EFFECT OF PHOSPHOROUS ON THE YIELD AND YIELD COMPONENTS OF MUNGBEAN AT MARC, JUGLOTE, GILGIT-BALTISTAN, PAKISTAN

Abdul Karim¹, Muhammad Qasim¹, M. Imran², Zulfiqar Ali Gurmani², Tajudin¹, Muhammad Din¹ and Shafiullah¹

¹Mountain Agriculture Research Center, Juglot, Gilgit, Pakistan
²National Agriculture Research Center, Park Road, Islamabad, Pakistan
Email of Corresponding Author: imran_571@yahoo.com

ABSTRACT
The study was carried out to evaluate the effect of five phosphorous levels on the growth and yield of mung bean crop at Mountain Agricultural Research Centre (MARC), Juglote during 2010. Results revealed that mung bean crop fertilized with 100 kg/ha phosphorus, gave maximum grain yield kg/ha, plant height, number of branches per plant, number of seeds per pod, 1000-grain weight and grain yield kg/ha. The dose of 100 kg/ha phosphorus was found more economical for getting the higher grain yield of mung bean crop under irrigated conditions of Gilgit-Baltistan. Thus it is recommended that farmers of Juglote should use 100 kg/ha of phosphorous in their area.

KEYWORDS: Mung bean (Vigna radiata L.), phosphorus effect, yield and yield components, Gilgit

INTRODUCTION
The yield and quality of mung bean can be improved by applying best agronomic practices such as optimum seed rate and suitable variety & balance fertilizer requirements. The requirement for phosphorus is greater for healthy crop growth with efficient root system and profuse nodulation. Beside all these factors phosphorus plays a key role in pod filling and ultimately enhances the production. Mung bean (Vigna radiata L.) belongs to family leguminoseae and sub-family papilionaceae. It is a tropical, warm season legume crop adapted to a variety of soil. Mung bean is successfully grown on sandy and light “Mera” soils. The optimum temperature requirements for this crop range from 65-75F. It is a very rapid growing annual crop, maturing in 80-110 days. The crop is sown in both summer and spring in Pakistan. As a kharif crop, it is sown in June, July while as spring crop, it is sown from mid of March to April.

The average yield is quite low which requires attention of the crop experts. Among various factors, judicious use of fertilizer is of prime importance. Phosphorous plays vital role in improvement of crop yield and improves the quality of grains. Ashraf (1981) reported that the application of 75 kg Nitrogen +125 kg Phosphorous/ha by favorable effecting the individual yield components increased the grain by 10.72, 50.45 and 80.89% 125 kg phosphorous/ha are, 75 kg N/ha and control respectively/ha. Sadaqat et al (1981) reported that yield of grain as well as yield of crude protein and oil per unit area in Soyabeancan be significantly improved by the use of P and K each at the rate of 90 kg/ha. Shabbir (1982) revealed that application of 60kg /ha significantly increased the number of branches per plant, number of pod per plant and thousands grain weight in chicer arietinum. He further stated that 60 kg/ha produced higher seed yield over control. Rafey et al (1980) obtained maximum yield of forage and seed yield of mung bean at 120 kg /ha. The yield and quality of mung bean can be improved by applying best agronomic practices such as optimum seed rate and suitable variety & balance fertilizer requirement. Tomer et al (1996) in a field experiment vigna radiate CV.K-851 was sown at 20, 30 or 40 kg seed/ha and given 0, 30 or 60 kg p/ha. Seed yield was highest with the sowing the rates of 40 kg/ha and with the 60 kg phosphorous/ha. Chaudary and Singh (1983) concluded that N, P, K green gram soybean in maize had no adverse affect on yield on main crop and gave additional seed yield. The requirement for phosphorus is greater for healthy crop growth with efficient root system and profuse nodulation. Beside all these factors phosphorus plays a key role in pod filling and ultimately enhances the grain production. The present study was carried out to study the effect of phosphorous on the growth and yield of mung bean under agro-climatic conditions of Gilgit-Baltistan of Pakistan. Earlier studies show that phosphorus plays vital role in yield improvement in mung bean crop. Keeping in view this idea an experiment was launched to identify the optimum phosphorous requirements of the mung bean crop for high yield under agro-climatic conditions of Gilgit-Baltistan of Pakistan.
MATERIALS AND METHODS
A field experiment was conducted to study the effect of different levels of Phosphorus on the yield and yield components of mung bean crop at Mountain Agricultural Research Centre (MARC), Juglote, and Gilgit during 2010. Mung bean variety NM-98 was sown on July 12, 2010, with the help of single row hand drill using a recommended seed rate of 25kg/ha. The experiment was laid out in randomized complete block design (RCBD) with three replications and plot size of 4x1.8m². The experiment consisted of six levels of Phosphorus i.e. 0, 20, 40, 60, 80, 100 kg/ha with a basal dose of Nitrogen @ 20kg/ha. Single Super Phosphate and urea fertilizers were used as source of Phosphorus and Nitrogen respectively. All Phosphatic and Nitrogenous fertilizers were applied before sowing.

Following observations were recorded:
1. Days to flowering
2. Days to maturity
3. Plant height (cm)
4. Number of branches/plant
5. 1000-grain weight (gm)
6. Grain yield (kg/ha).

RESULTS AND DISCUSSION
The effect of various phosphorus levels on days to flowering, days to maturity, plant height, number of branches, 1000-grain weight, and grain yield of mung bean variety MN-98 was studied under agro-climatic conditions of Gilgit-Baltistan during the summer 2010. The result obtained are presented and discussed as under:

Days to flowering
Analysis of variance regarding effect of different phosphorus levels is given in the table-1. The statistical analysis showed that different phosphorus levels significantly affected the number of days to flowering. Maximum days to flowering (45.80) were recorded in control where no fertilizer was used. This period was significantly longer than the other treatments. The minimum days to flowering i.e. 40.06, 40.33 and 40.00 were recorded in T3, T4 and T5 where 60, 80 and 100 kg of phosphorus fertilizer was used. The control treatment was however statistically at-par with the application of 20 and 40kg phosphorus per ha. These treatments (T3, T4 & T5) were statistically uniform by availing 40, 40.33 and 40.06 days to flowering. The similar results were reported by Nelson (1947).

Days to Maturity
The data presented in table revealed that the maturity period was non significantly affected by different phosphorus levels. However, maturity period ranged from 50.80 to 62.20 days. The trend of crop maturity was almost same as in case of days to flowering. Although the data were not significant yet it had linearly decreasing trend with increasing doses of phosphorus. Untreated control had availed 62.20 days to maturity. The maximum days to maturity were taken by treatment where 40 kg phosphorus/ha was applied. The minimum days to maturity (50.80 days) was observed in T5 which was fertilized with 100 kg phosphorous.

Plant Height (cm)
The final plant height reflects the growth behavior of a crop plant. The data presented in Table-1 revealed that the plant height was affected highly significant by different phosphorus levels. It is evident from the table that maximum plant height of 67.08 cm was recorded from the T5 in which 100kg P₂O₅/ha along-with a basal dose of 20kg N/ha was applied. This was followed by T4 with plant height of 64.53cm. Minimum plant height (59.21cm) was measured from control plot. The data showed that increasing rate of phosphorus up to 100kg P₂O₅/ha increased plant height and there seems further scope of increasing plant height with increasing dose of phosphorus. The reports of Riss and Sherwood (1965), Machenzie and Lious (1975), Haq and Hussain (1981) are in agreement with present findings.

Number of branches/plant
Number of branches is considered one of the most important plant characters in view of the fact that the plant with profuse branches generally bears more pods as compared to those having least number of branches. The result in the table indicates highly significant effect of different doses of phosphorus fertilizer on the number of branches per plant in mung bean. The maximum numbers of branches per plant 9.33 were obtained from the treatment fertilized with 100kg P₂O₅/ha, it was followed by T3 and T4 with 8.36 and 8.70 branches per plant respectively. The data indicated that lower dose of phosphorus (20kg/ha) had not significantly increased the number of branches in mung bean plant while higher doses of phosphorus had
increased the number of branches. The difference between T_3, T_4 and T_5 were found to be non-significant. The results clearly indicated that the higher dose of phosphorus 100kg P_2O_5/ha is most appropriate for obtaining maximum number of branches/plant in mung bean. Shabbir (1982) reported that application of 20kg nitrogen and above 60kg Phosphorous/ha significantly increased the number of branches and grain yield.

**Number of grains/pod**

Data regarding the number of grains per pod of mung bean as influenced by the various phosphorus levels are presented in the Table. The data reveals that various phosphorus levels had highly significantly affected the number of grains per pod (9.16). The highest numbers of grains per pod were obtained with the application of 100 kg phosphorus/ha it was closely followed by the treatment 3 and treatment 4 producing 8.03 and 8.30 grains per pod respectively. The T_3 & T_4 were also statistically at-par with each other. Similarly T_3 was also statistically similar to T_2. This indicates that 100 kg phosphorus/ha is most suitable level for increasing grain number per plot in Mung bean plant. These results are corroborated with Ravanker et al (1973), Rajendran et al (1974) and Das et al (1977) who also observed similar results in pulse crops.

**1000-grain weight (gm)**

1000-grain weight is an important yield component of mung bean crop. The data pertaining to 1000-grain weight given in the table revealed that the variable doses of P_2O_5 (20 to 100kg/ha) led to produce significantly heavier seed as compared to control. Maximum 1000-grain weight of 33.04 gm was recorded from plants fertilized at the rate of 100 kg P_2O_5/ha while lower dose of phosphorus along with constant dose of nitrogen (20 kg N + 80 kg P_2O_5/ha) did not produce heavier seed than 100 kg P_2O_5/ha. Control plots produced the smaller grains (27.24 gm/1000-grains) as compared to the rest of treatments. The result indicated that the mung bean crop supplemented with fertilizer dose of 20kg basal dose of Nitrogen + 100 kg P_2O_5/ha produced heavier seeds. These results are in conformity with those of Kushwaha et al (1978), Almeid et al (1973) and Rajendran et al (1979) have also shown similar results.

**Grain yield (kg/ha)**

The results of grain yield kg/ha presented in the table showed that there was significant variation in grain yield due to application of various Phosphorous levels in mung bean crop. It is evident from the Table that plots fertilized with 100 kg P_2O_5/ha showed maximum grain yield of 1022 kg/ha. The plots fertilized at the rate of 80 60 and 40 P_2O_5/ha had produced the grain yield 1013.90, 994 and 921.20 kg/ha respectively and remained statistically at par with T_5. The minimum grain yield was obtained from control treatment as it produced only 774.20 kg of grain yield/ha. It could be concluded from these findings that the increasing of phosphorus levels up to maximum limit i.e. 100kg/ha had increased grain yield accordingly. However, the use of 40kg Phosphorus is most appropriate for getting economical yield of mung bean crop as it produced statistically similar grain yield to rest of the increased levels of phosphorus. Braga (1973), Briceno et al (1973) and Nartika (1979) have also reported similar findings. They have studied combination of phosphorus and nitrogen levels as found increased the grain yield of mung bean.

**Table-1**

<table>
<thead>
<tr>
<th>Treatments</th>
<th>P Levels (kg/ha)</th>
<th>Days to Flowering</th>
<th>Days to Maturity</th>
<th>Plant Height (cm)</th>
<th>No of branches plant</th>
<th>No of grains/pod</th>
<th>1000-grain weight (gm)</th>
<th>Grain yield kg/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>T0</td>
<td>0</td>
<td>45.80A</td>
<td>62.20 NS</td>
<td>59.21D</td>
<td>7.26D</td>
<td>5.13E</td>
<td>27.24D</td>
<td>774.2</td>
</tr>
<tr>
<td>T1</td>
<td>20</td>
<td>44.00A</td>
<td>60.6</td>
<td>60.66 CD</td>
<td>7.66CD</td>
<td>6.46D</td>
<td>28.74C</td>
<td>845.6</td>
</tr>
<tr>
<td>T2</td>
<td>40</td>
<td>44.41A</td>
<td>67.4</td>
<td>63.27 BC</td>
<td>8.23BC</td>
<td>7.70C</td>
<td>29.30C</td>
<td>921.2</td>
</tr>
<tr>
<td>T3</td>
<td>60</td>
<td>40.00B</td>
<td>56.8</td>
<td>63.73B</td>
<td>8.86AB</td>
<td>8.03BC</td>
<td>32.44B</td>
<td>994</td>
</tr>
<tr>
<td>T4</td>
<td>80</td>
<td>40.33B</td>
<td>56.1</td>
<td>64.53 AB</td>
<td>8.70AB</td>
<td>8.30B</td>
<td>32.44B</td>
<td>1013.9</td>
</tr>
<tr>
<td>T5</td>
<td>100</td>
<td>40.06B</td>
<td>50.8</td>
<td>67.08A</td>
<td>9.33A</td>
<td>9.16A</td>
<td>33.04A</td>
<td>1022.0</td>
</tr>
</tbody>
</table>
REFERENCES


