



# EFFECT OF DIFFERENT PHOSPHORUS LEVEL AND ARBUSCULAR MYCORRHIZAL FUNGI ON YIELD OF GREEN GRAM (*VIGNA RADIATA*) CROP

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## Abstract

A field experiment was conducted at the farm of Lovely Professional University, Phagwara to examine the effect of different phosphorus level and Arbuscular Mycorrhizal fungi on yield of green gram crop. N + 100% P + Mycorrhiza application was found effective in maximizing the Length of pods, number of seeds per pod, number of pods per plant, test weight, seed yield per plant, seed yield per hectare. From the analysis of research done, it has been concluded that application of 100% P along with mycorrhiza was found most effective in comparison to other treatments.

**Key words :** Mycorrhiza, Phosphorus, Growth, Yield.

## Introduction

Green gram is among rich protein foods. It contains 25 percent protein which is three times more than that of cereals. Vegetarian population prefers green gram for the requirement of protein. It contains 56.7 % carbohydrate 1.3% fats, 4.1% fibres. 3.5% minerals and various amino acids. *i.e.* lysine, thiamine, cystine methionine etc. If we talk about germinated green gram seeds then it contains vitamin C and easily digestible protein which is good for consumed by two ways *i.e.* split pulse or whole pulse which is an important supplement of cereal based diet. One important recipe of moong dal is khichdi which is mostly recommended to the ill or aged person because it is easy to digest and considered as complete diet. In India Moong dal is taken with chappati as well as with rice. When wheat or rice is combined with green gram its biological value increases because of the complementary relationship of the essential amino acid.

The response of plants to mycorrhizal infection depends upon the phosphorus level, kind and form of roots and soil type (Hayman, 1982). The mycorrhizal associations encourage plant development through the supply of some elements such as N, P and K (Alkam and

Basiouny, 1983), Ca and Mg (Kawai and Yamamoto, 1986; Dodd *et al.*, 1990) and Zn (Bowen, *et al.*, 1974). Mycorrhizal associations decreased the susceptibility of the plant to some soil-borne diseases (Mirghani, 1994).

AM fungi usually have their maximum effect on host plant growth when the level of P in the soil solution is such that P is either barely accessible or inaccessible to the non mycorrhizal plant. Because the effect of mycorrhizal colonization on host plants usually can be duplicated by P amendment of the soil, it is possible to establish categories of mycorrhizal dependency of host plants by assessing their response to AM fungal colonization at different concentrations of soil solution P. When the soil solution P concentration is at or near 0.002 mg/liter, most plant species will respond dramatically to mycorrhizal colonization. As P concentration is increased from this level to 0.02 mg/liter, the dependency of plants on AM fungi for P uptake diminishes progressively, and at 0.2 mg/ liter only the very highly mycorrhiza-dependent species respond significantly to mycorrhizal colonization.

On consideration of above mentioned points we have planned present study to fulfill following objectives:

1. To examine the response of green gram to different Phosphorus levels

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2. To examine the effect of mycorrhiza on yield of green gram
3. To examine the economics of different treatments

### Materials and Method

The experimental was conducted at LPU field, School of Agriculture, Lovely Professional University, Phagwara, Punjab, during 2017-2018. The farm is situated at altitude 232 meter above mean sea level and latitude 31.25°N and longitude 75°E. The soil status of experimental site is sandy loam soil, well fertile and free from weeds and well tilth soil. Has good drainage and rich in nutrients. The soil experimental field was sandy loam in texture, acidic in reaction with low level of organic carbon, available nitrogen and available  $P_2O_5$  but a medium level of available  $K_2O$ .

#### Chemical properties of soil

Soil texture	pH	EC (dsm <sup>-1</sup> )	Av.N (kg/ha)	Av.P (kg/ha)	Av.K (kg/ha)
Sandy Loam	7.9	0.53	368	21	270

#### Treatment Details

T <sub>0</sub>	CONTROL
T <sub>1</sub>	RDF (12.5:40:0)
T <sub>2</sub>	N + 100% P + Mycorrhiza (10Kg/ha)
T <sub>3</sub>	N + 75% P + Mycorrhiza
T <sub>4</sub>	N + 50% P + Mycorrhiza
T <sub>5</sub>	N + 25% P + Mycorrhiza
T <sub>6</sub>	N + 0% P + Mycorrhiza

### Result

#### Length of pods (cm)

Length of pods of the green gram crop is significantly affected by the application of the nutrients in the various treatments. Maximum length of pod T<sub>2</sub> (N + 100% P + mycorrhiza) followed by T<sub>1</sub> (RDF) and the minimum length of pods is observed in T<sub>0</sub> (control). The maximum length was observed is 6.57cm and then in T<sub>2</sub> *i.e.* 6.28cm and the minimum length was observed in T<sub>0</sub> is 5.32cm. Sarkar and Banik (1991) found that use of 10 kg N ha<sup>-1</sup> increased pod length. Owolade *et al.*, (2006) declared that application of phosphorus from SSP at 30, 60, 90, and 120 kg  $P_2O_5$  considerably enhanced length of pods of cowpea.

#### Number of seeds pod<sup>-1</sup>

Number of seeds per pods were significantly affected by the dose of the fertilizer in the treatments. Maximum seeds per pod were observed in the T<sub>2</sub> (N + 100%P + mycorrhiza) followed by T<sub>3</sub> (N + 75%P + mycorrhiza) and the minimum number of the seeds were observed in

#### Effect of various treatments on Length of pod, Number of seeds per pod and Number of pods per plant

Treatment	Length of pod (cm)	Number of seeds pod <sup>-1</sup>	Number of pods plant <sup>-1</sup>
T <sub>0</sub>	5.33 <sup>d</sup> ±0.21	7.45 <sup>c</sup> ±0.25	13.18 <sup>d</sup> ±0.13
T <sub>1</sub>	6.28 <sup>ab</sup> ±0.02	11.98 <sup>b</sup> ±0.34	16.60 <sup>b</sup> ±0.27
T <sub>2</sub>	6.58 <sup>a</sup> ±0.09	13.30 <sup>a</sup> ±0.24	17.80 <sup>a</sup> ±0.11
T <sub>3</sub>	6.13 <sup>bc</sup> ±0.09	12.55 <sup>ab</sup> ±0.21	16.65 <sup>b</sup> ±0.26
T <sub>4</sub>	6.00 <sup>bc</sup> ±0.13	11.63 <sup>b</sup> ±0.38	15.60 <sup>c</sup> ±0.20
T <sub>5</sub>	6.13 <sup>bc</sup> ±0.05	11.48 <sup>b</sup> ±0.53	15.73 <sup>c</sup> ±0.55
T <sub>6</sub>	5.88 <sup>c</sup> ±0.09	12.13 <sup>b</sup> ±0.24	15.43 <sup>c</sup> ±0.14

T<sub>0</sub> (control). The maximum number of seeds observed in T<sub>2</sub> (13.30) and then in T<sub>3</sub> *i.e.* 12.55 and the minimum number of seeds per pod was observed in T<sub>0</sub> (7.45).

#### Number of pods plant<sup>-1</sup>

Number of pods per plant in crop was significantly affected by the application of the RDF and mycorrhiza. Maximum number of pods was in T<sub>2</sub> (N + 100%P + mycorrhiza) followed by T<sub>3</sub> (N + 75%P + mycorrhiza) and the minimum number of pods were observed in T<sub>0</sub> (control). Maximum number of pods per plant were 17.80 in T<sub>2</sub> followed by T<sub>3</sub> *i.e.* 16.65 and the minimum number of pods per plant was observed in T<sub>0</sub> is 13.18. Patel *et al.*, (1992) stated that higher number of pods/ plant was attained with the application of 30 kg N and 60 kg  $P_2O_5$ /ha. Singh *et al.*, (2011) on mung bean stated that highest number of pods/plant (16.1) were attained with the use of 12.5 kg N + 40 kg P/ ha.

#### Test weight (g)

Test weight of 100 seeds of the green gram crop was significantly affected by the application of the RDF and mycorrhiza. Maximum test weight of 100 seeds was in T<sub>2</sub> (N + 100%P + mycorrhiza) followed by T<sub>3</sub> (N + 75%P + mycorrhiza) and the minimum test weight was observed in T<sub>0</sub> (control). The maximum test weight observed was 45.98g and then in T<sub>3</sub> that was 44.65g and minimum test weight was observed in T<sub>0</sub> (37.60g). Sarkar and Banik (1991) found that use of 10 kg N ha<sup>-1</sup> increased test weight. (Kumpawat, 2008) found that use of 45 kg  $P_2O_5$ /ha increased 1000-seed weight (47.90 g). Ghanshyam *et al.*, (2010) found that progressive increment in P levels had noteworthy increment on test weight of greengram over control. Patel *et al.*, (1992) noted that 1000-seed weight as well as grain yield with the application of 30 kg N and 60 kg  $P_2O_5$ /ha.

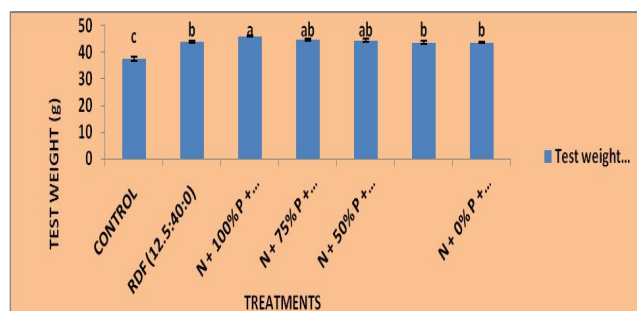
#### Seed yield plant<sup>-1</sup> (g)

Yield per plant of the green gram crop was

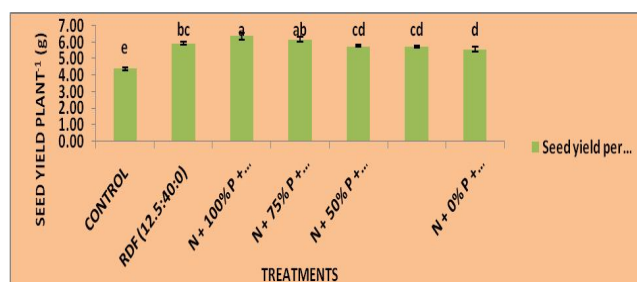
### Effect of various treatments on Test weight (1000 seeds), yield per plant (g/plant), Seed yield hectare<sup>-1</sup> (kg/ha)

Treatment	Test weight (1000) (g)	Seed yield plant <sup>-1</sup> (g)	Seed yield hectare <sup>-1</sup> (kg/ha)
T <sub>0</sub>	37.60 <sup>c</sup> ±0.85	4.40 <sup>e</sup> ±0.09	880.00 <sup>d</sup> ±18.26
T <sub>1</sub>	43.98 <sup>b</sup> ±0.45	5.95 <sup>bc</sup> ±0.10	1179.00 <sup>b</sup> ±13.70
T <sub>2</sub>	45.98 <sup>a</sup> ±0.20	6.38 <sup>a</sup> ±0.21	1276.00 <sup>a</sup> ±42.10
T <sub>3</sub>	44.65 <sup>ab</sup> ±0.29	6.19 <sup>ab</sup> ±0.15	1237.50 <sup>a</sup> ±30.10
T <sub>4</sub>	44.58 <sup>ab</sup> ±0.56	5.77 <sup>cd</sup> ±0.05	1154.00 <sup>bc</sup> ±9.45
T <sub>5</sub>	43.55 <sup>b</sup> ±0.57	5.73 <sup>cd</sup> ±0.06	1145.00 <sup>bc</sup> ±12.58
T <sub>6</sub>	43.73 <sup>b</sup> ±0.13	5.57 <sup>d</sup> ±0.13	1114.00 <sup>c</sup> ±25.74

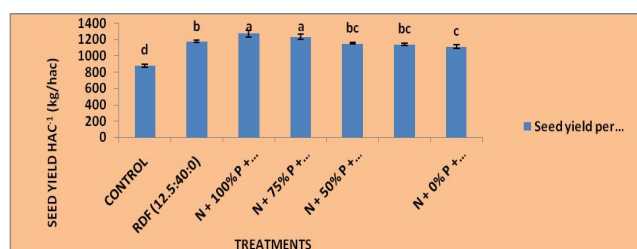
significantly affected by the application of the nutrients. Maximum yield of the plant was in T<sub>2</sub> (N + 100%P + mycorrhiza) followed by T<sub>3</sub> (N + 75%P + mycorrhiza) and minimum yield was observed in T<sub>0</sub> (control). The maximum yield observed was 6.38g and then in T<sub>2</sub> 6.19g and the minimum yield was observed in T<sub>0</sub> (4.40g). Yakadri *et al.*, (2002) found that utilization of N @ 20 kg



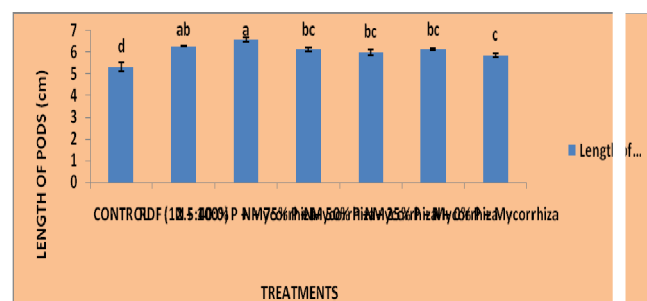
Effect of various treatments on Test Weight (1000 seeds)



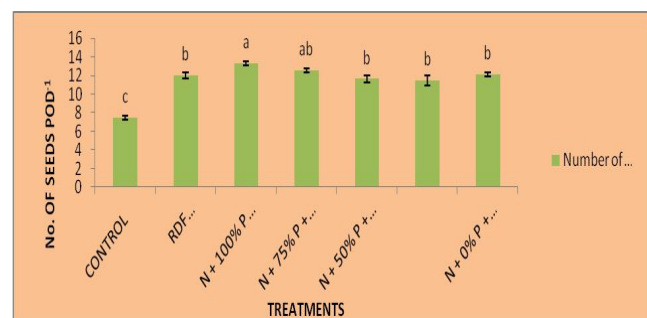
Effect of various treatments on Yield per plant (g/plant)



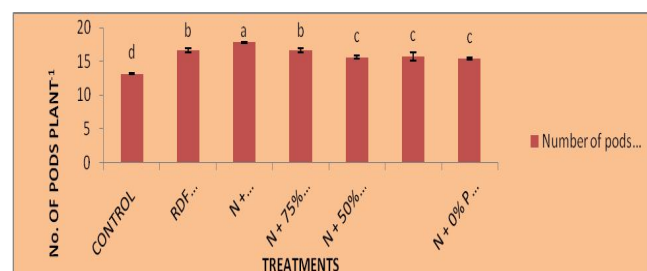
Effect of various treatments on Yield per hectare (kg/ha)



Effect of various treatments on Length of pod per plant



Effect of various treatments on Number of seeds per pod



Effect of various treatments on Number of pods per plant

ha<sup>-1</sup> and P @ 60 kg ha<sup>-1</sup> cause increment seed yield (942 kg ha<sup>-1</sup>) of green gram. Sharma *et al.*, (2003) declared that the significantly higher seed yield of greengram was found with use of 20 kg N ha<sup>-1</sup> and 60 kg P<sub>2</sub>O<sub>5</sub>/ha over control.

### Seed yield hectare<sup>-1</sup> (kg/ha)

Seed yield per hectare of the green gram crop was significantly affected by the application of the nutrients. Maximum yield per hectare was in T<sub>2</sub> (N + 100%P + mycorrhiza) followed by T<sub>3</sub> (N + 75%P + mycorrhiza) and minimum yield was observed in T<sub>0</sub> (control). The maximum yield observed was 1276kg and then in T<sub>3</sub> (1237kg/hac) and the minimum yield was observed in T<sub>0</sub> (880kg). Mandal *et al.*, (2005) reported that application of phosphorus @ 60 kg ha<sup>-1</sup> recorded significantly higher seed yield (1255 kg ha<sup>-1</sup>) over control. Luikham *et al.*, (2005) stated that seed yield (15.13 q ha<sup>-1</sup>) was increased with the use of 60 kg P<sub>2</sub>O<sub>5</sub>/ha.

### Conclusion

N + 100% P + Mycorrhiza application was found effective in maximizing the length of pods, number of

seeds per pod, number of pods per plant, test weight, seed yield per plant, seed yield per hectare. From the analysis of research done, it has been concluded that application of 100% P along with mycorrhiza was found most effective in comparison to other treatments. Hence N + 100% P + Mycorrhiza application was recommended for the green gram crop.

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