 for the early-ripening hybrid DN Meotida, by 29.4 % for mid-early DB Khotyn compared to the control; weight of 1,000 grains – by 12.3 and 16.0 %, grain yield – by 27.6 and 26.1 %, respectively.*
Key words: *maize, hybrid, seed treatment, feeding, individual productivity, yield*

Introduction. Maize (*Zea mays* L.) is the leader in global grain production, second only to wheat and rice, and is superior to other cereals in terms of its biological potential, productivity and product quality. One of the prerequisites for high yields is balanced nutrition, and the use of microfertilisers is a cheap way to increase maize yields. Application of foliar feeding with compound fertilisers with microelements is an integral part of the fertiliser system for maize, as during the growing season, maize plants consume up to 80 g/ha of manganese, 350–400 g/ha of zinc, 70 g/ha of boron, 50–60 g/ha of copper [1]. It should be noted that microelements cannot be replaced by other nutrients. Since maize assimilates a small part of mobile microelements from the soil, which are in an easily accessible form, and immobile gross reserves of microelements become available to plants only after compound microbiological processes involving humic acids and root secretions, under certain conditions it may be necessary to feed crops with modern fertilisers containing these elements [2]. With foliar feeding, macro- and microelements easily penetrate corn plants, are well assimilated, quickly involved in the synthesis of organic substances in the leaves or transferred to other plant organs and used in

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metabolism [3, 4].

The research conducted in different soil and climatic zones indicate a fairly high efficiency of the plant growth stimulants containing growth promoting substances and microfertilisers in maize cultivation. In particular in the Forest-Steppe, when these substances are used for pre-sowing seed treatment, seed germination and germination energy are enhanced, growth processes are intensified, and plant development is improved. At the same time, it increases the viability of young maize plants and their resistance to low temperatures at the beginning of the growing season [5–7]. In the critical development stages, foliar feeding provides an increase in leaf surface area, plant height, individual productivity and grain yield. It is noted that the combination of pre-sowing seed treatment and foliar feeding provides the greatest efficiency [8–10].

In the North of Ukraine, the use of microfertilisers and growth regulators for seed treatment and foliar feeding of maize has a positive effect on ear length, grain weight and yield formation, but has different effects on the grain quality – protein, starch and fat content [11].

Based on the research conducted by the SE Institute of Grain Crops of NAAS, the use of microfertilisers for the compound improvement of morphological and reproductive parameters of maize plants in the Northern Steppe conditions leads to an increase in leaf surface area and significantly affects the grain content of the ear, the thousand grain weight and the maize yield [4, 12]. At the same time, it was found that the role of microfertilisers improves on the background without the application of N_{45}, while the effectiveness of microfertilisers decreases when N_{45} is applied for pre-sowing cultivation or inter-row tillage [13].

In the South of Ukraine, under irrigation conditions, the application of growth regulators and microfertilisers for pre-sowing seed treatment and foliar feeding significantly affects the plant height and the formation of the productivity in hybrids of different maturity groups, while the duration of the seedling – flowering stage is only partially affected [3].

In addition, it is noted that when maize is grown for biogas production, the application of microfertilisers for seed treatment and foliar feeding without macrofertilisers has little effect on the energy yield from biogas, but provides the highest energy coefficient [14].

Thus, the application of growth regulators and microfertilisers is an integral part of the modern agricultural technologies, as they not only regulate growth processes, increase the level of yield and grain quality, but also enhance plant resistance to adverse hydrothermal conditions, diseases, pests and are environmentally friendly for the environment and human health.

The purpose of the study was to investigate how growth stimulants and compound microfertilisers affect plant growth and development, formation of individual productivity, yield and grain quality of maize in the Western Forest-Steppe.

Materials and Methods. The research was conducted at the Khmelnytskyi State Agricultural Experimental Station of the Institute of Feed Research and Agriculture Podillia of NAAS during 2019–2020. The soil of the experimental plot is a low humus podzolic medium loamy chernozem slightly washed out, on loess loam of brownish-pale colour, with a finely nutty structure. In the wet state, it is sticky. The soil is sufficiently saturated with bases – 39.8–42.0 mg eq. per 100 g, with a hydrolytic acidity of 1.8–2.7 mg eq. per 100 g of soil. The humus content (according to Tiurin) is 3.2 %. Medium nutrient availability: content of easily hydrolysable nitrogen – 14.4–16.6, mobile phosphorus – 11.0–12.0, exchangeable potassium – 7.8–8.0 mg per 100 g of soil.

The maize cultivation technology is generally accepted for the Western Forest-Steppe of Ukraine, except for the factors studied. After harvesting the predecessor (soybean), stubble breaking was carried out to a depth of 6–8 cm and the primary tillage (ploughing) – to a depth of 25–27 cm. In spring, tillage began with harrowing, followed by two cultivations: the first was to a depth of 10–12 cm, and the second (pre-sowing) was to the depth of seed placement. Mineral fertilisers were applied for pre-sowing cultivation at the rate of $N_{48}P_{48}K_{48}$. Sowing of the early ripening hybrid DN Meotyda and the mid-early hybrid DB Khotyn was carried out in the optimal dates for the region - in the late April with the planned pre-harvest density of 90 and 85 thousand plants/ha, respectively, using the SU-12 seeder. Pre-sowing seed treatment was carried out on the day of sowing, feeding maize plants – in the stages of 3–5 and 7–9 leaves according to the experiment design.

We used the following products of domestic production in our research:

– *Vympel-K*, a stimulant for the seed treatment, which contains polyethylene oxides (770 g/l) and amber-humic complex (33 g/l), increases field germination and seed germination energy, protects seeds during long-term storage in unfavourable conditions, enhances the effectiveness of the biologicals, seed dressers, macro- and microfertilisers, promotes active development of the root system, stabilises and stimulates the vital activity of agronomically useful soil microflora around the seeds;

– *Vympel-2*, a plant growth stimulant, contains polyhydric alcohols (at least 300 g/l), humic acids (up to 30 g/l) and carboxylic acids of natural origin (3 g/l), increases yield and quality of products, efficiency of biologicals, pesticides, macro- and microelements by 20–30%, improves drought resistance and plant immunity, accelerates sugar accumulation, enhances the development and activity of soil microorganisms;

– *Oracle Seeds* microfertiliser contains nitrogen, phosphorus, potassium, sulphur, iron, copper, zinc, boron, manganese, cobalt and molybdenum, has a powerful physiological effect on seedlings, increases the seed germination energy, promotes intensive root growth, increases plant resistance to diseases, pests and other negative factors;

– *Oracle Multicomplex* microfertiliser contains nitrogen, phosphorus, potassium, sulphur, iron, copper, zinc, boron, manganese, cobalt and molybdenum, has a powerful physiological effect on the plant, compensates for the lack of nutrients during unfavourable growth conditions, stimulates the assimilation of nutrients from the soil by plants, increases plant resistance to diseases and stressful conditions, yield and product quality;

– *Oracle Colofermin Zinc* microfertiliser, which contains zinc, nitrogen, sulphur and colofermin, effectively prevents zinc deficiency in plants, increases drought and heat resistance of plants, reduces susceptibility to fungal diseases, enhances root development and vegetative mass growth, stabilises the synthesis of chlorophyll, protein and carbohydrates in cells;

– *Oracle Colofermin Magnesium* microfertiliser, which includes magnesium, nitrogen and colofermin, prevents magnesium deficiency in plants, restores chlorophyll regeneration and enhances protein synthesis, prevents chloroplast destruction, accelerates growth processes and cell division, causes intensive assimilation of soil moisture by the plant, increasing drought resistance;

– *Oracle Colofermin Phosphorus* microfertiliser, which contains phosphorus, nitrogen and colofermin, promotes root development, increases plant immunity and flowering, reduces the fungal disease percentage, accelerates afterripening and improves seed quality.

The number of pre-sowing seed treatment and foliar feeding of crops for each maize hybrid is 5. The number of experimental variants was 6 x 2 = 12. The experiment was replicated three times; the location of the plots was randomised.

The research methods are as follows: field – to determine the response of maize hybrids to the studied factors; morphophysiological – to obtain biometric parameters of plants; calculation and weight method – to establish parameters of plant structure and productivity; mathematical and statistical method – to determine the reliability of the results in field experiments.

Results. Scientifically, the biological properties of hybrids in terms of resistance to weather factors and the level of mineral nutrition of plants affect their productivity. During the period of our research (2019–2020), the weather conditions were characterised by significant deviations from the average long-term values for the average daily air temperature indicator – higher than average, and precipitation – in some months there was a shortage of precipitation, which corresponds to the general climate change trends in Ukraine towards increasing aridity and temperature regime (Table 1).

These conditions significantly affected the growth and development of maize plants, the formation of individual productivity and grain yield. At the same time, it made it possible to evaluate the efficiency of growth stimulants and compound microfertilisers for pre-sowing seed treatment and foliar feeding of maize plants.

An import element in the formation of maize hybrids' grain productivity is the number of ears per plant or per unit area. As a result of our observations, it was found that the plants of the studied maize hybrids formed different num-

Table 1. Weather conditions for the 2019–2020 growing season

Years	Months						For the growing season
	April	May	June	July	August	September	
Average daily air temperature, ºC							
2019	11.6	16.8	25.0	22.5	22.6	16.7	19.2
2020	11.0	13.3	22.5	21.9	22.5	18.2	18.2
Average for 1960–2020	8.5	13.6	18.4	19.2	18.6	13.4	15.3
Total precipitation, mm							
2019	73.5	302.4	94.1	127.9	54.8	54.9	707.6
2020	14.7	195.9	196.7	224.8	39.4	75.2	746.7
Average for 1960–2020	45.7	70.1	107.4	129.9	89.8	62.4	505.3
Hydrothermal coefficient							
2019	2.10	5.74	1.25	1.82	0.78	1.08	2.12
2020	0.45	4.75	2.93	3.30	0.57	1.39	2.23
Average for 1960–2020	1.81	1.61	1.93	2.16	1.58	1.56	1.77

bers of ears on the experimental plots. On average, over the years of research, the early ripening maize hybrid DN Meotyda formed 98–108 and the mid-early hybrid DB Khotyn 93–98 productive ears per 100 plants (Table 2). Depending on the methods of pre-sowing seed treatment and foliar feeding, the increase in the number of productive ears was 3–10 pieces or 3.1–10.2 % for the early ripening hybrid DN Meotyda and 1–5 pieces or 1.1–5.4 % for the mid-early hybrid DB Khotyn compared to the control. The largest number of productive ears of the studied hybrids DN Meotyda (108 ears) and DB Khotyn (98 ears) was formed in the variant with the application of growth stimulants and compound microfertilisers for pre-sowing seed treatment and foliar feeding, the smallest – 101 and 93 ears, respectively – in the variant with the application of growth stimulant alone.

It was proved that grain weight per ear is the element of the maize yield structure that most influences the level of crop yield, which varied both over the years of research and in the variants of pre-sowing seed treatment and foliar feeding. Our calculations showed that, on average, over the years of research, pre-sowing seed treatment and foliar feeding of maize in the early growth stages provided an increase in grain weight per ear of the early ripening hybrid DN Meotyda from 125.2 g in the control to 134.1–159.3 g or by 7.1–27.2 %, and the mid-early hybrid DB Khotyn – from 157.7 g in the control to 166.3–204.2 g or by 5.5–29.4 % in the studied variants (Table 2).

The thousand grain weight, as an indicator of grain size formed on the ears, also changed due to the influence of hybrid characteristics, microfertilisers and growth regulators. On average, over the years of research, the thousand grain weight of the early ripening hybrid DN Meotyda increased by 20.8–36.9 g or 6.9–12.3 % compared to the control, while the mid-early hybrid DB Khotyn increased by 30.9–47.0 g or 10.5–16.0 % depending on the method of pre-sowing seed treatment and foliar feeding in the early development stages.

For both maize hybrids, the yield of grain per 1 ear was also changed, both by the studied variants of pre-sowing seed treatment and foliar feeding, and by the years of research, which averaged 81.1–83.6 % for the early ripening hybrid DN Meotyda and 78.6–80.8 % for the mid-early hybrid DB Khotyn.

The application of microfertilisers and plant growth regulators had a positive effect on the grain yield formation by maize hybrids. Over the years of research, the average grain yield of the early ripening hybrid DN Meotyda was 7.21–9.20 t/ha, and the mid-early hybrid DB Khotyn – 7.66–9.65 t/ha (Table 3).

The increase in yield, compared to the control, was 0.64–1.99 t/ha or 8.9–27.6 % in the early ripening hybrid DN Meotyda, and 0.67–2.00 t/ha or 8.7–26.1 % in the mid-early hybrid DB Khotyn, due to the full or partial supply of microelements and growth regulating substances

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Table 2. Influence of pre-sowing seed treatment and foliar feeding on the elements of the yield structure of the early-ripening maize hybrids (average for 2019–2020)

No.	Variants		DN Meotyda			DB Khotyn		
	pre-sowing seed treatment	treatment of crops	Number of productive ears per 100 plants, pcs.	Grain weight per 1 ear, g	Thousand grain weight, g	Number of productive ears per 100 plants, pcs.	Grain weight per 1 ear, g	Thousand grain weight, g
1.	Control (no treatment)		98	125.2	300.8	93	157.7	293.8
2.	Vympel-K, 0.5 l/t	*In stages of 3-5 leaves and 7-9 leaves:* Vympel-2, 0.5 l/ha	101	134.1	321.6	94	166.3	324.7
3.	Vympel-K, 0.5 l/t + Oracle Seeds, 1.0 l/t	*In stages of 3-5 leaves and 7-9 leaves:* Vympel-2, 0.5 l/ha + Oracle Multicomplex, 1.0 l/ha	103	140.1	326.2	95	174.0	330.8
4.	Vympel-K, 0.5 l/t + Oracle Seeds, 1.0 l/t + Oracle Zinc, 1.0 l/t	*In stages of 3-5 leaves and 7-9 leaves:* Vympel-2, 0.5 l/ha + Oracle Multicomplex, 1.0 l/ha + Oracle Zinc, 1.0 l/ha	107	152.6	332.8	97	193.3	340.3
5.	Vympel-K, 0.5 l/t + Oracle Seeds, 1.0 l/t + Oracle Zinc, 1.0 l/t	*Stage of 3-5 leaves:* Vympel-2, 0.5 l/ha + Oracle Phosphorus, 2.0 l/ha *Stage of 7-9 leaves:* Vympel-2, 0.5 l/ha + Oracle Zinc, 1.0 l/ha + Oracle Magnesium, 2.0 l/ha	108	159.3	337.7	98	204.2	340.8
6.	Vympel-K, 0.5 l/t + Oracle Seeds, 1.0 l/t + Oracle Zinc, 1.0 l/t	*In stages of 3-5 leaves and 7-9 leaves:* Oracle Zinc, 1.0 l/ha	106	145.9	329.2	96	182.3	337.1

Grain Crops. Vol. 6. No. 2. 2023. P. 97–104

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Table 3. Grain yield of maize hybrids of early ripening groups depending on the methods of pre-sowing seed treatment and foliar feeding (average for 2019–2020)

No.	Variants		DN Meotyda			DB Khotyn		
	pre-sowing seed treatment	treatment of crops	Yield, t/ha	± to control		Yield, t/ha	± to control	
				t/ha	%	t/ha		%
1	Control (no treatment)		7.21	-	-	7.66	-	-
2	Vympel-K, 0.5 l/t	*In stages of 3-5 leaves and 7-9 leaves:* Vympel-2, 0.5 l/ha	7.85	+0.64	8.9	8.33	+0.67	8.7
3	Vympel-K, 0.5 l/t + Oracle Seeds, 1.0 l/t	*In stages of 3-5 leaves and 7-9 leaves:* Vympel-2, 0.5 l/ha + Oracle Multicomplex, 1.0 l/ha	8.08	+0.87	12.1	8.56	+0.90	11.7
4	Vympel-K, 0.5 l/t + Oracle Seeds, 1.0 l/t + Oracle Zinc, 1.0 l/t	*In stages of 3-5 leaves and 7-9 leaves:* Vympel-2, 0.5 l/ha + Oracle Multicomplex, 1.0 l/ha + Oracle Zinc 1.0 l/ha	8.79	+1.58	21.9	9.24	+1.58	20.6
5	Vympel-K, 0.5 l/t + Oracle Seeds, 1.0 l/t + Oracle Zinc, 1.0 l/t	*Stage of 3-5 leaves:* Vympel-2, 0.5 l/ha + Oracle Phosphorus, 2.0 l/ha *Stage of 7-9 leaves:* Vympel-2, 0.5 l/ha + Oracle Zinc, 1.0 l/ha + Oracle Magnesium, 2.0 l/ha	9.20	+1.99	27.6	9.66	+2.00	26.1
6	Vympel-K, 0.5 l/t + Oracle Seeds, 1.0 l/t + Oracle Zinc, 1.0 l/t	*In stages of 3-5 leaves and 7-9 leaves:* Oracle Zinc, 1.0 l/ha	8.41	+1.20	16.6	8.88	+1.22	15.9
LSD_{05}		2019	0.17			0.16		
		2020	0.21			0.12		

with their distribution during the growing season, especially during critical periods of plant development.

According to the results of the research, it was found that the least effective variant among the studied was variant 2 (seed treatment with Vympel-K, 0.5 l/t; treatment of crops with Vympel-2, 0.5 l/ha in the stages of 3–5 leaves and 7–9 leaves). The increase in grain yield, compared to the control, was 0.64 t/ha or 8.9 % in the early ripening hybrid DN Meotyda, and 0.67 t/ha or 8.7 % in the mid-early hybrid DB Khotyn.

The most effective variant was variant 5 (seed treatment with Vympel-K, 0.5 l/t + Oracle Seeds, 1.0 l/t + Oracle Zinc, 1.0 l/t; treatment of crops with Vympel-2, 0.5 l/ha + Oracle Phosphorus, 2.0 l/ha in the 3–5 leaf stage and Vympel-2, 0.5 l/ha + Oracle Zinc, 1.0 l/ha + Oracle Magnesium, 2.0 l/ha in the 7–9 leaf stage), which provided the highest increase in maize grain yield – 1.99 t/ha or 27.6 % in the early ripening hybrid DN Meotyda and 2.00 t/ha or 26.1 % in the mid-early hybrid DB Khotyn compared to the control.

Conclusions. Thus, pre-sowing seed treatment and foliar feeding of maize plants in the early development stages (3–5 and 7–9 leaves) using the seed treatment stimulant Vympel-K, plant growth stimulant Vympel-2, complex microfertilisers Oracle Seed, Oracle Multicomplex, Oracle Colofermin Zinc, Oracle Colofermin Magnesium and Oracle Colofermin Phosphorus improve individual productivity and increase grain yields.

It was found that the least effective variant among the studied was variant 2 (seed treatment with Vympel-K, 0.5 l/t; treatment of crops with Vympel-2, 0.5 l/ha in the stages of 3–5 leaves and 7–9 leaves), where the grain weight per 1 ear increased in the early ripening hybrid DN Meotyda by 7.1%, in the mid-early DB Khotyn – by 5.4 %, the thousand grain weight – by 6.9 and 10.5 %, and the increase in grain yield compared to the control was 8.9 % and 8.7 %, respectively.

The highest indicators of individual productivity and grain yield are provided by variant 5 (seed treatment with Vympel-K, 0.5 l/t + Oracle Seeds, 1.0 l/t + Oracle Zinc, 1.0 l/t; treatment of crops with Vympel-2, 0.5 l/ha + Oracle Phosphorus, 2.0 l/ha in the 3–5 leaf stage and Vympel-2, 0.5 l/ha + Oracle Zinc, 1.0 l/ha + Oracle Magnesium, 2.0 l/ha in the 7–9 leaf stage). The grain weight per 1 ear increased by 27.2 % in the early ripening hybrid DN Meotyda, by 29.4 % in the mid-early hybrid DB Khotyn, by 12.3 % and 16.0 % in the thousand grain weight, and by 27.6 % and 26.1 % in the grain yield, respectively, compared to the control.

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Хмельницька державна сільськогосподарська дослідна станція Інституту кормів та сільського господарства Поділля НААН, с. Самчики, Хмельницький район, Хмельницька область, 31182, Україна

Актуальність. Добрива є одним із найефективніших засобів впливу на урожайність і якість зерна кукурудзи. Поряд з макроелементами (N, P, K) у формуванні зернової продуктивності кукурудзи важливу роль відіграють мікроелементи (B, Cu, Fe, Mn, Zn, Mo). Потреба в цих елементах невелика, однак вони вкрай необхідні для росту і розвитку рослин. **Визначення проблеми.** Ефективним способом забезпечення рослин мікроелементами протягом вегетації можуть бути обробка насіння та позакореневі підживлення, що сприятимуть покращенню якості продукції, збільшенню урожайності та економічної ефективності вирощування кукурудзи. Застосування регуляторів росту, комплексних рідких добрив є одним з нових і перспективних напрямів у сільському господарстві України, однак мало дослідженим в мовах Західного Лісостепу**. Метою досліджень** було вивчення впливу стимуляторів росту та комплексних мікродобрив на ріст і розвиток рослин, формування показників індивідуальної продуктивності, урожайності та якості зерна кукурудзи в умовах Лісостепу Західного. **Матеріали і методи.** Дослідження проводилися у 2019–2020 рр. на чорноземах опідзолених середньо суглинкових. У двох факторному досліді вивчали гібриди кукурудзи ДН Меотида та ДБ Хотин; стимулятори росту (Вимпел-К, Вимпел-2) та мікродобрива (Оракул насіння, Оракул мультикомплекс, Оракул колофермин цинку, Оракул колофермин магнію), що використовувалися для обробки насіння або обприскування посівів у фази 3–5 та 7–9 листків. **Результати.** Встановлено, що рослини досліджуваних гібридів кукурудзи формували різну кількість качанів на дослідних ділянках, а саме ДН Меотида – 98–108, ДБ Хотин – 93–98 продуктивних качанів на 100 рослинах. Допосівна обробка насіння та позакореневе підживлення кукурудзи на ранніх етапах росту забезпечували зростання ваги зерна з 1 качана ранньостиглого гібриду ДН Меотида на 7,1–27,2 %, а середньораннього гібриду ДБ Хотин – на 5,5–29,4 % , маси 1000 зерен, відповідно, на 6,9–12,3 % та 10,5–16,0 %. Урожайність зерна зростала у ранньостиглого гібриду ДН Меотида на 8,9–27,6 %, у середньораннього гібриду ДБ Хотин – на 8,7–26,1 %. **Висновки.** Найвищі показники індивідуальної продуктивності та урожайності зерна забезпечує варіант, який передбачає обробку насіння: Вимпел–К + Оракул насіння + Оракул цинк; обробку посівів у фазу 3–5 листків: Вимпел–2 + Оракул фосфор та у фазу 7–9 листків: Вимпел–2 + Оракул цинк + Оракул магній). Вага зерна з 1 качана збільшується, порівняно до контролю, у ранньостиглого гібриду ДН Меотида на 27,2 %, середньораннього ДБ Хотин – на 29,4 %, маса 1000 зерен – на 12,3 та 16,0 %, урожайність зерна – на 27,6 та 26,1 % відповідно.

Ключові слова: *кукурудза, гібрид, обробка насіння, підживлення, індивідуальна продуктивність, урожайність*