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Effect of Different Levels of Bio-fertilizers and Plant Growth Regulators on Growth attribute and Protein content of Mungbean under Custard Apple Based Agri-Horti System

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ABSTRACT

A field experiment was conducted to study the effect of different levels of bio-fertilizers and plant growth regulators (PGR's) on mungbean under custard apple based agri-horti system in a complete randomized block design with different treatment combinations viz., Harit Vardan (bio-fertilizer), Bioplantomin (liquid bio-manure), Biovita (organic product), Farm Bahar (polymorphic growth hormones) and Plantgro (multi-micronutrients) which were replicated thrice. These treatments were applied in different doses and method of application was either through soil treatment or foliar spray. The biometric observations on growth attributes were recorded at an interval of 15 d i.e.15th , 30th and 45th days after sowing and at maturity. Use of Bioplantomin (liquid bio-manure) at 3.5 l/ha as foliar spray resulted in highest plant height (55.0 cm), number of branches/ plant (4.32), number of trifoliate leaf/plant (9.4) and total dry matter accumulation/plant (11.66g). Protein content (25.70%) as compared to control.

Key Words: Agri-horti System, Custard Apple, Growth, Mungbean, Protein.

INTRODUCTION

Agro forestry system with judicious mixing of crop, tree and grasses me*et al*l basic requirements of mankind and his livestock (Dhewa *et al,* 2015). Tree based cropping system have proved to be very successful in areas receiving less than 1000 mm rainfall with nine months of dry season. The relatively short juvenile phase of fruit trees, high market value of products and the contribution of fruits to household dietary needs, fruit-tree-based agro forestry enjoy high popularity among producers worldwide. Farmers realize the problem of no economic returns in the initial stage of fruit tree orchards till the tree starts bearing fruits. There is ample scope to utilize the introduction of the fruit tree during the initial 5 to 6 yr by growing arable crops.

Mungbean (*Vigna radiata* L. Wilczek) is a pulse or food legume crop used primarily as dried seed and occasionally as forage of green pods and seeds for vegetables. It is becoming an important crop, as it is the best alternative to meet the food needs of the large population of developing countries due to its nutritional superiority and nitrogen fixing characters (Raza *et al,* 2012). Potential yield of mungbean can be achieved through optimum use of inputs and agronomic practices. It is drought tolerant that can withstand adverse environmental conditions and hence successfully be grown in rain fed areas (Anjum *et al,* 2006). It is widely grown in Indian subcontinent as a short duration catch crop between two principal crops. Mungbean, compared with other crops has a better chance of surviving under adverse condition such as poor soil fertility and moisture stress.

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Bio-fertilizers and Plant growth regulators (PGR's) are known to improve physiological efficiency including photosynthetic ability of plants and offer a significant role in realizing higher crop yields. Fertilizer is one of the most important factors that affect crop production. Fertilizer recommendation for soils and crops is a dynamic process and the management of fertilizers is one of the important factors that greatly affect the growth, development and yield of mungbean. Organic nutrients also provide balanced nutrition in addition to enhancing water holding capacity and improving physical, chemical and biological properties (micro-organisms) of soils which assist in better uptake of nutrients. Multi-micronutrients are important supplement for the plant food. It is feasible in open field agriculture and also contain iron and zinc that are often immobilized in the conducting system, enter into the plant system through leaves. Besides, PGR'S also enhance protein and nutrient content (nitrogen, phosphorous and potassium). Hence, there is a need to study the effect of different levels of bio-fertilizers and PGR's on growth attribute and protein content of mung bean under custard apple based agri-horti system to boost up the productivity and protein contents.

MATERIALS AND METHODS

The experiment was carried out in the year kharif season of 2012, at the Agronomy farm of Rajiv Gandhi South Campus, Brakachha (BHU) Mirzapur which is situated in Vindhyan region of district Mirzapur (25º 10' latitude, 82º 37' longitude and altitude of 427 m above mean sea level) occupying over an area of more than 1000 ha where variety of crops like agricultural, horticultural, medicinal and aromatic plants are grown.

The soil of the experimental farm was sandy loam in texture with pH 5.4 and 0.28% organic carbon. The N, P_2O_5 and K_2O content were 180.8, 12.9 and 145.3 kg/ha, respectively. The total rainfall during the crop season 2012-13 was 1207.4 mm; maximum and minimum temperature were 38.7ºC and 16ºC, and relative humidity are 90 and 33 per cent, respectively. The experiment was conducted in randomized block design with 13 (thirteen) treatments which were replicated thrice (Table 1).

Recommended intercultural operations were practiced. The biometric observations on growth attributes were recorded at an interval of 15 d, that is, 15th ,30th and 45th days after sowing and at maturity. Growth attributes like plant height, number

Table 1. Detail of Treatments.

Treatment	Particular	Quantity/ ha	Application
T1	Harit Vardan (bio-fertilizer)	3.5kg	Soil treatment
T2	Harit Vardan (bio-fertilizer)	5.5kg	Soil treatment
T3	Harit Vardan (bio-fertilizer)	7.5kg	Soil treatment
T4	Bioplantomin (liquid bio- manure)	1.5 l	Foliar spray
T5	Bioplantomin (liquid bio-manure)	2.5 l	Foliar spray
T6	Bioplantomin (liquid bio-manure)	3.5 l	Foliar spray
T7	Biovita (organic product)	0.4 l	Foliar spray
T8	Biovita (organic product)	0.6 l	Foliar spray
T9	Biovita (organic product)	0.8 l	Foliar spray
T10	Farm Bahar (polymorphic growth Hormones)	2.0ml	Seed Treatment
T11	Farm Bahar (polymorphic growth hormones)	2.0ml	Seed Treatment + Foliar Spray
T12	Plantgro (multi-micronutrients)	4.0 g	Foliar spray
T13	Control	-	-

of trifoliate leaf/plant, number of branches/ plant, total dry matter accumulation/plant were measured. For protein content, seed sample from each plot was taken randomly and subjected to chemical analysis by Kjeldahl's method (Jackson, 1962). Available nitrogen percentage was determined through standard wet digestion method. Nitrogen percentage was converted to protein content by multiplying with constant factor (6.25) (Hiller *et al,* 1948).

RESULTS AND DISCUSSION

Effect on Plant height

Plant height is a genetically controlled character but several studies indicated that the plant height can either be increased or decreased by the application of synthetic plant growth regulators and biofertilizers. However, in the present investigation significant differences were observed in plant height of mung bean due to application of different treatment combinations (Table 2). Plant height (55.0 cm) was highest when (T6) Bioplantomin (liquid bio-manure) was applied at 3.5 l/ha as foliar spray which was at par with Plantgro 4.0 gm /l (T12), Bioplantomin 2.5 l /ha (T5) and Farm Bahar 2ml/ l (T11). Lowest plant height (38.56 cm) was obtained in control treatments (T13). The increased growth parameters may be attributed to increased cell division due to sufficient supply of nitrogen and phosphorus by PGR's and biofertilizers.

Total dry matter accumulation

Bioplantomin (T6) was applied at 3.5 l/ha as foliar spray observed highest dry matter (11.66g) accumulation which was at par with Plantgro 4g/l (T12), Bioplantomin 2.5 l/ ha (T5) and Farm Bahar 2ml/ l (T11) due to the beneficial effect of these treatments on leaf development. Control treatment (T13) recorded (6.15g) significantly lowest total dry matter accumulation (Table 2). This could be due to the translocation of stored photo-assimilates towards the development of reproductive organs and senescence. Shah and Prathapsenan (1991) reported that application of Cycocel lead to increase leaf dry weight by 52.7 per cent over control in green gram. Similar result were also been observed by Balchandar *et al,* (2003) in black gram through the foliar application of molybdenum and boron.

Number of trifoliate leaf

In general, leaf is considered as an important functional unit of plant which is factory of photosynthesis and ultimately contributes to the enhancement of yield. The number of leaves was maximum at 40 DAS and declined later due to shedding. In general, the application of various treatments increased the number of leaves over the control. Bioplantomin 3.5 l /ha (T6) as foliar spray was found to be more effective (9.4) among all the treatments, while lowest number of trifoliate leaf per plant (4.66) obtained with control treatments (T13) (Table 2). The increase in leaves number due to the application of organic components influences stimulatory effects on cell division and enlargement, protein and nucleic acid synthesis in potato (El-Banna *et al,* 2006). Similarly, penetration of roots to deeper depths, resulting more absorption of water and nutrients influences the leaf number is the function of biofertilizers and PGR's. Finding of Prakash *et al,* (2003) suggested that the application of Chamatkar at 120 ppm increased the number of leaves in black gram.

Number of Branches

The application of various treatments increased the number of branches significantly and the increase was more pronounced at higher concentration of the treatments. Bioplantomin 3.5 l/ha (T6) recorded higher number of branches per plant (4.32) at all the stages and it was found at par with Plantgro 4g/l (T12) against minimum (2.52) in control (Table 2). The increase in the number of branches could be due to the suppression of apical dominance as a result of increase in the auxin activity due to the application of growth retardants, thereby diverting the polar transport of auxin towards the basal buds leading to increased branching. Similarly, Dhaka and Anamika (2003) reported that application of Cycocel, Mepiquat Chloride (DPC), phosphatic

Table 2. Effect of different levels of bio-fertilizers and PGR's on plant height, dry matter accumulation, trifoliate leaves/plant and branches/ plant at harvesting.

Treatment	Plant height (cm)	Dry matter accumulation (g)	Number of trifoliate leaf/ plant (No.)	Number of branches/plant (No.)
T1	45.24	6.56	5.7	2.65
T2	47.85	7.37	6.16	3.08
T3	48.91	8.12	6.83	3.26
T4	49.32	8.52	7.03	3.34
T5	54.51	10.23	8.8	4.00
T6	55.00	11.66	9.4	4.32
T7	46.22	7.11	5.96	2.90
T8	48.74	8.01	6.4	3.14
T9	49.41	8.66	7.4	3.57
T10	50.02	8.84	7.9	3.77
T11	50.95	9.99	8.53	3.98
T12	54.62	11.11	9.03	4.26
T13	38.56	6.15	4.66	2.52
SEm±	0.80	0.22	0.08	0.07
CD (P=0.05)	2.35	0.64	0.24	0.21

fertilizers and micronutrients increased the number of branches in green gram.

Protein content

The influence to protein content in plant is result of stimulation of bio-chemical interaction of biofertilizers and PGR's with plant biological activity. The protein content was showed significant differences between treatments. Maximum protein content (25.7%) was recorded with Bioplantomin (T6) which was significantly superior over remaining treatments and control (18.97%). In the present investigation, it may be ascribed to increased nitrogen uptake of leaves due to the application of treatments because biofertilizers and PGR's supports phytohormones production which stimulate nutrients absorption as well as photosynthesis process as a result of this protein content increases (Cakmakci *et al,* 2007). A significant effect of inorganic P fertilizers and N and P biofertilizers application on seeds/grains protein content has been reported by various workers in different crops Aslam *et al* (2010) in chick pea and Selvakumar *et al* (2012) in black gram.

Effect on custard apple

Statistically non-significant differences observed in the mentioned growth parameters of custard apple might be due to shorter growth phase of mungbean which could not realized the noticeable changes in the limited observation period (Table3).

CONCLUSION

Among the various treatments applied in the experiment, the Bioplantomin 3.5 l/ha (T6) recorded the highest growth attribute and protein content which showed comparable results with Plantgro 4g/l(T12), Bioplantomin 2.5 l/ ha (T5) and the control (T13) showed the lowest performance. Hence, it may be concluded that Bioplantomin 3.5 l/ha should be applied through foliar spray to obtained maximum growth attribute and protein content in mungbean under custard-apple based agri-horticulture system.

Table 3. Effect of different levels of bio-fertilizers and PGR's on growth parameters of custard apple based agri-horti system.

Tree height (m)		Canopy diameter (m)		Stem girth (cm)		Shading (m)	
At sowing	At crop maturity	At sowing	At crop maturity	At sowing	At crop maturity	At sowing	At crop maturity
2.88	3.62	8.10	8.73	32.78	33.54	2.88	4.72

REFERENCES

Anjum M S, Ahmed Z I and Rauf C A (2006). Effect of rhizobium inoculation and nitrogen fertilizer on yield and yield components of mungbean. *Int J Agric Biol* **8**: 238-40.

Aslam M, Ahmad H K, Himayatullah A M, Ahmad E, Sagoo A G, Hussain I U A and Manzoor M (2010). Nodulation, grain yield and grain protein contents as affected by rhizobium inoculation and fertilizer placement in chickpea cultivar. *Sarhad J Agric* 26: 467-74.

Balachandar D, Nagarajan P and Gunasekaran S (2003). Effect of organic amendments and micronutrients on nodulation and yield of blackgram in acid soil. *Legume Res* **26**: 192-95.

Cakmakci R, Erat M, Erdogan U and Donmez M F (2007). The influence of plant growth-promoting rhizobacteria on growth and enzyme activities in wheat and spinach plants. *J Plant Nut and Soil Sci* **170**: 288-95.

Dhaka T V S and Anamika (2003). Effect of mepiquat chloride (DPC) and urea on growth and yield attributes of broad bean (*Vicia faba* L.). *Plant Arc* **3**: 291-93.

Dhewa J S, Singh Y, Sulochana and Bajia R (2015). Effect of phosphorus levels and PSB on growth indices and yield of green gram (*Vigna radiata* (L.) Wilczek) under custard apple (Annona squamosa) based on agri-horti system. *The Biosc* **10**: 1317-20.

El-Banna E N, Ashour S A and Abd El-Salam, H Z (2006). Effect of foliar application with organic compounds on growth, yield and tubers quality of potato (*Solanum tuberosum* L.). *J Agric Sci* **31**: 1165-75.

Hiller A, Plazin J and Vanslyke D D (1948). A study of conditions of Kjeldhal determination of nitrogen in proteins. *J Bio Chem* **176**: 1401-20.

Jackson M L (1962). Soil Chemical Analysis. Prentice Hall of India Private Limited, New Delhi. p. 498.

Prakash M, Kumar J S, Kannan K, Kumar M S and Ganesan J (2003). Effect of plant growth regulators on growth, physiology and yield of black gram. *Legume Res* **26**: 183-87.

Raza M H, Sadozai G U, Baloch M S, Khan E A, Din I and Wasim K (2012). Effect of irrigation levels on growth and yield of mungbean. *Pakistan J Nutr* **11**: 876-79.

Selvakumar G, Reetha S and Thamizhiniyan P (2012). Response of Biofertilizers on growth, yield attributes and associated protein profiling changes of black gram (*Vigna mungo* L.). *World App Sci J* **16**: 1368-74.

Shah T and Prathapasenan O (1999). Effect of cycocel on the growth and yield of mungbean (*Vigna radiata* L.). *J Agro* **166**: 40-47.

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