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Fertilization Systems in the Tomato Crop in the Field

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Abstract. The article presents the results of researches, experiments and interpretations obtained by using differentiated fertilization technologies for tomato crops in the field.

Keywords: fertilization, field, tomato crop

INTRODUCTION

Soil composition is one key to tomato growing success. Tomato plants need nutrients at differing amounts at various stages of growth. Most fertilizers are a combination of Nitrogen, Phosphorus and Potassium (NPK). Other nutrients and minerals, in smaller amounts help tomato plants to grow robustly and healthy (Amar, 2003) Adding fertilizer is only one step to providing plants with proper nutrients and increasing crop yield. Soil composition and structure directly affects tomato plant health (Zhuang, 1982)

The objective of this research is to identified the effect of complex (NPK) mineral fertilization in field tomatoes and the interaction of this fertilization with the organic fertilizer that is most widely used in agriculture and horticulture (semi-fermented stable manure); the establishment of agrochemical optimum doses (AOD), according to the tomato production curves, and the change in soil agrochemical indices.

MATERIAL AND METHODS

The experimental protocol in the field used aluviosoil eutric molic from lower terrace (floodplain) Mureş River; Soil horizons: Ap-Am-ACGor – Cgor. Agrochemical soil is slightly acidic to surface, neutral on the base profile, medium-low in humus content, content-poor in P, content medium to low in K. Groundwater located at 2 to 3 m depth. The horizon ACGor presents gleizare phenomena**,** not so good for tomato plants.

a. For studying the effect of different mineral complex fertilization doses on tomato crop – yields production the investigated factors are NPK doses through complex fertilizers 15:15:15

The experimental scheme:

1. Control plot (M1) – unfertilized;
2. Control plot (M_2) – fertilized with 25 tons manure/ha + $N_{100}P_{100}K_{100}$;
3. $N_{100}P_{100}K_{100}$;
4. $N_{150}P_{150}K_{150}$;5. $N_{200}P_{200}K_{200}$; 6. $N_{250}P_{250}K_{250}$.

As biological material, in the field was cultivated the tomato variety Unirea.

RESULTS AND DISCUSSION

Application of complex (NPK) fertilizers in the field cultivated with tomatoes determined to obtain high yields of fruit. Differences (increases) of the tomato yields were statistically assured since the first graduation of mineral fertilization ($N_{100}P_{100}K_{100}$).

Maximum fruit production was obtained at $N_{200}P_{200}K_{200}$ graduation then production tends to be capped and even diminish (Tab. 1, Fig. 1 and Fig. 2). Effect of applying differentiated doses of Complex mineral (NPK) can be described satisfactorily by a relationship of type $y = a + bx + cx^2$ where the independent variable (x) is the size (level) of mineral fertilization.

Organo-mineral formula (25 t stable manure/ha + N_{100} P_{100} K_{100}) is equivalent in nutritional intake with only mineral $N_{200}P_{200}K_{200}$ dose causing maximum fruit production in tomato. The decision has these two alternatives almost similar as efficiency (Tab. 2)

The two systems could be applied one by year and the fields could produce high yields of fruit of tomato and a good protection for soil fertility.

Tab. 1

Effect of complex NPK mineral fertilization on field tomato (Unirea) production (average 2007-2009)

No	Fertilization variant	Production		Differences (M1)	
		t/ha	%	t/ha	Significance of difference
1.	Control 1- unfertilized	34.52	100	-	-
2.	Control 2- fertilized 25 t stable manure/ha+ N_{100} P_{100} K_{100}	61.80	179	27.28	***
3.	N_{100} P_{100} K_{100}	48.12	139	13.60	*
4.	N_{150} P_{150} K_{150}	56.24	163	21.72	**
5.	N_{200} P_{200} K_{200}	62.40	181	27.88	***
6.	N_{250} P_{250} K_{250}	60.80	176	26.28	***
DL (5%)				12.40	
DL (1%)				18.40	
DL (0.1%)				22.30	

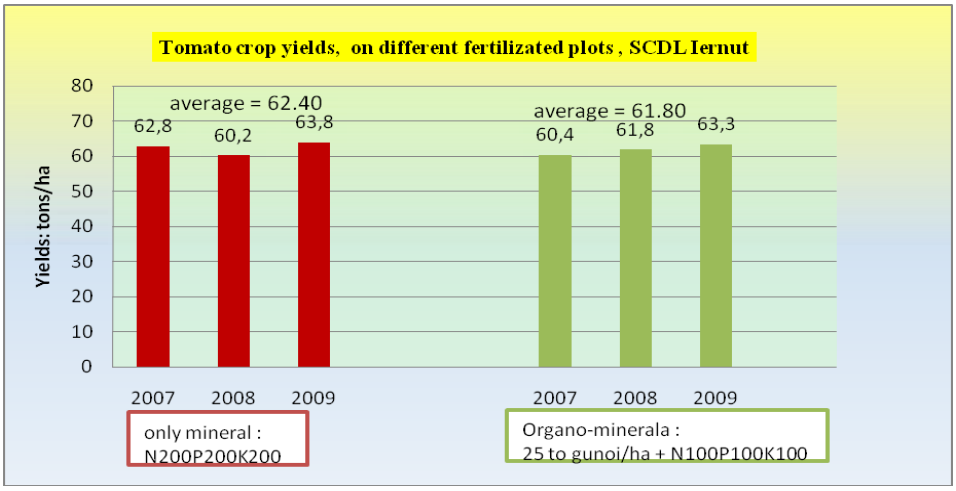

Fig. 1. Dynamics of tomato productions under the influence of differentiated fertilization

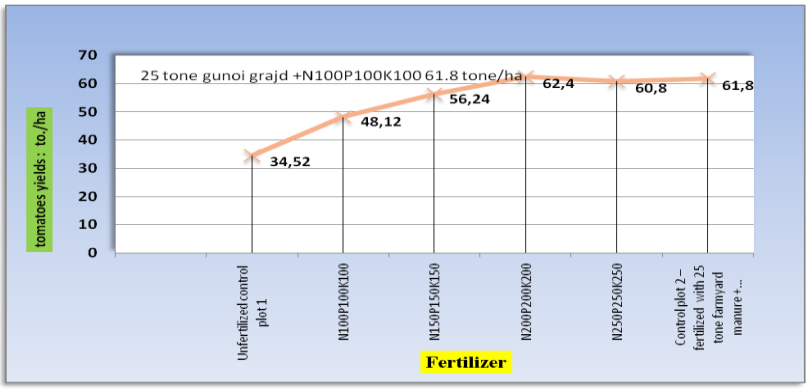

Fig. 2. Production curve in tomatoes under the influence of mineral NPK fertilization

Tab. 2

Optimal dosage recommendation for tomatoes field crop (UNIREA variety)

No.	Recommended fertilization formula	(tons/ha) Forecasted production	Agrochemical significance of fertilization
1.	N_{200} P_{200} K_{200}	> 60	Technique optimum production (DOT)
2.	25 t stable manure/ha + N_{100} P_{100} K_{100}	> 60	Maintenance dose

CONCLUSIONS

In field-cultivated tomatoes, through a fertilization system based on the complex (NPK) application of fertilizers on the Unirea tomato variety, fruit productions that surpassed 55-60 t/ha were obtained. The maximum fruit production, in the conditions of an exclusive complex mineral fertilization is 62.40 t/ha, obtained under doses of $N_{200}P_{200}K_{200}$ considered the optimum technical doses (OTD) that could have been equated in terms of effect, by means of an alternative fertilization as a maintenance doses with 25 t/ha manure + $N_{100}P_{100}K_{100}$. These two fertilizing solutions remain the annual alternatives for the fertilizing technology of field tomatoes (Tab. 2). Production differences were statistically available as an effect of complex mineral (NPK) application of fertilizers from a $N_{100}P_{100}K_{100}$ doses, with maximum fruit production in the case of $N_{200}P_{200}K_{200}$ and a tendency for the diminishing of productions in the case of higher doses. The real analysis of the effects of complex NPK fertilization has shown that mineral fertilization, even in the case of extremely high productions and effects, determines a certain annual variability of productions compared to the organic-mineral one, where the organic support provides a constant increased evolution of fruit production. Complex NPK fertilization (200:200:200) and the organic-mineral one (25 t stable manure + $N_{100}P_{100}K_{100}$) determine a substantial improvement of tomato quality and a preponderance of superior quality classes (Extra and First Quality). At the basis of the effects of differentiated NPK and organic-mineral fertilization lies agrochemical optimization determined in the soil-plant system through the fertilization variants mentioned.

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