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Influence of foliar top dressings upon amount of mealies at hybrids of corn

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The purpose. To study dependence between amount of normally formed mealies and foliar top dressings with microfertilizers Ekolist Monozinc and Rostok Kukurudza, bacterial preparation Biomag and growth regulator of plants Vympel at hybrids of corn of different groups of ripeness. **Methods.** Field, laboratory and statistical. **Results.** At foliar top dressings the amount of normally formed mealies increased. The greatest amount of mealies was in group of middle-ripening hybrids — 1,24 pieces, whereas at early ripening hybrids it made 1,09 pieces, and at middle-early ripening hybrids — 1,14 pieces on the average for years of probes. The amount of normally formed mealies essentially depended on genetic features of each hybrid, the greatest amount of mealies in group of early ripening hybrids is fixed for DKS 2960 and DKS 2971 — 1,13 pieces, in group of middle-early ripening hybrids — DKS 3472 — 1,24 pieces, and DKS 3420 — 1,13 pieces, in group of middle-ripening hybrids — DK 391 and DK 440 —1,31 pieces **Conclusions.** Foliar top dressings ensured growth of amount of normally developed mealies in comparison to control on 0,01 – 0,05 pieces, but this growth was below the least essential variance. Increase of amount of foliar top dressings with microfertilizers, growth regulator of plants and bacterial preparation did not ensure growth of amount of mealies on a plant. The most essential growth of amount of mealies for a plant (0,03-0,1 pieces) in comparison to control was fixed in alternative with microfertilizer Ekolist Monozinc.

Key words: *corn, mealie, hybrid, top-dressing, specimen, microfertilizer, growth regulator, agrotechnique, ripeness.*

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Formulation of the problem. One of the main indicators of the productivity of corn hybrids is the number of normally formed cobs per plant. The study of the influence of foliar infusions with microfertilizers, plant growth regulators and bacterial agents is promising and relevant, especially in terms of reducing the amount of organic fertilizers and the high cost of mineral fertilizers.

Analysis of recent research and publications.

On a stalk of corn develops 1-2 cobs, rarely more [1, 2]. Most modern hybrids of corn are characterized by single-shear [3]. However, in production conditions, hybrids that are susceptible to multiplying, which are formed in terms of 100 plants 150-160 cobs, are rare, and occasionally there may be some plants with three and, exceptionally, even four cobs. However, in most modern corn biotypes, this index ranges from 110 to 130 cats per 100 plants [4].

Farmers, seeking biological ways to increase the productivity of corn, quite often raise the question of the possibility of using in the production of multicellular biotypes of crop. The number of cobs on a corn plant is a hereditary attribute that can be influenced selectively, and also to some extent by agrotechnical, creating the best conditions for cultivation [4].

In the unfavorable conditions of cultivation, multi-cobs hybrids, although they do not form two cobs, however, have considerably less infertile plants, and for the optimal balance of nutrients in the soil, moisture content, pre-harvest density of plant standing and biological characteristics, such hybrids are capable of forming two economically suitable cobs [4, 5].

Since in the sinus of each leaf, with the exception of 2-4 upper, there is a bud, then the corn plant under ideal conditions of cultivation, which fully corresponds to its biological requirements, can hypothetically form as many cobs leaves as the leaves (including the subleaves, which can also form cobs) [4-6].

The reason for the appearance of two-cob plants in corn can be agrotechnical, that is, sowing or falling of plants. The largest cobs are formed on corn plants in the axils of leaves located from the 7th to 15th stem nodes. The most developed and largest in corn is the upper cobs [4].

In the given literary sources the dependence of the number of formed cobs and carried out foliar feeding is given.

So V.F. Zavertyaluk, M.V. Marenichenko [7] indicate an increase in the number of formed corncobs during foliar feeding, that is, when feeding elements, the number of cobs per 100 corn plants increases by 2-3.

Material and methods of research

The research was conducted in 2011-2013 in the research enterprise of the State Enterprise "Kordelivske" IC of the NAAS of Ukraine. The soil of the experimental plot is black, common low humus, medium loamy on the forest, humus content (according to Tyurin) in the arable layer of 4.6%.

Experimental scheme: factor A - corn hybrids of different ripening groups: Kharkiv 195 MB, DKS 2960, DKS 2949, DKS 2971, mid-term group DKS 3472, DKS 3420, Pereyaslavsky 230 SV, DKS 3871, mid-group DK 391, DK 440, DKS 4964 , DK 315, Factor B - foliar feeding - control (without feeding), microfertilizer application "Ecolistmonozinc" and "Rostok kukurudza," "Biomag" bacterial preparation, plant growth regulator "Vympel", factor C - number of foliar feeding - one in a phase of 5-7 leaves of corn and two in a phase of 5-7 and 10-12 leaves of corn.

Biomag (nitrogen soil fixator) introduced 2 l / ha of the preparation at the expense of the working solution 300-500 l / ha. Contains producers of Azotobacter choococcum, which are a type of aerobic free-living soil bacteria that capture nitrogen from the air and are used as a product of their livelihoods. When they are decomposed in the soil, nutrients available to plants are formed. In soil, bacteria can be used as a source of energy of carbon compounds: mono- and disaccharides, which they oxidize to carbon dioxide, as well as alcohols, salts of organic and even aromatic acids. The beneficial effect of Biomag on plants is due to two factors: its ability to absorb molecular nitrogen from the air and synthesize various biologically active substances such as phytohormones, groups of organic acids and amino acids. Performance of the bacterial preparatoin Biomag is increased when combined with trace elements Mo, B, Co and Mg.

" Rostok kukurudza " (Table 1) is a complex fertilizer based on complexing acid (EDTA), was introduced at a rate of 3.0 l / ha.

Table 1. Characteristics of the chemical composition of the micronutrient " Rostok kukurudza "

Microfertilizer	Composition of microfertilizer, g / l								
	N	MgO	SO_3	Fe	Mn	B	Zn	Cu	Mo
«Rostok kukurudza»	80	42	26	4,2	4,2	2,2	22	1,5	0,1

"Vympel"- the growth regulator of plants was introduced at normal 1.5 l / ha. The active ingredient of the vimpole is: cryopolyethylene oxide 400 (230 g / kg), polyethylene oxide 1500 (540 g / kg), humic acid salts (sodium humate 3 g / kg), succinic acid (3 g / kg). It consists of a unique amber-humate chelating complex that contains all the necessary trace elements of the plant.

"Ecolistmonozink" - Zn (112 g / l) the rate of application of 2 l / ha - zinc concentrate in the form of EDTA chelate. Contains 6.0% nitrogen, 4.0% sulfur and 8.0% zinc in its composition.

The climatic conditions for years of research turned out to be different from the middle-aged. So, characterizing the climatic conditions of 2011, it should be noted that the first frosty cold weather in the first or second decade of April limited the use of the early term of sowing hybrids of corn. In the month of May, there was an increase in temperature and deficiency of rainfall, which significantly affected the germination of seeds. Subsequently, the weather conditions of this year differed little from the average annual and were favorable for the growth and development of corn. In 2012, very high temperatures in April-May have created unfavorable agro-climatic conditions for the growth and development of corn. The decrease in the amount of precipitation during the period of wax-full ripeness contributed to the intense moisture content of corn grain. In the second and third decades of April 2013, a sharp increase in temperature was observed and there was a lack of moisture. In the future, the climatic conditions of 2013 were little different from the perennials and were favorable for the growth and development of corn.

The seeding was carried out using a sowing machine Supern-8, with a seeding rate of 75 thousand units. seed per hectare. Repetition in experiments for hybrids - 3-4 times. Placement of sites - by the method of renamed blocks. The area of the sown area is 25 m^2, the registration area is 10.5 m^2.

Determination of linear measurements of plants: the total height and attachment of the cob, the number of cobs, as well as the structural analysis of the crop (10 cobs in each repetition), were carried out according to generally accepted methods for corn [8-10].

Research results

In the course of the study, the influence of foliar nutrition by microfertilizers "Ecolistmonozink", "Rostok kukurudza," the plant growth regulator Vympel and bacterial preparation "Biomag" on the number of normally formed cobs on corn plant were studied.

Characteristics of early ripening hybrids of corn on the number of normally formed cobs depending on the application of foliar feeding are given in Table 2.

Table 2. Influence of foliar feedings on the number of cobs in early-ripening corn hybrids, pc. (for 2011-2013 ± Sr)

Hybrid (A)	Foliar feeding (B)	Number of feedings (C)	Number of cobs, psc.			
			2011 p.	2012 p.	2013 p.	Average, ± Sr
Kharkivskiy 195 MB	Control (without fertilizers)	-	1,0	1,0	1,0	1,0±0,0
	Biomag	I*	1,0	1,1	1,0	1,0±0,1
		II*	1,0	1,1	1,0	1,0±0,1
	Ecolistmonozink	I*	1,0	1,1	1,0	1,0±0,1
		II*	1,0	1,1	1,0	1,0±0,1
	Rostok kukurudza	I*	1,0	1,1	1,0	1,0±0,1
		II*	1,0	1,1	1,0	1,0±0,1
	Vympel	I*	1,0	1,1	1,0	1,0±0,1
		II*	1,0	1,1	1,0	1,0±0,1

DKS 2960	Control (without fertilizers)	-	1,1	1,0	1,2	1,1±0,1
	Biomag	I*	1,1	1,0	1,2	1,1±0,1
		II*	1,1	1,0	1,2	1,1±0,1
	Ecolistmonozink	I*	1,1	1,1	1,3	1,2±0,1
		II*	1,1	1,1	1,3	1,2±0,1
	Rostok kukurudza	I*	1,1	1,1	1,2	1,1±0,1
		II*	1,1	1,1	1,2	1,1±0,1
	Vympel	I*	1,1	1,0	1,2	1,1±0,1
		II*	1,1	1,0	1,2	1,1±0,1
DKS 2949	Control (without fertilizers)	-	1,1	1,0	1,0	1,0±0,1
	Biomag	I*	1,1	1,1	1,0	1,1±0,1
		II*	1,1	1,1	1,0	1,1±0,1
	Ecolistmonozink	I*	1,2	1,1	1,0	1,1±0,1
		II*	1,2	1,2	1,0	1,1±0,1
	Rostok kukurudza	I*	1,1	1,1	1,0	1,1±0,1
		II*	1,1	1,1	1,0	1,1±0,1
	Vympel	I*	1,1	1,1	1,0	1,1±0,1
		II*	1,1	1,1	1,0	1,1±0,1
DKS 2971	Control (without fertilizers)	-	1,1	1,1	1,1	1,1±0,0
	Biomag	I*	1,1	1,2	1,1	1,1±0,1
		II*	1,1	1,2	1,1	1,1±0,1
	Ecolistmonozink	I*	1,1	1,2	1,1	1,1±0,1
		II*	1,1	1,2	1,1	1,1±0,1
	Rostok kukurudza	I*	1,1	1,2	1,1	1,1±0,1
		II*	1,1	1,2	1,1	1,1±0,1
	Vympel	I*	1,1	1,1	1,1	1,1±0,0
		II*	1,1	1,1	1,1	1,1±0,0
LSD_{05} ***, psc.		Factor A – 0,04; Factor B – 0,04; factor C – 0,03.				-

Note: * - a single feeding of the preparation into the phase of 5-7 leaves of corn;

** - two-time feeding of the preparation in the phase of 5-7 and 10-12 leaves of corn;

*** - a dispersion analysis in equation for uniform dispersions is made

****for the determination of the significance of the options for foliar feeding.

Analyzing the data in Table 2, it should be noted that in the group of early hybrids, the number of normally developed cob per plant varied from 1.0 to 1.17 units. Thus, in particular, on average for three years, the number of cobs in the hybrid (factor $_{ALSD05\ hybrid\ =\ 0,04\ pieces}$) Kharkivskiy 195MV was 1.03 pieces, DKS 2960 - 1.12 pieces, DKS 2949 - 1.07 pieces . and DKS 2971 - 1.12 pcs.

Carrying out of root crops (factor $B_{LSD\ 05\ Foliar\ fertilization\ =\ 0.04\ pcs.}$) Did not significantly affect the growth of the number of normally formed cobs, and on average for three years the number of cobs was: Kharkivskyi 195MV - 1.03 pcs., DKS 2960 - 1, 13 pcs., DKS 2949 - 1,08 and DKS 2971 - 1,13 pcs. On the control (without feeding) the number of formed swaths in the early-hybrid hybrids was Kharkivskyi 195MV - 1.0 pcs., DKS 2960 - 1.10 pcs., DKS 2949 - 1.03 and DKS 2971 - 1.10 pc. That is, the application of foliar feedings, although it provides an increase in the number of molds formed on the plant, but this growth is not significant and is below the LSD significance, except for the DKS 2949 hybrid, whose growth rate is 0.05 pcs.

Regarding the number of extra-root infusions (the factor $C_{LSD05\ the\ number\ of\ foliar\ feedings\ =\ 0,03\ psc}$), the application of one and two extracorporeal feedings to the phase of 5-7 and 10-12 leaves of maize has the number of

cobs, the average for three years of research was the same and amounted to: Kharkivskyi 195MV - 1,03 pcs., DKS 2960 - 1,13 pcs., DKS 2949 - 1,08 and DKS 2971 - 1,13 pcs. That is, the number of foliar feedings does not affect the number of formed corncobs.

In the middle aged group of maize hybrids, there was also a significant difference between the number of normally formed cobs and the genetic features of a particular hybrid.

Characteristics of medium-early corn hybrids by the number of cobs depending on foliar nutrition are given in Table 3.

Table *3.* Influence of foliar feedings on the number of cobs in medium-early corn hybrids, pc. (for 2011-2013 ± Sr)

Hybrid (A)	Foliar feeding (B)	Number of feedings (C)	Number of cobs, psc.			
			2011 p.	2012 p.	2013 p.	Average, ± Sr
DKS 3472	Control (without fertilizers)	-	1,2	1,2	1,2	1,2±0,0
	Biomag	I*	1,2	1,2	1,2	1,2±0,0
		II*	1,2	1,3	1,2	1,2±0,1
	Ecolistmonozink	I*	1,3	1,3	1,3	1,3±0,0
		II*	1,3	1,3	1,3	1,3±0,0
	Rostok kukurudza	I*	1,2	1,3	1,3	1,3±0,1
		II*	1,2	1,3	1,3	1,3±0,1
	Vympel	I*	1,2	1,2	1,2	1,2±0,0
		II*	1,2	1,2	1,2	1,2±0,0
DKS 3420	Control (without fertilizers)	-	1,3	1,0	1,1	1,1±0,2
	Biomag	I*	1,3	1,0	1,1	1,1±0,2
		II*	1,3	1,0	1,1	1,1±0,2
	Ecolistmonozink	I*	1,3	1,0	1,1	1,1±0,2
		II*	1,3	1,0	1,1	1,1±0,2
	Rostok kukurudza	I*	1,3	1,0	1,1	1,1±0,2
		II*	1,3	1,0	1,1	1,1±0,2
	Vympel	I*	1,3	1,0	1,1	1,1±0,2
		II*	1,3	1,0	1,1	1,1±0,2
Pereyaslavsky 230SV	Control (without fertilizers)	-	1,1	1,0	1,1	1,1±0,1
	Biomag	I*	1,1	1,0	1,1	1,1±0,1
		II*	1,1	1,0	1,1	1,1±0,1
	Ecolistmonozink	I*	1,1	1,0	1,2	1,1±0,1
		II*	1,1	1,0	1,2	1,1±0,1
	Rostok kukurudza	I*	1,1	1,0	1,2	1,1±0,1
		II*	1,1	1,0	1,2	1,1±0,1
	Vympel	I*	1,1	1,0	1,1	1,1±0,1
		II*	1,1	1,0	1,1	1,1±0,1
DKS 3871	Control (without fertilizers)	-	1,2	1,0	1,0	1,1±0,1
	Biomag	I*	1,2	1,0	1,0	1,1±0,1
		II*	1,2	1,0	1,0	1,1±0,1
	Ecolistmonozink	I*	1,2	1,1	1,1	1,1±0,1
		II*	1,2	1,1	1,0	1,1±0,1
	Rostok kukurudza	I*	1,2	1,1	1,0	1,1±0,1
		II*	1,2	1,1	1,1	1,1±0,1
	Vympel	I*	1,2	1,0	1,1	1,1±0,1
		II*	1,2	1,0	1,0	1,1±0,1
LSD_{05}***, psc.		Factor A – 0,05; Factor B – 0,05; factor C – 0,03.				-

Note: * - a single feeding of the preparation into the phase of 5-7 leaves of corn;

** - two-time feeding of the preparation in the phase of 5-7 and 10-12 leaves of corn;

*** - a dispersion analysis in equation for uniform dispersions is made.

From the data in Table 3, it is evident that the number of normally formed cats per plant, on average for three years, in hybrids of the middle-aged group (factor $A_{LSD\ 05\ hybrid\ =\ 0.05\ pieces}$) was DKS 3472 - 1.24 pieces, DKS 3420 - 1, 13 pcs., Pereyaslavsky 230SV - 1,08 pc. and DKS 3871 - 1.09 pcs. That is, the largest number of cobs form such hybrids middle-aged group of ripeness, such as DKS 3472 and DKS 3420.

Conducting of foliar feeding (factor $B_{LSD\ 05\ foliar\ fertilization\ =\ 0,05\ pc.}$) did not provide a significant increase in the number of cobs. So the number of cobs in control (without feeding) in the middle-hybrid group, on average for three years, was DKS 3472 - 1,20 psc, DKS 3420 - 1,13 pieces, Pereyaslavsky 230CB - 1,07 pieces. and DKS 3871 - 1,07 pcs., and in the case of foliar feeding - 1,25 pcs., 1,13 pcs., 1,08 and 1,1 pc respectively.

As for the number of foliar feeding crops (factor $C_{LSD\ 05,\ the\ number\ of\ foliar\ feedings\ =\ 0.03\ pc.}$), It should be noted that for the hybrid DKS 3472, a one-time foliar feeding to a 5-7 leaf corn ensures the formation of 1.24 cobs, and a double phase 5-7 and 10-12 leaves - 1.25 pots, DKS 3420 - 1.13 and 1.3 pcs., Pereiaslavsky 230CB - 1.08 and 1.08 pcs., DKS 3871 - 1.10 and 1, 09 pcs. That is, an increase in the number of foliar feeding does not provide a significant increase in the number of normally formed cobs per plant.

The corn hybrids of the middle-ripening groups had for the years studied the largest number of normally formed cobs (1.24 pcs.), compared with early-middle and medium corn hybrids.

The number of normally formed corncobs depending on the results of foliar feedings in the group of middle-ripening hybrids is presented in Table 4.

Table *4.* Influence of foliar feedings on the number of cobs in middle-ripening corn hybrids, pc. (for 2011-2013 ± Sr)

Hybrid (A)	Foliar feeding (B)	Number of feedings (C)	Number of cobs, psc.			
			2011 p.	2012 p.	2013 p.	Average, ± Sr
DK 391	Control (without fertilizers)	-	1,3	1,2	1,3	1,3±0,1
	Biomag	I*	1,3	1,2	1,4	1,3±0,1
		II*	1,3	1,2	1,4	1,3±0,1
	Ecolistmonozink	I*	1,3	1,2	1,5	1,3±0,2
		II*	1,3	1,2	1,5	1,3±0,2
	Rostok kukurudza	I*	1,3	1,2	1,4	1,3±0,1
		II*	1,3	1,2	1,5	1,3±0,2
	Vympel	I*	1,3	1,2	1,4	1,3±0,1
		II*	1,3	1,2	1,4	1,3±0,1
DK 440	Control (without fertilizers)	-	1,4	1,2	1,2	1,3±0,1
	Biomag	I*	1,4	1,2	1,3	1,3±0,1
		II*	1,4	1,2	1,3	1,3±0,1
	Ecolistmonozink	I*	1,4	1,3	1,4	1,4±0,1
		II*	1,4	1,3	1,4	1,4±0,1
	Rostok kukurudza	I*	1,4	1,2	1,4	1,3±0,1
		II*	1,4	1,2	1,4	1,3±0,1
	Vympel	I*	1,4	1,2	1,2	1,3±0,1
		II*	1,4	1,2	1,3	1,3±0,1
DKS 4964	Control (without fertilizers)	-	1,3	1,1	1,2	1,2±0,1
	Biomag	I*	1,3	1,1	1,2	1,2±0,1
		II*	1,3	1,1	1,2	1,2±0,1
	Ecolistmonozink	I*	1,3	1,1	1,3	1,2±0,1
		II*	1,4	1,1	1,3	1,3±0,2
	Rostok kukurudza	I*	1,3	1,1	1,3	1,2±0,1
		II*	1,3	1,1	1,3	1,2±0,1
	Vympel	I*	1,3	1,1	1,2	1,2±0,1
		II*	1,3	1,1	1,2	1,2±0,1

DK 315	Control (without fertilizers)	-	1,1	1,1	1,0	1,1±0,1
	Biomag	I*	1,1	1,2	1,1	1,1±0,1
		II*	1,1	1,2	1,1	1,1±0,1
	Ecolistmonozink	I*	1,1	1,2	1,1	1,1±0,1
		II*	1,1	1,2	1,1	1,1±0,1
	Rostok kukurudza	I*	1,1	1,2	1,1	1,1±0,1
		II*	1,1	1,2	1,1	1,1±0,1
	Vympel	I*	1,1	1,1	1,0	1,1±0,1
		II*	1,1	1,1	1,0	1,1±0,1
LSD_{05} ***, psc..		Factor A – 0,05; Factor B – 0,05; factor C – 0,03.				-

Note: * - a single feeding of the preparation into the phase of 5-7 leaves of corn;

** - two-time feeding of the preparation in the phase of 5-7 and 10-12 leaves of corn;

*** - a dispersion analysis in equation for uniform dispersions is made.

The number of cobs, which was formed in middle-ripening corn hybrid, was DK 391 and DK 440- 1.31 in average for three years (factor $A_{LSD\ 05\ hybrid\ =\ 0.05\ pieces}$), DKS 4964 - 1.22 pieces. and DK 315 - 1.11 pcs.

In the case of foliar feedings (factor B $_{LSD\ 05,\ root\ feeding\ =\ 0.05\ pc.}$), The number of normally formed cobs in a group of mid-ripening corn hybrids, on average over three years, was DK 391 - 1.31 pcs., DK 440- 1.32 pc ., DKS 4964 - 1.22 pc. and DK 315 - 1.12 pcs., while the number of cobs in the control (without feeding) was 1.27 pcs., 1.27 pcs., 1.20 pieces and 1.07 pc, respectively.

The number of foliar feeding (factor C $_{LSD\ 05\ number\ of\ foliar\ feedings\ =\ 0,03\ pcs.}$) Provided an increase in the number of formed cobs at 0.01-0.05 pc. in comparison with control.

According to M. Dudka and V. Churchill [11], an increase in the number of cobs in the application of foliar feeding is 11.5-12.8%, as compared with control. That is, the data obtained by other scientists regarding the relationship between the number of normally formed cobs and carried out foliar nutrition are confirmed by the results of the research.

Conclusions:

The largest number of cobs was noted in the group of middle-ripening hybrids - 1.24 pcs., whereas in the early- ripening hybrids it was 1.09 pcs., and in the middle ripening - 1.14 pcs., on average over the years of research.

The number of normally formed cobs depended significantly on the genetic characteristics of each hybrid, the largest number of cobs in the group of early- ripening hybrids was noted in DKS 2960 and DKS 2971 - 1.13 p, in the group of medium-term ripening hybrids - DKS 3472 1.24 pieces and DX 3420 - 1.13 pcs. and in the group of mid-late ripening hybrids - DK 391 and DK 440 - 1.31 pcs.

The cultivation of foliar feedings provided for an increase in the number of normally developed cobs, compared with a control of 0.01-0.05 units, but this growth was below the smallest significant difference.

An increase in the number of foliar infusions by microfertilizers, plant growth regulator and bacterial preparation on the growth of the number of cobs per plant.

The most significant growth of cobs on the plant (0,03-0,1 pc.), as compared with control, was established on the variant where the microfetilizer "Ekolistmonozink" was introduced.

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