INT. J. BIOL. BIOTECH., 2 (3): 737-739, 2005.

BIOLOGICAL EFFECT OF BIO-FERTILIZER – HUMIC ACID ON MUNG BEANS (*VIGNA RADIATA* L.) WILCZEK

M. Ashraf, Saqib Nasir and T. B. Sarfaraz

Fuel Research Centre, PCSIR, Karachi-75280, Pakistan

ABSTRACT

Field experiments on mung beans *(Vigna Radiata* L.) Wilczek were conducted using lignitic derived humic acids. The study includes soaking of seeds with 0.005% aqueous humate and followed by spray of humate solution with variable concentrations (0.001 – 0.0075 g/l/m^2). Effect of supplementation with Sarsabz (a micronutrient formulation) was also studied. Significant effects were observed on plant height, root weight, No. of pods, pod length, pod grain weight, dry weight of plant, waste material, seed protein value and yield of grain. The experimental results showed that humic acids greatly enhance the yield of mung beans, at concentration 0.05%, which is almost doubled as compared to controls.

Key words: Humic acid, bio-fertilizer, soaking, humate solution, lignite, oxidized coal, plant hormone.

INTRODUCTION

Economic pressure due to rapid population growth and low crop production, especially in grain legumes and cereals has increased a lot in recent years. Improved quality and increased yields, which may result from application of relatively inexpensive growth regulators would ease these problems. Growth regulations have a breath taking range of regulatory effects at different concentrations (Sharif *et al.*, 2003).

Humic acid is a vital growth regulator and it acts like a plant hormone due to plant hormone like structure. Humates are salts of humic acids, which are the acid compounds in Humus matter, whether derived from oxidized coal or decaying plant matter. Chemically humic acid is a complex mixture of dark brown color, amorphous powder consisting of both aliphatic, aromatic entities. It ranges in molecular weights from hundred to thousands. Humic acid of reproducible characteristics can be extracted in large quantities from lignites (Garcia *et al.*, 1994). Studies have shown that Pakistan's low rank weathered coal have sizeable amount of Humic acid. It can be utilized as such and in its salt form in agriculture as a fertilizer and soil conditioner (Ahmed *et al.*, 1992). Humic acid application enhances availability of micronutrients (trace elements) since it interacts with metal ions (Baruh *et al.*, 1994). Wheat yield has also been reported to increase by the use of Humic acids (Sharif *et al.*, 2002).

Faust (1998) reports that humic acid is the most responsive in high carbohydrate containing plants like potato, sugar, beet, tomato, carrot, fruits of all types barley, maize, wheat, rice and to a lesser extent in beans, oil crops and fiber crops. Therefore, present study was carried out to find out yield enhancement on mung bean. Mung bean being an excellent source of protein has a considerable potential in the country (Haqqani and Zubair, 2004).

MATERIALS AND METHODS

The field experiments were carried out at Fuel Research Centre, PCSIR, which has slit loam texture soil with pH 7.8 to 8.05. The crop was planted in the first week of July 2004. The land was thoroughly prepared. The field was divided into plots of one sq. meter with three replicates. Humic acid used in this study was derived from coal of Lakhra (Surriaya and Hai, 1999), which has the following analysis.

SEED TREATMENT

Mung seeds (2 g) obtained from local market were soaked in 0.005% aqueous humic acid solution (250 ml) for 24 hrs. The soaked seeds were then allowed to germinate in trial fields. After four days plumule started emerging. The 1m^2 was treated with 1 litre solution diluted ten times of the concentrations. For comparison the effects of four concentrations of humic acid and one concentration of a micronutrient supplement (sarsabz) were compared to control.

First treatment was given on 11th day by spraying the field in the concentration mentioned in Table-2. On 20th day thinning process of experimental field was performed and 2nd spray of humic acid solution was performed. Third spray accompanied with irrigation containing humic acid was carried out after 40 days. Lastly after 95 days only irrigation with humic acid was performed.

Table 1. Effect of Humic Acid on various parts of mung bean plant.

Treatment %	Length of plant	No. of Pods / Plant	Pod length	Wt. Of Pod (gm)	Dry plant wt (kg/ha)	Root length (Inch)	Yield (Mung pulses) Kg/m^2	Kg/ha
Control	9.57	5.75	3.75	5.08	0.007	3.57	1.43	1,430
0.01 HA	20.42	13.15	4.17	14.38	0.009	4.75	1.95	1,950
0.025 HA	21.82	10.44	4.47	11.69	0.01	4.90	1.61	1,610
0.05 HA	20.90	10.00	4.07	10.79	0.006	4.45	2.53	2,530
0.075 HA	17.87	11.00	4.17	11.72	0.01	4.84	1.68	1,680
HA + SBZ	20.65	11.35	4.22	12.78	0.007	4.37	2.26	2,260

Table 2. Protein content of mung bean seeds.

Sample	% N_2	% Protein	Remarks
0.01 % H A	4.20	26.25	As observed in control
0.025 % H A	4.50	28.12	Higher than control
0.05 % H A	4.85	30.31	Enhanced
0.075 % H A	4.60	28.75	Higher than control
H A + Mung	4.9	30.62	Enhanced
Control	4.25	26.56	-

RESULTS AND DISCUSSION

The results in Table 1 indicate that maximum yield was observed with 0.05% concentration, while other concentrations also showed yield enhancement as compared to controls. Treatment with ammonium humate also affected height of plant, no. of pods plant, pod length, weight and root length. When used in combination with a nutrient formula Sarsabz did not exceed than treatment of humic acid alone. Therefore, it can be concluded that humic acid selects micronutrients by its own mechanism. There are reports that small concentrations of humic acid due to the increased permeability of plant cells and promoted uptake of water and other nutrients like P and K increased yield (Cheng, 1977, Schimitzer and Poalpost, 1967).

Seed protein content was determined on the basis of nitrogen content (Table 2). It was noted that percentage of protein was higher upto (30.62%) in treated plants. The above studies also suggest that effect of humic acid is very significant in enhancing the yield and nutrient value of pulses. It can be an indigenous, economical and easy to apply bio-fertilizer for pulse crops.

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(*Accepted for publication June 2005*)