Plant Archives Volume 20 No. 2, 2020 pp. 3643-3646 **e-ISSN:2581-6063 (online), ISSN:0972-5210**

STUDY OF EFFECT OF DIFFERENT NUTRIENTS AND SOWING METHOD ON GROWTH OF MUNGBEAN (*VIGNA RADIATA* L.) VARIETY PERFORMANCE

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Abstract

A field experiment was conducted at Agricultural Research Farm, School of Agriculture, Lovely Professional University, Phagwara, Punjab, during *Rabi* 2017-2018. The soil texture was sandy loam, with pH 7.83 to 7.98 and 0.4dSm^{-1}. The study was conducted to evaluate the performance of mung bean, by growing in different nutrients and sowing methods. In this experiment cultivar used was SML 668. The experiment was conducted using Two Factorial Random Block Design with three sowing patterns (flat sowing, raised bed sowing, ridge sowing) and 6 treatments T_0 (control), T_1 (Compost), T_2 (NPK), T_3 (Micronutrients), T_4 (NPK + Micronutrients), T_5 (NPK + Micronutrients + Compost) and were replicated three times. It was found that Ridge sowing shows. T_5 showed better results in growth and yield parameters (NPK + Micronutrients + Compos). However ridge sowing and T_5 interaction performed better results in higher plant height, number of leaves, number of branches and grain yield whereas interaction between flat sowing and T_5 sowing shows better results in pod length, number of grains per pod, pods per plant and 1000 grains weight.

Key words : NPK, micronutrients, compost, grain weight, yield, fertilizer.

Introduction

Mung bean (*Vigna radiata* L.) is one of important kharif as well as summer, short duration crop, grown mainly for pulse. It fixes 200 to 300 kg/ha/year, nitrogen through symbiotic relation (Geletu and Mekonnen, 2018) and fulfill plant requirement for available nitrogen (Mahmood and Athar, 2008; Mandal *et al*., 2009). Because of good palatability, easy digestibility, short term of crop and high cost of market, mung bean is a good choice for agriculturists (Choudhary, 2010). Many factors are responsible for the low yield of mung bean at farmer's field which include factors such as unawareness of farmers about optimum date of sowing, improper proper planting patterns, insufficient weed control, insect and pest management practices and imbalanced use of fertilizers. Among these factors, proper sowing time and planting pattern are of great importance. Planting pattern influences radiation interception and utilization of moisture from soil (Malik *et al*., 2003). Application of N, P, K, S and Mg, etc. and inorganic fertilizer in the form of compost in balanced form is essential for major processes like plant development and yield. Among other agronomic practices, proper method of planting may considerably increase the production of green gram. Ideal planting geometry is precious and important for better and efficient utilization of available plant growth resources in order to get maximum productivity (Sanjay *et al*., 2014). Foliar use of supplements alongside soil application has great benefit for providing nutritional requirements of crops such as rapid and productive response by the plants, less product needed and independence of soil conditions. Foliar nutrition designed to mitigate the problems like fixation and immobilization of nutrients. This method provides utilization of nutrients more effectively and for overcoming deficiencies rapidly especially for short duration crops (Shruthi, 2013). The foliar application is one of the best methods because plants can fully utilize fertilizers, and these cause less environmental pollution (Das, 1999; Barik *et al*., 1994). Vermicompost is a sustainable bio-fertilizer

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made from the organic wastes with the help of earthworms. Vermicompost is a rich source of N, P, K and micronutrients. It is also rich in growth hormones, vitamins and acts as powerful biocide against diseases and nematodes besides improving physical condition of soil. The application of vermicompost at increasing rates significantly increased nutrient content and uptake of N, P and K in grain and straw of green gram crop (Anita, 2017).

Materials and Methods

Experiment location

The research experiment was conducted at Agricultural Research Farm, School of Agriculture, Lovely Professional University, Phagwara, Punjab during *Rabi* season of the year 2017-2018, August to December. Geographically, farm is situated 31.25'N latitude and 75'E longitude with an altitude of 232 meter above the mean sea level. The soil of experimental field was found to be sandy clay loam and pH of the soil varied from 7.83 to 7.98., EC (0.4dSm^{-1}), available phosphorus (248 kg/ ha), available nitrogen (235 Kg /ha). Geographically, farm is situated 31.25'N latitude and 75'E longitude with an altitude of 232 meter above the mean sea level. It has annual rainfall of 1919.5mm, subtropical with cool winters, hot summers and a distinct rainy season. Supplemental irrigation to the field provided through canal water as per crop water demand.

Experimental design and treatments

The experimental design was laid out on two factorial Randomized Block Design with 3 sowing methods *viz.*, S_1 (flat sowing), S_2 (raised bed sowing), S_3 (ridge sowing) and 6 treatments *viz.*, T_o (control), T_1 (NPK), T_2 (compost), T_3 (micronutrients), T_4 (NPK + micronutrients), T_5 (NPK + micronutrients + compost) with three replications. The Blocks were divided into 3 blocks to represent 3 replications. Irrigation and all other agronomic practices were carried out uniformly throughout the growing season. Application of NPK and micronutrients was done by foliar spraying.

Statistical analysis

The data was recorded for various growth, yield and quality attributes and then analyzed variance as described by Cochran and Cox (1987) for two factorial Randomized Block Design (RBD).

Results and Discussion

Plant height: It was observed that at harvest maximum plant height was recorded for treatment T_5 (NPK + micronutrients + compost) *i.e.* and S_3 (ridge method) *i.e.* 79.20 cm table 2a, because of proper aeration and availability of nutrient with organic matter. Wasma *et al.*, (2016) reported that application of inorganic fertilizer and compost has beneficial effect on the growth of mung bean. These findings are in agreement with this study that on application of NPK+ micronutrients + compost shows a positive impact on the height of mung bean as well as obtaining good grain yield after combined application of fertilizers and micronutrients when grown on ridges. It was observed that plant height was found to be maximum in S_3 ridges sowing *i.e.* 74.64. (Table 1).

Number of leaves per plant: It was observed that number of leaves was found to be maximum in S_3 (ridge sowing) *i.e.* 54.68 (Table 1). Among interaction the maximum number of leaves were found maximum for T_5 (NPK + micronutrients + compost) and S_3 (ridge method) *i.e.* 59.20 (Table 2a). Same result was observed for number of leaves per plant and number of branches and these findings are in agreement with Romel *et al.*, (2014).

Number of branches per plant: It was observed that number of branches was found to be maximum in ridge sowing *i.e.* 26.40 T_5 (NPK + micronutrients + compost) has a maximum number of branches record of 27.54 (Table 1). Among interaction of branches were found maximum for T_5 (NPK + micronutrients + compost) and S_3 (ridge method) *i.e.* 79.20 (Table 2a). Delbar *et al.*, (2014) concluded that foliar application of micronutrients results in increase in plant height, number of leaves. It has been observed that application of T_5 (NPK + Micronutrients + Compost) has attained maximum number of leaves.

Number of grains per pod: The number of grains per pod is very important character which affect on the yield per plant. More number of grains per pod was found maximum in S_1 (flat sowing) because germination was less and plant showed more number of branches and healthiness. For fertilizer treatment T_5 (NPK + micronutrients + compost) *i.e.* 12.16 (Table 1), it was observed effective response on mung bean. Whereas, interaction between sowing method and different treatment combinations were found to be maximally higher among the combination T_5 (NPK + micronutrients + compost) and S_1 (flat sowing). These present findings can be further supported by findings of Hammad *et al.*, (2014).

Pod length: In the study conducted by Mondal *et al.*, (2010) found that foliar application on micronutrients at reproductive stage appears effective in improving pod length of mung bean which is comparable to this current study in which pod length was found to be maximum in application of T_5 (NPK + Micronutrients + Compost) *i.e.* 10.70 cm. and in sowing method it was found

Table 1: Influence of different sowing method and treatments.

Traits / Treatments	Plant height^{-1}	Number of leaves^{-1}	Number of branches^{-1}	Number of grains per pod	Pod length (cm)	Number of Pods^{-1}	1000 grains Weight (g)	Grain yield per plot (g)	Straw yield per plot	Biological yield per plot
T_0	63.34	45.63	23.82	9.54	7.50	20.15	50.55	166.00	393.33	559.33
T_1	69.01	49.53	24.16	9.77	8.61	22.03	52.14	220.55	553.33	773.88
T_2	68.42	48.47	24.70	10.58	9.33	22.82	54.08	238.33	576.66	814.99
T_3	70.25	51.87	25.17	11.10	9.54	22.90	54.00	283.33	610.33	893.66
T_4	71.18	54.67	24.97	11.51	10.11	26.60	53.98	293.88	625.66	919.54
T_5	71.57	56.87	27.54	12.16	10.70	27.55	53.90	299.77	643.33	943.1
S_1	63.77	47.87	24.30	11.34	10.67	25.78	53.81	219.33	455.55	674.88
S_2	68.49	50.97	24.50	10.15	8.61	21.19	52.00	241.33	627.94	869.27
S_3	74.64	54.69	26.40	10.83	8.61	24.06	53.72	290.27	617.83	908.1

$S\text{-}_1$: Flat sowing
S_2 : Raised bed sowing
S_3 : Ridge sowing
T_0 : Control
T_1 : Compost
T_2 : NPK
T_3 : Micronutrients
T_4 : NPK + Micronutrients
T_5 : NPK + Micronutrients + Compost

Table 2a: Interaction of different sowing method and treatments.

Traits / Treatment	Plant height^{-1} (cm)			Number of Leaves^{-1}			Number of branches^{-1}			Number of grains per pod			Pod length(cm)		
	S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3
T_0	59.53	63.77	66.73	36.90	50.00	50.00	23.17	23.80	24.50	9.66	9.00	9.96	8.30	7.00	7.20
T_1	64.70	69.60	72.73	48.50	47.00	53.10	24.13	23.77	24.60	10.06	9.06	10.20	9.63	8.10	8.10
T_2	61.67	68.40	75.20	46.00	46.40	53.00	22.60	24.20	27.30	11.20	10.23	10.30	11.20	8.30	8.50
T_3	63.70	69.47	77.60	50.20	51.20	54.20	25.70	24.20	25.60	12.00	10.10	11.20	11.33	8.50	8.80
T_4	65.60	68.77	79.20	50.20	55.20	58.60	24.37	24.33	26.20	12.00	11.16	11.36	11.53	9.70	9.10
T_5	67.40	70.90	76.40	55.40	56.00	59.20	25.80	26.67	30.17	13.13	11.36	12.00	12.00	10.10	10.00

Table 2b: Interaction of different sowing method and treatments.

Traits / Treatment	Number of Pods^{-1}			1000 grains Weight (g)			Grain yield per plot (g)			Straw yield per plot (g)			Biological yield per plot (g)		
	S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3
T_0	22.16	18.29	20.00	51.06	49.26	51.33	151.66	163.00	183.33	325.00	435.00	420.00	476.66	598.00	603.33
T_1	23.33	20.25	22.52	52.33	51.40	52.70	185.00	191.66	285.00	405.00	636.66	618.33	590.00	828.32	903.33
T_2	24.43	21.34	22.69	54.46	53.33	54.46	200.00	216.66	298.33	455.00	645.00	630.00	655.00	861.66	928.33
T_3	26.20	16.96	25.55	54.46	54.26	54.46	250.00	283.33	316.66	486.66	678.33	666.00	736.66	961.66	982.66
T_4	28.36	25.13	26.32	55.20	52.20	54.56	260.00	293.33	328.33	520.00	684.33	672.66	780.00	977.66	1000.9
T_5	30.23	25.16	27.27	55.36	51.53	54.80	269.33	300.00	330.00	541.66	688.33	700.00	810.99	988.33	1030.0

$S\text{-}_1$: Flat sowing
S_2 : Raised bed sowing
S_3 : Ridge sowing
T_0 : Control
T_1 : Compost
T_2 : NPK
T_3 : Micronutrients
T_4 : NPK + Micronutrients
T_5 : NPK + Micronutrients + Compost

maximum for flat sowing (Table 1). For interaction pod length was maximum in combination T_5 (NPK + micronutrients + compost) and S_1 (flat sowing) 12.00 (Table 2a). Dilip *et al.,* (2016) observed significant increase in pod length after application of micronutrients.

Number of pods per plant: The combined application of T_5 (NPK + micronutrients + compost) has resulted in highest number of pods per plant *i.e.* 27.55 (Table 2b). This finding is substantiated by the study done by Das *et al.,* (2015) which showed that combined application of N:P:K (19:19:19) fertilizer spray increases the yield components of mung bean.

1000 grain weight: It was found that maximum grain weight was found in S_1 (flat sowing) *i.e.* 53.81 g (Table 1). Combination of T_5 (NPK + micronutrients + compost) and S_1 (flat sowing method) resulted in highest results

i.e. 55.36 g (Table 2b).

Table 1 shows the effect of different treatment combinations and sowing methods on yield parameters. The different sowing methods along with different treatments showed significant influence on grain yield as well as straw yield. Higher yield per plot was observed in ridge sowing. Among the treatments T_5 (NPK + micronutrients + compost) showed better results as compared to other treatments. Among interaction T_5 (NPK + micronutrients + compost) and S_3 (ridge method) resulted in better yield *i.e.* 330 g (Table 2b). Straw yield was observed maximum in sowing method for S_2 (raised bed) and in fertilizer treatment for T_5 (NPK + micronutrients + compost), whereas, interaction T_5 (NPK + micronutrients + compost) and S_3 (ridge sowing) found maximum for straw yield (Table 2b). Netwal (2003) reported the application of vermicompost and compost had significant increasing effect of straw yield.

Conclusion

The study has evaluated that ridge sowing method showed higher growth parameters as well as yield and yield attributes in comparison to other sowing methods. The study has evaluated that foliar spraying of micronutrients and NPK and application of compost has shown a synergistic effect on the growth and yield of mung bean as compared to other treatments. The combination of compost with foliar application of micronutrients and NPK showed increase in plant height, number of leaves, branches per plant, pod length, pods per plant, grains per pods well as grain yield and straw yield. Therefore, it can be concluded that the combination of compost with application of micronutrients and NPK should applied by the use of ridge sowing method to get good yield.

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