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THE EFFECT OF NPK, Mg AND B ON THE YIELD, MORPHOLOGICAL CHARACTERISTICS AND QUALITY CHARACTERISTICS OF INDUSTRIAL TOMATOES

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Abstract

In the two year period from 1994 to 1995 field experiments with industrial tomatoes were done on the test fields at the Agricultural Institute in Strumica. The tests were carried out on alluvial soil, with low lime content, humus, nitrogen (N), moderate available phosphorus (P), and potassium (K). The subject of the experiment was the effect of NPK, magnesium (Mg) and boron (B) fertilization, on the yield, morphological and chemical characteristics of the industrial tomato variety "AT-70-14". It was seen that Mg and B influenced the yield of this kind of tomato. The economic effect of fertilization was highest with the variant with $N_{100}P_{100}K_{150} + 1\% \text{ Mg} + 0,50\% \text{ B}$.

1. Introduction

NPK mineral fertilizers have been used in the Rep. of Macedonia for over 30 years. Therefore much of our soil is well supplied with phosphorus and potassium. That is particularly important for some kinds of alluvial and delluvial soils. In the well developed countries, the production and uses of mineral firm and soluble fertilizers supplied with macro and micro elements based on NPK (NPK +Mg; NPK+B; NPK+Zn etc.) have been sued for a long time.

The results of tests published in the world literature, proved the usefulness of Mg. This element is part of the structure of chlorophyll, pectin, feting, organic acids, and cofermets. It activates many ferments which play an important role in the metabolism of the plant. Boron is produced in the reproductive organs and has a role in the insemination of the plant.

In our country, until now, there have been no tests done on the effect of magnesium and NPK-based boron on tomatoes. This two year study reveals the high economic effect these two elements, especially magnesium (Mg), have.

2. Material and Methods

The two-year field experiment was conducted on low carbonate alluvial soil with 1,65% humus, 3,5% CaCO_3 , with a moderate amount of available phosphorus and potassium. The following variants were involved in the study:

- Variant 1. Control (0),
- Variant 2. $N_{100} P_{100} K_{150}$,
- Variant 3. $N_{100} P_{100} K_{150} + 1,0\% \text{ Mg}$,
- Variant 4. $N_{100} P_{100} K_{150} + 0,5\% \text{ B}$,
- Variant 5. $N_{100} P_{100} K_{150} + 1,0\% \text{ Mg} + 0,5\% \text{ B}$.

NPK is composed of $N_{50+50} P_{100} K_{150}$, or 625 kg/h NPK 8-16-24 and 185 kg/h uras 27% N (50 kg/h N) in all NPK variants. The experiment was conducted in 4 repetitions in an accidental block system. The size of the parcels were 21 m². Planting distance was 90 x 40 sm. The main fertilization of the tomatoes with NPK, Mg and B was done before germination, with the tilling and mixing of the soil. Malnutrition with uras was done in the mass flowering phase and in the initial ripening phase. According to need, all necessary scientific farming methods and protective processes were used.

3. Results and Discussion

3.1. Yields

In the favorable year of 1994 higher yields were obtained. In the very rainy year of 1995, due to bacterial and fungus diseases, lower yields were obtained.

Data on yields and some morphological and quality characteristics are found in table 1 (Table 1).

The drought in 1994 was very favorable for yields; higher yields were obtained but only with artificial irrigation. In the rainy year of 1995, despite the use of proper plant protection with fungicides, the yields were lower. Due to a lack of nutrients in the control in 1995, the first harvest was 50%, but in the variant NPK + Mg + B the initial harvest was only 40,5%.

In 1994, the variant with B showed a higher effect than the variant with Mg in 1995. This can be explained by the fact that boron influenced the defenses against plant diseases.

Morphological characteristics of the tomatoes showed no significant differences. Dry matter in 1995 showed higher values, from 12,5% - 25,0%. Nitrate values were approximately the same, except in variant NPK + B (9,0 mg/kg in 1995), where there were insignificant differences, which were deemed not hazardous to health.

3.2. Economic effect of fertilization

The economic effect of fertilization was calculated as follows:

a) Price of the fertilizers:

Variant 2: NPK	the price of the fertilizer was 6250 denari/ha,
Variant 3: NPK + Mg	the price of the fertilizer was 6875 denari/ha,
Variant 4: NPK + B	the price of the fertilizer was 7312 denari/ha,
Variant 5: NPK + Mg + B,	the price of the fertilizer was 7938 denari/ha.

b) Price of industrial tomatoes was 2,7 denari/kg.

The cost of the increased harvest, yield, transportation to the factories etc. of variant 3 were 1000 denari/kg; variant 4, 1880 den/kg and variant 5, 3320 den/kg.

On the basis of the above mentioned facts, the economic effect of the fertilization was obtained (table 2).

Table 1 : The effect of NPK, Mg and B on yield and some morphological and quality characteristics on industrial tomatoes.

	vari- ant	yield t/ha	%	mass of fruit g	length of fruit cm	width of fruit cm	thick- ness of peri- carp cm	dry matter %	NO ₃ mg/kg
1994	1	97,5	100,0	126,8	5,2	6,1	0,5	4,0	7,0
	2	103,0	105,6	127,2	5,1	6,1	0,5	4,0	8,0
	3	112,0	114,9	133,1	5,3	6,2	0,5	4,0	7,0
	4	106,0	108,7	123,8	5,2	6,2	0,5	4,0	6,0
	5	119,1	122,1	158,6	5,4	6,6	0,5	4,0	7,0
1995	1	66,8	100,0	157,0	5,6	6,9	0,6	4,5	7,0
	2	67,6	104,9	204,3	5,6	6,8	0,5	5,0	7,0
	3	70,1	105,1	193,0	5,5	6,9	0,6	4,8	8,0
	4	72,3	108,2	179,8	5,8	7,3	0,5	4,5	9,0
	5	75,9	113,9	145,5	5,4	6,8	0,5	4,5	6,0
ave - rage of 2 years	1	81,5	100,0	141,9	5,4	6,5	0,5	4,2	7,0
	2	85,3	104,7	165,8	5,3	6,5	0,5	4,5	7,5
	3	91,1	112,1	163,1	5,4	6,6	0,5	4,4	7,5
	4	89,2	109,1	151,8	5,5	6,8	0,5	4,2	7,5
	5	97,5	119,6	152,1	5,4	6,7	0,5	4,2	6,5

Table 2 : Economic effect - average for the two years of the test

vari- ant	yield t/ha	increased yield by NPK t/ha	price of fertilizer den/ha	over yield den/h a	increased yield den/ha	cost of yield den/ha	total cost	brute income den/ha
1	81,5	—	—	—	—	—	—	—
2	85,3	—	6 250	10260	—	—	—	—
3	91,1	5 800	6 875	25920	15660	2320	2945	12715
4	89,2	3 900	7 313	20790	10530	1560	2623	7907
5	97,5	12 200	7 900	43200	32940	4880	6530	26410

The highest economic effect was obtained from the variant NPK + Mg + B with a profit of 12 200 denari per ha, followed by the variant NPK + Mg with a profit of 5 800 denari per ha and finally by NPK + B with 3 900 denari per ha.

According to the results of our experiment, we can conclude that the use of NPK fertilizers with Mg and B fertilizers are very effective in the region of Strumica and they are also very effective for the rest of the agricultural regions in the Rep. of Macedonia.

4. Concluding remarks

According to the results obtained from our tests of the effect of NPK, Mg and B on yield and some morphological and quality characteristics on industrial tomatoes "AT-70-14" on alluvial soil in the region of Strumica, we can conclude the following:

- Yields in 1995 were approximately 2/3 of the 1994 yields due to bacterial and fungus diseases.
- In 1995, boron fertilizers had a greater effect than magnesium fertilizers.
- In the favorable year of 1994 the fruits had a bigger mass, but the other morphological characteristics did not show any significant differences from 1995.
- In 1995, dry matter showed relatively larger values, from 12,5% to 25,0%.
- The use NPK fertilizers, based on Mg and B, are recommended for our agricultural production of industrial tomatoes.

References

- Cuvardić M., Lazić B., Manojlović S., Udović M, 1988, Karakteristika plodnosti povrtarskog zemljišta Backe i uloga sistema plodnosti zemljišta u upotreba đubriva u povrtarskoj proizvodnji, Poljoprivredni fakultet - Institut za ratarstvo i povrtarstvo, Novi-Sad.
- Peshovski M. and Ivanovski P., 1988, Vremenski raspored na potrošeniot trud I koristnje mehanizacija vo proizvodstvoto na piperka, Sozijalisticho zemjodelstvo, Br. 11 - 12, Skopje.
- Trpevski V., Avramovski T. and Stojanova M., 1990, Rezultati od ispituvanjata na plodnosta na pochvata so N, P₂O₅ i K₂O vo nekoj oranzerii vo R. Makedonija i visinata na prinosite kaj domatite i krastavicite. Jug. Simpozium "Intenzivno gajenje povrcha i proizvodnja u zashtichenom prostoru", Ohrid, Zbornik radova, 13 - 16.
- Trpevski V., Stojanovska L., Demirovska V., and Ognenovski V., 1992, Uticaj razlicitih kolicina azota na kvalitet prinosa kod nekih sorta paradajza, Savremena poljoprivreda, Novi Sad, XL (1992) 1 - 2, 100 - 105.