NPK SOIL CONTENT MODIFICATIONS AND THE TOMATOES PRODUCTION FERTILIZATION EFFECT

MODIFICAREA CONȚINUTULUI DE NPK DIN SOL ŞI EFECTUL FERTILIZĂRII ASUPRA PRODUCȚIEI DE TOMATE

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Abstract. *In this paper was to evaluate the soil fertilization effect in four sorts of tomatoes cultivated in field condition, in west area country.*

The experience was done in a cambic cernosium soil, with low acidity reaction and the high natural fertility potential favorable vegetables cultivation. On the fertilization application have to realize high average productivity/ ha and sustain good yields fertility. The study was performed on control soil samples (without fertilizers) and soil samples after differentiated NPK fertilization in variable doses: $N_{30}P_{30}K_{30}$, $N_{45}P_{45}K_{45}$, $N_{60}P_{60}K_{60}$, $N_{120}P_{60}K_{60}$. The fertilization doses and the application methods in tomatoes fertilization were to determine in correlations between agro chemistry factors. The recherché material was using tomatoes samples in different precocity steady: early (Export II), half early (Stefania) and middle tardy (Ace Royal and Campbell1327). After research were observed the production increase was obtain at $N_{45}P_{45}K_{45}$ doses fertilization.

Rezumat. *In aceasta lucrare s-a urmarit influenta îngrasamintelor asupra productiei unor soiuri de tomate cultivate in conditii de camp, in zona de vest a tarii. Tipul de sol pe care s-a amplasat experienta este un cernoziom cambic, sol cu reactie usor acidă, cu un bun potential de fertilitate favorabil culturii legumicole. La aplicarea îngrasamintelor trebuie avut in vedere ca, in afara satisfacerii cerintelor plantelor, pentru a asigura sporirea susținuta a producțiilor medii la hectar, trebuie să se realizeze si ridicarea continua a fertilitatii solului. Cercetarile s-au efectuat pe un sol nefertilizat, precum si in conditii de fertilizare diferențială cu NPK in urmatoarele doze: $N_{30}P_{30}K_{30}$, $N_{45}P_{45}K_{45}$, $N_{60}P_{60}K_{60}$, $N_{120}P_{60}K_{60}$. Dozele de îngrăşăminte şi metodele de aplicare pentru îngrăşarea legumelor din grupa solano-fructoaselor, se stabilesc conform cu cerințele față de factorii agrochimici. Ca material de cercetare s-au folosit soiuri de tomate in diferite stadii de precocitate: timpuriu (Export II), semitimpuriu (Stefania) si semitarziu (Ace Royal si Campbell1327). In urma cercetarii s-a observat ca cea mai mare productie de tomate, la toate soiurile, a fost obtinuta la doze de $N_{45}P_{45}K_{45}$.*

The importance of tomato as a vegetable crop is reflected in its large-scale cultivation in the world. Tomato is grown in about 4 million hectares over 160 different countries.(International Plant

Nutrition Institute, 2007) Romania produces about 600.000 and 700.000 t tomatoes/year, current average productivity is 13.3-16.0 t/ha. (Statistical Rumanian Annuar, 2003)

Other research show that tomatoes production ist between 40-120 t/ha, differentiate for tomatoes sort: Export II – 60-80 t/ha, Stefania – 120-160 t/ha, Campbell 1327 – 40-80 t/ha and Ace Royal – 40-60 t/ha.(Ciofu R., 2003)

Tomatoes can be produced across a wide range of soil as long as drainage and physical soil structure is good. The plant produces a fibrous root mass, which can exploit the subsoil given the absence of cultivation pans. Most of the root mass is normally concentrated in the cultivated zone of top 60 cm and 70% of the root volume is in the top 20 cm of top soil. Optimum soil pH is between 6.0-6.5. (Manescu, 2003)

As a rule, all of the plants requirements for phosphorus and third to half of the nitrogen and potassium needs are supplied at planting. The remainder is applied over the course of the growing and cropping period.

Nitrogen is an important nutrient in tomatoes and timing and quality of application is critical. Excess nitrogen is often more common than deficiencies. Too much nitrogen will make plants very bushy and reduce the quality of tomatoes. Nitrogen affects both crop yields and quality.

Phosphorus is necessary for cell division and growth, root and shoots development, photosynthesis, energy transfer and movement of carbohydrates. Involvement in the plants energy cycle provides benefits to many aspects of busy growth and fruit production. Soil testing is recommended to assess phosphorus levels prior to planting.

Potassium is essential for metabolic processes that sustain plant growth and reproduction, playing a regulatory role in plants. Potassium also plays a vital role in photosynthesis, disease and drought resistance, protein synthesis, root maturity, crop maturity and the regulation of plant water use. (www.agrichem.com.au)

The fertilizers are better used in optimum water supply conditions. (Manescu B., 2003)

MATERIAL AND METHOD

Field experiments

Soil samples were taken (0-25 cm depth) before and after fertilization.

Fertilization was control (without fertilizers) and mineral fertilizers (NPK) in variable doses: $N_{30}P_{30}K_{30}$, $N_{45}P_{45}K_{45}$, $N_{60}P_{60}K_{60}$, $N_{120}P_{60}K_{60}$.

Analytical methods

Soil properties were analyzed using the fallowing methods: pH was determined in aqua solution.

Total N (%) was determined by the Kjeldahl method, digested in H_2SO_4 distilled and titrated with 0.1M NaOH.

Soil humus (%) was determined by the Tiurin method, humified soil organic matter was oxidized using potassium dichromate with sulphur acid (1:50) and excess dichromate determined by titration with Mohr salt solution. (Baksiene E., 2006) Phosphorus were determined by spectrophotometry using Spectrophotometer UV-VIS SPECORD 205 by Analytik Jena and Potassium by flame photometry method. (MAIA, 1983)

Tomatoes samples were collected on June-July (varieties Export II and Stefania) and August (Ace Royal and Campbell 1327).

RESULTS AND DISCUSSIONS

In table 1 was presented soil agrochemical parameters before experiment.

Table 1

Soil agrochemical parameters before experiment

Humus	pH	N(%)	P(ppm)	K (ppm)
3	6.34	0.29	163	160

The soil analysis show that soil its favorable for tomatoes cultivation.

The fertilization was applied in spring, with four weeks before tomatoes plantation.

In table 2 was presented soil agrochemical parameters after NPK differentiated fertilization

Table 2

Soil agrochemical parameters after NPK differentiated fertilization

Tomatoes varieties	Fertilization dozes	N(%)	P (ppm)	K(ppm)
Export II	Control	0.25	86.0	140
	$N_{30}P_{30}K_{30}$	0.25	92.4	140
	$N_{45}P_{45}K_{45}$	0.25	94.5	150
	$N_{60}P_{60}K_{60}$	0.26	114.2	147
	$N_{120}P_{60}K_{60}$	0.25	120.0	147
Stefania	Control	0.25	90.4	146
	$N_{30}P_{30}K_{30}$	0.24	110.2	143
	$N_{45}P_{45}K_{45}$	0.25	112.6	147
	$N_{60}P_{60}K_{60}$	0.25	120.1	143
	$N_{120}P_{60}K_{60}$	0.25	124.2	143
Campbell 1327	Control	0.25	84.6	140
	$N_{30}P_{30}K_{30}$	0.24	119.6	147
	$N_{45}P_{45}K_{45}$	0.25	121.7	143
	$N_{60}P_{60}K_{60}$	0.24	114.8	147
	$N_{120}P_{60}K_{60}$	0.24	106.9	143
Ace Royal	Control	0.27	94.5	150
	$N_{30}P_{30}K_{30}$	0.25	101.1	140
	$N_{45}P_{45}K_{45}$	0.25	122.0	143
	$N_{60}P_{60}K_{60}$	0.26	119.6	147
	$N_{120}P_{60}K_{60}$	0.25	123.2	143

The tomatoes production is present in table 3.

Table 3

Tomatoes production

Tomatoes varieties	Fertilization dozes	Production (t/ha)
Export II	Control	35
	$N_{30}P_{30}K_{30}$	35
	$N_{45}P_{45}K_{45}$	40
	$N_{60}P_{60}K_{60}$	32
	$N_{120}P_{60}K_{60}$	30
Stefania	Control	55
	$N_{30}P_{30}K_{30}$	58
	$N_{45}P_{45}K_{45}$	65
	$N_{60}P_{60}K_{60}$	64
	$N_{120}P_{60}K_{60}$	58
Campbell 1327	Control	50
	$N_{30}P_{30}K_{30}$	55
	$N_{45}P_{45}K_{45}$	63
	$N_{60}P_{60}K_{60}$	63
	$N_{120}P_{60}K_{60}$	46
Ace Royal	Control	41
	$N_{30}P_{30}K_{30}$	41
	$N_{45}P_{45}K_{45}$	44
	$N_{60}P_{60}K_{60}$	43
	$N_{120}P_{60}K_{60}$	34

CONCLUSIONS

The experiment shown that application of moderate doses NPK is essential for increased production but the fertilization with highly doses NPK reduce the production, less and less.

The fertilization with $N_{45}P_{45}K_{45}$ determinated maximum tomatoes yield.

NPK soil content was reduced after fertilization.

The tomatoes sorts did not influence the production.

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