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Effect of potassium humate, fulvic acid and Deprotinised Juice (DPJ) on seed germination and nutrient uptakes on Glycine max and Black gram.

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ABSIRACT:

A laboratory and pot experiment were conducted to study effect ofpotassium humate, fulvic acid and deproteinized Juice (DPJ) of Lucerne and Fenugreek on seed germination, seedling growth and nutrient uptakes of Soybean (*Glycine mox L.*) Merrill cv. Mahamendal and Black gram (*Phaseolus mungo L.*) cv. Local.

Seeds of soybean and black gram were treated with potassium humate and fulvic acid either alone or in combination with deproteinized leaf juice (DPJ) of Lucerne and Fenugreek and water served as control. Seeds were then sown on moist blotter papers and percent of seed germination and seedling growth (root length and shoot length) of soybean and black gram were recorded at the end of tenth day. In order to study the effect of potassium humate and fulvic acid on nutrients uptake (calcium and phosphorus) on *Glycine max* and *Phaseolus mungo* were selected after 55 days and 43 days from period of sowing respectively.

Results obtained during this investigation clearly indicated that combination of potassium humate, fulvic acid and DPJ treated crop plants showed significant increase on seed germination, seedling growth and nutrient uptake than either potassium humate,fulvic acid, DPJ or control (untreated).

Key words: Potassium humate, DPJ and nutrient uptake.

INTRODUCTION:

Soil is a living biological system containing billion of microorganism. These microorganisms feed on soil organic matter and break it down into humus. Humic substances are component of humus. Humic substances are widely distributed over earth surface. Humic substances classified into three categories like Humic acid, Fulvic acid and Humin[1]. Seed germination and seedling growth is stimulated by humic substances [2]. Potassium humate is the salt of humic acid. Humic acid (HA) and fulvic acid (FA) can be isolated from humus according to the acid or alkali solubility [3, 4].

Humic and fulvic acids as plant bio stimulants are mainly produced by biodegradation of lignin containing plant organic matter. Fulvic acid as an organic fertilizerand non-toxic mineral chelating additive with water binder that maximizes uptake through leaves and stimulates plant productivity [5].

It attracts water molecules and helping the soil to remain moist and aiding the movement of nutrients into plant roots. Fulvic acid easily binds or chelates minerals such as iron, calcium, copper, zinc and magnesium, as it can deliver this element to plant directly [6].

Humate contain many beneficial group such as the carboxylic (-COOH) and phenolic (OH) groups. Negatively charged particles of humate help in chelating with most the plant nutrients and water molecules. By improving the cation exchange capacity of the soil, humic acid increases the soil ability to hold more nutrients and moisture for the plant to utilize which improve the efficiency of fertilizers.

Poor germination and seedling establishment adversely affect growth and development of crop plants and results into low yields of crop plants. The success of seedling vigour depends on formation of radicle and plumule. Seedling vigour in the form of root length and shoot length of crop plants are positively affected by humic acid application [7, 8].Fulvic acid shows positive effect on the growth and quality of Italian lettuce in hydroponic culture.[9]. Fulvic acid is benefit to the soil adsorption of Cu (II) and Zn (II) at high concentrations. Besides, Zn (II) adsorbed is harder to be desorbed by the neutral salt solution[10].Development of roots regards to number, length and mass was increased when grown in sand or nutrient solution to which were added humic or fulvic acids extracted from oxidized lignite [11].

Foliar application with humic, fulvic acid and calcium as individual or in a combination improved growth parameter, yield and fruit quality of tomato and decreased the incidence of blossom end rot. The combination treatment with the three solutions was the most effective[12].Humic acid treatment increases nutrient uptake and physiological characteristic *Fragaria ananassa* var. Camarosa[13]. Fulvic acid was used to decrease the water stress or the stress imposed by hot, dry winds during ear development, grain yield increased by 7.3-18.0% [14].

High concentration of potassium humate, fulvic acid and DA-6 can significantly improve the yield of tomato in the early and late stages of bearing fruit [15]. Fulvic acid has the characteristics of increasing fertilizer utilization, improving soil physical and chemical properties, promoting crop growth and improving drought resistance, which has been widely used in wheat, cabbage, peanut and achieved good results [16,17,18].Foliar spraying of Fulvic acid increases growth parameters of safflower head numbers, numbers of seed in head, biological yield, harvest index and also oil percent [17, 19].

MATERIAL AND METHOD:

Seeds of soybean (Glycine mox (L.) Merrill cv. Mahamendal and black gram (Phaseolus mungo (L.)) cv. Local were collected from fieldand stored in gunny bags until used. Potassium humate (1.0%) and fulvic acid(1.0%) was obtained from M/S. V.Kumar and Sons, Aurangabad (M.S) and the solutions was prepared by dissolving 1.0 g of potassium humate in 100 mlwater. Seeds of soybean and black gram were collected from field and stored in gunny bags until used.

For the preparation of Deproteinised leaf juice (DPJ), fresh, green and healthy leaves of lucerne (Medicago sativa L.) and fenugreek (Trigonella Foenum-groecum L.) were crushed to a fine pulp. The pulp was pressed and the leaf juice released was collected separately and heated at 950C. lt was then filtered and filtrate (Deproteinised Juice) was collected.

Effect of potassium humate, DPJ (Lucerne and fenugreek) and DPJ with potassium humate were tested on seeds of soybean and black gram on moistened blotters in Petri dishes. ln each separately Petri dish 10 seeds were sown and regularly irrigated with potassium humate, DPJ (Lucerne and fenugreek) and DPJ with potassium humate. Final value was taken as mean (average) of three replicates for treatment and control. Seed germinated in tap water was served as control for comparison. The percent seed germination and seedling growth (root length and shoot length) of soybean and black gram was recorded 10 days after sowing.

Pot experiment was conducted in order to study the effect of potassium humate and fulvic acid on nutrients uptake (calcium and phosphorus) by crop plant like Glycine max and Phaseolus mungo were selected after 55 days and 43 days from period of sowingrespectively. Plants were raised in pots and irrigated with potassium humate (1.0%) and Fulvic acid (1.0 %) solution regularly (in case of control plants were irrigated with water). Dry weight of plant was obtained converted into ash and estimation of calcium (Titrimetrically with potassium permanganate (KMnO4)) and phosphorus colorimetrically) was carried out and results are presented in mg/100 gm of dry matter.

a. Total Ash:

The residue after incineration of sample at 550- 600oC is known as ash. For this purpose, the sample is subjected to a high temperature upto 600oC in muffle furnace and the ash contents were determined. During ignition to such a high temperature all organic compounds are decomposed and passed off in the form of gases, while mineral elements remained in the form of ash. For the preparation of total ash, 100 gm oven dry plant sample in a previously weighted vitrosil silica crucible was taken and heated on hot plate for about 30 minutes till the sample is sufficiently charred and turns black. Then the crucible was kept it in muffle furnace. Temperature was allowed to rise to 600oC and kept it constant for 2 hours. Then the crucible was allowed to cool down and directly transferred to desiccator. Then the crucible was weighted immediately to find out the weight of ash obtained per 100 grams of dry matter (dm) i.e. percent ash [20].

b. Acid soluble ash (ASA):

For the preparation of acid soluble ash, 50 ml of 5N HCl was added to the ash in crucible obtained as above. The mixture was heated for 30 minutes in hot boiling water bath. The mixture was allowed to cool andfiltered through a Whatman filter paper No.1. Distilled water was added to the filter paper to wash the filter paper until it is free from acid. The filtrate was collected. Finally, the filtrate was made up to the volume 100 ml by adding distilled water. This acid soluble portion of ash was stored for determination of the nutrients like calcium and phosphorus. Final values of calcium and phosphorus were represented in mg/100gm of dry matter of plant.

Table 1: Effect of potassium humate (1.0%), fulvic acid (1.0%) and deproteinised Juice (DPJ) on seed germination and seedling growth of Glycine max. (after =10 days).

Treatment		**Seed germination (%)**	**Root length (cm)**	**Shoot length (cm)**
Potassium humate		100	33.98	55.74
Fulvic acid		100	31.75	53.47
Lucerne	Deprotinised Juice	93.33	30.21	53.23
	DPJ+Potassium humate (1.0 %)+Fulvicacid(1.0 %)	100	34.00	58.15
Fenugeek	Deprotinised Juice	90.00	29.41	52.33
	DPJ+Potassiumhumate (1.0 %)+Fulvic acid (1.0%)	100	32.86	55.89
Control		86.66	31.89	47.00

Table2: Effect of potassium humate (1.0%),fulvic acid (1.0%)anddeproteinised Juice (DPJ) on seed germination and seedling growth of Phaseolus mungo. (after =10days).

Treatment		Seed germination (%)	Root length (cm)	Shoot length (cm)
Potassium humate		100	27.34	47.37
Fulvic acid		100	27.23	46.00
Lucerne	Deprotinised Juice	90.33	25.89	45.00
	DPJ+Potassium humate(1.0 %)+Fulvic acid (1.0 %)	100	28.31	48.15
Fenugeek	Deprotinised Juice	90.00	26.00	44.76
	DPJ+Potassium humate (1.0 %)+Fulvic acid (1.0%)	100	27.56	45.67
Control		80.00	25.10	43.64

Table 3. Effect of potassium humate (1.0%) and fulvic acid (1.0%) on nutrients uptake of Glycine max and Phaseolus mungo.

Sr. No	Name of Crop Plants	Ca (mg/100 gram of dry matter)			P (mg/100 gram of dry matter)		
		Potassium Humate (1.0%)	Fulvic acid (1.0%)	Control (water)	Potassium Humate (1.0%)	Fulvic acid (1.0%)	Control (water)
1	*Glycine max*	298	276	222	76.00	73.00	71.90
2	*Phaseolus mungo*	245	235	198	69.12	66.34	64.00

RESULTS:

1. SEED GERMINATION AND SEEDLING GROWTH:

Results presented in table-l show that there was an increase in seed germination in seeds of soybean treated with potassium humate (1.0%), fulvic acid (1.0%) and DPJ over potassium humate and fulvic acidand control in soybean.

Potassium humate, Fulvic acid, DPJ and pot humate, fulvic acid and DPJ showed 100% seed germination but DPJ of Lucerne and fenugreek alone showed 93.33% and 90.00% seed germination respectively as against 86.66 % in water (control). As regards to the seedling growth i.e., root length and shoot length, it was found that there was increase in root and shoot lengths in the seedlings treated with combine effect of potassiumhumate, fulvic acidand DPJ, potassium humateover potassium humate, fulvic acid, DPJ and control.

Results presented in table-2 show that there was an increase in seed germination in seeds of Phaseolus mungo treated with potassium humate (1.0%), fulvic acid (1.0%) and DPJ overpotassium humate and fulvic acidand control in soybean.

Potassium humate, Fulvic acid, DPJ and pot humate, fulvic acid and DPJ showed 100% seed germination but DPJ of Lucerne and fenugreek alone showed 90.33% and 90.00% seed germination respectively as against 80.00 % in water (control). As regards to the seedling growth i.e., root length and shoot length, it was found that there was increase in root and shoot lengths in the seedlings treated with potassium humate, fulvic acidand DPJ over potassium humate, fulvic acid and control in of Phaseolus mungo.

2. Nutrients uptake (ca and p):

Glycine max:

Calcium uptake in treated (humic acid and fulvic acid) plants was 298 mg and 276 mg / 100 gmof dry matter against 222 mg / 100 gm in control (water) and phosphorus uptake was 76.00 mg and 73.00 mg / 100 gm in treated plants against 71.90 mg / 100 gm in control (water).

Phaseolus mungo:

Calcium uptake in treated (humic acid and fulvic acid) plants was 245 mg and 235 mg / 100 gm of dry matter against 198 mg / 100 gm in control (water) and phosphorus uptake was 69.12 mg and 66.34 mg / 100 gm in treated plants against 64.00 mg / 100 gm in control (water).

The studies confirmed the treatment of potassium humate and fulvic acid is stimulatory for nutrients uptake of Glycine max and Phaseolus mungo .

REFENCES:

1. **Solange L M and Rezende M O (2008):** A powerful tool to characterize humic acid (HA). J. Brazil Chemical Society.9:24-28.
2. **Amal D A: 2001. M.Sc. (Ag)Thesis:** Effect of humic acid treatments on growth and development of groundnut under different fertilizer levels. Tamil Nadu Agricultural University, Coimbatore.
3. **Wen QX (1984):** Research method of soil organic substance. Beijing: Agriculture Publishing House. 1984, 234-2473.
4. **Li GL and Wei SQ (2003):** The characteristics of adsorption and desorption of humic acids on copper. Ecology and Environment. 12(1):4-7.
5. **Malan, C. (2015) Review:**Humic and fulvic acids. A Practical Approach.In Sustainable soil management symposium. Stellenbosch, 5-6 November 2015, Agrilibrium Publisher.
6. **Yamauchi, M., Katayama, S., Todoroki, T., Watanable, T. (1984):** Total synthesis of fulvic acid. Journal of the Chemical Society, Chemical Communications. 23, 1565-1576.
7. **Turkmen O, Semra D, Suat S and Altilla D (2005):** Effect of Arbuscular mycorhizal fungus and humic acid on the seedling development and nutrient content of Pepper grown under saline soil conditions. J. Biologica sciences. 5(5):568- 574.
8. **Ulukan H (2008).** Effect of soil applied humic acid at different sowing times on some yield component in wheat (Triticum sp.) hybrids. international Journal of Botany. 4(21.!64-175.
9. **Chen, Z.J. and J.Z. Ji, (2019)**: Effects of fulvic acid on the growth and quality of Italian lettuce in hydroponic culture. Hunan Agric. Sci., 10: 33-35.
10. **ZhantaiWang ,Minxia Cao Wenchang, Cai and Heping Zeng (2017):**The effect of humic acid and fulvic acid on adsorption-desorption behavior of copper and zinc in the yellow soil. Conference Proceedings 1820, 040027.
11. **Reynold A, Wardle D, Drought B and Canlwell R. (1995):**Gro-mate soil amendment improves growth of green house-grown Chardonnay' grapevines. J, Horti. Science. 30:539-542.

12.**M.E.Husein , S. Abou El Hassan , M.M. Shahein (2015):** Effect of humic, fulvic acid and calcium foliar application on growth and yield of tomato plants. ISSN: 2220-6655 (Print), 2222-5234 (Online) Vol. 7, No. 1, p. 132-140.

13. **Ameri A, Tehranifar A. (2012):** Effect of humic acid on nutrient uptake and physiological characteristic Fragaria ananassa var. Camarosa. J Biol. Environ. Sci. 6, 77-79.

14.**Payman MORADI, Babak PASARI and Farzad FAYYAZ (2017):** The effects of fulvic acid application on seed and oil yield of safflower cultivars European Agriculture18(3), p.584-597.

15. **Xiao Huaijuan, Zhou Yan, Mao Ke, Wang Jiqing and Liu Ke (2020):** Effects of Potassium Fulvic Acid and DA-6on the Growth and Yield of Tomato Cultivated with Rock Wool. / American Journal of Biochemistry and Biotechnology , 16 (2): 162.169.

16.**Baigorri, R., M. Fuentes, G. Gonza Lez-Gaitano, J.M. García-Mina and G. Almendros *et al*. (2009):** Complementary multianalytical approach to study the distinctive structural features of the main humic fractions in solution: Gray humic acid, brown humic acid and fulvic acid. J. Agric. Food Chem., 57: 3266-3272.

17.Canellas, L.P., F.L. Olivares, N.O. Aguiar, D.L. Jones and A. Nebbioso*et al*. (2015):Humic and fulvic acids as biostimulants in horticulture. Scientia Hortic.,196: 15-27.

18. **De Pascale, S., Y. Rouphael and G. Colla, (2017):** Plant biostimulants: Innovative tool for enhancing plant nutrition in organic farming. Eur. J. Hortic. Sci., 82: 277-285.

19.**M. Chanda1, S. Jha1, D. Mukhopadhyay and M. Pandey, (2021):** Characterization of Humic Acid and Fulvic Acid Extracted from Soil Samples of Cultivated Areas of North Bengal and Sikkim States, India Asian Journal of Chemistry; Vol. 33, No. 1 (2021), 62-66.

20.**Mungikar AM (1999):** Intercropping fodder crop. Saraswati printing press. Aurangabad 1999: 45.