THE EFFECTS OF HUMIC ACID PRODUCT ON SOIL FERTILITY MEASURED BY RYEGRASS TEST PLANT

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Introduction

By humic acid treatments, the increase of plant production is achieved by the positive influence of physiological processes (cell respiration, photosynthesis, protein synthesis, water and nutrient uptake, enzymatic activity). The humic acid products can have positive effects by enhancing the micro nutrient availability and microbiological activity, however, usually these benefits do not compensate for the extra costs related to the application of these additives under average production circumstances. In the production of fruits and vegetables, the yield growth and quality improvement of the products can compensate for the extra costs.

Materials and methods

The humic acid that was used in our experiments originated from South Africa. It was produced by Farmfert Formulators INC. and registered under the code number of PCT WO 2006/092720AI. The extraction of the humic substances from mineral coal, organic compost or both involved three steps. The first step, oxidizing reagent (HNO_3) was added to the raw material. The second step was to separate the fulvic acid from the intermediary product into a solution using pyroligneous acid. The remaining deposit is the humic acid, which was extracted during the third step resulting from the treatment with potassium-hydroxide.

In the experiment perennial ryegrass (*Lolium perenne*) was used as a test plant. The soil we used in our experiment was a young soil in early stage of weathering, originated from a sedimentary material, and developed under forest vegetation. Soil chemical properties from the area of experiment:

$CaCO_3$	P_2O_5	K_2O	NO_3-N	Salt	EC	pH(H_2O)	K_A
%	mg dm^{-3}	mg dm^{-3}	mg dm^{-3}	%	mS cm^{-1}		
10.6	47	130	3.5	0.02	0.45	8.1	35

Results and discussion

When examining the effects of humic substances, the impacts are evaluated, ie. the difference between the values resulting from the treatments and the control values are evaluated.

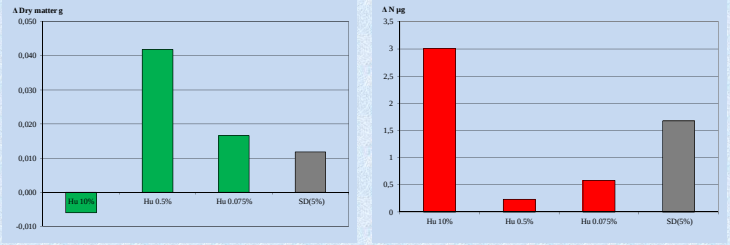

Figure 1. The effects of humic acid products on the dry matter production of ryegrass (left) and the nitrogen content taken up by the plants (right). (Δ: Treatment – Control)

When comparing the effects on dry matter content, we experienced that their average values differed more from each other than the SD(5%)=12 mg values. It can be seen on *Figure 1.* (left) that with 0.075% treatment, significantly higher effect (23 mg more) was gained compared to the effect of the 10% treatment. The 0.5% treatment resulted in even higher positive effect, which significantly exceeded the effects of the 0.075% treatment, with the difference of 25 mg. The 6 mg decrease for the 10% treatment compared to the control was not significant. This result indicated that the effects of treatments are dependent on the applied doses.

Analysing the data on nitrogen uptake by plants showed opposite tendency (*Figure 1.* right). There was not significantly higher N uptake in case of the 0.5 and 0.075% treatments. However, the N content taken up by plants increased in the 10% treatment pots compared to both values.

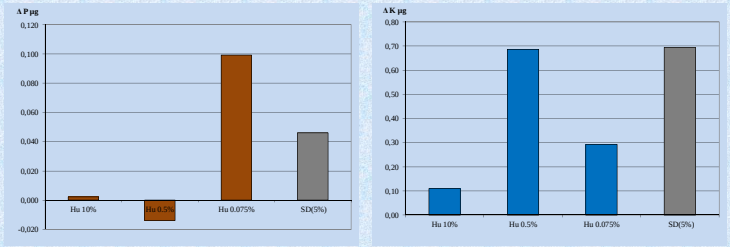

Figure 2. The effect of humic acid products on phosphorus (left) and potassium content (right) of ryegrass (Δ: Treatment – Control)

The P uptake under the 0.075% treatment (*Figure 2.* left) exceeded appreciably both the 10 and the 0.5% treatments. The difference between the effect of the 10 and the 0.5% treatment is not significant.

In case of the K content (*Figure 2.* right), the tendency-like positive effect of the 0.5% treatment cannot be statistically justified due to the high deviation of data.

Conclusions

The effects of humic acid product treatments on the dry matter production (yield), and nitrogen, phosphorus and potassium content of ryegrass were examined. The highest yield was measured in the case of 0.5% treatment. The 10% dose caused yield depression, however, in this treatment the nitrogen uptake was the highest. The highest phosphorus uptake was measured in case of the lowest dose of humic acid application. The potassium uptake did not respond significantly to the humic acid treatment.