

Synthetic Humic Acid Increased Nutrient Uptake in Cucumber Soilless Culture

ر. غمگسار، ز. شیخ طاهر، م. سلیمی، جمالعلی الفتی، غلامعلی پیوست

R. Qamgosar, Z. Sheikhtaher, M. Salimi, J.A. Olfati, Gh. Peyvast
University of Guilan, Horticultural Department, Rasht, Iran-Islamic Republic.

It has long been recognized that humic substances have many beneficial effects on soil and plant growth. These heterogeneous and complex molecules, ubiquitous in the environment, can produce various morphological, physiological and biochemical effects on higher plants. In order to determine, the effect of Humic acid on nutrient uptake by cucumber an investigation with cucumber cultivar 'Rubah-R' was conducted in a glass greenhouse in 2008 in the Agricultural Faculty of Guilan University, Rasht, Iran. Results showed that humic acid did not affect fruit, root and leaf dry matter of cucumber. Humic acid significantly affected yield attributes. Plant yield was higher when plants were treated with complete nutrient solution. Humic acid have significant effect on nutritional elements uptake by cucumber and as a result we can decrease element content in nutrient solution due to this humic acid positive effect.

Introduction

The influence of humic material on plant growth, have been investigated on biometric factors and numerous studies have shown that humic substances enhance root, leaf and shoot growth but also stimulate the germination of various crop species ([Piccolo et al., 1993](#)). These positive effects are explained by the direct interaction of HS with physiological and metabolism processes. The addition of HS increase nutrient uptake ([Linehan, 1978](#)), cell permeability ([Vaughan and Ord, 1985](#)) and modify mechanisms involved in plant growth stimulation (Lee and Bartlett, 1976). Nowadays humic acid available as a pure solid substrate can be used in nutrient solution like other elements. The objective of this work was to determine the effects of this type of humic acid on cucumber nutrient uptakes in hydroponics conditions and feasibility of decreasing elements content in nutrient solution.

Material and Methods

In order to determine, the effect of synthetic humic acid on cucumber nutrient uptake an investigation with cultivar 'Rubah-R' was conducted in 2008 in the Agricultural Faculty of Guilan University, Rasht, Iran. Treatments used in this research were as follow: Nutrient solution 100% (T1), Nutrient solution (100%) + Humic acid (1 mg/L) (T2), Nutrient solution (75%) + Humic acid (1 mg/L) (T3) and Nutrient solution (50%) + Humic acid (1 mg/L) (T4). Total nitrogen was determined by the Kjeldhal method using concentrated H₂SO₄, K₂SO₄ and CuSO₄ to digest the sample. Phosphorus, calcium and magnesium measured by spectrometry (Elliot and Dempsey, 1991) and potash were measured by Flame Photometry (Latiff, *et al.* 1996). A completely randomized experimental design was used with three replications and eight plants per experimental unit. The resultant data were subjected to analysis of variance using SAS statistical program. Means were separated by Tukey Test.

Results and discussion

No difference was observed on the effect of humic acid on fruit, root and leaf dry matter of cucumber in the treatments. In term of yield decreasing of elements level in nutrient the total yield significantly affected. Plant yield was higher when plants were treated with complete nutrient solution. Results also showed that root total nitrogen was affected in all treatments, but no significantly differences were found by fruits total nitrogen. Leaves total nitrogen were also affected positively by humic acid. No differences were found between nutrient solutions in term of potash content. It is evidence that humic acid can increase the uptake of potassium by cucumber. Although the calcium accumulation in roots indicate no significant differences between treatments, but an increase was found in the leaves. Treatment containing humic acid doesn't have significant differences in fruit and root phosphorous content. Although all treatments with humic acid could increase the amount of magnesium in cucumber fruits but no differences were found by roots and leaves in term of magnesium uptake. Humic substance displays a hormone-like

activity (Nardi et al., 1988). If humic substrate exhibit stimulatory effects on plant cell growth and development, it is reasonable to suggest that homeotic genes are up or down-regulated by such compounds (Costa et al., 2008).

This research indicates that synthetic humic acid have positive effect like other humic acid sources. In refer to abow result decreasing nutrient content can be restitution by humic acid addition in nutrient solution for plant nutrition content.

References

- Costa, G., Labrousse, P., Bodin, C., Lhernould, S., Carlué, M. and P. Krausz. 2008. Effect of humic substrates on the rooting and development of woody plant cuttings. *Acta Hort.* 779:255-258.
- Latif, L.A., A.B.M. Daran and A.B. Mohamed. 1996. Relative distribution of minerals an pileus and stalk of some selected mushroom. *Food Chem.* 56: 115-121.
- Lee. Y.S. and R.J. Bartlett, 1976. Stimulation of plant growth by humic substances, *Soil Sci. Soc. Am.* 40: 876-879.
- Linehan. D.J., 1978. Humic acid and iron uptake by plants, *Plant and Soil.* 50: 663-670.
- Nardi, S., Arnoldi, G. and G. Dell' Agnola. 1988. Release of the hormone-like activities from *Allolobophora rosea* and *A. caliginosa* faeces. *Can. J. Soil Science* 68: 563-567.
- Piccolo. A., G. Celano and G. Pietramellara, 1993. Effects of fractions of coal-derived humic substances on seed germination and growth of seedlings (*Lactuga sativa* and *Lycopersicum esculentum*), *Biol. Fertil. Soils.* 16:11-15.
- Vaughan. D. and B.G. Ord, 1985. Soil organic matter: a perspective on its nature, extraction, turnover and role in soil fertility. In: D. Vaughan and R.E. Malcom, Editors, *Soil organic matter and biological activity*, Dordrecht, Boston: 1-36.