THE EFFECT OF THE NITROGEN PHOSPHORUS AND POTASSIUM FERTILIZER UPON SOME ELEMENTS OF THE WINTER WHEAT CROP

Bucurean Eva*

*University of Oradea, Faculty of Environmental Protection, 26 General Magheru St., 410048 Oradea,Romania, e-mail: evabucurean08@yahoo.com

***Abstrac*t**

The paper presents the experimental results obtained during 2018 – 2020, regarding the effect of the chemical fertilizer with nitrogen, phosphorus and potassium, upon some of the elements of the winter wheat crop, grown in the pedo – climatic conditions of Inand region, Bihor county.

Key words: chemical fertilizers, winter wheat, degree of fraternity/unity, number of brathers, the lenght of the straw, the length of the ear, the weight of the ear.

INTRODUCTION

The wheat is the most important cultivated plant, with a main food importance. The large areas where it is growing as well as the attention paid to it are due to the carbon hydrate and protein contents of the grains and the ratio of there substances, in relation to the human body demands; the long – term period the grains can be preserved and the fact they can easily be transported; the plants present a high ecological plasticity, being cultivated in region of different climate and type of soil; the possibility of wholly – mechanized growing (Bîlteanu, 2003). The work "The effect of the nitrogen, phosphorus and potassium fertilizer upon some elements of the winter wheat crop" contributes to the fact of knowing the real possibilities of production increase. Fertilizer appliance is also of the measures that can increase the production potential of the cultivated soil. The intensifying of the use of fertilizer for the winter wheat is because of the fact that, as a result of the development of the chemical industry in our country, there are more opportunities of using larger quantities, as well as of the fact that there have been created winter wheat types which very well use the applied fertilizers.

MATERIAL AND METHOD

The experiment with the chemical fertilizers which took place in Inand region, Bihor county during 2018 – 2020 followed the influence of the nitrogen, phosphorus and potassium fertilizer used in different dosages as

follows: with no fertilizer, $N_{96}P_{96}$, $P_{64}N_{32}$, $P_{64}N_{64}$, $P_{64}N_{96}$, $N_{96}P_{96}K_{40}$, $N_{96}P_{64}K_{40}$, $N_{64}P_{64}K_{40}$, $N_{96}P_{32}$, N_{96} – applied in spring.

The fertilizer used were as follows: ammonium nitrate, superphosphate and potassium salt. The fertilizers were applied in autumn in the same time the soil was prepared, except for the last variant, for which the fertilizers were applied when winter ended. The experiment were placed using the linear method, in four repetitions. The witness used during the experiment was the first variant, for which the chemical fertilizers were not used. The quantities of fertilizers used for each of the variants were:
with no fertilizers, superphosphate 400 kg/ha, amonium nitrate 100 kg/ha, superphosphate 400kg/ha, superphosphate 400 kg/ha, superphosphate 400 kg/ha, superphosphate 400kg/ha, amonium nitrate 100kg/ha, superphosphate 400 kg/ha, amonium nitrate 100 kg/ha, superphosphate, 400 kg/ha, amonium nitrate 100 kg/ham, superphosphate 400 kg/ha, amonium nitrate 100 kg/ha, amonium nitrate 300 kg/ha, superphosphate 600kg/ha, potassium salt 100kg/ha, amonium nitrate 300 kg/ha, superphosphate 400 kg/ha, potassium salt 100 kg/ha, amonium nitrate 200 kg/ha, amonium nitrate 200 kg/ha, superphosphate 400 kg/ha, potassium salt 100 kg/ha, amonium nitrate 300 kg/ha.

RESULTS AND DISCUSION

The results regarding the winter wheat unity at the chemical fertilizer experiment are shown in table no 1, table no 2 and table no 3.

It can be noticed that during the first year of experiment, 2018, the number of productive brothers varied between 2,02 for the variant with no fertilizers and 3,90 for the variant which received the largest quantity of $N_{96}P_{96}K_{40}$ fertilizer.

The same thing can be noticed during the second year, 2019, the number of productive brothers varied between 243 for the variant with no fertilizer and 4.54 for the variant with the largest quantity of fertilizer. In the third year of the experiment, 2020, the number of productive brothers varied between 2.38 for the variant with no fertilizer and 3.68 for the variant with the largest quantity of fertilizer. It can also be noticed that the number of brothers was bigger for the variant with a larger quantity of nitrogen used in spring, at the beginning of growing. When taking into account the variants which received fertilizers in different quantities, there can not be noticed too much difference as concerns the unity degree.

As concerns the total number of the brother produced by each winter wheat plant until the bearing of winter and in spring until the end of unity, the data are presented in table no 2. It can be noticed that until the winter

begins, the $N_{64}P_{64}K_{40}$, variant developed with 90.4% more brothers than the variant with no fertilizers. It the case of the other variants the number of brothers increased by 47 – 71%. By the end of the period of unity the variants $P_{64}N_{64}$ and $N_{96}P_{96}K_{40}$ developed the largest number of brothers 97.6%, more than the variant without fertilizer.

Table 1

The influence of the chemical fertilizer upon the unity degree at the winter wheat

Year	Variant	Number of productive brothers			
		x	s	s %	s-x
2018	With no fertilizer	2.02	1.24	61.3	0.124
	P_{64} N_{32}	2.40	1.00	41.7	0.100
	P_{64} N_{64}	3.50	1.56	44.5	0.156
	P_{64} N $_{96}$	3.24	1.27	38.8	0.127
	N_{96} P_{32}	2.90	1.03	35.5	0.103
	N_{96} P_{96}	3.70	1.67	45.1	0.167
	N_{96} P_{96} K_{40}	3.90	1.34	34.3	0.134
	N_{96} P_{64} K_{40}	3.38	1.15	34.0	0.115
	N_{96} P_{64} K_{40}	3.36	1.17	34.8	0.117
	N_{96}-applied in spring	3.36	1.43	42.5	0.143
2019	With no fertilizer	2.43	1.21	49.8	0.121
	P_{64} N_{32}	3.30	1.11	33.6	0.111
	P_{64} N_{64}	3.25	1.03	31.7	0.103
	P_{64} N_{96}	3.17	1.18	37.2	0.118
	N_{96} P_{32}	3.41	1.10	32.2	0.110
	N_{96} P_{96}	4.40	1.53	35.0	0.153
	N_{96} P_{96} K_{40}	4.54	1.64	36.1	0.164
	N_{96} P_{64} K_{40}	3.05	1.12	36.7	0.112
	N_{64} P_{64} K_{40}	4.27	1.42	33.2	0.142
	N_{96}- applied in spring	3.18	1.05	33.0	0.105
2020	With no fertilizer	2.38	1.17	49.1	0.117
	P_{64} N $_{32}$	2.56	1.12	43.7	0.112
	P_{64} N_{64}	2.62	1.21	46.9	0.121
	P_{64} N $_{96}$	2.70	1.10	40.7	0.110
	N_{96} P_{32}	2.44	1.67	68.8	0.167
	N_{96} P $_{96}$	3.32	1.34	40.3	0.134
	N_{96} P_{96} K_{40}	3.68	1.14	32.9	0.114
	N_{96} P_{64} K_{40}	2.80	1.28	44.1	0.128
	N_{64} P_{64} K_{40}	3.10	1.42	45.8	0.142
	N_{96}- applied in spring	2.50	1.05	42.0	0.105

Table 2

Total number the beginning of winter and up to the end of unity period, for the winter wheat

Variant	Date of establishing					
	20.12		4. 03		24.03	
	Number of brothers	%	Number of brothers	%	Number of brothers	%
With no fertilizer	2.1	100.0	3.0	100.0	4.2	100.0
P_{64} N_{32}	3.2	152.2	4.9	163.3	7.1	169.0
P_{64} N_{64}	3.5	157.1	5.3	176.6	8.3	197.6
P_{64} N_{96}	3.2	152.3	6.4	213.3	6.8	161.9
N_{96} P_{32}	3.3	157.1	4.4	146.6	7.7	183.3
N_{96} P_{96}	3.6	171.4	5.5	183.3	7.9	188.0
N_{96} P_{96} K_{40}	3.1	147.6	5.8	193.3	8.3	197.6
N_{96} P_{64} K_{40}	3.3	157.1	4.7	156.6	7.0	190.4
N_{64} P_{64} K_{40}	4.0	190.4	6.5	216.6	6.8	161.9
N_{96}- applied in spring	2.1	100.0	3.0	100.0	4.9	116.6

It can be noticed the variants that received a big quantity of N96 nitrogen in spring, which produced a number of 2.8 brothers in spring, which represents 16.6% compared to the witness which was not fertilized.

The most important is not the number of brothers which can be formed under the influence of the chemical fertilizers, but the number of productive brothers which grow to make an ear.

Even if, out the total number of brothers, about 50%, appear in autumn and the rest of 50%, in spring less than 50% of the total number of brothers reach maturity. It should also be noticed the variant for which the nitrogen was applied in spring, at the beginning of vegetation, that presents a higher percentage of productive brothers compared to the total number of brothers formed on the plant 67.3%. This leads to the conclusions that the application of a certain quantity of nitrogen in spring at the beginning of the winter wheat period of vegetation stimulates, the growth of the brothers formed in autumn, that make an ear in a higher proportion.

The results regarding the influence of the chemical fertilizer upon the length of the straw are shown in table no 4, and table no 5. Generally speaking, in the case of grains there is a close relationship between the length of the straw and the resistance of plants when falling. The shorter and thicker an ear is, the higher resistance at falling. Plants falling is one of the most harmful phenomena which can appear during the vegetation period. It can be seen in table no 4 that during the there years of experimenting, for the

variant with no fertilizer, the length of the straw was smaller compared to the fertilized variants. The data in table no 5 show that, compared to the witness with no fertilizer, at the fertilized variants the plants length grew with a percentage of up to 77.7 %. That was. When winter began, the height of the plants at the fertilized variants was bigger than the variant with no fertilizer, the difference varying between 27.4% and 62.7%. For all the cases, we can see that when the dosage of fertilizer was small the height growth varied between 16.6% and 27.4%, white for the variants which received two or there dosages of nitrogen fertilizer, the height growth varied between 69.6% - 67.5%. It can also be noticed the positive influence of the nitrogen applied in spring upon the growth. Generally speaking the height growing of the plants is positively influenced by the chemical fertilizers, especially by the nitrogen fertilizer.

The increase of nitrate fertilizer dosage can lead to the increase of the plants height with up to 52% compared to plants cultivated without fertilizer but the resistance to falling decreases, in the same time

Table 3

The ratio between the number of brothers, formed in autumn of in spring and the number of productive brothers

Variant	Total number of brothers	Brothers made in autumn		Brothers made in spring		Productive brothers	
	x	x	%	x	%	x	%
With no fertilizer	4.2	2.1	50.0	2.1	50.0	2.0	47.2
P_{64} N_{32}	7.1	3.2	45.1	3.9	54.9	2.4	33.8
P_{64} N_{64}	8.3	3.3	39.8	5.0	60.2	3.5	42.1
P_{64} N_{96}	6.8	3.2	47.1	3.6	52.9	3.2	47.0
N_{96} P_{32}	7.7	3.3	42.9	4.4	57.1	2.9	37.6
N_{96} P_{96}	7.9	3.6	45.6	4.3	54.4	3.7	46.8
N_{96} P_{96} K_{40}	8.3	3.1	37.4	5.2	62.6	3.9	46.9
N_{96} P_{64} K_{40}	7.8	3.3	52.6	3.7	47.4	3.4	48.5
N_{64} P_{64} K_{40}	6.8	4.0	58.9	2.8	41.4	3.3	48.8
N_{96}- applied in spring	4.9	2.1	42.9	2.8	57.1	3.3	67.3

Table 4

The influence of the chemical fertilizers upon the straw`s length for the winter wheat

Year	Variant	Lenght of straw (cm)			
		x	s	s%	s-x
2018	With no fertilizer	77.2	7.9	10.2	0.79
	P_{64} N_{32}	90.2	10.1	11.1	0.01
	P_{64} N_{64}	93.5	11.1	11.8	1.11
	P_{64} N_{96}	93.6	9.8	10.4	0.98
	N_{96} P_{32}	95.4	8.4	8.8	0.84
	N_{96} P_{96}	97.2	5.3	5.4	0.53
	N_{96} P_{96} K_{40}	96.3	5.5	5.7	0.55
	N_{96} P_{64} K_{40}	102.1	8.6	8.4	0.86
	N_{64} P_{64} K_{40}	96.5	4.0	4.1	0.40
	N_{96}- applied in spring	92.1	8.1	8.7	0.81
2019	With no fertilizer	70.9	5.3	7.4	0.53
	P_{64} N_{32}	95.7	4.8	5.0	0.48
	P_{64} N_{64}	95.8	5.5	5.7	0.55
	P_{64} N_{96}	96.8	6.9	7.1	0.69
	N_{96} P_{32}	88.3	5.2	5.9	0.52
	N_{96} P_{96}	93.1	10.7	11.4	1.07
	N_{96} P_{96} K_{40}	98.4	5.6	5.7	0.56
	N_{96} P_{64} K_{40}	98.8	4.1	4.2	0.41
	N_{64} P_{64} K_{40}	99.5	6.1	6.1	0.61
	N_{96}- applied in spring	87.4	9.2	10.5	0.92
2020	With no fertilizer	117.6	6.8	5.7	0.68
	P_{64} N_{32}	125.1	7.6	6.0	0.76
	P_{64} N_{64}	124.8	9.7	8.0	0.97
	P_{64} N_{96}	123.9	10.1	8.1	1.01
	N_{96} P_{32}	118.5	6.4	5.4	0.64
	N_{96} P_{96}	114.5	5.2	4.5	0.52
	N_{96} P_{96} K_{40}	124.0	6.1	4.9	0.61
	N_{96} P_{64} K_{40}	120.3	8.8	7.3	0.88
	N_{64} P_{64} K_{40}	121.5	6.5	5.3	0.65
	N_{96}- applied in spring	116.9	8.4	7.1	0.84

Table 5

The influence of the nitrogen chemical fertilizer upon the rate of height growing for the winter wheat

Variant		Date of measurement				
		20.12	4.03	24.03	10.04	28.04
With no fertilizer	cm	10.2	15.9	18.8	18.8	47.8
	%	100.0	100.0	100.0	100.0	100.0
P_{64} N_{32}	cm	13.0	19.0	21.0	22.4	58.5
	%	127.4	119.4	116.6	119.1	122.4
P_{64} N_{64}	cm	14.0	21.9	21.8	31.5	70.0
	%	137.3	137.7	121.1	167.5	148.5
P_{64} N $_{96}$	cm	16.6	21.1	25.9	31.9	68.0
	%	162.7	132.7	143.8	169.6	146.4
N_{96} P_{32}	cm	16.0	22.3	23.6	28.6	67.0
	%	156.8	140.2	131.1	152.1	144.7
N_{96} P $_{96}$	cm	15.0	23.7	25.5	31.9	69.0
	%	147.0	149.0	141.6	169.6	148.5
N_{96} P_{96} K_{40}	cm	15.2	24.4	26.1	31.2	72.6
	%	149.0	153.6	133.6	166.0	151.8
N_{96} P_{64} K_{40}	cm	15.0	22.4	25.7	33.4	72.9
	%	147.0	140.8	142.7	177.7	152.5
N_{64} P_{64} K_{40}	cm	15.7	21.3	29.4	32.3	68.5
	%	153.8	1345.0	163.0	171.8	147.4
N_{96}- applied in spring	cm	10.2	17.0	18.7	24.7	68.2
	%	100.0	107.0	103.9	131.0	146.8

CONCLUSIONS

Following the experiments which took place between 2018 – 2020, regarding the effect of the application of chemical fertilizers upon certain elements of the winter wheat crop, these conclusions can be drawn.

The fertilizers positively influence the elements of nitrogen fertilizer influence the unity degree, beforehand. Large numbers of productive brothers are assured by means of fertilizing the plants with nitrogen, in spring, at the beginning of vegetation.

The length of the straw is also related to the degree of nitrogen used in the soil larger dosages of nitrogen fertilizer can lead to an increase of the height with about 52% compared to the plants cultivated on the soil not fertilized, but in the same time, the resistance towards falling lessens.

It can be noticed that during the experimental years the variant with no fertilizer registered the shortest height of the ear 5,40 cm in 2018, 5,32 cm an in 2019 and 6,61 cm in 2020.

The weight of the ear was directly proportional to its length, the smallest being registered at the variant with no fertilizer.

The nitrogen fertilizers help the growing of a more numerous number of grains in the ear and there is a positive connection between the length of the ear and the number of grains in the ear, because for the same variant, $P_{64}N_{96}$, the ear was the longest and the most numerous number of grains were registered.

For the pedo – climatic conditions of Inand region, during the 3 years of experiments, the application of the chemical fertilizers at the winter wheat showed positive effects upon the grain production per hectare.

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