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INFLUENCE OF THE USE OF FERTILIZERS ON THE CONTENT OF NUTRIENTS IN THE SOIL, YIELD AND QUALITY OF SPRING WHEAT

L.I. Mazurkevich - Candidate of Agricultural Science,

National University of Life and Environmental Sciences of Ukraine

Research has established that the systematic application of fertilizers in the grain and beet crop rotation causes a noticeable change in nutrient content of soil quality indicators and yield of wheat early Spring -93

Spring wheat, harvest, crop nutrients, fertilizers .

Introduction. The development of grain market in Ukraine depends on the grain industry, which is leading for most agricultural enterprises of various types. So, crops sown annually more than 40% of arable land.

In the last 8-10 years, the death of winter wheat due to unfavorable conditions of wintering each year was 1.5-2 million / ha, and in 2002-2003, about 5 million / ha, which required immediate increase in spring wheat crops . According to calculations of scientists NAASU , crops of spring wheat in Ukraine are as high as 1 million hectares. , Including soft -650 ha. , solid 350 - ha, including 30% in the southern steppe regions and 70% in the central, eastern and north- eastern. The level of yield of spring wheat and grain quality is largely dependent on the use of productive varieties, high technologies.

Ukraine has grown mainly winter wheat, and spring is a small area. Spring wheat gives lower (10-15 %) yields than winter , but modern varieties of spring wheat yield can provide 30-50 kg / ha and more.

Spring wheat needs moisture. When the soil moisture in the plow layer, especially during tillering, increases tillering and power of plants.

Spring wheat due to undeveloped root system, a short growing season and high removal of soil nutrients on the formation of 1 kg of grain (N - 3,5 kg P2O5 - K2O and 1.2 - 3.2 - 3.4 kg) is a choosy to the soil. The best thing for her is fertile and free from weeds black and brown soils with neutral and weak acid reaction of soil solution (pH 6 - 7.5). The growing season of wheat varieties is 85 - 105, solid 110-120 days. [4]

The need of spring wheat in some chemical elements in different periods of growth and development varies. In spring wheat observed two periods of amplified nitrogen nutrition : early growth and during grain filling . The lack of nitrogen in the first period leads to a reduction in yield , and the second - to a marked deterioration of grain quality . With a lack of nitrogen nutrition ear size is significantly reduced [15].

Normal fertilization is determined by many factors. In the forest-steppe zone on ashed humus and dark gray forest soils is recommended to bring N45- 60 R45 -60 K45 -60 , in gray and light gray - N50- 70R50 - 70K50 -70 on sod- calcareous soils marshy woodlands - N60-90P60- 90K60 -90.

For spring wheat with high protein content is necessary to ensure an adequate level of phosphorus and potassium nutrition and high levels of nitrogen nutrition. When applying fertilizer only in Pre- term, even with their high standards is not always possible to achieve improved quality of spring wheat [11].

Materials and methods of research. Research to study the effect of different doses and ratios of fertilizer on the background aftereffect 30 t / ha manure conducted field experiments in long-term agricultural chemistry department and quality of crops“ O.I. Dushechkina “ on " Agronomic Experimental Station ", of National University of Life and Environmental Sciences of Ukraine in 2010-2012. Continuous research incorporated 10 pilniy grain - beet crop rotation. For the study were taken following options: 1. Without fertilizer (control), 2. Delay application - background 3. Background + P80 4. Background R80K80 + 5. Background N80R80K80 + 6. Background + N110R120K120 7. N80R80K80.

Agrotechnics of growing - common for stepp area. In the experiment using ammonium nitrate (34.5 %) (GOST 2-85) granulated superphosphate (19.5 %) (GOST 5956-78) and potassium chloride (60%) (GOST 4568-95). Fertilizers made in accordance with the scheme of the experiment. The object of the study were Rannya93 spring wheat variety, which is the precursedby peas.

The grain harvest was collected by sheaves of test sites in the triple repetition of each accounting area.

Soil research area: meadow-chernozem carbonate hrubopyluvato - lehkosuhlynkovyy on loess loam.

The humus content in the plow layer of the soil is 4.1 %, slightly alkaline reaction of soil solution , pH - 8.1 , plants supply with nitrogen and phosphorus is medium, low with potassium .

Studies . The level of soil fertility is determined by the set of all properties of the soil and its indicators, including GDP are important contents of the main elements of nutrition, the number of mobile forms of these elements and their relationship in soil.

Lack of nitrogen in the soil has shown that wheat leaves turn yellow and then die.

Phosphorus is unique among the elements that determine soil fertility, due to its important role in the metabolism of plants and features of the dynamics of the content and value of different forms of the compounds in the soil. The systematic application of fertilizers, as the BS Nosko [3], enriches the soil with gross reserves of phosphorus and 45 % of the original level.

Lack of phosphorus in nutrient medium slows down plant nitrogen use .

Potassium has a positive effect on the formation of the root system , increasing the formation of lateral roots and rising of root hairs, increasing the absorptive surface of the root system.

Studies on the content of ammonium and nitrate nitrogen in the soil (Table 1) showed that the amount of ammonia nitrogen in the phase of tillering prevailed in the plow layer , with the deepening of 25 -50cm , their number decreased , similar to the content of ammonia nitrogen and changing the phase of full ripeness. Thus, control of the phase of tillering content in the plow layer N-NH4 was higher by 7.8 mg / kg soil than the depth of 25-50 cm, a phase of full maturity of 2.4 mg / kg soil. The highest content of N-NH4 seen a variant where the rate of one and half paid in mineral fertilizers and organic background aftereffect was in the plow layer of a phase: Bushing - 35.5 mg / kg, and full maturity - 24.1 mg / kg soil , with it’s content in control - 26.1 mg / kg, 6.0 mg / kg soil , respectively. The same pattern is observedin the contents of nitrate nitrogen. All versions fertilized nitrate nitrogen content was

higher than the control in both arable and in the subsurface layer. Most of its content in the soil was marked by a variant which were made against the background N110P120K120 aftereffect of organic fertilizers , which was in the plow layer of a phase : Bushing - 15.8 mg / kg of complete ripeness - 7.8 mg / kg soil , the content of N- control of NO3 - 4.5 mg / kg, 3.1 mg / kg soil , respectively.

So, fertilizers created favorable conditions for passing amonification and nitrification processes in the soil.

1. 1. Effect of prolonged use of fertilizers on the content of mineral forms of nitrogen (mg / kg of soil)

Variants of the experiment	Depth of sampling	$N\text{-}NH_4$		$N\text{-}NO_3$	
		Bushing	Full ripeness	Bushing	Full ripeness
Control	0-25	26,1	6,0	4,0	3,0
	25-50	18,3	3,6	3,0	2,4
Delay manure (Background)	0-25	26,8	10,0	4,7	3,1
	25-50	19,2	8,7	3,5	2,5
Background + P_{80}	0-25	28,2	12,6	8,12	3,4
	25-50	21,6	10,3	6,2	2,9
Background + P_{80} K_{80}	0-25	29,3	13,1	10,2	4,2
	25-50	24,8	11,9	7,6	3,1
Background + $N_{80}P_{80}K_{80}$	0-25	32,9	20,3	12,7	7,5
	25-50	28,6	15,2	8,2	5,3
Background + N_{110} $P_{120}K_{120}$	0-25	35,5	21,6	13,8	8,0
	25-50	30,2	17,0	10,1	6,2
N_{80} $P_{80}K_{80}$	0-25	30,5	18,9	11,9	6,9
	25-50	27,6	14,0	8,6	5,0

As shown in Table 2. prolonged use of fertilizer has positive effect on the dynamics of phosphorus in the soil, it increases the number of ways according to the fertilizer in increasing numbers and diversity. Phosphorus content on fertilized variations during different phases of plant growth and development of spring wheat ranged : Bushing - in the plow layer (0- 25cm) - 33.0 - 78.4 mg / kg in the subsoil (25-50 cm) - 30,2-70,2 mg / kg soil phase of full maturity - in the plow layer - 20,8-62,9 mg / kg in the subsoil - 18,0-55,8 mg / kg soil , the phosphorus content in the control in the plow layer -33.0 mg / kg, 20.8 mg / kg soil , respectively, and in the subsoil - 30.2 mg

/ kg and 18.0 mg / kg soil , respectively. The highest content of phosphorus in the soil marked a variant with the introduction of one and half fertilizer using organic and aftereffect was in the plow layer of a phase : Bushing - 78.4 mg / kg soil; going up - 73.2 mg / kg of complete ripeness - 62 9 mg / kg , the contents of the control - 33.0 mg / kg and 31.2 mg / kg and 20.8 mg / kg soil , respectively.

2 Effect of long-term fertilizer application on phosphorus and potassium in the soil, mg / kg

Variants of the experiment	Depth of sampling	P_2O_5		K_2O	
		Bushing	Full ripeness	Bushing	Full ripeness
Control	0-25	33,0	20,8	95,0	54,0
	25-50	30,2	18,0	87,2	51,2
Delay manure (Background)	0-25	54,1	26,9	105	51,6
	25-50	50,0	24,6	91,5	48,4
Background + P_{80}	0-25	56,2	44,5	125	55,8
	25-50	51,3	37,2	110	49,3
Background + P_{80} K_{80}	0-25	64,3	47,2	132	60,5
	25-50	57,1	39,1	126,1	56,1
Background + $N_{80}P_{80}K_{80}$	0-25	68,2	54,3	148,6	80,9
	25-50	61,4	46,3	137,2	75,6
Background + N_{110} $P_{120}K_{120}$	0-25	78,4	62,9	148,0	94,8
	25-50	70,2	55,8	140,1	82,3
N_{80} $P_{80}K_{80}$	0-25	65,1	51,6	136,3	77,5
	25-50	60,3	44,2	129,8	73,2

It is known that the seasonal dynamics of mobile potassium content in the plow layer soil during the growing season in the plow layer under the p / g cultures change, so its amount is gradually decreasing from the beginning to the middle of the growing season. In spring wheat plants from soil potassium comes from the early days of its growth to flowering. As can be seen from Table 2 prolonged use of fertilizers affect

the dynamics of potassium in the soil like phosphorus, so with increasing number and variety of fertilizers in the soil increases the content of mobile potassium compounds .

It is known that fertility and nutrient regime of soils are factors that are giving effect to the rights and are a key means of increasing yield of spring wheat .

Analysis of harvest data (Table 3) shows that the largest wheat crop on average over three years was obtained in listed one and half fertilizer N110 R120 K120 aftereffect on the background application - 3.60 t / ha, slightly lower yield 3.34 t / he received when making single fertilizer (N80P80K80) before this is on background. With introduction of one fertilizer obtained yield 3.11 t / ha yield also decreased in the versions with the introduction of phosphate and potash fertilizers in normal 80 kg / ha, against aftereffect manure. The lowest yield were studied in the embodiment where a aftereffect of 12 t / ha manure was 2.67 t / ha , giving control to increase yield of 0.38 t / ha, this indicates that these variants apparently was insufficient number of batteries to form higher yields of grain.

If we analyze the yield for the whole experiment , it should be noted that prolonged use of fertilizers for wheat ravine contributed to higher grain yield an average of three years , at 0,38-1,32 t / ha yield in control of - 2.28 t / ha.

One of the main parameters that characterize the quality of the harvest of spring wheat varieties Early 93 are protein and gluten content in grain (Table 3).

The results indicate that the protein content in spring wheat on average for three years fertilized options is 13,5-15,9 % control of 12.7%. Highest protein content obtained variant which made for one and half rate fertilizer (N110P120K120) on the background aftereffect manure , which is - 15.9 %.

Below protein content in grain was on a variant which brought a Single fertilizer (N80P80K80) and amounted to 15.6 %, still below the rate was studied variant where the aftereffect of organic fertilizers and amounted to - 13.5 %.

If we analyze the protein content in the whole experiment , it should be noted that the fertilizer increased its content 0,8-3,2 %.

3. Yield and grain quality of spring wheat depending on fertilizer use (average for 2010-2012)

Variants of the experiment	harvest		Protein		"Raw" gluten	
	%	To gain control t / ha	%	To gain control t / ha	%	To gain control t / ha
Control	2,28	-	12,7	-	26,6	-
Delay manure (Background)	2,67	0,38	13,5	0,8	28,1	1,5
Background + P_{80}	2,93	0,65	14,7	2,0	29,6	3,0
Background + P_{80} K_{80}	3,04	0,76	14,5	1,8	29,3	2,7
Background + $N_{80}P_{80}K_{80}$	3,34	1,06	15,6	2,9	31,3	4,7
Background + N_{110} $P_{120}K_{120}$	3,60	1,32	15,9	3,2	32,5	5,9
N_{80} $P_{80}K_{80}$	3,11	0,83	14,9	2,2	29,3	2,7

$HIP_{0,05т/га\ 0,27-0,29}$

Content of "raw" gluten on the control of the average for the three years amounted to - 26.6 %. Fertilization increased the content of different ways to 1,5-5,9 %. Highest gluten content - 32,5% were in making one and half fertilizer spreaders aftereffect on the background , to gain control there was - 5.9%. The smallest influence on the content of gluten found in the variant where the aftereffect was studied only 12 t / ha manure - 28.1 %, to gain control of this variant was - 1.5%. Thus analyzing the data of our study we can conclude that to obtain high and stable yield of spring wheat with good quality, you need a balanced mineral (nitrogen, phosphorus, potassium) power plants.

Conclusions

1. Found that mineral fertilizers on the background aftereffect increased content of organic nutrients in both arable and in the subsurface soil layer. The highest content of one and half seen when making fertilizer (N110 P120K120) on a background of organic aftereffect in tillering phase and a phase of full ripeness .

2. Prolonged use of mineral fertilizers on the organic background aftereffect increased grain yield by an average of three years 0,38-1,32 t / ha at harvest control

of 2.28 t / ha protein on 0,8-3,2 % at protein content in the control of 12.7% , the content of "raw" gluten on 1,5-5,9 % in the content of the control -26 , 6%. The highest of these values were obtained with N110 P120K120 made against the background of aftereffect manure.