RESEARCH ON THE INFLUENCE OF ORGANOMINERAL FERTILIZATION ON THE HARVEST AND QUALITY OF POTATO TUBERS IN THE PEDOCLIMATIC CONDITIONS OF THE BOZOVICI DEPRESSION, PATAŞ TERRITORY

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Abstract. *The research was carried out between 2019 and 2021 in the Bozovici Depression, Pătaş territory, located in the west of the country. The climate of the area is characterized by average annual temperatures between 9 - 100C, with not too hot summers and moderately harsh winters. The multiannual average of atmospheric precipitation varies between 670 – 750 mm. The soil type was eutric semicarbonate alluviosol. The texture is coarse sandy loam between 0-120 cm, the soil reaction is slightly alkaline with pH-7.6, the humus content 2.72%, the nitrogen index (IN) 2.66, the degree of saturation in bases 97.7 %. The effect of variable doses of nitrogen applied on a constant background of phosphorus and potassium administered alone and on backgrounds of manure and green manures was investigated. The synthesis results of the 3 experimental years show that on average the 4 gradations of the nitrogen dose (N100, N120, N140, N160), applied on a constant background of P90K90 gave a harvest of 24,676 kg/ha tubers. In the variant in which the same doses of mineral fertilizers were applied on a basis of 20 tons/ha of manure, the harvest was 28,833 kg/ha tubers, so higher by 16%, respectively the increase in the harvest was 4157 kg/ha Ha. In the variant in which fertilization was done with the same doses of mineral fertilizers, but on the basis of green fertilizers, the increase was only 10%, respectively 2487 kg/ha. On average over the 3 graduations, fertilization only with mineral fertilizers, the fund in which mineral fertilizers were applied together with manure and respectively with green fertilizers, nitrogen fertilizers increased the yield by 10% compared to the N100 variant in the N120 variant, by 20% in the N140 variant and by 35% in the N160 variant. The yield differences were assured as very significant. The paper also covers the evolution of starch content and production.*

Key words: *potato, organomineral fertilization.*

INTRODUCTION

The potato is one of the most important plants, currently cultivated on all continents, in over 180 countries, on a world surface of 18-19 million ha. In our country, the area occupied by potatoes is 270-280 thousand ha. In the Bozovici depression where the research was carried out, potatoes are cultivated on about 8300 ha with an average production of 13-14 thousand kg/ha. well below the area's potential.

The technological link studied was crop fertilization. When setting the NPK doses, the numerous experiences carried out in the country and in the large potato-growing countries were taken into account. At the potato research institute in Braşov, mathematical models were developed (COPONY, 1978) for the optimization of potato fertilization with a probability of 70-80%. In order to achieve high potato productions for autumn-winter consumption, doses of N120-140, P110-125K70-100 are recommended (AXINTE, M.2001).

In the experience carried out, the effect of organomineral fertilization was studied, namely fertilization only with NPK mineral fertilizers, the application of the same doses of NPK on a background of 20 tons/ha of manure (fertilizer widely used in Denmark, Canada, Germany with crop increases of 4000-10000 kg/ha BERCA, M , 2011). In all countries where the potato is a staple crop, fertilization starts with organic fertilizers, manure and green manures. For the current trend of greening agricultural ecosystems, a lot of attention is paid to

raising animals, especially cattle and pigs, not only for obtaining meat and milk, but also for obtaining manure. For these reasons, in our own research on mineral fertilization, attention was paid to organomineral fertilization. Among mineral fertilizers, nitrogen fertilizers have received the most attention. BRAIN,F.2002 made recommendations regarding the amount of nitrogen for an average yield level of 25 – 35 t/ha obtained with a total nitrogen consumption of 110 – 130 kg/ha. In the situation where the climatic conditions allow and the potential of the varieties can be better used by increasing the doses of nitrogen by 30-40% without exceeding the doses recommended by the EU unless the replacement of normal nitrogen is done with organic nitrogen.

MATERIALS AND METHODS

The experiments carried out in the Bozovici Depression were of a bifactorial type, with the following gradations of the factors: Factor A – basic fertilization: a1- with NPK mineral fertilizers; a2 – fertilization with 20 t/ha manure+NPK mineral fertilizers and a3- green fertilizers (white lupine) + NPK fertilizers. Factor B – dose of nitrogen fertilizers: b1 – N10;, b2 – N120; b3- N140; b4- N160. Nitrogen fertilizers were applied on a constant background of P90K90.

The variety studied was Productiv, from the semi-late maturity group of quality B. The starch content is 16%. Production capacity 55 t/ha. The variety is intended for autumn-winter consumption and industrialization. The predecessor plant was the winter wheat crop. The applied technology was the current one, specific to the culture. At harvest, the production of each variety was recorded, samples were taken for starch content analysis and starch production was calculated.

RESULTS AND DISCUSSIONS

Table 1 presents the synthesis of the harvest results obtained in the 2019-2021 experimental cycle. The harvest results, in the researched area, were between the limits of 21,144 kg/ha and 33,055 kg/ha. On the basis of NPK, on average, on the 4 graduations of the nitrogen dose, the average yield of 24,676 kg/ha was obtained.

On the bottom fertilized with 20 t/ha of manure + mineral fertilizers in the same doses, the average yield of 28,833 kg/ha was obtained, surpassing the control by 16%, returning a yield difference of 4,157 kg/ha statistically assured as very significant.

On the basis of green fertilizers + NPK in the same doses, the average yield of 27,163 kg/ha was obtained, returning a yield increase of 10%, respectively a difference of 2,487 kg/ha ensured as very significant.

With reference to the influence of nitrogen fertilizers applied on the P90K90 background, in the variant fertilized with N100 the average yield of 23,126 kg/ha was obtained. By increasing the dose to N120, the yield of 25,474 kg/ha was obtained, i.e. a yield increase of 10%, which corresponds to a difference of 2,348 kg/ha. In the version fertilized with N140, the average yield was 27,750 kg/ha, the increase of the harvest being 20%, which corresponds to a difference of 4.624 kg/ha. In the version fertilized with the dose of N160, the highest yield of 31,213 kg/ha was obtained. The yield increase was 35%, which corresponds to a very significant difference of 8,087 kg/ha.

Synthesis of harvest results obtained in the experimental cycle 2019-2021

The harvest results show that the organomineral fertilization, in the mentioned variants, proved superior to the variant of unilateral fertilization only with mineral fertilizers. An important aspect is that on the constant background of P90K90 there was an increase in the

yield, with the increase in the nitrogen dose, the highest yield being in the version fertilized with N160.

In fig.1. the evolution of the starch content according to fertilization is shown and figure 2 shows the variation of starch production.

Table 1.

The A factor Basic fertilizer	**Fact B dose of N on a constant background of P90K90**				**Factor A means**			
	N_{100}	**N_{120}**	**N_{140}**	**N_{160}**	**Harvest Kg/ha**	**%**	**The difference Kg/ha**	**The meaning**
NPK	21144	22984	25401	29175	24676	100		
Manure +NPK	24716	27721	29842	33055	28833	116	4157	XXX
Greens + NPK	23518	25719	28008	31410	27163	110	2487	XXX

DL 5%=724
DL1%=1198
DL0.1%=2244

Factor B environments

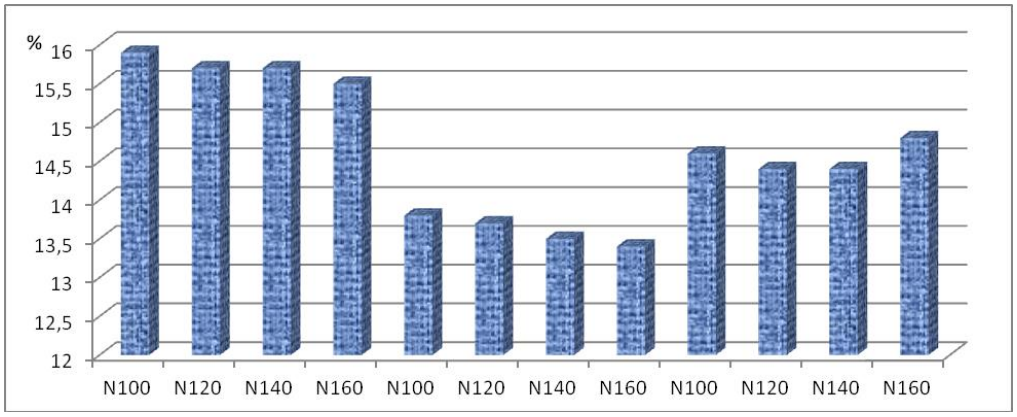
Specification	**N_{100}**	**N_{120}**	**N_{140}**	**N_{160}**
Harvest Kg/ha	23126	25474	27750	31213
%	100	110	120	135
The difference Kg/ha		2348	4624	8087
The meaning		XXX	XXX	XXX

DL5%=939 DL%1=1288 DL 0.1%=1753

In all 3 basic agrofunds, the highest starch content was on the fund fertilized only with mineral fertilizers, on average on nitrogen doses of 15.7%. Nitrogen fertilizers negatively influenced the starch content, which decreased from 15.9% in the version fertilized with N100 to 15.5% in the version with N160.

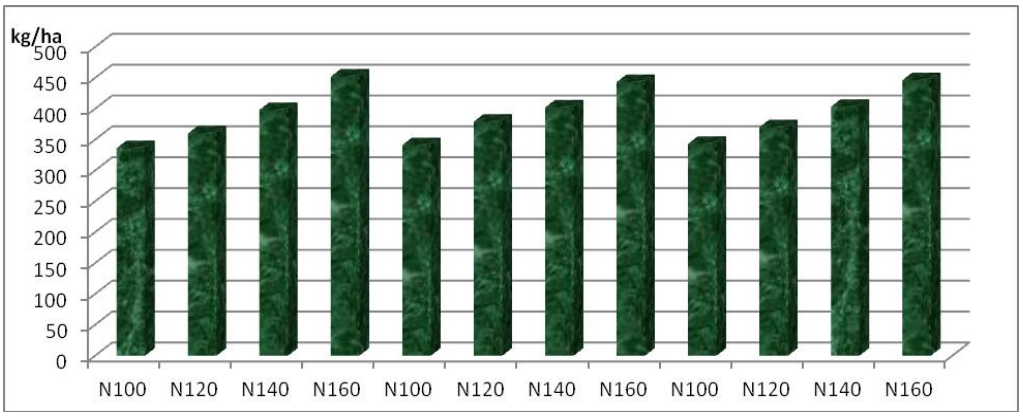
On the agrofund with manure + mineral fertilizers it was the lowest of only 13.6%, and in the agrofund with green manures + mineral fertilizers in the same doses the average content was 14.5%.

Starch production (fig.2) increased from 386 kg/ha in the agro-fund fertilized only with mineral fertilizers (N100P90K90) to 392 kg/ha in the agro-fund where mineral fertilizers were applied on a background of 20 t/ha of manure and at 390 kg/ha on the agro-fund where mineral fertilizers were applied on the ground fertilized with green fertilizers. The highest starch productions on all 3 agrofunds were achieved in the version fertilized with N160P90K90 of 452 kg/ha. On the background fertilized with 20 t/ha and mineral fertilizers with N160P90K90 the production of starch was 443 kg/ha and on the background with green fertilizers and N160P90K90 the production of starch was 446 kg/ha.



% starch	15.9	15.7	15.7	15.5	13.8	13.7	13.5	13.4	14.6	14.4	14.4	14.8
Dose N	N_{100}	N_{120}	N_{140}	N_{160}	N_{100}	N_{120}	N_{140}	N_{160}	N_{100}	N_{120}	N_{140}	N_{160}
agro	Mt				+20 t/ha manure				+green fertilizers			
Average amount	15.7				13.6				14.5			

Fig. 1. Variation of starch content according to fertilization



Dose of N	N_{100}	N_{120}	N_{140}	N_{160}	N_{100}	N_{120}	N_{140}	N_{160}	N_{100}	N_{120}	N_{140}	N_{160}
agro	Mt				20 t/ha of manure				Green manures			
Starch production	336	360	398	452	341	379	402	443	343	370	403	446
X agrofond	386				392				390			
%	100				102				101			

Fig. 2. Variation of starch production according to fertilization

CONCLUSIONS

The research carried out in the Bozovici Depression, Pătaş territory, on a eutric, semi-carbonate alluvial soil, in the 2019-2021 experimental cycle leads to the following conclusions:

1. The pedoclimatic conditions in the area where the research was carried out are favorable for potato cultivation.

2. The semi-late variety Productiv benefited from good growing conditions. The best yields of over 36 t/ha were obtained in the version fertilized with 20 t/ha manure + N160P90K90.

3. On average, the doses of mineral fertilizers applied led to the average yield of 24,676 kg/ha when fertilization was carried out unilaterally with NPK, the average yield increased by 16% when the application of mineral fertilizers was made on the basis of 20 t/ha of manure and with 10% when the application was made on a background of green fertilizers (white lupine).

4. Nitrogen fertilizers increased the yield with increasing dose, on average on the 3 agrofunds by 10% in the variant with N120, by 20% in the variant with N140 and by 35% in the variant with N160 compared to the control variant fertilized with N100.

5. The starch content was negatively influenced by nitrogen fertilization, the extreme values in the researched area were 15.9% in the variant fertilized with mineral fertilizers in dose N100P90K90, to 13.4% in the variant in which mineral fertilizers were applied on fund of 20 t/ha of manure.

6. The production of starch increased with the increase of the nitrogen dose, the highest values being obtained in the N160P90K90 variant based on 20 t/ha of manure.

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