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Uptake of Phosphorus and Potassium in Roots of Tomato (*Lycopersicon esculentum* Mill., cv. "Sidra F₁") as Dependent Upon Soil Chemical Properties

MILENA DJURIC¹, PAVLE MAŠKOVIC¹, SRECKO CURCIC^{2*}, MILAN PAVLOVIC³, MILANKO LJUJIC⁴

¹University of Kragujevac, Faculty of Agronomy, Cara Dušana 34, 32000 Čačak, Serbia

²University of Kragujevac, Faculty Technical Science Čačak, Svetog Save 65, 32000 Čačak, Serbia

³University of Novi Sad, Technical faculty- Mihailo Pupin-, 23000 Zrenjanin, Serbia

⁴JKP 17 september, 32300 Gornji Milanovac, Serbia

*The objective of this study was to evaluate the degree of phosphorus and potassium uptake in roots of tomato (*Lycopersicon esculentum* Mill., cv. 'Sidra F₁') as dependent upon the chemical properties of the soil. The experiment was conducted during 2010 and 2011 under controlled greenhouse conditions at the Faculty of Agronomy, Čačak. The material used in the study included tomato seedlings and 9.5 litre pots filled separately with one of the following soil types: chernozem, vertisol, fluvisol and pseudogley, which were collected from four different sites located in the Moravica District region in Serbia. Immediately before the experiment, each soil type was subject to chemical analysis to evaluate pH, cation exchange capacity, humus content, and available phosphorus and potassium levels. pH was determined by a digital pH metre, humus content by the bichromatic method, cation exchange capacity (CEC) by the ammonium acetate method, and phosphorus and potassium content by the AL-method. The objective of this part of the analysis was to assess the chemical properties of the test soils prior to the experiment. The experiment was set up in a randomised block design in four treatments (soil types) in five replications. Each treatment in each replication was presented with ten tomato plants which means that the experiment included a total of 200 plants. The agro-technical measures applied in all experimental plots were identical. The P and K content of tomato roots was determined at both the flowering and full maturity phenostage using the AAS method. The results showed that the uptake of both phosphorus and potassium was highest in the treatment involving tomato cultivation on vertisol and lowest in that on luvisol and pseudogley. As opposed to the other soil types, vertisol had favourable chemical properties: neutral to slightly acid reaction, a high cation exchange capacity and a high humus content, which favoured the uptake of phosphorus and potassium by the plant. Luvisol and pseudogley basically do not have these characteristics; therefore, these soils can be recommended for tomato cultivation only after improvement of chemical properties.*

Key words: nutrition, humus, cation exchange capacity, pH, soil

Climate and edaphic factors in the Republic of Serbia offer exceptionally favourable conditions for tomato production, due to which there has been a long tradition of widespread tomato cultivation in Serbia. Notwithstanding this fact, tomato yields per unit area in Serbia are rather low as compared to the European average. Low yields of tomato are not the result of the genetic potential of the cultivars and hybrids used but rather of an inadequate use of cultural practices in tomato growing, notably irrigation and fertilisation [1].

Apart from the above factors, successful tomato production also depends upon the type of soil used for the cultivation of this crop. Only soils that exhibit a stable structure, high biological activity, good aeration and water infiltration and retention capacity, favourable chemical properties and a high level of available nutrients have the potential to become a medium for the cultivation of this and other agricultural crops [2].

The objective of this study was to evaluate the degree of phosphorus and potassium uptake in tomato as (*Lycopersicon esculentum* Mill., cv. 'Sidra F₁') dependent upon the chemical properties of the soil used for tomato cultivation.

Phosphorus (P) and potassium (K) are dealt with in this study due to their vital role for tomato development.

Phosphorus forms part of nucleoproteins, phospholipids and a large number of enzymes involved in energy processes, which is directly correlated with the development of the plant as a whole and its root system in particular [3].

Potassium plays an important role at the stage of tomato maturation since it activates or regulates the activity of over 80 enzymes closely associated with nutrient synthesis. Moreover, potassium is important for plant osmoregulation since it directly induces a change in the osmotic potential and cell turgor [4]. This study was conducted on four different soil types, including leached soil (luvisol), pseudogley, alluvial soil (fluvisol) and vertisol, which are widely present in the Republic of Serbia.

Experimental part

Materials and methods

This study was conducted in 2010 and 2011 under controlled greenhouse conditions at the Faculty of Agronomy in Čačak. The material used in the study included tomato (*Lycopersicon esculentum* Mill., cv. 'Sidra F₁') plants and 9.5 litre pots filled separately with one of the following soil types: luvisol, pseudogley, fluvisol and vertisol. All seedlings of tomato (*Lycopersicon esculentum* Mill., cv. 'Sidra F₁') used in the study were produced in a certified

* email: srecko.curcic@ftn.kg.ac.rs

