

Beneficial Effect of Coal Humic Acids and Their Si-enriched Derivative Towards Potatoes

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Pesticides are known to increase agricultural production tremendously as these chemicals act on pests that destroy agricultural produce. However, agricultural pesticide contamination may result from the use and/or misuse of agricultural pesticides, and is manifested as adverse effects on human health. Adverse human health effects or symptoms of agricultural pesticide contamination include headache, body weakness, blurred vision, vomiting, irritability, impaired concentration, abdominal pain etc. Therefore, biological activity of humics is of special interest due to their adaptive properties, that is their ability to mitigate negative environmental effects such as unfavourable weather and soil conditions, presence of toxicants or pathogenic organisms and others.

For this study leonardite HA obtained by desalting of the commercial potassium humate Powhumus (Humintech Ltd., Germany) was used. Si-enriched derivative of HA was synthesized using 3-amino-propyltrimethoxy-silane (APTS) according to [1] and assigned as Si-HA. Obtained derivative contained 3.24 % of Si.

To assess biological activity of HA and their Si-enriched derivative field experiments with potatoes *Solanum tuberosum* L. var. Zhukovskii early-ripe was carried out. For tuber treatment 50 mg l⁻¹ solutions of HA or Si-HA were used at a dosage 2 l per 100 kg of tubers, and treatment with water was used for the plank. Another two treatments with humics were carried out when mass budding and flowering were observed. Concentration of working solutions for sprinkling was 50 mg l⁻¹ and application rate was 40 l per 100 m⁻². Trials were performed in quadruplicates.

Performed experiments showed that HA did not influence significantly on plants growth, whereas yield of potatoes treated with Si-HA was 19 c ha⁻¹ higher as compared to blank (Table 1).

Table 1. Influence of HA and their Si-enriched derivative on potatoes growth

Variant	Yield, c ha ⁻¹	Amount of tubers of different weight, % of total		
		> 80 g	25-50 g	< 25 g
Blank	378±32	33±7	31±6	36±6
HA	383±36	36±8	35±6	29±6
Si-HA	397±32	36±8	33±7	31±7

Alongside with observed increase in total yield of potatoes treated with HA and Si-HA, considerable improvement of external quality of potatoes was observed. In particular, when HA or Si-HA was applied, amount of tubers of larger fraction (tuber weight greater than 80 g) increased, and that of medium fraction (tuber weight 25-50 g) decreased. So, usage of Si-enriched derivatives of humic preparations resulted in both yield and trade quality of potatoes. The letter was evident for topicality of further study of interaction of Si-enriched humic derivatives with crops.

References

1. Perminova I.V., Ponomarenko S.A., Karpouk L.A., Hatfield K. Humic derivatives, methods of preparation and use. Patent pending, PCT application № /RU2006/000102.

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