EFFECT OF FERTILIZATION ON THE CONTENT OF MAGNESIUM IN TOMATOES

D. KOSTOVA * H. BOTEVA **

***Agricultural University - Plovdiv**
12, Mendeleev Str., 4000 Plovdiv, Bulgaria
****Vegetable Crops Research Institute, Plovdiv, Bulgaria**

INTRODUCTION

In the conditions of intensive farming the interest towards the micro- and macro elements promptly increases. The attention is pointed towards the occurring changes in their content in the system soil-plants [1-3]. Along with a clarification of their influence upon the nutrition of plants, it is a great interest their accumulation in the separate parts of plants- rhizome, stems, leaves and fruit.

Magnesium belongs to the group of biogenic or macroelements. In the shortage of this element, plants cannot finish their vegetative and reproductive stage of their life-cycle [4]. It is proved that magnesium ions activate enzymes that take part in the transfer of energy from one system to another in the plant organism. Magnesium is one of the elements which are actively absorbed by plants.

The aims of the present research are to study the influence of the level of potassium, the form of the potassium fertilizer in soil upon the content of magnesium in the stems and leaves of tomatoes.

MATERIAL AND METHODS

The experimental work is brought out on a too leached meadow-maroon soil.

Variants of the experiment:

1. basic fertilization
2. Fertilization with K_8 (K_2SO_4)
3. Fertilization with K_{16}(K_2SO_4)
4. Fertilization with K_{24}(K_2SO_4)
5. Fertilization with K_8 (KNO_3)
6. Fertilization with K_{16}(KNO_3)
7. Fertilization with K_{24}(KNO_3)

The experiment is brought out in seven variants in two levels of potassium fertilization, as two sources have been tested- potassium sulphate and potassium nitrate.

The plants are cultivated in seedlings in a steal-glass hot-house. The sowing is carried out with a quota under crops 3 g/m^2. The seedlings are pricked off in the field of high flat bed, in a scheme of 120+ 40/30 cm. The experiment is set according the block-method in four replications with an area under review 9.6 m^2.

The basic fertilization is carried out on the basis of the agrochemical analysis of the soil, as it comprises 30 kg/da triple superphosphate and potassium fertilizer, according to the variants from 2 to 8. The feeding up with nitrogen is carried out in three times; before planting, first earthing up, and after 20 days. NH_4NO_3 has been used. Potassium is brought in two times: before planting and sprout of first raceme as large as peanut. K_2SO_4 and KNO_3 have been used.

Procedure — A wet burning of the plant sample was carried out in which a mixture of sulphuric and nitric acids was used for the oxidation of the organic substance. A portion of 2 g of air-dry plant material was placed into a Kjeldal flask and moistened with 4 ml distilled water. 5 ml conc. sulphuric acid and 10 ml conc. nitric acid were added. The flask was slightly heated to avoid splashing of the solution decomposition and fuming away of HNO_3. If the oxidation of the organic substance was not completed, HNO_3 was added and heated again. When all the organic material was oxidized, the solution was heated at a higher temperature for 10 min [5]. After cooling the solution was diluted with water and filtered. It was transferred into a volumetric flask of 50 ml and diluted to the mark with distilled water.

RESULTS AND DISCUSSION

The influence of the potassium fertilization upon the content of magnesium in the stems and leaves of tomatoes has been studied (Table 1 and 2). Two sources of potassium fertilization has been tested with potassium sulphate and potassium nitrate in different levels of fertilization

Table 1 Magnesium content in stems of tomatoes (g/kg dry matter)

N	Variants	Tomatoes	Magnesium g/kg
1	basic fertilization	stems	35.3
2	K_8 (K_2SO_4)	stems	34.0
3	K_{16} (K_2SO_4)	stems	33.9
4	K_{24} (K_2SO_4)	stems	49.4
5	K_8 (KNO_3)	stems	60.1
6	K_{16} (KNO_3)	stems	35.5
7	K_{24} (KNO_3)	stems	48.9

Before the setting of the trial for determination the kind and quantity of fertilizers for a main fertilization and monthly for the feeding-up there had been made an agrochemical analysis of the soil in a water extraction. Mineral nitrogen (NH_4-N+NO_3-N) – 2.1 mg/100g soil, movable forms of P_2O_5 and K_2O – respectively 20.5 mg and 17.7 mg/100 g soil, soil reaction $pH_{(H2O)}$ 6.9 – 7.0, content of humus – 2.1% had been determined.

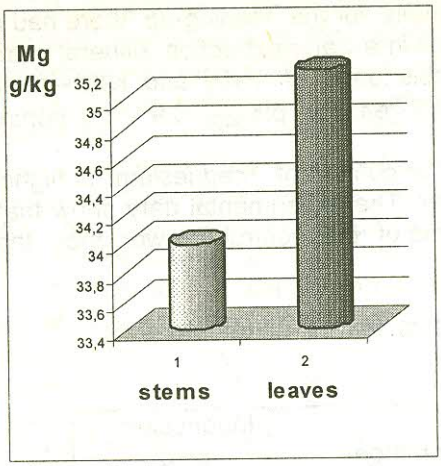
In the control (basic fertilization) the content of magnesium is highest in leaves of tomatoes 41.7 g/kg dry matter. The experimental data show that the content of this element 35.3 g/kg in stems of the control is lower than that in leaves.

Table 2 Magnesium content in leaves of tomatoes (g/kg dry matter)

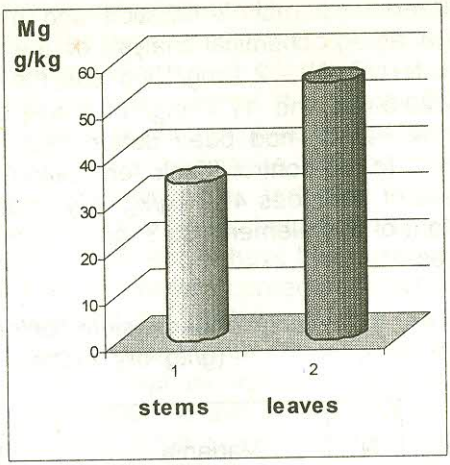
N	Variants	Tomatoes	Magnesium g/kg
1	basic fertilization	leaves	41.7
2	K_8 (K_2SO_4)	leaves	35.2
3	K_{16} (K_2SO_4)	leaves	55.2
4	K_{24} (K_2SO_4)	leaves	72.1
5	K_8 (KNO_3)	leaves	64.2
6	K_{16} (KNO_3)	leaves	48.1
7	K_{24} (KNO_3)	leaves	43.5

In fertilization with potassium sulphate three levels are tested: $K_8(K_2SO_4)$, $K_{16}(K_2SO_4)$ and $K_{24}(K_2SO_4)$. The experimental data show that the content of magnesium in stems and leaves changes in the same way in the three levels of fertilization with K_8, K_{16}, K_{24} (Fig. 1**A**, 1**B**, 1**C**). The biggest amount of magnesium accumulates in levels 35.2 g/kg, 55.2 g/kg and 72.1 g/kg dry matter. The content of magnesium in the stems is lower (Table 1). The experimental data show that this difference in the content of magnesium in stems and leaves increases with an increase of the amount of potassium from K_8 to K_{24} introduced in soil.

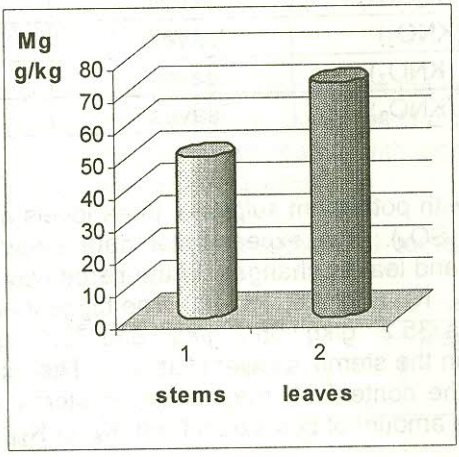
In the three levels of potassium fertilization with potassium sulphate the biggest amount of magnesium 72.1 g/kg accumulates in leaves in fertilization with $K_{24}(K_2SO_4)$, and the least amount of magnesium 35.2 g/kg in fertilization with $K_8(K_2SO_4)$ (Table 2). This indicates that with the increase of the fertilization norm of potassium in soil, the amount of the assimilated magnesium by leaves of plants increases.



A) - $K_8(K_2SO_4)$



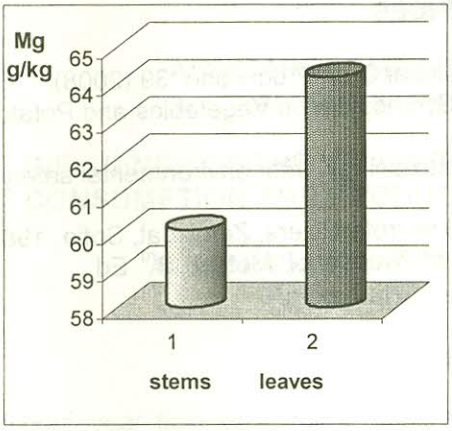
B) - $K_{16}(K_2SO_4)$



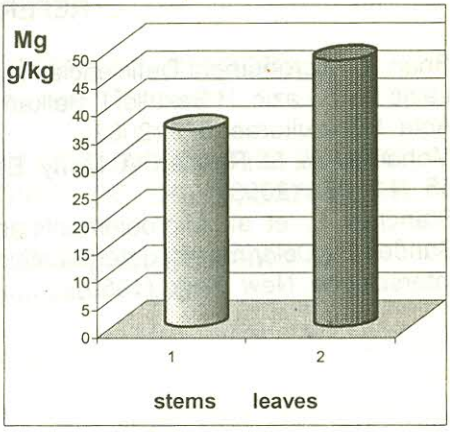
C) - $K_{24}(K_2SO_4)$

Fig. 1 Content of Mg in tomatoes in different levels of fertilization with K_2SO_4: 1- stems, 2- leaves

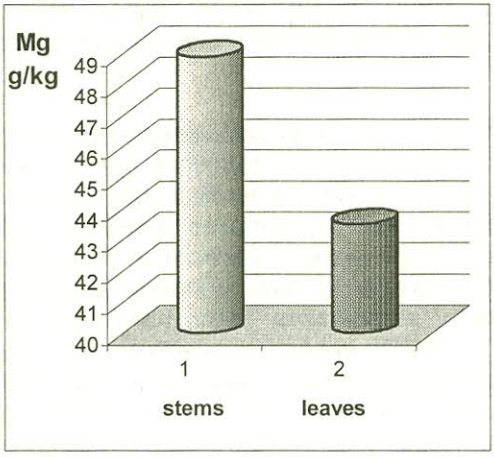
In fertilization with potassium nitrate three levels are tested: $K_8(KNO_3)$, $K_{16}(KNO_3)$ and $K_{24}(KNO_3)$. The experimental data show that the change in the concentration of magnesium in separate parts of plants - stems and leaves has the same subordination as in fertilization with potassium sulphate. An exception can be seen only in fertilization with $K_{24}(KNO_3)$ (Fig.2**A**, 2**B**, 2**C**).



A) - $K_8(KNO_3)$



B) - $K_{16}(KNO_3)$



C) $K_{24}(KNO_3)$

Fig. 2 Content of Mg in tomatoes in different levels of fertilization with KNO_3: 1- stems, 2- leaves

The experimental data show that the biggest amount of magnesium 48.1 g/kg is accumulated in leaves of tomatoes in a level of potassium in soil $K_{16}(KNO_3)$. The content of magnesium in leaves decreases in 43.5 g/kg (variant 7, Table 2) in fertilization with $K_{24}(KNO_3)$. The biggest content of magnesium in leaves 64.2 g/kg (variant 5, Table 2) corresponds to the lowest fertilization norm of potassium in soil $K_8(KNO_3)$.

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