

Effect of Different Phosphorus Level and Arbuscular Mycorrhizal Fungi on Nitrogen and Phosphorus Uptake By Seed 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.

Keywords: Growth , Mycorrhiza, Phosphorus, , Yield.

Introduction

Green gram is among rich protein foods. It contain 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% mimerals and various amino acids. i.e lysine, thiamine, cystine methonine etc. If we talk about germinated green gram seeds than 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.

Material and Method

The experiment 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 tilled 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 P₂O₅ but a medium level of available K₂O.

Chemical properties of soil

Soil texture	pH	E.C (dsm^{-1})	Av. N (kg/ha)	Av. P (kg/ha)	Av. K (kg/ha)
Sandy Loam	7.9	0.53	368	21	270

Treatment Details

T0	CONTROL
T1	RDF (12.5:40:0)
T2	N + 100% P + Mycorrhiza (10Kg/ha)
T3	N + 75% P + Mycorrhiza
T4	N + 50% P + Mycorrhiza
T5	N + 25% P + Mycorrhiza
T6	N + 0% P + Mycorrhiza

Table 1: Effect of various treatments on Nitrogen uptake by seed (kg/ha) and Phosphorus uptake by seed (kg/ha)

Treatment	Nitrogen uptake by seeds (kg/ha)	Phosphorus uptake by seeds (kg/ha)
T0	27.85 ^f ±0.96	4.91 ^d ±0.15
T1	40.87 ^c ±1.30	7.22 ^b ±0.16
T2	45.92 ^a ±1.90	8.42 ^a ±0.25

T3	43.75 ^b ±1.47	8.01 ^a ±0.21
T4	39.38 ^{cd} ±1.44	7.24 ^b ±0.03
T5	38.27 ^{de} ±1.49	7.18 ^b ±0.10
T6	36.51 ^e ±0.65	6.65 ^c ±0.13

Here, T0:- CONTROL, T1:- RDF, T2:- N + 100% P + Mycorrhiza, T3:- N + 75% P + Mycorrhiza, T4:- N + 50% P + Mycorrhiza, T5:- N + 25% P + Mycorrhiza, T6:- N + 0% P + Mycorrhiza. According to DMRT (Duncan's multiple range test) the mean followed by different letters are significantly different at $p < 0.05$, for separation of means.

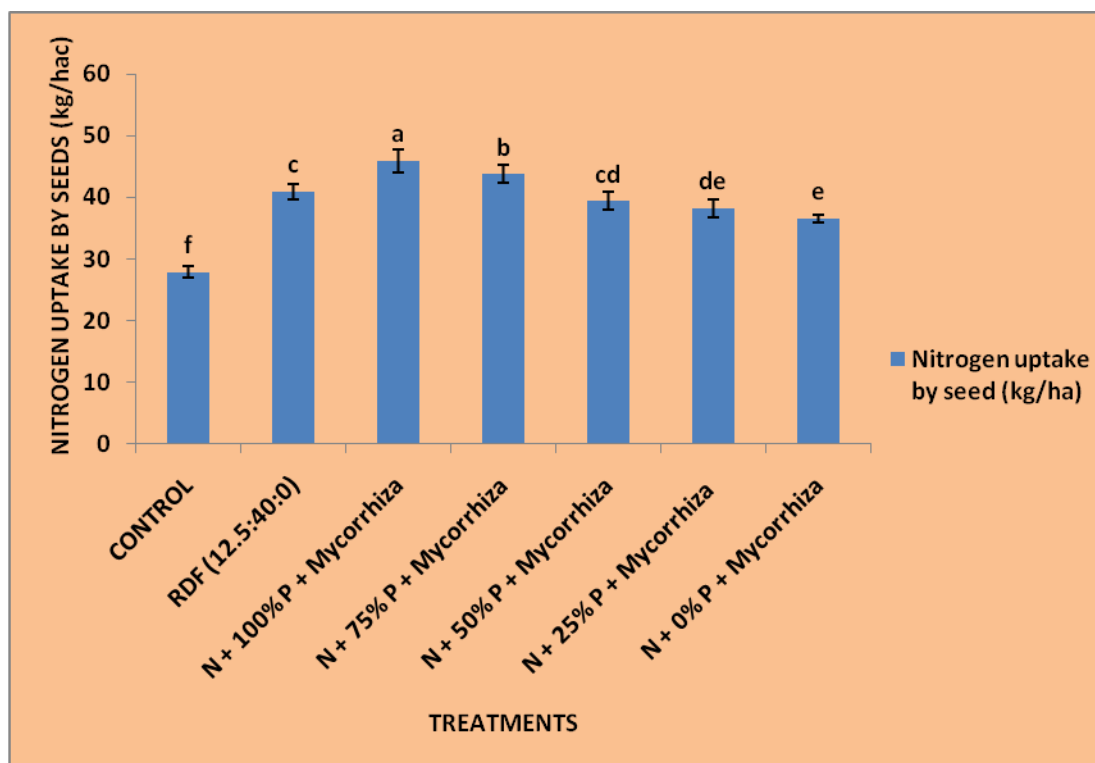


Figure 1 Effect of various treatments on Nitrogen uptake by seed (kg/ha)

Patel et al., 1992 noted that higher nutrient uptake (71.30 N and 10.74 P_2O_5 /ha) with the use of 30 kg N and 60 kg P_2O_5 per hectare. **Teotia et al., (2001)** found that application of P or S considerably enhanced N and K content both in grain and straw. **Tanwar et al., (2003)** stated that N and P content increased by (14.27 and 41.84 %) in grains and by (31.77 and 29.34 %) in

straw with the use of 60 kg P_2O_5 /ha separately. **Mandal *et al.*, (2005)** recorded that application of 60 kg P_2O_5 /ha found maximum NPK uptake by green gram. **Chavan *et al.*, 2008** declared that considerably increase in N and P uptake in straw and grain by the rising in P level from 25 to 50 and 50 to 75 kg P_2O_5 /ha. **Ghanshyam *et al.*, (2010)** declared that the use of 9 kg phosphorus ha^{-1} considerably affected nutrient uptake on an average by 25.6, 23.2 and 32.4 % correspondingly over control in green gram. **Patel *et al.*, (2012)** recorded the take-up of 106.15 kg N, 14.84 kg P, 47.50 kg K and 2.97 kg Zn because of higher nutrient level (N30 P60 K40 Zn10).

2 Phosphorus uptake by seeds (kg/hac)

Phosphorus uptake by seeds of the green gram was significantly affected by the application of the different levels of RDF and mycorrhiza. Maximum phosphorus uptake by seeds was observed in T2 (N + 100%P + mycorrhiza) followed by T3 (N + 75%P + mycorrhiza) and the minimum phosphorus uptake by seeds was observed in T0(control). The maximum phosphorus uptake by seeds was 8.42 kg/hac and the minimum phosphorus uptake by seeds was observed in T0 (4.91 kg/hac). Application of N + 100%P + mycorrhiza contributes maximum in the phosphorus uptake by seeds and increased the average phosphorus uptake by seeds by 48.81% as compared to control. Therefore, N + 100%P along with mycorrhiza application was found to be best in maximising the phosphorus uptake by seeds.

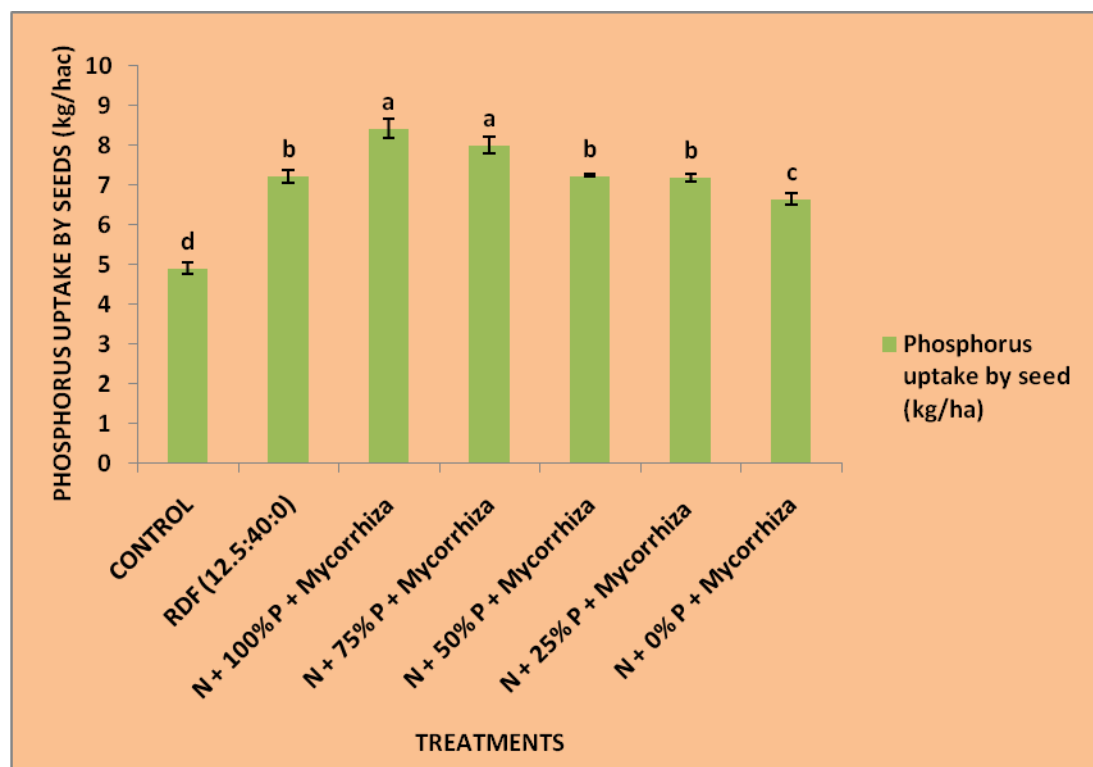


Figure 2 Effect of various treatments on Phosphorus uptake by seed (kg/ha)

Patel et al., 1992 noted that higher nutrient uptake (71.30 N and 10.74 P_2O_5 /ha) with the use of 30 kg N and 60 kg P_2O_5 per hectare. **Teotia et al., (2001)** found that application of P or S considerably enhanced N and K content both in grain and straw. **Tanwar et al., (2003)** stated that N and P content increased by (14.27 and 41.84 %) in grains and by (31.77 and 29.34 %) in straw with the use of 60 kg P_2O_5 /ha separately. **Mandal et al., (2005)** recorded that application of 60 kg P_2O_5 /ha found maximum NPK uptake by green gram. **Chavan et al., 2008** declared that considerably increase in N and P uptake in straw and grain by the rising in P level from 25 to 50 and 50 to 75 kg P_2O_5 /ha. **Ghanshyam et al., (2010)** declared that the use of 9 kg phosphorus ha^{-1} considerably affected nutrient uptake on an average by 25.6, 23.2 and 32.4 % correspondingly over control in green gram. **Patel et al., (2012)** recorded the take-up of 106.15 kg N, 14.84 kg P, 47.50 kg K and 2.97 kg Zn because of higher nutrient level (N30 P60 K40 Zn10).

Conclusion

N + 100% P + Mycorrhiza application was found effective in maximizing nitrogen and Phosphorus uptake by the seed due to that 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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