



Varietal response to different levels of fertility and bio-fertilizers on yield and quality of summer green gram (*Vigna radiata* L.)

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Abstract : The field experiment on varietal response to different levels of fertility and bio-fertilizers on yield and quality of summer green gram was conducted on sandy loam soil at Pulses Research Station, Model Farm, Anand Agricultural University, Vadodara, Gujarat during summer season of the year 2009-10. The variety V₂ (Meha) produced significantly higher seed and stover yield by 8.60 and 11.59 per cent, respectively as compared to the variety V₁ (GM-4). The yield and yield attributes as well as protein content in seed increased significantly with increase in fertility levels up to 75 % RDF (30-15-0 kg NPK ha⁻¹) except number of pods plant⁻¹ which was increased only up to 50 % RDF (20-10-0 kg NPK ha⁻¹). Seed treatment of *Rhizobium* + PSB significantly improved the seed and stover yields as well as protein content in seed as compared to control.

Key Words : Varieties, Green gram, Fertility levels, Bio-fertilizers, Yield, Quality

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INTRODUCTION

Pulses contain a high percentage of quality protein nearly three times as much as cereals. Thus they are cheaper source to overcome protein malnutrition among human beings (Kachroo, 1970). It is the most important plant group which concerned in symbiotic nitrogen fixation (Gupta *et al.*, 2006). In spite of significant importance of this crop, the yield is very low in India as well as in Gujarat probably due to the fact that, its cultivation is mainly confined under rainfed conditions and in poor textured soils. To meet the increasing demand of pulses, a time has come to give a serious thought for increasing either area or yield per unit area of this crop. Among the factors affecting crop production, proper management of nutrients plays a vital role in increasing the green gram production. Optimum fertilizer application either in the

form of organic, inorganic or bio-fertilizers is one of the well established techniques for increasing the crop production. Among the pulses, green gram (*Vigna radiata* L.) is one of the most important crop which is commonly grown in summer and rainy seasons in India. Pulse as well as mung bean production has been steadily decreasing due to reduced acreage. Therefore, to meet the situation, it is necessary to boost up the production through varietal development and proper management practices. The present study was therefore, undertaken to find out the effect of levels of fertility and bio-fertilizer on of green gram genotypes.

MATERIALS AND METHODS

The field experiment was conducted at Pulses Research Station, Anand Agricultural University, Model Farm, Vadodara,

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Gujarat during the summer season of the year 2009-10. The soil of the experimental field was sandy loam in texture with pH of 7.6. The soil was medium in available N (270 kg^{-ha}), available P (42.5 kg^{-ha}) and high in available K (285 kg^{-ha}) and the organic carbon content was 0.71 per cent. The field experiment was laid out in Factorial Randomized Block Design (FRBD) replicated three times with net plot size of 9.6 m² (2.4 m x 4 m) consisting of combination of two varieties (GM - 4 and Meha) four levels fertility (control, 50 % RDF, 75% RDF and 100% RDF) and two levels of seed treatment *viz.*, no seed treatment and seed treatment with *Rhizobium* +PSB. Nitrogen and phosphorous were drilled manually as per the treatments through urea and DAP, respectively prior to sowing in the furrows at 30 cm apart. The *Rhizobium* + PSB seed inoculation was given to the half the quantity of seeds and dried under shade. In order to evaluate the effect of different treatments on yield and qualities of green gram, the observations were recorded from five plants taken at random from each plot.

RESULTS AND DISCUSSION

The results of the present study as well as relevant discussions have been presented under following sub heads:

Effect of varieties :

Yield and yield attributes :

The varieties showed significant difference for number of pods plant⁻¹, number of seeds pod⁻¹, test weight (g) and seed and stover yield. Variety V₂ (Meha) produced more

number of pods plant⁻¹ and seeds per pod than variety V₁ (GM-4). The increase in number of pods plant⁻¹ and seeds per pod of variety V₂ (Meha) by 18.81 and 8.68 per cent, respectively over variety V₁ (GM-4). The variety V₁ (GM-4) produced bolder seed (41.08 g) as compared to variety V₂ (Meha), which recorded 36.55 g test weight. The variation in test weight can be attributed to genetical and inherent characters. Variety V₂ (Meha) gave 8.60 and 11.58 per cent higher seed and stover yield than variety V₁ (GM-4). Higher seed and stover yield of this variety may be attributed to better contribution of yield attributing characters (Table 1). Kumar *et al.* (2002) and Rajkhowa *et al.* (1992) also reported such variation in green gram varieties.

Quality :

Protein content was significantly influenced by different varieties (Table 1). The variety V₂ (Meha) recorded 7.32 per cent higher protein content over variety V₁ (GM-4). It might be due to genetic make-up of this cultivar. Such variation in protein content among chickpea varieties was observed by Singh and Idnani (2007).

Effect of fertility levels :

Yield and yield attributes :

Application of F₁ (50 % RDF), F₂ (75 % RDF) and F₃ (100 % RDF) were at par and produced significantly more number of pods compared with F₀ (control) (Table 1). The per cent increase over F₀ (control) was to the tune of 10.08, 13.80 and 15.15 with F₁ (50 % RDF), F₂ (75 % RDF) and F₃ (100 % RDF),

Table 1: Yield attributes, yield and quality of green gram as influenced by varieties, fertility levels and bio-fertilizers

Treatments	Number of pods plant ⁻¹	Number of seeds pod ⁻¹	Test weight (g)	Yield (kg ha ⁻¹)		Protein content in seed (%)
				Seed	Stover	
Variety (V)						
V ₁ : GM-4	17.13	7.80	41.08	860	947	21.18
V ₂ : Meha	18.81	8.68	36.55	934	1057	22.73
S.E.±	0.248	0.155	0.190	22	23	0.163
C.D. at 5 %	0.717	0.448	0.549	62	67	0.471
Fertility levels (F)						
F ₀ : Control	16.37	7.50	37.68	738	832	20.66
F ₁ : 50 % RDF	18.02	8.13	38.65	843	954	21.96
F ₂ : 75 % RDF	18.63	8.58	39.15	985	1088	22.80
F ₃ : 100 % RDF	18.85	8.75	39.76	1021	1135	22.39
S.E.±	0.351	0.220	0.269	30	33	0.231
C.D. at 5 %	1.014	0.634	0.776	88	94	0.667
Bio-fertilizers (B)						
B ₀ : Control	17.55	8.07	38.62	862	965	21.56
B ₁ : <i>Rhizobium</i> +PSB	18.38	8.42	39.00	932	1039	22.35
S.E.±	0.248	0.155	0.190	22	23	0.163
C.D. (0.05)	0.717	NS	NS	62	67	0.471
C.V. %	6.77	9.23	2.40	11.8	11.3	3.64

respectively. The number of seeds per pod was also increased with increase in fertility levels from 0 to 100% RDF. However, there were no significant differences between two consecutive levels of fertility. The test weight of green gram was also increased significantly with increase in fertility levels from 0 to 100 % RDF. The maximum test weight was observed in the treatment receiving the highest level of fertility. It was at par with 75% RDF and found significantly superior to rest of the fertility levels. The significant increase in seed and stover yields were also obtained with increase in fertility levels up to 75% RDF. The increase in yield with increase in fertility levels might be due to better nourishment to plant for better partitioning dry matter which in turn results in increased seeds yield. The present findings lend support from results of Kumar *et al.* (2002) and Chovatia *et al.* (1993).

Quality :

The protein content in green gram was increased to the extent of 6.29, 10.36, 8.37 per cent with treatments F₁ (50 % RDF), F₂ (75 % RDF) and F₃ (100 % RDF), respectively over control (Table 1). It might be due to more availability and uptake of nitrogen. Nitrogen is main constituent of protein and it is involved in the synthesis of amino acids and there by increased protein content in seed. The similar result has also been reported by Bhalu *et al.* (1995), Ram and Dixit (2000) and Soni and Gupta (1999).

Effect of bio-fertilizer treatments :

Yield and yield attributes :

The seed treatment with bio-fertilizer resulted in significant improvement in number of pods per plant but it did not alter the number of seeds pod⁻¹ and test weight (Table 1). The seed treatment with bio fertilizer also increased the seed and stover yields. The magnitude of increase in seed and stover yield with *Rhizobium* + PSB was to the tune of 8.12 and 7.69 per cent, respectively over no inoculation. Increase in seed and stover yield under inoculation might have been due to the cumulative effect of increased growth and yield attributes as well as increased nitrogen and phosphorous uptake by crop. Similar observations were also made by Meena *et al.* (2001), Sarkar *et al.* (1993) and Raut and Kohire (1991).

Quality :

The increase in protein content under seed inoculation with *Rhizobium* + PSB was 3.66 per cent over no inoculation (Table 1). *Rhizobium* inoculation helped the plants by fixing atmospheric N more effectively. As a result, the N content in seed was increased substantially with subsequent increase in protein. The present result closely supports the results of Meena (2001) and Rao and Rao (1993). It was concluded that for securing maximum seed yield with better quality, summer green gram variety V₂ (Meha) should be fertilized with F₂ (75

% RDF) in conjunction with bio-fertilizer treatment B₁ (*Rhizobium* + PSB) in sandy loam soil under middle Gujarat agro-climatic conditions.

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