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THE REPORT

ON THE SCIENTIFIC AND RESEARCH WORK

«Study of the micronutrient fertilizer of “Nanoagricole”, LTD in 2010»

Head of research,
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Crop and Plant Variety Study

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Харків 2010

1. Scheme of establishment and methodology of performing the research.

In 2010 researches on studying microfertilizer Nanoagricole were held on the base **The State Enterprise Experimental Facility(SEEF) “Elitne” of The Plant Production Institute nd. a. V. Ya. Yuryev of NAAS** by scientific researchers of Laboratory of Crop and Variety Study. According to this there were established researches on studying efficiency of using the microfertilisers on the following crops:

1. winter wheat variety Doskonala;
2. sunflower hybrid Yason;
3. sugar beets hybrid Boruta;
4. pea variety Tzarevych;

The researches were established in accordance with methods of State Variety Testing (Kiev, 2002) and were performed accordingly to the demands of field research methods виконувались згідно вимог методики польового досліджу (B.O.Dospehov, 1985).

Spraying fo crops were performed once or twice, and also treatment of seed material.

Preceding crop: for winter wheat - pea grain; sunflower - spring cereals; soybeans and sugar beets - spiked cereal; for barley - spring rape.

Soil of the research plot is the typical powerful medium black earth which is characterised as following: humus content in the plowing layer is 5,0 — 5,25%; pH of salt extract is 6,0 — 6,5. Before establishing the experiments levels of nitrogen in the soil was 17,2; mobile phosphorus — 8,6; exchangeable potassium — 11,5 mg/eq. Per 100 g of soil. The main soil treatment consisted of plowing to a depth of 20-22 cm for the spring rape and sunflower and surface cultivation (double disking) for winter wheat, early spring harrowing and pre-sowing cultivation to a depth of seeding-down.

Seeding of all the experiments was carried out in accordance with the agronomic requirements (total area - 32,4 m², record plot - 25,0 m²). Seeding was conducted with the drill CH-16M to a depth of 4 - 5 cm, followed by seed rolling with rollers ZKKSH-6, sunflower sowing — with drill SUPN-8, the record plot of corn and sunflower was 50,0 m².

The plant protection products used: herbicide Calibre (50 g/ha), Karate Zeon - 200 g/ha, Alto - super — 0,4 l/ha; Decis profi - 40 g/ha; Nurel D — 1.0 l/ha.

WEATHER CODITIONS OF AUTUMN AND SUMMER PERIOD 2010.

Decade	Long-term average annual				Air temperature, °C			The sum of effective temperatures, °C	The amount of precipitation, mm
	Average daily air temperature, °C	The sum of average daily temperatures, °C	The sum of effective temperatures, °C	The amount of precipitation, mm	Average daily	maximal	minimal		
1	2	3	4	5	6	7	8	9	10
September 2009.									
1	17,2			15,7	19,0	28,4	12,3	89,5	13,7
2	14,3			14,1	17,5	25,5	4,4	75,4	2,7
3	12,0			13,7	14,0	24,0	4,0	40,5	3,3
Aor the month	14,5	439	117,2	43,5	16,8	28,0	4,0	205,4	19,7
October 2009.									
1	9,8			12,2	10,2	18,6	1,2	19,5	4,0
2	8,3			13,2	12,1	20,5	4,1	21,7	24,6
3	4,5			13,8	6,5	15,3	-3,6	7,7	70,2
For the month	7,5			39,2	9,6	20,5	-3,6	39,9	98,8
November 2009.									
1	2,1			7,0	1,1	7,0	-6,9		2,1
2	0,6			18,1	5,9	9,6	0,8		43,9

3	-0,9			17,9	6,3	9,6	1,9		1,8
For the mont h	0,6			43,0	4,4	9,6	-6,9		47,8
1	2	3	4	5	6	7	8	9	10
December 2009 p.									
1	-2,9			11,7	0,9	9,0	-5,4		5,0
2	-3,7			18,3	-11,1	-2,0	-23,2		21,4
3	-4,6			13,5	-1,8	4,6	-16,0		61,3
For the mont h	-3,7			43,5	-4,0	9,0	-23,2		87,7
January 2010.									
1	-5,5			11,9	-5,5	2,0	-20,2		28,0
2	-7,3			12,7	-8,6	0,5	17,9		6,8
3	-6,8			13,7	-14,7	1,2	-26,8		10,5
For the mont h	-6,5			38,3	-9,6	2,0	-26,8		45,3
February 2010.									
1	-6,6			9,0	-6,8	2,2	-17,6		14,6
2	-6,0			13,1	-4,1	2,0	-12,5		33,4
3	-4,7			8,4	-0,7	4,2	-6,1		8,0

For the month	-5,8			30,5	-3,9	4,2	-17,6		56,0
March 2010.									
1	-2,7			7,8	-1,9	4,6	-11,4		4,9
2	0,4			9,3	-1,8	7,0	-10,8		6,7
3	2,7			11,2	4,2	13,0	-2,8		2,5
For the month	-0,3			28,3	0,2	13,0	-11,4		14,1
April 2010.									
1	7,4			14,2	9,1	16,8	2,8	3,1	4,3
2	9,0			12,4	10,9	19,8	2,7	12,4	6,1
3	12,3			8,9	10,9	18,6	1,3	14,4	3,0
For the month	9,6	287	42,2	35,5	10,3	19,8	1,3	29,9	13,4
May 2010.									
1	14,9			13,2	18,7	28,4	10,0	87,0	19,9
2	16,6			11,7	17,8	24,4	11,5	78,3	33,6
3	16,7			18,8	16,7	25,4	8,9	73,4	9,5
For the month	16,1	482	142,8	43,7	17,7	28,4	8,9	238,7	63,0
June 2010.									
1	2	3	4	5	6	7	8	9	10

1	19,8			13,4	21,2	30,4	12,7	112,4	14,1
2	20,0			25,1	22,3	34,0	11,4	122,9	10,6
3	20,7			24,8	24,9	34,2	19,4	149,1	1,3
For the month	20,2	605	275,0	63,3	22,8	34,2	11,4	384,4	26,0
July 2010.									
1	21,0			19,5	23,4	31,4	16,3	134,0	31,6
2	21,6			25,0	25,6	35,3	18,0	156,0	42,3
3	21,5			27,2	25,1	36,0	17,1	166,5	28,3
For the month	21,4	641	346,7	71,7	24,7	36,0	16,3	456,5	102,2
During March-July	13,1	2005	806,7	242,5	15,1	36,0	-11,4	1109,5	218,7
August 2010.									
1	21,9			11,1	28,9	39,1	20,9	188,8	0,0
2	20,8			19,0	27,0	37,8	16,6	168,9	0,0
3	19,1			16,8	20,3	31,9	10,4	113,4	14,7
For the month	20,6	638,6	282,0	46,9	25,4	39,1	10,4	471,1	14,7

During April-August	17,0	3093	1206	305	20,2	39,1	1,3	1580,6	219,3
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Meteorological conditions of the vegetation period of the research.

Weather conditions of autumn 2009 were warm and dry. Thus, the average daily air temperature in September was 16,8 ° C at a norm of 14,5 ° C, in October and November, the air temperature was above the norm by 2,1 and 3,8 ° C, respectively. The amount of precipitation in September was less than long-term average of 23,8 mm, and in October and November on the contrary was more by 59,6 and 4,8 mm, respectively to the months.

The average daily temperature in December was close to normal (-4 ° C), in January it was below the norm by 3,1 ° C, above normal in February for 1,9 ° C. The amount of precipitation in December 2009 exceeded the norm by 44, 2 mm, in January 2010 — by 7 mm, in February — by 25,5 mm.

The beginning of spring was wet enough, but warm. Thus, the amount of precipitation in March (21,2 mm) was close to normal, and daily average air temperature was above normal (0,7°C against -0,3°C). In April, the temperature readings were close to normal (10,1°C) and the amount of precipitation was below normal by 12 mm. May can be described as warm air temperature and excessive moistening. The main amount of precipitation in May fell in the second decade (40 mm).

Drought conditions in the summer noted during all the summer months. Average daily air temperature was above normal in June by 2,6 ° C, in July by 3,3 ° C, in August by 4,8 ° C. The amount of precipitation was below normal in June by 37,3 mm in August by 32,2 mm, which had a negative impact on the formation and ripening of grain.

The first decade of July exceeded indicators of the long-term average daily air temperature by 2,4 ° C, and rainfall was by 12,1 mm.

In general, during spring and summer (March — the first decade of July) the vegetation season can be described as dry, rainfall was less by 9,8% than the norm, and warm: average daily air temperature was above the norm by 2,0 ° C.

Average daily temperature in September was 16,8 ° C at a norm of 14,5 ° C, in October and November the air temperature was above normal by 2,1 and 3,8 ° C, respectively. The amount of precipitation in September was less than the multiyear averages by 23,8 mm, and in October and November on the contrary — more by 59,6 and 4,8 mm, respectively.

FINDINGS WINTER WHEAT

In the experiment with winter the wheat variety Doskonala was sown. Tillage was double disking with BDT-7, presowing cultivation to a depth of seed-down. The experiments were carried out in a fixed 9-crop rotation. The effect of micronutrients on yield of winter wheat was researched.

Spraying of winter wheat crops with microfertilizers was carried out in phases: spring tillering and starting of ear formation. Flow rate of the working solution was (1: 100) - 200 l/ha.

The microfertilizers had positive effect on the ratio of productive tillering of winter wheat plants in fertilized background. However, in the background without fertilizer rates were lower than the control without treatment (Table. 1).

Table 1

Tillering and plant height of winter wheat varieties Doskonala depending on the crops processing with the preparation Nanoagricole, 2010.

Treatment option	Nutrition background	Number of plants, million pcs./ha	Number of sproutings, million pcs./ha	Coefficient of the total tillering	Coefficient of productive tillering
Control	Without fertilizers	1,12	4,24	2,79	2,56
	Aftereffect of manure+	1,36	5,24	2,98	2,43

	N ₆₀ P ₆₀ K ₆₀				
1st spraying	Without fertilizers	1,48	5,44	3,68	2,62
	Aftereffect of manure + N ₆₀ P ₆₀ K ₆₀	1,68	8,60	5,12	3,60
± before control	Without fertilizers	0,36	1,20	0,89	0,06
	Aftereffect of manure + N ₆₀ P ₆₀ K ₆₀	0,32	3,36	2,14	1,17
2nd spraying	Without fertilizers	2,00	6,80	4,40	2,68
	Aftereffect of manure + N ₆₀ P ₆₀ K ₆₀	2,08	6,80	4,78	2,96
± before control	Without fertilizers	0,88	2,56	1,61	0,12
	Aftereffect of manure + N ₆₀ P ₆₀ K ₆₀	0,72	1,56	1,80	0,53

According to the research, it was defined that a single spraying with the drug Nanoagricole in crop rotation background (without fertilizer) helped to improve the yield of winter wheat by 1,79 t/ha (89,9%), while double spraying the crops — 0,55 t/ha (27,6%). While growing winter wheat on background with N₆₀P₆₀K₆₀ large increase in yield of winter wheat was also obtained in the variant with a single spraying of crops — 1,24 t/ha (51,7%). Double treatment of crops with the microfertilizers enhanced the yield of winter wheat by 0,58 t/ha (24,2%) (Table. 2). The second treatment took place at the anomalous heat as for this area.

Table 2

Yields of winter wheat varieties Doskonala depending on the treatment with Nanoagricole and mineral nutrition, t/ha in 2010.

Treatment option	Without fertilizers	N ₆₀ P ₆₀ K ₆₀	±
Control	1,99	2,40	0,41
1st spraying	3,78	3,64	-0,14
± before control	1,79	1,24	

<i>Increase before control, %</i>	89,9%	51,7%	
2nd spraying	2,54	2,98	0,44
<i>± before control</i>	0,55	0,58	
<i>Increase before control, %</i>	27,6%	24,2%	

That is, under abnormal conditions of 2010 on winter wheat crops more efficient was single spraying with the microfertilizers Nanoagricole.

SUNFLOWER

Sunflower is the main oil crop in Ukraine. In the conditions of 2010 the impact of the micronutrient fertilizer on productivity of sunflower of hybrid Yason.

In an option without the use of chemical fertilizers the treatment of crops with Nanoagricole contributed to higher yields of sunflower provided twice spraying at 0,28 t/ha (27,5%). A single spraying and seed treatment effected on the yield of sunflower was less significant. On the background of putting $N_{30}P_{30}K_{30}$ treatment of sunflower with the microfertilizers in difficult weather conditions in 2010 (air and soil drought) was less effective 0,28 t/ha or 21,7% (Table. 3).

Table 3

Productivity of sunflower hybrid Jason depending on treatment with Nanoagricole and mineral nutrition, t/ha, 2010.

Treatment option	Without fertilizers	$N_{30}P_{30}K_{30}$	\pm
Control	1,02	1,29	0,27
Seed treatment	1,17	1,42	0,52
<i>± before control</i>	0,15	0,13	
<i>Increase before control, %</i>	14,7%	10,1%	
1st spraying	1,19	1,43	0,22
<i>± before control</i>	0,17	0,14	
<i>Increase before control, %</i>	16,7%	11,0%	
2nd spraying	1,30	1,57	0,07
<i>± before control</i>	0,28	0,28	

<i>Increase before control, %</i>	<i>27,5%</i>	<i>21,7%</i>	
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SUGAR BEETS

The study of the effect of micronutrients on yield of sugar beet was carried out on hybrid Boruta.

It was defined that the most effective treatment options in conditions of 2010 was single spraying of sugar beet crops. On unfertilized background increment of root yield was 10,5 t/ha or 21,2% (Table. 5).

Table 5

Yield of sugar beet hybrid Boruta depending on the treatment with Nanoagricole and mineral nutrition, t/ha in 2010.

Treatment option	Without fertilizers	N ₆₀ P ₆₀ K ₆₀ plowing	N ₆₀ P ₆₀ K ₆₀ chisel plowing
Control	49,5	60,5	44,5
1st spraying	59,0	75,5	57,5
<i>± before control</i>	<i>10,5</i>	<i>15,0</i>	<i>13,0</i>
<i>Increase before control, %</i>	<i>21,2%</i>	<i>24,8%</i>	<i>29,2%</i>

On the background of mineral fertilizers in a dose N₆₀P₆₀K₆₀ (with option of tillage — plowing) spraying of sugar beet crops with Nanoagricole preparation enhanced their productivity by 15 t/ha (24,8%). By chisel plowing of sugar beet the yield increment was up to 13,0 t/h (29,2%).

PEA

The effect of the preparation Nanoagricole on the yield of pea variety Tzarevych. It's defined that treatment of seeds with microfertilizers significantly contributed to increasing the yield of pea (tab. 6). Very successful treatment option with a drug Nanoagricole in conditions of 2010 was a single spraying of peas crops. Yield increment of pea in this option ranged from 0,32 t/ha (14,5%) due to the aftereffect of manure to 0,77 t/ha (40.5%) on the background of putting N₆₀P₆₀K₆₀.

Double spraying of pea crops with the microfertilizers also contributed to the increase in the yield of peas, but almost by the same parameters 19,4-36,8%. The greatest increase in grain yield in this option was obtained when adding $N_{60}P_{60}K_{60}$ (0,70 t/ha or 36,8%). Yield increment on the background of aftereffect of manure was only 14,5-19,4% due to high levels of trace elements in the soil. Option with the seed treatment and a single spraying of crops was effective only on the background of fertilizer application in a dose $N_{60}P_{60}K_{60}$ (increment of 0,68 t/ha or 35,8%).

Таблиця 6

Yields of pea variety Tzarevych depending on the treatment with Nanoagricole preparation and mineral nutrition, t/ha, 2010.

Treatment option	Without fertilizers	Manue 30 t/ha (aftereffect) - background	Background d + $N_{30}P_{30}K_{30}$	Background + $N_{60}P_{60}K_{60}$
Control	1,86	2,22	2,11	1,90
1st spraying	2,26	2,54	2,66	2,67
<i>± before control</i>	0,40	0,32	0,55	0,77
<i>% before control</i>	21,5%	14,5%	26,1%	40,5%
2nd spraying	2,43	2,65	2,59	2,60
<i>± before control</i>	0,57	0,43	0,48	0,70
<i>% before control</i>	30,6%	19,4%	22,8%	36,8%

CONCLUSION

1. A single spraying of crops with the solution Nanoagricole on crop-rotation background (without fertilizer) helped to improve the yield of winter wheat by 1,79 t/ha (89,9%), while at double spraying of crops — 0,55 t/ha (27,6 %).

2. When growing winter wheat on background of $N_{60}P_{60}K_{60}$ the increment of grain yield of winter wheat was also obtained in the variant with a single spraying of crops (1,24 t/ha or 51,7%). Double treatment of crops with the microfertilizers enhanced the yield of winter wheat by 0,58 t/ha (24.2%).
3. In an option without the use of mineral fertilizers the Nanoagricole treatment of crops contributed to higher yields of sunflower provided twice spraying at 0,28 t/ha (27,5%). A single spraying and seed treatment effected on the yield of sunflower less significantly.
4. On the background of applying mineral fertilizers in a dose $N_{60}P_{60}K_{60}$ (tillage option — plowing) spraying of sugar beet crops with the drug Nanoagricole enhanced their productivity by 10,5-15,0 t/ha. By chisel tillage sugar beet yield increment was increased up to 13 t/ha (29,2%).
5. The best treatment option with the solution Nanoagricole in the conditions of 2010 was a single spraying of pea crops. Pea yield increment in this option ranged from 0,32 t/ha (14,5%) due to the aftereffect of manure to 0,77 t/ha (40,5%) on the background of adding $N_{60}P_{60}K_{60}$. The biggest increment in grain yield was obtained with double treatment and on the background of $N_{60}P_{60}K_{60}$ (0,70 t/ha or 36,8%).