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INFLUENCE OF LEVELS OF POULTRY MANURE ON YIELD AND NPK CONTENT IN SEED OF MUNGBEAN

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ABSTRACT

Mainul MI, Rupa WS, Ashrafuzzaman Kh, Mehraj H, Jamal Uddin AFM (2014) Influence of levels of poultry manure on yield and NPK content in seed of mungbean. *Int. J. Expt. Agric.* 4(3), 12-15.

An experiment was conducted at the Sher-e-Bangla Agricultural University Farm, Dhaka during the period from February to April of 2012 to find out the effect of different levels of poultry manures on growth and yield performance as well as nutrient content of mungbean (BARI Mung 6). Four levels of poultry manure *viz.* P_0 (Control i.e., no poultry manure), P_1 (4 t ha^{-1}), P_2 (7 t ha^{-1}) and P_3 (10 t ha^{-1}) were applied on the experiment which was followed by Randomized Complete Block Design with three replications. Tallest plant (40.44 cm), maximum number of leaves/plant (19.01), number of branches/plant (10.21), average dry weight/plant (7.16 g), number of pods/plant (14.59), number of seeds/pod (4.40), 1000-seed weight (41.56 g), seed yield (1.01 t ha^{-1}), stover yield (1.93 t ha^{-1}), N content in seed (3.56%), P content in seed (0.47%) and K content in seed (1.25%) were found from P_3 (10 t ha^{-1}) which was statistically similar with P_2 (7 t ha^{-1}) in most of the parameters whereas minimum from P_0 (Control).

Key words: *BARI Mung 6, poultry manure, growth and yield*

INTRODUCTION

Mungbean (*Vigna radiata* L.) is one of the most important pulse crops grown in Bangladesh. Animal manures are valuable sources of nutrients and the yield-increasing effect of manure is well established also effects on improvement of soil organic matter, soil structure and soil biological life are well. It may contain other growth-promoting substances like natural hormones and B vitamins (Leonard 1986). The organic forms of N and P in manures must be mineralized or converted into inorganic forms over time and availability of K in manure is considered similar to that in commercial fertilizer (Motavalli *et al.* 1989). Application of manure will produce crop yields equivalent or superior to those obtained with chemical fertilizers (Xie and MacKenzie, 1986; Motavalli *et al.* 1989) also improve crop quality (Eck *et al.* 1990; Pimpini *et al.* 1992). Crop improvements response was usually attributed to manure supplied nutrients or to improved soil conditions not provided by commercial fertilizer (CAST 1996). Manure improves the physical condition of the soil and increases P and biological activity (Sommerfeldt and Chang, 1985; Chang *et al.* 1990; CAST 1996). The organic matter, total N and micronutrient content of the surface soil are increased as a result of manure application. The manure requirements for most of the crops are high, ranging from 5 to 20 tons of fresh manure ha^{-1}. Manure, when applied, will be mineralized gradually and nutrients become available. However, the nutrient content of manure varies due to the fertilizer value of manure is greatly affected by diet, amount of bedding, storage and application method (Harris *et al.* 2001). Considering the above points in view the current study was undertaken for the evaluation of the effect of different levels of poultry manure on growth and yield as well as nutrient content of mungbean.

MATERIALS AND METHODS

The experiment was carried out at the Sher-e-Bangla Agricultural University Farm, Dhaka during the period from February to April of 2012 to find out the effect of different levels of poultry manures on growth and yield performance as well as nutrient content of mungbean (BARI Mung 6). Four levels of poultry manures *viz.* P_0 (Control i.e., no poultry manure), P_1 (4 t ha^{-1}), P_2 (7 t ha^{-1}) and P_3 (10 t ha^{-1}) were applied on the experiment which was followed by Randomized Complete Block Design with three replications. The size of the each plot was 3.0 m x 2.0 m and total number of plots was 12. The land was ploughed twice followed by laddering. Seeds were sown on 21st February 2012 @ 35 kg ha^{-1} by maintaining 10 cm plant to plant and 30 cm line to line distance. The insecticide Sumithion 57 EC was sprayed @ 0.02% at the time of pod formation to control pod borer. The crops were harvested at a time due to synchronous maturity of pods. The crop bundles were sun dried for two days on threshing floor. Seeds were separated from the plants by beating the bundles with bamboo sticks. The collected seeds were dried in sun to lower the moisture content to 12% level. The dried and cleaned seed and stover were weighed. Ten plants were randomly selected prior to maturity from each plot for data recording. Data were collected on plant height, number of leaves/plant, number of branches/plant, number of pods/plant, number of seeds/pod, weight of thousand seeds, seed yield and stover yield. Nitrogen, phosphorus and potassium content on seed were also measured. The plant material (seed) were dried in an oven at 60^0C at 72 hours after sun drying and finely ground in a grinder machine for chemical analysis. Then the prepared samples were put into paper bags.

The total nitrogen was determined from the seed sample by macro Kjeldahl method. The samples were digested by commercial H_2SO_4 in presence of catalyst mixture K_2SO_4, $CuSO_4$ and selenium powder. The formed $(NH_4)_2SO_4$ was mixed with NaOH during distillation. The liberated ammonia was received in 4% boric acid

(H_3BO_3) solution and 5 drops of mixed indicator of bromocresol green ($C_2H_{14}O_5BO_4S$) and methyl red ($C_{10}H_{10}N_3O_2$) solution. Finally the distillate was titrated with standard (0.05N) H_2SO_4 until the color changed to pink (Jackson 1973).

The % N in plant was calculated by the following formula:

$$\% \text{ N} = \frac{(\text{T} - \text{B}) \times \text{N} \times 0.014 \times 100}{\text{S}}$$

Where; T = Titration value for sample (ml.), B = Titration value for blank (ml), N = Normality of H_2SO_4, S = Weight of the sample (g), 1 mL N $H_2SO_4 \equiv 0.014$ g N

Exactly 0.5 g plant sample was taken in a 250 ml conical flask and 10 ml of di-acid mixture (HNO_3 : $HClO_4$ = 2 : 1) was added to each conical flask. The flask was then placed on an electric hot plate and heated until white fumes were evolved. Then the flask was removed from the hot plate and allowed to cool. After cooling, the digest was filtered and transferred to a 100 ml volumetric flask and the final volume was made up to 100 ml with distilled water (Singh 1999). From the digest, phosphorus, potassium and sulphur were analyzed by following standard methods.

Phosphorus in the digest was determined colorimetrically using $SnCl_2$ as reducing agent. The intensity of color read at 660 nm wave length with a spectrophotometer (Jackson 1973). Potassium of the plant sample was determined with the help of flame emission spectrophotometer. The samples were aspirated into a gas flame. The air pressure was fixed at 10 PSI. Percent emission was recorded following the method described by Ghosh *et al.* (1983).

The collected data on different growth and yield parameters and nutrient contents of mungbean were statistically analyzed. The means for all treatments were calculated and the analyses of variances for all the characters were performed by 'F' variance test using MSTAT-C computer package program. The significance of difference between pair of means was performed by the Dancan's Multiple Range Test (DMRT) (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

Crop characteristics, yield attributes and yield of mungbean significantly influenced by level of poultry manure. The tallest plant was found from P_3 (40.44 cm) followed by P_2 (39.49 cm) and P_1 (38.26 cm) whereas shortest one from P_0 (37.46 cm) at harvest (Table 1). Increased rate of poultry manure is favorable for plant height of mungbean. Karmegam and Daniel (2000) found similar results in case of cowpea by using organic manure. Maximum number of leaves/plant was found in P_3 (19.01) which was statistically similar with P_2 (18.77) while minimum from P_0 (16.48) which was statistically similar with P_1 (16.93) at harvest (Table 1). Number of branches/plant varied significantly among different levels of poultry manures. Maximum number of branches/plant was found from P_3 (10.21) which was statistically similar with P_2 (9.88) while minimum from P_0 (7.83) at harvest (Table 1). Maximum average dry weight/plant was found in P_3 (7.16 g) which was statistically similar with P_2 (7.02 g) and subsequently followed by P_1 (6.66 g) minimum from P_0 (6.358 g) (Table 1). Maximum number of pods/plant was found in P_3 (14.59) whereas minimum from P_0 (12.03) (Table 1). Application of poultry manure @ 15 t ha^{-1} to soybean recorded significantly higher number of pods/plant (Aruna and Narsa Reddy, 1999). Abbas *et al.* (2011) found that application of DAP at 124 kg along with 10 tha^{-1} of poultry litter yielded maximum number of pods/plant. Maximum number of seeds/pod was found from P_3 (4.40) which was statistically similar with P_2 (4.19) whereas minimum from P_0 (3.57) (Table 1). Different doses of poultry manure showed significant differences in case of 1000-seed weight of mungbean. Maximum 1000-seed weight was found from P_3 (41.56 g) which was statistically similar with P_2 (40.81 g) while minimum from P_0 (37.01 g) (Table 2). Application of poultry manure @ 2 t ha^{-1} significantly increases 100-seed weight (4.14 g) in sunflower (Chinnamuthu and Venkatakrishnan, 2001). Maximum seed yield was found in P_3 (1.01 t ha^{-1}) which was statistically similar with P_2 (0.96 t ha^{-1}) while minimum in P_0 (0.52 t ha^{-1}) (Table 2). Application of poultry manure @ 15 t ha^{-1} increased seed yield (1143.0 kg ha^{-1}) on soybean (Aruna and Narsa Reddy, 1999). Maximum stover yield was found from P_3 (1.93 t ha^{-1}) which was statistically similar with P_2 (1.85 t ha^{-1}) while minimum from P_0 (1.64 t ha^{-1}) (Table 2).

Nitrogen (N), Phosphorus (P) and Potassium (K) content in seeds: Application of the different levels of poultry manures showed significant differences for N content in seed. Maximum N content in seed was found in P_3 (3.56%) which was statistically similar with P2 (1.52%) while minimum from P_0 (3.20%) (Table 2). There were no significant differences were found in P content in seeds due to the application of different levels of poultry manures. However, maximum P content in seed was found in P_3 (0.47%) and minimum from P_0 (0.43%) (Table 2). K content in seeds showed a significant difference among the treatments due to the application of different levels of poultry manure. Maximum K content in seed was found in P_3 (1.25%) which was statistically similar with P_2 (1.24%) while minimum from P_0 (1.14%) (Table 2). N content in seeds (3.39%), P content in seeds (0.35%) and K content in seeds (2.25%) was found due to the application of the vermicompost (Rupa *et al.* 2014).

Table 1. Effect of level of poultry manure on crop characters and yield attributes of mungbean (BARI Mung 6)

Treatments	At harvest			Average dry weight (g)/plant	Number of pods/plant	Number of seeds/pod
	Plant height (cm)	Number of leaves	Number of branches			
P_0	37.46 c	16.48 b	7.83 c	6.36 c	12.03 c	3.57 c
P_1	38.26 bc	16.93 b	9.03 b	6.66 bc	12.48 bc	3.92 bc
P_2	39.49 ab	18.77 a	9.88 a	7.02 ab	13.21 b	4.19 ab
P_3	40.44 a	19.01 a	10.21 a	7.16 a	14.59 a	4.40 a
LSD0.01	1.45	0.65	0.79	0.37	1.10	0.39
CV%	2.33	3.13	6.50	8.03	5.44	2.89

In a column means having similar letter(s) are statistically similar and those having dissimilar letter(s) differ significantly at 0.01 level of probability

Table 2. Effect of level of poultry manure on yield attributes, yield and NPK content in seed of mungbean (BARI Mung 6)

Treatments	1000-seed weight (gm)	Seed yield (tha^{-1})	Stover yield (tha^{-1})	Content in seed (%)		
				N	P	K
P_0	37.01 c	0.52 c	1.64 c	3.20 c	0.43 a	1.14 c
P_1	38.41 b	0.76 b	1.70 bc	3.44 b	0.46 a	1.20 b
P_2	40.81 a	0.96 a	1.85 ab	3.52 a	0.46 a	1.24 a
P_3	41.56 a	1.01 a	1.93 a	3.56 a	0.47 a	1.25 a
LSD0.01	1.10	0.18	0.19	0.08	0.07	0.01
CV%	7.51	3.91	5.01	3.51	4.09	6.29

In a column means having similar letter(s) are statistically similar and those having dissimilar letter(s) differ significantly at 0.01 level of probability

CONCLUSION

From the above result and discussion it can be concluded that application of poultry manure increases yield of mungbean and NPK content in mungbean seeds. Application of 10 t ha^{-1} poultry manures showed best result for yield attributes also NPK content of BARI Mung 6.

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