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Effect of Potassium Humate on Vegetative Growth and Protein Contents of *Glycine max* (L.) Merrill and *Phaseolus mungo* (L.)

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Abstract

A pot experiment was conducted to study the effect of potassium humate (salt of humic acid) on vegetative growth and protein contents of *Glycine max* (L.) Merrill and *Phaseolus mungo* (L.). For the study of various vegetative characters (height of plant, number of branches per plant, number of leaves per plant, diameter of canopy, stem diameter, root length and shoot length) and protein contents of *Glycine max* and *Phaseolus mango*, one percent potassium humate solution was used as treatment and water served as control. The vegetative characters and protein contents of *Glycine max* and *Phaseolus mungo* were studied after 57 and 41 days from sowing respectively. Results obtained during this investigation clearly indicated that potassium humate treated plants showed significantly increased on vegetative characters and protein contents of *Glycine max* and *Phaseolus mungo* than control plants (untreated plant).

Key words: Humic acid, Potassium humate, Vegetative characters and Protein contents.

Introduction

Soil organic matter includes the remains of all plants and animals bodies which are fallen on earth surfaces. The final residue obtained form microbial decomposition of organic mater is called as humus and process of formation of humus is called as humification. Humic substances are component of humus. Humic substances are widely distributed over earth surface. Humic substances can be classified into three general categories like humic acid, fulvic acid and humin [1]. Humic acid play an important role in various areas of agriculture such as soil chemistry, fertility, plant physiology and environmental science [2]. Lignite humic acid was tested on growth and yields of Turmeric (*Curcuma longa* (L).) in Afisol and observed that humic acid showed stimulatory effects on growth and yield of turmeric [3].

Potassium humate is the salt of humic acid. Potassium humate is dark colored, water soluble and alkali insoluble. The application of humic acid caused an increment in root fresh weight while making plant to susceptible to the root rot pathogens [4]. In field experiment it was

found that application of humic acid increases shoot length, root length and nodules dry weight in response to treatment upto 400 to 800 mg/kg soil [5]. Humic acid increased the root and shoot ratio as well as the production of thin lateral roots of tomato plants [6]. Application of humic acid in field (2.5 kg ha per plot) on yield component of wheat hybrids (*Triticum sp*) at four sowing times (St_1,St_2, St_3 and St_4) on clay soil of central Anatolian field conditions in a randomized complete block design with four replications was showed that treated plants showed more plant height, spike number, grain number and 100 grain weight as compared to untreated plants[7].

Effect of mixing of urea with humic acid increases nutrient uptake, growth of plant and reduces environmental pollution in agriculture [8]. Regarding protein contents of crop plants, potassium humate treatment enhanced overall metabolism of crop plants. *Glycine max* and *Phaseolus mango* crop plants treated with potassium humate, protein contents were increased and there by yield in general [9]. The objective of this research was to determine effects of potassium humate on vegetative growth and protein contents of *Glycine max* and *Phaseolus mungo*.

Materials and Methods

The effect of potassium humate (1.0%) against control (tap water) were tested for vegetative characters and protein contents of *Glycine max* and *Phaseolus mango.* Seeds of *Glycine max* (L.) Merrill and *Phaseolus mungo* (L.) were collected from field during year 2007. Four kg seeds of each crop plants in small gunny bags were stored in laboratory for experiments. The observations recorded included vegetative characters and protein contents of crop plants.

Potassium humate formulation

The commercial product of potassium humate is black, crystalline and water soluble. It is obtained from M/S. V.Kumar and Sons, Aurangabad (M.S). The solutions of potassium humate of concentration 1.0% were prepared by dissolving 1.0 gm of potassium humate in 100 ml water. The effects of potassium humate (1.0%) were tested on vegetative characters and protein content of crop plants as these concentrations gave better results.

Vegetative characters

In order to study the effect of potassium humate (1.0 %) on various vegetative characters of *Glycine max* (L.) Merrill cv. Mahamendal and *Phaseolus mungo* (L.) cv. Local, a pot experiment was conducted. Plants were raised in pots and irrigated with potassium humate solution (1.0 %) regularly (in case of control plants were irrigated with water). Vegetative characters (height of plant, number of branch per plant, number of leaves per plant, diameter of canopy, stem diameter, root length and shoot length) were recorded on 57^{th} day (*Glycine max*) and 41^{th} day (*Phaseolus mungo).*

Protein content

For this study, the test tubes were arranged on stand and added standard protein solution (0.2mg / ml) in each test tubes in following way. 1^{st} test tube 0 ml, 2^{nd} 0.2 ml, 3^{rd} 0.4 ml, 4^{th} 0.6 ml, 5^{th} 0.8 ml and 6^{th} 0.2 ml protein extract. Then distilled water was added in each test tube so that final volumes become 1ml. Now 5 ml of copper solution was added to all test tubes and mixed thoroughly. The test tubes were allowed to stand at room temperature for 10 min. Then 0.5 ml of Folin-Ciocalteau reagent was added in all test tubes. Now this reaction produced blue colours in about 30 minutes. The optical density was recorded by using blank (Test tube No.1) at 660 nm by using systronic spectrophotometer (Type106). The amount of

protein in leaves of *Glycine max* (after 57 days) and *Phaseolus mungo* (after 41 days) was determined by using standard graph. The final values are expressed in mg/gm fresh weight of leaves.

Table-1 Effect of potassium humate (1.0%) on vegetative characters of *Glycine max* and *Phaseolus mungo*

S.N.	Vegetative characters	***Glycine max***		***Phaseolus mungo***	
		Potassium humate (1.0%)	Control (water)	Potassium humate (1.0%)	Control (water)
1	Height of plant (cm)	87.41	78.19	48.2	41.7
2	Number of branches per plant	7.02	5.21	17.32	14.00
3	Number of leaves per plant	63.23	55.41	53. 4	46.00
4	Diameter of canopy	59.25	52.81	62.2	52.1
5	Stem diameter (cm)	0.42	0.38	0.28	0.13
6	Root length (cm)	30.20	27.21	16.4	11.2
7	Shoot length (cm)	57.21	50.98	31.8	30.5

Table-2 Effect of potassium humate (1.0%) on protein contents of *Glycine max* and *Phaseolus mungo*

S.N.	Name of crop plants	Protein contents (mg/gm) of fresh leaves	
		Potassium humate (1.0%)	Control (water)
1	***Glycine max***	13.87	11.67
2	***Phaseolus mungo***	10.79	9.98

Results and Discussion

Vegetative Characters

1. Glycine max (L.) Merrill

Results presented in Table-1 show that there was an increase in all the vegetative characters in treated plants over control (water). Potassium humate (1.0%) treated plants showed height of plant 87.41 cm (control-78.19 cm), number of branches per plant 7.02 (control-5.21), number of leaves per plants 63.23 (control 55.41), diameter of canopy 59.25 cm (control-52.81cm), stem diameter 0.42 mm (control-0.38 mm), root length 30.20 cm (control 27.21 cm) and shoot length 57.21 cm (control 50.98).

2. Phaseolus mungo (L.)

From the results presented in Table-1 it is clear that there was an increase in all the vegetative characters in treated plants over control (water). Potassium humate solution (1.0%) treated plants showed height of plant 48. 2 cm (control- 41. 7 cm), number of branches per plant 17.32 (control-14.00), number of leaves per plants 53. 4 (control 46.00), diameter of canopy 63. 2 cm (control-52.1cm), stem diameter 0.28 mm (control-0.13 mm), root length 16.4 cm (control 11.2 cm) and shoot length 31. 8 cm (control 30.5).

Protein contents

Results obtained are presented in Table-2; from the results it is evident that there was an increase in the biochemical in treated plants over the control (water). Treated *Glycine max*

plants showed proteins 13.87 mg/gm (control 11.67 mg/gm) and treated *Phaseolus mungo* crop plant showed proteins 10.79 mg/gm (control 9.98 mg/gm).

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Conclusion

Thus optimum concentration of potassium humate as regards to vegetative characters and proteins contents of *Glycine max* and *Phaseolus mungo* was found to be 1.0%. Concentrations above 1.0% were found to be inhibitory.

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