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Research Article

Growth and Yield Response of Mung Bean (*Vigna radiata* L.) in Different Levels of Potassium

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Abstract

Potassium application is related to mung bean plant growth, total biomass and crops yield. Different potassium level of soils is significantly affected the mung bean plants yield and yield contribution parameters. Maximum mung bean yield was 689 Kg/ha was obtained with the application of 85 Kg potash per hectare. Genotype HUM-1, and HUM-2 produced higher seed yield than JM - 72. The interactive effect of three mung bean varieties and their potassium level was found significant in different parameters. My studies were determining the effect of K on vegetative growth (plants dry weight and plant height), yield components (plant height, number of pods/plant, number of seeds/pod and seeds yield kg/hectare) produced seeds.

Keywords: Mung Bean; HUM-1; HUM-2; JM-72; K; Yields

Introduction

Mung bean (*Vigna radiate* L) is a summer pulse crop with short duration (70 - 90 days) during spring and autumn seasons. It has high nutritive value so many effective uses, green pods in cooking as peas, sprout rich in vitamins and amino acids. Mung bean has been grown and consumed in Africa, Australia and Asia including Pakistan where considered as a cheapest source of proteins [1]. Its seed contains 24.2% protein, 1.3% fat and 60.4% carbohydrate. This crop can be used for both seeds and forage since it can produce a large amount of biomass [2]. The average yield is quite low which requires attention of the crop experts among various factors.

NPK is improved mung bean yield [3], among other macro nutrients like potash (K) as plays a vital role in plant enzyme activation and resistance against the different diseases [4]. Potassium is also plays an effective role in mung bean like plant growth and sustainable crop production [5], it activates more than 60 enzymes [6]. Indian soils are increases intensity of cropping and introduction of high yielding in considerable use in different level of potassium and crops are growing responsive to potassium fertilizers. Mung bean plants height, pods per plant, seeds per pod and seed yield are increased significantly with potassium application and maximum seed yield obtained with 90 Kg potash per hectare [7]. They observed significant differences of protein content in different mung bean cultivars due to application of potassium.

The present study was indicating the effect of different levels of potassium under uniform levels of nitrogen and phosphorus on growth and yield performance of diverse mung bean cultivars under irrigated conditions of IESD BHU Varanasi Uttar Pradesh. Such study will be useful to create awareness among the farming system as use of fertilizer in balanced amount to get maximum production.

Material and Methods

Cultivation of Mung bean

Five level of potassium (0,30,60,90 and 120 Kg/ha) were studied for growth and yield response of three cultivar varieties of mung bean (HUM-1, HUM-2 and JM-721) during autumn season 2016. Layout design of mung bean was randomized complete block design (RCBD) with factorial arrangements of 3 replications. The seed bed was well prepared three times in plot size 3x3m2 in which row to row space 75 cm and plant to plant space 25 cm. The crop was sowing on 05 March 2016 using seed rate of 15 Kg per hectare with a basal dose of nitrogen and phosphorus (85 Kg/ha) along with prescribed doses of potash that applicable in the form of urea, Diammonium phosphate (DAP) and sulphate of potash (SOP), respectively. Experimental field was irrigated time to time as required particularly at all critical stages of mung bean.

NPK Analysis

Composite soil samples were taken from the IESD BHU Varanasi field prior to sowing of crop, after fertilization and after harvest of crop from 0 - 30 cm during autumn season 2016. The soil samples were air dried, grounded, well mixed and passed through a 2 mm sieve and analyzed for chemical properties. Chemical compositions of mung beans soils are analyzed during sowing, after flowering and harvesting, respectively.

Statistical Analysis

Ten mung bean plants of each plot were selected and analysis at harvest stage and randomly recording plant height, number of branches per plant, number of pods per plant and number of seeds per pod. After collection of required data, M. Stat software was used to analyze the data. F test was significant, means were compared by LSD test at 5% probability level [8].

Result and Discussions

Plant Height (cm)

Potash levels affected significantly plant height of mung bean. Maximum plant height was 54.26 cm obtained when potash was applied at 85K g/ha. It was statistically applicable at 60 and 120 Kg potash per hectare. Minimum plant height was 38.36 cm obtained in plots where no potash applied due to high root shoot ratio is an association with potassium uptake [9]. Results are observed significantly with higher plant height in mung bean crop at the rate of 60-100-100 K Kg /ha.

Number of Branches Per Plant

Maximum number of fruits bearing branches per plant was 5.78 recorded at 120 Kg potash per hectare against minimum control. Number of pod bearing branches per plant was significantly increased from potassium application in mung bean [10] plant during autumn season 2016. Result was attributes many differences in climatic conditions. The interaction between K and different variety of mung beans were highly significant. The maximum number of pods was 26.71 and bearing branches per plant was observed in V3 K3. The minimum number of pod was bearing 5.19 branches per plant in V2 K0.

Number of Pods Per Plant

Number of mung bean pods/plant was significantly affected by potash levels. Maximum number of pods/plant was 26.71 obtained when potash applied at 90 Kg per hectare. Minimum number of pods/plant was 21.34 obtained in plots as a control. Similar findings were also recorded [10] by some studied on yield and quality of mung bean that affect different potassium level (0, 25, 75, 100 and 125 Kg/ha) that reported number of pods/plant, number of seeds per pod in potassium application.

Treatments	Plant Height (cm)	No of branches plant^{-1}	No of pods plant^{-1}	No of seed pod^{-1}	No of plants plot^{-1}	1000 seeds weight (g)	Seed yield kg ha^{-1}
Varieties (V)							
V1 (HUM-1)	54.26	5.8	22.56	6.68	229.0	36.99	588.0
V2 (HUM -2)	48.54	4.6	19.46	5.88	227.0	34.42	586.0
V3(JM-72)	53.42	5.4	22.46	6.53	229.0	35.52	584.0
Potassium level (K)							
K0	38.36	5.13	17.78	6.18	229.0	27.21	432.9
K1	46.58	5.26	24.46	6.14	227.0	29.34	578.6
K2	46.72	5.24	24.78	7.81	229.0	32.44	673.8
K3	49.43	5.23	23.81	8.42	227.0	36.76	763.6
K4	48.56	5.78	25.67	7.46	229.0	39.56	726.7
Interaction (K levels x Varieties)							
V1xK0	36.84	5.21	24.34	6.73	228.0	26.79	574.0
V1xK1	44.83	5.43	22.34	5.34	227.0	24.57	566.0
V1xK2	42.56	5.29	24.23	6.43	226.0	25.46	643.0
V1xK3	43.56	5.63	25.27	6.26	226.0	28.91	673.0
V1xK4	43.73	5.26	25.76	6.56	227.0	31.45	787.0
V2xK0	44.81	5.19	24.58	5.93	226.0	30.46	584.0
V2xK1	44.72	5.38	25.63	6.62	227.0	34.62	688.0
V2xK2	52.26	5.81	26.32	6.84	226.0	35.67	684.0
V2xK3	54.34	5.67	24.61	8.82	227.0	34.75	589.0
V2xK4	53.78	5.63	23.51	7.63	229.0	36.74	679.0
V3xK0	44.81	5.22	21.34	5.84	227.0	34.56	557.0
V3xK1	44.72	5.63	25.21	6.84	229.0	36.61	587.0
V3xK2	52.26	6.73	25.67	7.93	229.0	34.67	689.0
V3xK3	54.34	6.46	26.71	9.82	229.0	32.57	741.0
V3xK4	53.78	8.84	26.43	8.67	229.0	29.56	734.0

Table1: Growth and yield response of two cultivars of mungbean to different potassium levels (Means sharing same letter statistically at P≤0.05 by LSD).

Number of Seeds Per Pod

Potassium perform a significant role in mung bean grain yield. The higher grain yield was observed from 180 kg/ha potassium, this compared to the control that was obtained 42%. Maximum number of mung bean seeds per pod was 8.42 obtained when potash was applied at 90 Kg/ha, and minimum number of mung bean seeds was 4.14 per pod obtained each plot where no amount of potash was applied. Thus, K application not only enhanced the availability of other nutrient but also increased the photosynthesis rate of mung bean. Therefore, a difference between mung bean varieties for number of seeds per pods was significant. Potassium perform a significant role in mung bean grain yield. The higher grain yield was observed from 180 kg/ha potassium, this compared to the control that was obtained 42%. Maximum number of mung bean seeds per pod was 8.42 obtained when potash was applied at 90 Kg/ha, and minimum number of mung bean seeds was 4.14 per

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Number of Plants Per Plot

Optimum plant density was access good crop growth, which ultimately lead to higher crop yield in mung bean plot. Number of plants per plot was non- significant from use different levels of potassium. Similar plant populations were release with uniform seed rate that maintain the plant to plant distance of population. The variation in different mung bean population was evaluated in three genotypes.

1000 Seeds Weight (g)

The differences of mung bean seed weight are estimated. 1000 seeds weight were also noted, from different treatments of fertilizers that applicable at 120 Kg/ha as resulted in maximum 1000 seeds weight. Minimum seed weight was recorded from that plots where no potash was applied. 1000 seed weight were significantly analysis from three varieties of mung bean. The variety HUM produced significantly higher seed weight was 36.99g that higher than JM-72 (35.52g) and HUM-2 (34.42g). Variation of seed weight between three varieties can be attributed to genetic makeup of mung bean plants.

Seed Yield (Kg/ha)

Seed yield of mung bean was also affected significantly by potassium levels. Maximum seed yield was 763.6 Kg/ha recorded when potash was applied at the rate of 90 Kg ha-1. Minimum seed yield was 432 Kg/ha observed in plot where no potash fertilizer was applied in mung bean field. The interaction between varieties and fertilizer levels were also depicted non-significant. Their water stress causes a significant role in decrease grain yield due to decrease of nutrient supplement, while stress during grain filling reduce grain yield through grain weight [11].

Harvest Index

Potassium show significant influences on the harvest index evaluated. Data calculated from revealed potassium fertilizer that exerted significant influences on harvest index, and maximum was recorded (42.37%) when T4 - 45 kg P_2O_5 per hectare was applied, but similar to 15 and 30 Kg P_2O_5 ha^{-1} and minimum was 33.46% with control. The growth, yield and yield attributes of mung bean was increased with the application of phosphate fertilizer up to 45 kg P_2O_5 ha^{-1} and some of the above parameters was differed in three mung bean varieties.

Conclusion

All the above-mentioned parameters of mung bean were influenced by graded levels of K. Finding results from the above parameters are presented here and concluded significant K level for formers application. Thus, growth and yield of mung bean were suit nutrient environmental conditions of Varanasi, however, this is based on one season experiment; further trails may be needed to performance in different environmental condition and different types of soils. Now, I concluded that macronutrients (K) have importance application for mung bean production in different soils. These experiments are depicted notable response in growth and yield due to potassium application of 90 Kg/ha. It is recommended for farmers, while 180 kg potassium/ha, even in severe stress condition, but it can be decrease harmful effects of water stress on the number of pods/plant, number of grains/pod, 1000 seed weight, grain. JM - 72 variety was more resistant to water stress, compared with local variety, and also it is more responsive to various amounts of potassium fertilizer.

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