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Effect of Phosphatic Fertilizers Levels on Growth and Yield of Mungbean (*vigna radiate - l)* Under the Climatic Condition of Quetta.

Botany

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Abstract

A Field experiment was conducted, to determine the effect of varying levels of Phosphatic fertilizer on the growth and yield of Mungbean variety AZRI – 2006 at the ARI, Sariab field Quetta during Kharif 2012.The results revealed that all the levels of Phosphatic fertilizer showed significant impact on Mungbean compared to that of control plots, However, treatment of Phosphatic fertilizer @ 85 Kg ha^{-1} out yielded rest of the treatments giving the maximum growth and grain yield of 1227.7 Kg ha^{-1}.

Keywords: Mungbean (*Vigna radiata),* phosphatic fertilizer, gain yield, Balochistan

Introduction

Mungbean (*Vigna radiate – L*) is an important pulse crop that can be grown twice a year i.e. in spring and autumn. Among the grain legumes, it is one of the important conventional pulse crops of Pakistan. It ranks second to chickpea (*Cicer arietinum*) amongst grain legumes from production point of view. Its seed is more palatable, nutritive, digestible and non-flatulent than other pulses grown in country. It contains 24.7% protein, 0.6% fat, 0.9% fibber and 3.7% ash (Potter and Hotchkiss, 1997). Besides being a rich source of protein, it

maintains soil fertility through biological nitrogen fixation in soil and thus plays a vital role in furthering sustainable agriculture (Kannaiyan, 1999).
It is a short duration crop therefore has less water requirement as compared to summer crops. Moreover, it is drought resistant that can withstand adverse environmental conditions, and hence successfully be grown in rain fed areas (Anjum *et al*., 2006).
In Balochistan, during 2010-2011, Mungbean was grown on an area of 12646 hectares with total production of 6679 tons with the average yield of 528Kg ha^{-1} (Anonymous, 2010 - 2011).
The average yield is quite low which requires attention of the crop experts. Among various factors judicious use of fertilizer is of prime importance. It is a evidence from the literature that application of major nutrients i.e. NPK improved Mungbean yield (Ali *et al* 1996 and 2010).

Growth and development of crops depend largely on the development of root system. Phosphorus (P) is one of the three macronutrients that plants must obtain from the soil. It is a major component of compounds whose functions relate to growth, root development, flowering, and ripening (Raboy, 2003). Most of the soils throughout the world are P deficient (Batjes, 1997), soils of Pakistan are generally alkaline in reaction and calcareous in nature. These types of soils usually contain traces of available micronutrients and macronutrients Moreover, with the introduction of high yielding varieties, increased cropping intensity and heavy applications of N and P fertilizers, the deficiency of some macronutrient have occurred in the country. The beneficial effects on the yield of different crops have been noticed from the soil application of the deficient macronutrient (Khan *et al*., 2004), and the poor performance of fertilizer phosphorus is one of the major causes depressing the productivity of the crops. Hence, the effect of phosphorus on root development is well established (Hossain and Hamid, 2007). Addition of N and P fertilizer enhances root development, which improves the supply of other nutrients and water to the growing parts of the plants, resulting in an increased photosynthetic area and thereby more dry matter accumulation. The application of phosphorus to Mungbean has been reported to increase dry matter at harvest, number of pods $plant^{-1}$, seed pod^{-1}, 1000 grain weight, seed yield and total biomass (Mitra *et al*., 1999). Non-addition of P to Mungbean wills ultimately decreasing the yield and quality of the crop. Phosphorus fertilization is, therefore, very essential for exploiting maximum yield potentials of different crop plants. As the degree of P fixation depends on the ratio of applied phosphorus, fixation of broadcast P is much greater than the fertilizer applied in bands because of narrow soil to fertilizer ratio in the latter situation (Rashid and Din, 1993).

Farmers have a wrong notion that green gram, being legume crop does not need any nutrient and usually grow it on the marginal lands without applying

any fertilizer. This seems to be an important reason for low productivity in the country. Contrary to above notion,

Ali *et al* (2010) conducted an experiment on four levels of phosphorus (P) (0, 30, 57& 84Kg ha^{-1}) were applied and found increase in germination m^2, number of branches $plant^{-1}$, number of pods $plant^{-1}$, 1000 grain weight and grain yield Kg ha^{-1} of Mung bean where phosphotic fertilizer applied @ 30 – 57 and 84 Kg ha^{-1}.(Lange *et al.*, 2007), Maqsood *et al*., (2001) investigated the effect of phosphorus rates on the agronomic traits of two mash bean genotypes (Mash-97 and Mash-88). The phosphorus rates were 0, 50, 75 and 100 kg P_20_5 ha^{-1}. Phosphorus application @ 75 Kg ha^{-1} gave significantly the highest seed yield of 1832 Kg ha^{-1}, Ali *et al* (1996) observed significantly higher plant height in Mungbean crop when fertilizer applied at the rate of 60 – 100 – 100 NPK Kg ha^{-1}.

Ail *et al* (2002) found increased number of branches, yield components and yield of mash compared with treatments given no phosphorus. Increased straw yield, number of pods $plant^{-1}$, number of seeds pod^{-1} and 1000-grain weight.

Malik *et al*., (2003) also studied the effect of seed inoculation and phosphorus levels viz., 0, 30, 50, 90 and 110 Kg ha^{-1} on growth, seed yield and quality of Mungbean cv. NM-98. Maximal 1000-grain weight, grain yield and protein contents were obtained from the plots where inoculated seed was grown with phosphorus applied @ 50 Kg ha^{-1}.

Fatima *et al* (2001), Abbas *et al* (2011) reported that the addition of K_2SO_4 to Mungbean plants significantly increased stem length; number of branches $plant^{-1}$, number of pods $plant^{-1}$, number of grains pod^{-1}, 100seed weight, and seed yield $plant^{-1}$ and seed yield ha^{-1}. Similarly, Naeem *et al* (2000) investigate the yield of mungbean as affected by different durations of weed competition under high Phosphorus states on the mungbean variety NM – 54 the phosphorus rate was (0–50 and 75Kgha^{-1}).observed maximum number of pods $plant^{-1}$, number of grains pod^{-1},1000grains weight and grain yield were produced in plot where 75 Kg ha^{-1}.phosphorus was applied. Akhtar *et al*., (1984) found increased number of branches, yield components and yield of green gram compared with treatments given no phosphorus. Increased straw yield, number of pods $plant^{-1}$, number of seeds pod^{-1} and 1000-grain weight has also been reported by Rathore *et al*., (1992). Adequate amount of phosphorus in soils favors rapid plant growth, early fruiting / maturity and improves the quality of the produce; hence the experiment was design to evaluate the different levels of phosphorus to increase the grain yield of Mungbean.

Materials and methods

The trail was laid out under ARI, Sariab Quetta, to study the response of Mungbean to Phosphatic fertilizer in arid areas. Mungbean was sown during

Kharif season 2012 with hand drill using seed rate 25 Kg ha^{-1}. The experiments comprised of four treatments in RCBD having three replications. The four treatments were T1 (Control), T2 (Phosphatic fertilizer @ 35 Kg ha^{-1}), T3 (Phosphatic fertilizer @ 60 Kg ha^{-1}) and T4 (Phosphatic fertilizer @ 85 Kg ha^{-1}), were applied with started dose of nitrogen. TSP was used as a source of phosphorus. Soil was well prepared with three ploughing and two planking before final layout. All other agronomic practices i.e. thinning, hoeing, eradication of weeds and irrigation was kept same for all treatments. Mungbean variety AZRI-2006 was used as a test variety. The trial was laid out on 26-05-2012.The plot size was 8mx9 m and row to row distance was kept 30m. First irrigation was applied approximately 40 days after sowing and others after fifteen days intervals. Four irrigations were applied to the crop. The yield data were recorded by harvesting randomly selected 3m x 3m from each treatment, whereas number of pods was recorded on the average of ten plants from each treatment. Data was subjected to statistical analysis are presented as mean values of three replications. Data were analyzed statistically for analysis of variance (ANOVA) following the method described by Gomez & Gomez (1984).The significance of differences among the means was compared by using Least Significant Difference (LSD) Test (Steel & Torrie, 1984).

Results and discussion

Emergence m^2

The data regarding emergence m^2 presented in Table (1). The result of analysis of variance show that the Phosphatic fertilizer level had significantly affected on the emergence m^2 .High emergence was found in plot where phosphorus applied 85 kg ha^{-1} (46.00) while low emergence m^2 was recorded in control (40.67). These results were in full agreement with those obtained by Ali *et al* (2010). Who reported that the Phosphorus application increase germination m^2 in Mungbean.

Number of Branches $Plant^{-1}$

Table 1 Exhibits that different level of Phosphatic fertilizer has significant effect on number of branches $Plant^{-1}$. Maximum numbers of branches Plant-1 (2.70) were observed where Phosphatic fertilizer applied @ 85 kg ha^{-1}. While control plots produced significantly lower number of branches $Plant^{-1}$ (1.61). These results were in full agreement with those obtained by Tariq *et al* (2001) Hussain *et al* (2011) who reported that the number of pod bearing branches $Plant^{-1}$ was significantly increased by potassium applications in Mungbean. Increase number of branches $Plant^{-1}$ in

Mungbean was also reported by Ali *et al* (2010), Fatima *et al* (2001) Akhtar *et al*., (1984).Their findings supported this research work.

Plant height (cm)

The data presented in Table (1). Indicate that Phosphorus application had a significant effect on the Plant height. The highest Plant height was recorded where Phosphorus was applied at the rate of 85 kg ha^{-1} (70.63cm) followed by 60 kg ha^{-1} (61.85cm). While control plots produced significantly lower Plant height (57.02cm). These results are in line with Ali *et al* (1996) who observed significant higher plant height in Mungbean crop when fertilized at the rate of 60 – 100 – 100 kg ha^{-1}NPK, Increased stem length when applied K_2SO_4 in Mungbean also reported by Fatima *et al* (2001).

Number of pods $plant^{-1}$

The data pertaining to the number of pods $Plant^{-1}$ are affected by Phosphorus levels presented in Table (1). Which reveal that phosphorus levels had significantly affected on number of pods $Plant^{-1}$ significantly highest number of pods $Plant^{-1}$ (16.00) was recorded from the plot on which fertilizer was applied at the rate of 85 kg ha^{-1}. While significantly least number of pods $Plant^{-1}$ (8.33) was counted in control. These results conforms the findings of Malik *et al*., (2003), Ahmed *et al*., (1992). Who reported that N & P increased the number of pods $Plant^{-1}$ in Mungbean, Naeem *et al* (2000) also observed maximum number of pods $Plant^{-1}$ where phosphorus was applied @75 Kg ha^{-1} over control.

Numbers of grain pod^{-1}

Table 1 reveals a significant effect of phosphorus levels on the number of grains Pod^{-1} against control. significantly highest number of grain Pod^{-1} (8.67) where Phosphorus was applied at the rate of 85 kg ha^{-1} and (8.33) number of grain Pod^{-1} where fertilizer applied @ 60 kg ha^{-1}. While control plots produced significantly lower number of grain Pod^{-1} (5.67). These results are in favor of the findings of Naeem *et al* (2000), Akhtar *et al*., (1984), Ali *et al* (1996),Reddy *et al* (1990) and Maqsood *et al*., (2001) have also reported increase in number of grains Pod^{-1} due to P_2O_5 application**.**

1000Grain weight (gm)

Statistical means recorded for 1000 grain weight given in Table 1, which indicated that the effect of Phosphorus was significant. The maximum 1000grain weight (39.33gm) was recorded from plot where phosphorus was

applied @ 85 kg ha^{-1}, while control plots produced significantly lower 1000grain weight (29.20gm). These results are in line with findings of Malik *et al* (1990 and 2003), Ali *et al* (1996 and 2010) and Naeem *et al* (2000) reported increase in 1000 seed weight due to application of Nitrogen and Phosphorus in mung bean.

Grain yield (Kg ha^{-1})

Fig 1 indicate that the all the levels of Phosphatic fertilizer showed significant impact on mung crop compared to control plots. But T4 (P_2O_5 @ 85 kg ha^{-1}) produced highest yield (12.27.7Kg ha^{-1}),While control plots produced significantly lower yield (873 Kg ha^{-1}). These results are in full agreement with the findings of Ali *et al* (1996), Ali *et al* (2010), Malik *et al* (2003), Maqsood *et al*., (2001), Naeem *et al* (2000) and Hussain *et al* (2011).

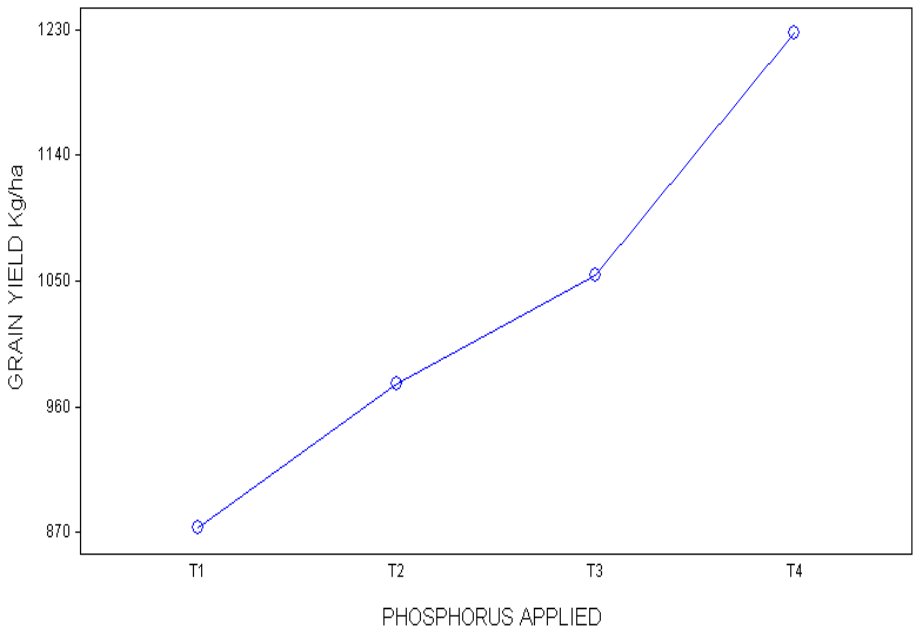
Treatment	Emergence (m^2)	No. of branches $plant^{-1}$	Plant Height (cm)	No. of pod $plant^{-1}$	No. of grain pod^{-1}	1000-grain weight (gm)	Yield (Kg ha^{-1})
T_1= (Control)	40.67c	1.61c	57.027c	8.33d	5.67c	29.20d	873d
T_2=(Phosphatic fertilizer @ 35 Kg ha^{-1})	41.33c	2.16c	59.62bc	11.33c	7.33b	31.30c	976.3c
T_3 = (Phosphatic fertilizer @ 60 Kg ha^{-1})	44.00b	2.43b	61.85b	13.00b	8.33a	33.43b	1054.3b
T_4=(Phosphatic fertilizer @ 85 Kg ha^{-1})	46.00a	2.70a	70.53a	16.00a	8.67a	39.33a	1227.7a
LSD5%	0.65	0.025	1.24	0.27	0.27	0.33	23.67

Conclusion

The effects of phosphorus level on grain yield of Mungbean were found to be positive and significant. Grain yield of Mungbean crop was a function of cumulative effect of various yield components which were influenced by genetic make up of the variety various agronomic practices and environmental conditions. The application of Phosphatic fertilizer @ 85 kg ha^{-1} gave the maximum number of pods $plant^{-1}$, number of grains $pod^{-1,}$ plant height and ultimately resulting in maximum grain yield (12.27.7Kg ha^{-1}).

Table 1: Effect of different levels of Phosphatic fertilizer on the growth and yield of Mungbean during the year 2012

Fig 1: Effect of different levels of Phosphatic fertilizer on the grain yield (Kg ha^{-1}) of Mungbean during the year 2012



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