

RADICULAR FERTILIZATIONS VS FOLIAR FERTILIZATIONS AND THEIR IMPACT ON THE CHEMICAL COMPOSITION OF PLANTS ON A TOMATO CULTURE

FERTILIZĂRI RADICULARE VS FERTILIZĂRI FOLIARE ȘI IMPACTUL ACESTORA ASUPRA COMPOZIȚIEI CHIMICE A PLANTELOR, LA O CULTURA DE TOMATE

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Abstract : *The use of fertilizers correctly involves analyzing and determining the factors that condition their effect. The doses, certain stress factors, the biological features of crops, pedo-climatic conditions, the level of agri-technics applied and, last but not least, the farming system are factors that influence the level of production. The tomatoes, especially the very productive varieties, respond differently to the doses and the range of fertilizers used. The paper presents a fertilization study, in a site belonging to a family association, located in Sorogari, Iasi County. The results obtained confirm the agronomic efficiency of foliar fertilizations and combined root and foliar fertilization. During the experience, the chemical composition of tomato plants is clearly influenced by the combination of the two types of fertilizations, radicular and foliar. The production is maximum and is at the same quantitative level, equally in Borviso 500 and also 18-46 (300 kg.ha)+Borviso 500, on differentiated fertilized plot.*

Key words : foliar fertilizations, foliar diagnosis, macroelements

Rezumat: *Utilizarea de îngrășăminte în mod corect, presupune analiza și determinarea factorilor ce condiționează efectul lor. Dozele, anumiți factori de stress, particularitățile biologice ale culturilor, condițiile pedoclimatice, nivelul agrotehnicii aplicate și nu în ultimul rând sistemul de agricultură sunt factori care influențează nivelul producțiilor. Tomatele, cu precădere soiurile foarte productive, răspund diferențiat la dozele și sortimentul de îngrășăminte folosite. Lucrarea prezintă un studiu de fertilizare, într-un amplasament aparținând unei asociații familiae, situate în Sorogari, jud. Iași. Rezultatele obținute, certifică eficiența agronomică a unor fertilizări foliare și fertilizări combinate radicular și foliar. În cadrul experienței organizate, compoziția chimică a plantelor de tomate este clar influențată de combinația celor două tipuri de fertilizări, radiculare și foliare. Producțiile sunt maxime și se situează la același nivel cantitativ, în egală măsură în varianta Borviso 500 dar și 18-46 (300 kg.ha)+Borviso 500, pe agrofonduri diferențiat fertilizate.*

Cuvinte cheie: fertilizare foliară, diagnoză foliară, macroelemente

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INTRODUCTION

One of the major objectives of modern agriculture is the achievement of high and constant expectations for crops, both quantitatively and qualitatively, in the context of the real protection of agroecosystems (Rusu, 2005). The use of fertilizers in a correct and scientific way, represents a profitable and efficient measure to achieve these objectives, which together with an agrochemical control of soils and plants, leads to a substantial change in the quantity and quality of the crops. The radicular fertilizations, in addition to foliar ones, in dosages and optimized reports and in accordance with the application of the entire complex of technological links, compete for the creation of an adequate nutritional medium, but also for the harvesting of the expected level (Volf, 2008). Foliar diagnosis is an increasingly widespread process for detecting possible nutritional disturbances (Spencer and Chan, 1981) and is applicable in agricultural practice, potentiating soil analyzes and often explaining the disruptive phenomena of metabolism generated by a multitude of dysfunctions at the chemistry level of the soil.

MATERIAL AND METHOD

The researches were carried out during the year 2017, within a private vegetable garden, located in Sorogari, Iasi County.

An area of 0.50 ha has been organized on a crop of tomato cultivar, semi-seeded variety, using a range of fertilizers, applied radicularly and foliarly. Fertilization variants were distributed in the field, according to the subdivision blocks method, with four repetitions.

There were used as radicular fertilizers, ammonium nitrate (33%), concentrated superphosphate (50%) and potassium salt (40%) in basic fertilizations in two progressive doses, respectively 425 kg / ha and 675 kg / ha. s.a. Also as a root fertilizer, in additional fertilization was also used Cx 18-46-0 complex, in single dose, 300 kg / ha s.a. For the fertilizations of organic protection (foliar) Borviso fertilizer was given in 3 runs at 3-4 week intervals in two doses, 250 mL / ha and 500 mL / ha, respectively.

The analysis of the soil type indicates the presence of mesocalcaric cambic chernozem (low leached or decarbonated), clay, developed on loessoid, undisturbed, non-irrigated deposits. The soil unit belonging to the research polygon presented: $pH_{(H_2O)}$ 6.9-7.5, neutral to slightly alkaline reaction, medium humus content (2.4-2.5% H), low to medium content in nitrates (1.9-3.9 mg NO_3^- / 100 g soil), low content in mobile phosphorus (20.8-52.8 ppm P-AL); good supply status in mobile potassium (260-301 ppm K-AL). Boron is at the lower limit of a medium insurance (0.4-0.5 ppm B)

As a biological material, Buzau tomato 1600 variety was used.

The harvesting and preparation of the vegetative organs (leaves) was done according to the standardized methodology. The time of sampling was at blossom, at the second node, the newly matured leaf. The lab analyzes on vegetative samples were aimed at:

- Determination of total nitrogen, N_t %, Kjeldahl method
- Dosing of total phosphorus, P_t %, colorimetric method with MoO_3 and $SnCl_2$
- Dosing of total potassium, K_t %, flame photometry method with atomic absorption

Production records were made by weighing and reporting per hectare.

RESULTS AND DISCUSSIONS

The administration of fertilizers, in radicular and foliar form but also in combination, has improved the chemical composition in tomato plants. In this respect, the values of the macro-nutrient contents in the plant reflect a fairly wide range of values, indicating that they increase in relation to the type of fertilizer used and the dose (tab. 1).

The total nitrogen content of the vegetal material increases from the unfertilized control variant to the variant 18-46 (300 kg / ka) + Borviso 500, when using both plots, respectively 425 kg / ha and 675 kg / ha, for this variant – obtaining values of 6.18 and 6.50% N_t, classified as state of optimal insurance (Reuter, 1986)

The total phosphorus content is at values of hidden deficit for the control variant and increases to optimal values for the rest of the variants. Borviso 500 variant and 18-46 (300 kg / ka) + Borviso 500, record comparable values on both agro-funds used.

The total potassium increases in value, progressively with the range of fertilizer used but also with the dose. Values 5.09 and 5.17% K_t, for variant 18-46 (300 kg / ka) + Borviso 500, on both plots, slightly exceed the optimum, ranging from 3-5% K_t, quoted in the literature.

Table 1

The basic chemical composition % N, P and K of dry substance

Var. /plot	150-100-175 kg/ha NPK a.s.			250-200-275 kg/ha NPK a.s.		
	Nt	Pt	Kt	Nt	Pt	Kt
	%	%	%	%	%	%
Control - unfertilized plot	5.41	0.31	2.23	5.41	0.31	2.23
18-46 (300 kg/ha)	5.63	0.43	3.51	5.91	0.49	3.87
Borviso 250	5.71	0.52	3.75	5.90	0.60	3.95
Borviso 500	6.12	0.65	4.98	6.45	0.69	5.04
18-46(300 kg/ha)+ Borviso 250	6.06	0.55	4.45	6.15	0.62	4.98
18-46(300 kg/ka)+ Borviso 500	6.18	0.65	5.09	6.50	0.68	5.17

For tomato crops in the analyzed site, the radicular and foliar fertilized variants, in combination, recorded significantly higher yields than the rest of the variants (tab 2).

For the plot 150-100-175 kg / ha NPKs.a, the maximum yields are obtained for the variant 18-46 (300 kg / ka) + Borviso 500, respectively 52050 kg / ha of fruit, with 21800 kg more than the control unfertilized variant.

For the plot 250-200-275 kg / ha NPK, the Borviso 500 and the 18-46 (300 kg / ka) + Borviso 500 variants yield largely and comparably, 60980 and 61340 kg / ha of fruit, with a difference from the control of 202% and 203%, respectively.

Table 2

Influence of basic and additional fertilization on production

Var. /plot	150-100-175 kg/ha NPK s.a			250-200-275 kg/ha NPK s.a		
	Prod. kg/ha	%	Dif. ±kg/ha	Prod. kg/ha	%	Differ. ±kg/ha
Control - unfertilized plot	30250	100	-	30250	100	-
18-46 (300 kg/ha)	45650	151	+15400	50432	167	+20182
Borviso 250	43200	143	+12950	49600	164	+19350
Borviso 500	51250	169	+21000	60980	202	+30730
18-46(300 kg/ha)+ Borviso 250	50269	166	+20019	56800	188	+26550
18-46(300 kg/ka)+ Borviso 500	52050	172	+21800	61340	203	+31090

CONCLUSIONS

At the analyzed site, the tomato culture responds to the fertilization administration, thus, significant results regarding the elemental chemical composition determined by the foliar diagnosis is obtained both in the variants fertilized only foliarly, as well as at the combined variants with the radical fertilizations supplemented by the foliar ones .

By providing a rich and balanced plot in fertilizing elements for the soil belonging to the studied site, the yields are maximum and comparable for the Borviso foliar fertilized variant at 500 mL / ha but also in the combined form 18-46 (300 kg / ka) + Borviso 500, doubling in comparison with the unfertilized control type.

The Borviso foliar fertilization at the 500 mL / ha dose proves to be beneficial and effective, both by stimulating the NPK synergism processes in the soil and implicitly in the plant, as well as in stimulating the production.

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