INFLUENCE OF SUPPLIMENTARY FERTILIZATION ON STATUS OF SOIL FERTILITY AND PRODUCTION, AT A CROP OF POTATOES IN POSITION BELONGINGTO TCE 3 BRAZI, GIROV, NEAMT COUNTY

INFLUENŢA FERTILIZĂRII SUPLIMENTARE ASUPRA STĂRII DE FERTILITATE A SOLURILOR ŞI ASUPRA PRODUCŢIEI, LA O CULTURĂ DE CARTOF, ÎNTR-UN AMPLASAMENT APARŢINÂND TCE 3 BRAZI, GIROV, JUDEŢUL NEAMŢ

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Abstact: *Fertilization of soils is a very important agrochemical measure, in the chain of the technological links of a culture. The harmonization of the use of fertilizers in the ground, plant and cultivation technology and agronomic efficiency, are steps required in the case of using crops in an intensive system. The potato produced in the appropriate climate zones, is one of the cultures that have a favourable response to fertilization. The paper presents results of a study using conventional fertilizers as well as additional fertilizer on a crop of potato. The results showed that together with basic fertilization, the additional fertilization with a complex of fertilizers administered radicularly improved the fertility of the soil, providing nitrogen-form equivalent to an average towards the normal; the amount of phosphorus digestible and assimilable potassium is normal levels towards higher level. But the production is influenced by the foliar fertilizers, situated in the case of the agro-fond160-120-95 kg / ha a.s. NPK at 34,570 kg for Fertcomplex to 34,400 for Kristalon. The maximum productionis reached on the same agrofond of fertilization, in the version of combined administration of phasial, root and foliar fertilization, i.e. in the variant 16+20 + 18+46 + Kristalon.*
Key words: agronomic efficiency, fertilization, fertility

Rezumat: *Fertilizarea solurilor este o măsură agrochimică deosebit de importantă, în lanţul verigilor tehnologie ale unei culturi. Armonizarea folosirii îngrăşămintelor în raport cu solul, planta şi tehnologia de cultură şi eficientizarea agronomică, reprezintă paşi obligatoriu de parcurs, în cazul practicării unor culture în sistem intensiv. Cartoful, produs în zone cu climat adecvat, este una din culturile care au un răspuns favorabil la fertilizare. Lucrarea prezintă rezultatele unui studiu, utilizând fertilizatori convenţionali la o cultură de cartof, administraţi ca agrofond dar şi ca fertilizatori suplimentari. Rezultatele obţinute au evidenţiat că alături de fertilizarea de bază, fertilizările suplimentare cu îngrăşăminte complexe administrate radicular, îmbunătăţesc starea de fertilitate a solurilor, situând asigurarea cu azot-forme asimilabile, la medie către normală, conţinutul în fosfor asimilabil şi potasiu asimilabil, la nivelul normal către ridicat. Producţiile însă sunt influenţate şi de*

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fertilizările foliare, situându-se în cazul agrofondului 160-120-95 kg/ha s.a NPK la 34400 kg pentru Fertcomplex şi 34570 pentru Kristalon. Producţia maximă se obţine totuşi pe acelaşi agrofond de fertilizare, în varianta administrării combinate a fertilizărilor faziale, radicular şi foliar, respectiv în varianta 16-20+18-46+Kristalon.
Cuvinte cheie: eficentizare agronomică, fertilitate, fertilizare

INTRODUCTION

The fertilizations during the growing season, are designed to complete the nutrients applied before the vegetation startup till the optimal economic dose and taking into consideration the dynamic requirements of plant nutrients (Budoi, 2001).The simultaneous application to the root and vegetative system, two, three, or more essential nutrients during the vegetation period of the plant, proves itself to be an efficient practice to stimulate production, superior to the application of simple fertilizers (Volf, 2008). Amid the fund fertilization, judiciously set, in gradually increasing doses, is distinguished at all species of crops, the production levels being higher than the unfertilized sample (Volf, 2003). Numerous surveys of crops done in the last decade, both nationally and internationally certify the need for this type of use.

MATERIAL AND METHOD

The study undertaken was done within TCE 3 Brazi, Girov, Neamt County, in 2015, on a potato crop. The area taken into study was of 0.5 ha, being organized an experience, according to the method of sub-divided blocks in four repetitions. The potato had as prior plant maize, the previous year. The variety of potato was Castrum, a variety with high production potential, resistance to drought and high temperatures but also with good resistance manna.

The area where the site is located has a pronounced continental climate, where the average temperature is 8.4^0C and annual average precipitation amount is of 635.5 mm distributed in a number of 89.5 days, which gives good condition for the growth and development of potato crop.

The soil on which the culture is located is a aluvisol proxicalcaric gleic, with pH of 5.54 - 5.8, an acid number of 3.12- 4.32 me/100 g soil, a humus content of 1.86 to 2.58% and a degree of base saturation of 71-76%.

For basic fertilization there was used urea (46.6% a.s.), superphosphate concentrated (50% a.s.) and potassium salt (40%) administered in progessive doses of 110 kg/ha N, 75 kg/ha a.s. P_2O_5 and 45 kg/ha K_2O, namely 135 kg/ha a.s., N, 95 kg/ha P_2O_5, 70 kg/ha K_2O and the third level of fertilization 160 kg/ha a.s. N, 120 kg/ha a.s. P_2O_5 and 95 kg/ha K_2O.

For phasal fertilizations there were used two solid complex fertilizers, respectively Cx 16-20-0 and Cx 18-46-0, produced by SC Arvi Agro SRL and administered in dose of 25 kg/ha a.s. fertilization I and 50 kg/ka a.s. fertilization II and two foliar fertilizers Fertcomplex and Kristalon in doses of 5 L / ha a.s. fertilization I and 7 L/ha fertilization II. The chemical composition and physico-chemical characteristics of these fertilizers are varied (tab. 1, tab. 2, tab. 3). The phasal fertilization, with both liquid and solid fertilizers were performed at the beginning of vegetation, at 10-15 leaves and before flowering.

Table 1

Chemical composition of foliar fertilizers

Foliar fertilizer	CSA %	pH	N g/L	P g/L	K g/L	B g/L	S g/L	Mn g/L	Mg g/L	Zn g/L	Cu g/L	Fe g/L	Mo g/L
Fertcomplex	16	6.5	80	80	75	0.3	0.4	0.4	0.04	0.04	0.1	0.3	0.03
Kristalon	16	6.6	180	180	180	0.025	-	0.04	-	0.025	0.01	0.07	0.004

Table 2

Physical-chemical indicators of NPK 16-20-0 ferilizer

(source: S.C. ARVI AGRO S.R.L.)

Name of indicators	Specifications	Values obtained according to the analysis
Total nitrogen (N, %)	16	15.5
Ammonia nitrogen ($N\text{-}NH_4$, %)	16	15.5
Total phosphorus (P_2O_5)	20	19.4
Soluble phosphorus in NACS (P_2O_5)	20	19.2
Soluble phosphorus in water (P_2O_5)	18	18.3
Soluble sulfur in water (S)	12	12.0
Content of water (H_2O) %, max	2	1.3
Granulometric structure %		
< 1%	3	max 3

Table 3

Physical-chemical indicators of NPK 18-46-0 fertilizer

(source: S.C. ARVI AGRO S.R.L.)

Name of indicators	Specification
Total nitrogen (N, %)	18
Content of water (H_2O) %, max	1.8
Fosfor total (P_2O_5)	46
Free flow.	100
Granulometric structure % (fraction of the total mass of granules on dimensions)	
< 1 mm	3

The soil samples were taken at the end of the vegetation in the previous year, for the dosage of initial forms of macro-elements in the soil and at the end of vegetation in the analyzed year, for the same dosage forms and their analysis conducted after fertilization. The harvesting depth was of 0-20 cm.

We have conducted a series of analyzes of soil samples, using the methods of RISSA dosing, namely:

- colorimetric dosage forms of ammoniacal and nitric nitrogen, the method with Nessler's reagent and phenol acid -2,4 disulfonic
- content of phosphorus in the soil, extacted with a solution of ammonium lactate acetate of pH = 3.7 to 3.8 determined by Egner-Riehm-Domingo method or in the case of fertilized soils with non-activated phosphorites by extraction with a solution of 0.3% ammonium molybdate in 0.001 N $CaCl_2$ at pH = 4.4;
- content of mobile potassium in the soil, extracted with phosphorus and the same solutions as determined by flame photometry method.
- degree of saturation in base;
- humus content, Schollenberger version.
- hydrolytic acidity - Kappen method.

RESULTS AND DISCUSSIONS

The fertilizing elements administered in the form of fertilizera influenced the accesible forms of nutrients in the soil, development which had effect, regardless the time of application and the dosage used. Thus, the results reflect a fairly wide range of values, emphasizing the fact that they grow, in relation to nature and chemical composition of the fertilizing material (tab. 4).

The content of nitrogen accessible forms registered progressive growth rates from the control variant towards the variants with additional complex solid fertilizer but also in relation to agro-fund. The 20+18-46 si 16-20+18-46+ Kristalon variants, recorded on a NPK 160-120-95 ha and a content of 25 ppm NO_3 + NH_4, which falls to a ground of state average supply.

The accessible phosphorus registers increases from 28 ppm to 46 ppm at theunfertilized control sample, 48 ppm and 56 ppm P-AL for 16-20 + 18-46 + Kristalon sample, the agrofunds 110-75-45, 135-95-70 and 160-120-95 kg/ha a.s. NPK respectively, values that fall in a state of high assurance of this element for the soil.

The potassium in assimilable forms reaches comparable values, at the variants that were additionally fertilized with complex fertilizers but also at variants of combined suplimetary fertilization, clearly being also influenced by the agrofund. The 160-120-95 kg/ha a.s. NPK agrofund, bringing in the soil a content of 235 and 237 ppm of K-AL, for the variants 16-20 + 18-46 and 16-20 + 18-46 + Kristalon, which means that it brings a state of normal provision of the soil with potassium.

Table 4

Influence of fertilization on accessible forms of nutritive elements

Var./agrofund	110-75-45 kg/ha NPK a.s.			135-95-70 kg/ha NPK a.s.			160-120-95 kg/ha NPK a.s.		
	NH_4+ NO_3 ppm	P-AL ppm	K-AL ppm	NH_4+ NO_3 ppm	P-AL ppm	K-AL ppm	NH_4+ NO_3 ppm	P-AL ppm	K-AL ppm
Mt . unfert	10	28	176	10	28	176	10	28	176
16-20-0	11	34	185	19	37	190	22	41	194
18-46-0	15	44	180	19	47	192	23	49	220
16-20+18-46	23	49	183	23	49	195	25	55	235
Fertcomplex	10	27	176	11	27	178	11	29	175
Kristalon	11	28	175	12	27	177	10	29	174
16-20+18-46+ Fertcomplex	24	46	182	25	48	199	24	56	229
16-20+18-46+ Kristalon	23	47	180	24	47	200	25	55	237

The potato yields obtained after fertilization significantly increase, especially for the supplementary fertilized variants with complexes administered radicularly and foliarly, on all agrofunds (tab. 5)

On the agrofund 110-75-45 kg/ha a.s. NPK, the yields reach 33400 and 34500 kg/ha at the variants 16-20 + 18-46 + Fertcomplex and 16-20 + 18-46+Kristalon, with differences in comparison to the control sample of +11400 and +12500 kg, respectively.

Using the agrofund 135-95-70 kg/ha a.s. NPK, the comparable production variations are obtained in 16-20 + 18-46 of 34450 kg/ha potatoes and Kristalon with 33280 kg/ha potatoes. But the maximum yield is obtained with version 16-20 + 18-46 + Kristalon of 37800 kg/ha potatoes with a difference of +15800 kg/ha from the unfertilized control sample.

On the agrofund of 16 0-120-95 kg/ha a.s. NPK, the maximum production of potatoes are obtained in 16-20 + 18-46 + Kristalon variant of 39850 kg/ha potato, with an increase + 17850 kg compared to the control sample.

Table 5

Influence of basic and supplementary fertilization on production

Var./agrofund	110-75-45 kg/ha NPK a.s			135-95-70 kg/ha NPK a.s.			160-120-95 kg/ha NPK a.s.		
	Yield kg/ha	%	Diff. ±kg/ha	Yield kg/ha	%	Diff. ±kg/ha	Yield kg/ha	%	Diff ±kg/ha
Mt . unfert	22000	100	-	22000	100	-	22000	100	-
16-20-0	25050	114	+3050	29100	132	+7100	33120	151	+11120
18-46-0	28550	130	+6550	32250	146	+10250	33950	154	+11950
16-20+18-46	30150	137	+8150	34450	156	+12450	35450	161	+13450
Fertcomplex	29220	133	+7220	31250	142	+9250	34400	156	+12400
Kristalon	32000	145	+10000	33280	151	+11280	34570	157	+12570
16-20+18-46+ Fertcomplex	33400	152	+11400	34900	159	+12900	36850	168	+14850
16-20+18-46+ Kristalon	34500	157	+12500	37800	172	+15800	39850	181	+17850

CONCLUSIONS

1. The potato is successful in this climatic zone taking also advantage of a soil adequate for its culture, high productions, influenced on the one hand by an agrofund rich in nutrients and on the other hand, by the complex of fertilizers used.

2. The state of providing the fertilizing elements to the soil, using the proposed fertilizers, is situated in the medium towards optimal levels for nitrogen, medium towards optimal levels for phosphorus and potassium and certifies the impact of fertilization, especially the radicular one on the fund of nutritive elements in the soil.

3.The most efficient fertilization variants in terms of preserving the status of the soil, were the variants 16-20 + 18-46, 16-20 +18-46 Fertcomplex and 16-20 + 18- 46 + Kristalon, on the agrofund 160-120-95 kg/ha a.s. NPK.

4. On an agrofund of nutritive elements in increasing doses and usinf combined phasal fertilization, simultaneously applied radicularly and foliarly, there could be obtained remarkable yields.

5. Comparable productions are obtained both in the foliar fertilization on the 160-120-95 kg/ha a.s. NPK agrofund, as well as in the combined fertilizations (radicular + foliar) on the 135-95-70 kg/ha a.s. NPK agrofund, which proves equally important to ensure fertility status of the soil and also thge impact which the phasal fertilizations have.

6. Ensuring an agrofund of 160-120-95 kg/ha a.s. NPK, when administered phasally the16-20-18-46 + Kristalon complexes, leads to maximum increases of yield.

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