EFFECTS OF HUMIC ACID ON GREEN FLESH PEPPER FORCING

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ABSTRACT - Effects of humic acid on green flesh pepper forcint
The natural humic acid can be a helper factor among others of plant germination, water and nutrient uptake. Moreover it helps to improve root-growing and increase stress tolerance. Products of humic acid extracts and also granulated forms can be essential accessory in integrated vegetable growing.
In our experiment a provocative test of Humic acid (Huminit® with 50 m/m % humic acid active substance) was set. It was used in 3 of 4 treatments in ratios of 0,3 kg/m^3; 0,75kg/m^3 and 1,5kg/m^3 in 4 repeats. The control didn't get any humic acid. All of the treatments got the same amounts of water and N-P-K solution that was irrigated by water. Ratio of NPK was defined by phenological phase.
The green hot pepper variety was the *Capsicum annuum* 'Rush'. Planting time was on 20th of June 2010, pepper was planted in twin rows (90+60x35 cm), and plants were planted to small containers (9 liters of media/container). Plants were pruned to two stem. The treatments were mixes of substrates. The peppers were harvested in every 10-15 days.
Measurements: weight of harvested fruits that was measured after classification (4 groups: extra, I. class, II. class, wastrel); weight, diameter of shoulder, and length of one pepper; height of plants, chlorophyll content (in SPAD) of peppers.
Difference of peppers wasn't significant between treatments, although a small increasing of values of highest concentration of humic acid was noticed in heights and weights. Any difference of measured SPAD values wasn't found.
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Keywords: humic acid, pepper forcing, flesh green pepper

INTRODUCTION

Producing healthy plants for integrated growing became a prime goal years ago, as proper plant health can reduce the number of necessary handling during the growing period. Most diseases and damages caused by pests can be prevented in well conditioned plantations. One of the main tasks of integrated production is to organize plant protection, which is based on reasonability and prevention (ZENTAI, 2001).
According to LEDÓNÉ (2009) integrated approach attributes equal importance to environmental protection, nature conservation and healthy food production, as a main part of human health; and in the same time, it takes economics into consideration. The need for applying integrated growing technologies arises from two sides: consumers need residue free vegetables, while producers need efficient plant protection technologies (ZENTAI, 2001). SOLTÉSZ (1997) says that environment conscious growing technologies do exist, and these apply certain kinds of chemicals, which have a less serious negative effect on environment. This should be a basic requirement for all growers (SERESS – FÖLDI, 2002). According to DEGUINE *et al* (2009) and FERRON – DEGUINE (2009) integrated growing and pest management have an effect on the reduction of polluting materials and might have a cost reducing effect as well (HOLB, 2009; WU AND SARDO, 2009).
Integrated growing technologies can open a way to the organic growing, and it may be more than a conventional technology (NOELL, 2002; WU AND SARDO, 2009). Applying

environment friendly growing technology in seedling production could be a requirement as well. In this technology additional materials can be used too. PAP *et al.* (2009) treated lettuce seedlings with huminic acid in potassium soap solution. Humic acids are formed from plant residues which dissolved in millions of years, and they have a positive effect on water and nutrient uptake (VADÁSZ, 1997). By applying this material, the usage of chemical fertilizers can be reduced in conventional vegetable forcing (SZLÁVIK, 2000). According to the research conducted by PAP *et al.* (2009) potash did not affect or only slightly affected the development of seedlings, but in the growing period it had a significant positive affect. Due to their experience, the quality of the growing media had a much more important role during seedling production, than potash.
The aim of this study was to examine the role of added Huminit with 12% humic acid content in soilless seedling production and the affect it has on grown plants. According to the data from field experiments, where humic acid caused 15-20% yield growth, we presumed that applying Hypothesis 0 = the sufficient dose of official information will have effect for increasing of yield at least in 15%. Humic acid can cause salt stress and gives any other problem in double dose.

MATERIAL AND METHOD

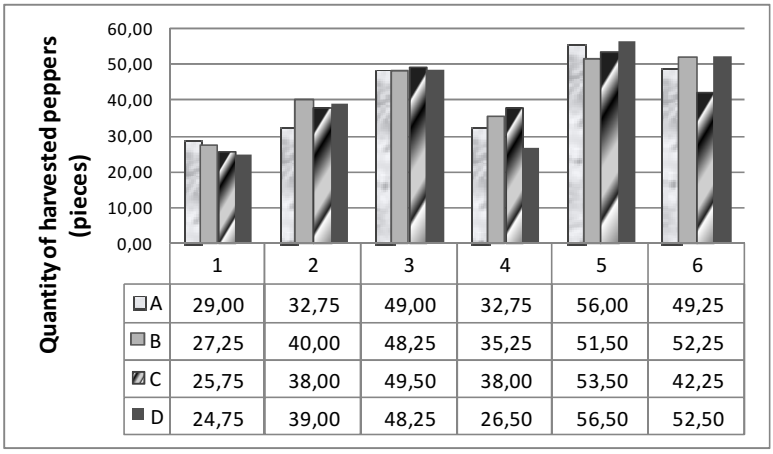
The experiment took place in the Soroksár Experimental Field of the Corvinus University of Budapest. The most important physical features of forced pepper plants were measured.
In our experiment a provocative test of Humic acid was set. Huminit® is an arid pelleted material with 50 m/m % humic acid active substance. It was used in 3 of 4 treatments in ratios of 0,3 kg/m^3; 0,75kg/m^3 and 1,5kg/m^3 in four repeats. The control didn't get any humic acid.

Signs and treatments:
A – control - only soil.
B – 0,3 kg/m^3 of Huminit® mixed with 9 liters of soil.
C – 0,75kg/m^3 of Huminit® mixed with 9 liters of soil.
D – 1,5kg/m3 of Huminit® mixed with 9 liters of soil.

All of the treatments got the same amounts of water and N-P-K solution that was irrigated by water. The amounts and ratio of NPK was defined by the current temperature and intensity of light, and also by phenological phase of peppers.
The green hot pepper variety was the *Capsicum annuum* 'Rush'. Planting time was on 20th of June 2010, pepper was planted in twin rows (90+60x35 cm), and plants were planted to small containers (9 liters of media/container). Plants were pruned to two stem. The treatments were mixes of substrates. The peppers were harvested in every 10-15 days. Harvesting was begun in August of 2010 and was performed 7 times. Six harvests were measured.
Measurements: weight of harvested fruits that was measured after classification (4 groups: extra, I. class, II. class, wastrel); weight, diameter of shoulder, and length of one pepper; height of plants, chlorophyll content (in SPAD) of peppers. In SPAD measurement we created 3 levels on every plant. Three points of three leafs per levels was measured by Konica-Minolta 502 SPAD chlorophyll meter.

RESULTS

According to the data showed on *Figures 1* and *2*, the quantity corresponded with the quality of the yield. No correlation was seen in case of neither measured parameters between the different treatments and the yield.
The measurements of plant height showed no difference in case of the various treatments, though on every double stalked plant had one slightly shorter stem.



	1	2	3	4	5	6
A	29,00	32,75	49,00	32,75	56,00	49,25
B	27,25	40,00	48,25	35,25	51,50	52,25
C	25,75	38,00	49,50	38,00	53,50	42,25
D	24,75	39,00	48,25	26,50	56,50	52,50

Fig. 1. The amounts of harvested pepper, Soroksár, 2010.

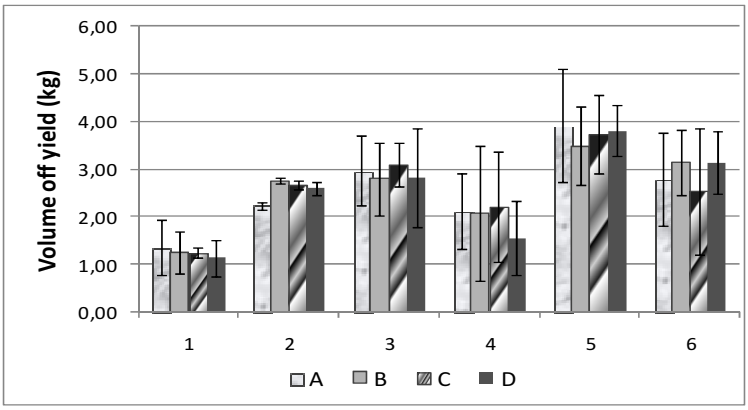


Fig. 2. The average of total weights of harvested peppers of treatments, Soroksár, 2010.

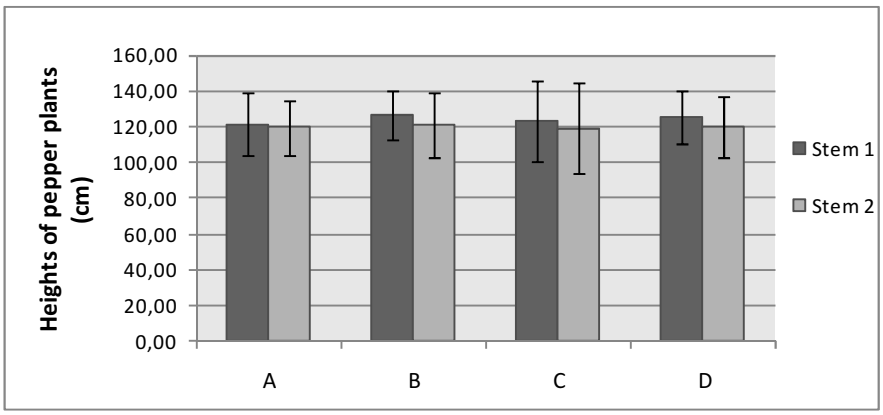


Fig. 3.: The average of heights of pepper plants.

Figure 4 shows the amount of chlorophyll in SPAD. Leafs from the lower zones had higher SPAD values, this result is reflected in the color of the leafs as well. No significant difference occurred in case of the various treatments.

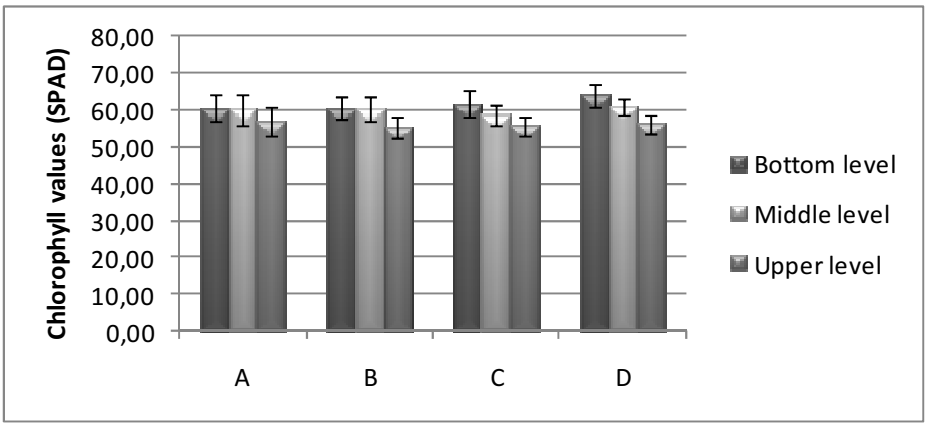


Fig. 4. The average of chlorophyll content (SPAD) in levels of treatments.

CONCLUSIONS

According to the data of the various measurements, no significant difference can be seen between the different treatments. Even those plants which got extreme dose of high humic acid, did not show any abnormalities. We can say that though humic acid caused no yield growth, it did not have a negative affect either, even if applied in double dose.
Since the plants did not get any serious stress during the growing period (in which case humic acid would have gotten a more important role), additional experiments needed to determine how plants treated with humic acid would react to stress factors such as drought and high salt level.

ACKNOWLEDGEMENT

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