

# Effect of Seed Inoculation and Phosphorus Application on Growth, Seed Yield and Quality of Mungbean (*Vigna radiata* L.) CV. NM-98

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## ABSTRACT

Effect of seed inoculation and phosphorus levels viz., 0, 30, 50, 90 and 110 kg ha<sup>-1</sup> on growth, seed yield and quality of mungbean cv. NM-98 was studied at the Agronomic Research Area, University of Agriculture, Faisalabad during the year 2000. 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<sup>-1</sup>. The increase in grain yield was attributed to increased number of pods per plant, number of grains per pod and heavier grain weight. The potent crop of mungbean cv. NM-98 can be grown with the application of P @ 50 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> and using *Rhizobium* inoculated seed under irrigated conditions of Faisalabad.

**Key Words:** Seed; Phosphorus; Yield; Quality, Mungbean

## INTRODUCTION

Mungbean (*Vigna radiata* L.) commonly known as green gram is an important conventional pulse crop of Pakistan. It has an edge over other pulses because of high nutritive value, digestibility and non-flatulent behavior. Its grain contains 24.20% protein, 1.3% fat, 60.4% carbohydrates; calcium and phosphorus are 118 and 340 mg per 100 g of seed, respectively. It is capable of fixing atmospheric nitrogen through *Rhizobium* species. *Rhizobium* species in the presence of phosphorus not only fix more nitrogen through increased number of nodules but the protein contents, dry matter and grain yield of various legumes crops also increased to considerable extent.

Agrawal *et al.* (1976) reported that seed yield of mungbean increased from 0.77 t ha<sup>-1</sup> with 25 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> to 0.93 t ha<sup>-1</sup> with 50 kg P<sub>2</sub>O<sub>5</sub>. Ramakrishan *et al.* (1977) concluded that application of 60 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> to mungbean gave seed yield of 1480 kg ha<sup>-1</sup>. Brar and Lal (1991) observed that seed inoculation to mungbean and application of 50 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> produced seed yield of 0.30 t ha<sup>-1</sup>. Hussain (1994) reported that maximum protein contents (24.28%) were obtained when crop was fertilized @ 75 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup>. Provorov *et al.* (1998) observed that seed inoculation of mungbean increase herbage mass by 6%. Chowdhury *et al.* (2000) reported that dry matter production increased in mungbean with *Rhizobium* inoculation and increase in phosphorus rate.

## MATERIALS AND METHODS

The studies were carried out at the Agronomic Research Area, University of Agriculture, Faisalabad, during autumn, 2000 on sandy clay loam soil. Experiment was laid out in randomized complete block design (RCBD),

which consisted of three replications, and net plot size was 2.4 x 5 m. Experiment comprised of seven treatments viz., control, seed inoculation only and seed inoculation plus six levels of phosphorus 0, 30, 50, 70, 90, and 110 kg ha<sup>-1</sup>.

The mungbean cv. NM-98 was sown on well-prepared seedbed on 24<sup>th</sup> July 2000 in planting pattern of paired rows 40/20 cm with the help of single row hand drill and using seed rate of 20 kg ha<sup>-1</sup>. The basal dose of nitrogen was applied @ 30 kg ha<sup>-1</sup> in the form of urea while the phosphorus was applied as triple super phosphate in the respective plots. All other cultural practices were uniform for all treatments. The crop was harvested on 20<sup>th</sup> October 2000 when about 90% pods had reached to the maturity level.

Data collected were analyzed statistically using Fisher's analysis of variance technique and Duncan's Multiple Range (DMR) test was employed at 5% probability level to test significance differences among the treatment means (Steel & Torrie, 1984).

## RESULTS AND DISCUSSION

Seed inoculation alone did not influence plant height at harvest (Table I). Seed inoculation alone and with P application suppressed plant height and this suppression increased with increasing levels of P<sub>2</sub>O<sub>5</sub>. Data in Table I. reveal that maximum plant height (68.13) was observed in control however; it was statistically at par with T<sub>2</sub> treatment. These results are in line with that of Hussain (1994), who reported that application of P alone or in combination with N and K to mungbean crop significantly reduced plant height.

Inoculation along with P increased number of pods per plant. Maximum number of pods per plant (22.47) was found in T<sub>4</sub> treatment, which was significantly different

**Table I. Effect of seed inoculation and phosphorus application on growth, seed yield and quality of mungbean (*Vigna radiata* L.) CV. NM-98**

Treatments	P rates kg/ha	Plant height at harvest (cm)	No. of pods per plant	No. of grains per pod	1000-grain weight (g)	Grain yield kg/ha	Protein contents (%)
T <sub>1</sub> = No inoculation	0	68.13 a	15.40 d	9.8 c	39.60 d	739.2 g	22.04 e
T <sub>2</sub> = Seed inoculation only	0	67.90 a	15.73 d	10.83 abc	39.99 c	742.2 f	22.81 d
T <sub>3</sub> = Seed inoculation +	30	64.30 b	19.53 bc	11.39 ab	40.70 b	1016 c	23.79 c
T <sub>4</sub> = Seed inoculation +	50	58.43 c	22.47 a	12.06 a	42.27 a	1158 a	24.61 a
T <sub>5</sub> = Seed inoculation +	70	56.40 c	20.13 ab	11.21 ab	40.23 c	1082 b	24.24 b
T <sub>6</sub> = Seed inoculation +	90	56.43 c	17.02 cd	10.26 bc	37.97 e	865.1 d	23.10 d
T <sub>7</sub> = Seed inoculation +	110	55.00 c	16.13 d	9.76 c	37.35 f	846.1 e	23.13 d
LSD		3.50	2.97	1.87	0.35	2.79	0.34

Any two means, not sharing a letter in column differ significantly ( $P < 0.05$ )

from other treatment except T<sub>5</sub>. The minimum number of pods per plant (15.40) was noted in control, which was however, statistically on par with T<sub>2</sub>, T<sub>6</sub> and T<sub>7</sub> treatment. Similarly results were also reported by Gill (1979). He observed that application of inoculation (*Rhizobium phaseoli*) along with of 50-75 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> to mungbean crop significantly increase the number of pods per plant.

The difference in number of grains per pod was found significant and the maximum number of grain per pod (12.06) was found in T<sub>4</sub> treatment and it was however statistically at par with T<sub>2</sub>, T<sub>3</sub> and T<sub>5</sub> treatments. On the contrary, the lowest number of grains per pods (9.76) was recorded in T<sub>7</sub> treatment and it was statistically on par with control, T<sub>2</sub> and T<sub>6</sub> treatments. These results are in line with that of Gill (1979), who reported that application of inoculation (*Rhizobium phaseoli*) along with of 50-75 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> to mungbean crop significantly increase the number of grain pod<sup>-1</sup>.

Application of P @ 50 kg ha<sup>-1</sup> to inoculated crop of mungbean produced maximum 1000-grain weight of 42.27 g. The minimum 1000-grain weight (37.35 g) noted in T<sub>7</sub> treatment, while T<sub>2</sub> and T<sub>5</sub> were statistically at par with each other. These results are in line with the findings of Patel *et al.* (1980), they reported that mungbean seed inoculated with *Rhizobium* or application of 0, 20, kg N and 20 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> increased 1000-grain weight.

Application of 50 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> to inoculated plants produced maximum grain yield (1158 kg ha<sup>-1</sup>). The minimum grain yield (739.2 kg ha<sup>-1</sup>) was found in control. The increase in grain yield by seed inoculation and phosphorus application @ 50 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> was due to better plant growth and well development of yield contributing parameters. These results are in line with the findings of Das *et al.* (1997) they stated that seed yield of mungbean was significantly higher with *Rhizobium* + VAM (*Vesicular Arbuscular Mycorrhiza*) as compared to no seed inoculation and it increased from 0.77 t ha<sup>-1</sup> with 25 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> to 0.93 t ha<sup>-1</sup> with 50 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> and decrease these after with 75 kg ha<sup>-1</sup>.

Maximum protein contents (22.61%) were found in T<sub>4</sub> treatment. The treatment T<sub>2</sub>, T<sub>6</sub> and T<sub>7</sub> were not significantly different with one another. The minimum protein contents (22.04) were noted in control. These results are in line with

findings of Malik *et al.* (1988) they reported increase in seed protein contents with the use of 75-100 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup>.

## CONCLUSIONS

Seed inoculation + 50 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> was found to be more efficient as compared to other treatments. So from this it is convenient to say that a potent crop of Mungbean cv. NM-98 can be grown with the phosphorus application @ of 50 kg ha<sup>-1</sup> P<sub>2</sub>O<sub>5</sub> and using *Rhizobium* inoculated seed under irrigation conditions at Faisalabad, Pakistan.

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