



P-ISSN: 2349-8528

E-ISSN: 2321-4902

www.chemijournal.com

IJCS 2020; 8(6): 1674-1677

© 2020 IJCS

Received: 29-08-2020

Accepted: 09-10-2020

NS GhulePG Student, Agronomy Division,
RCSM College of Agriculture,
Kolhapur, Maharashtra, India**AS Bhosale**Associate Professor of
Agronomy, Agronomy Division,
RCSM College of Agriculture,
Kolhapur, Maharashtra, India,
India**AV Satpute**PG Student, Agronomy Division,
RCSM College of Agriculture,
Kolhapur, Maharashtra, India**VB Gedam**Assistant Professor of
Agronomy, Agronomy Division,
RCSM College of Agriculture,
Kolhapur, Maharashtra, India**Corresponding Author:****VB Gedam**Assistant Professor of
Agronomy, Agronomy Division,
RCSM College of Agriculture,
Kolhapur, Maharashtra, India

Effect of fertilizer levels on yield and economics of summer green gram (*Vigna radiata* L.)

NS Ghule, AS Bhosale, AV Satpute and VB Gedam

DOI: <https://doi.org/10.22271/chemi.2020.v8.i6x.11003>

Abstract

The agronomic investigation entitled, "Performance of summer green gram (*Vigna radiata* L.) to fertilizer levels" was undertaken at Post Graduate Research Farm, Agronomy Division of Rajarshree Chhatrapati Shahu Maharaj College of Agriculture, Kolhapur (M.S.), India during summer, 2019. The experiment was laid out in a factorial randomized block design were replicated thrice with twelve treatment combinations comprises three NP fertilizer levels NP₁-75% of RDF (15, 30 kg ha⁻¹ N and P₂O₅), NP₂-100% of RDF (20, 40 kg ha⁻¹ N and P₂O₅), and NP₃-125% of RDF (25, 50 kg ha⁻¹ N and P₂O₅), and four potassium levels as a K₀ (00 K₂O Kg ha⁻¹), K₁ (15 K₂O Kg ha⁻¹), K₂ (20 K₂O Kg ha⁻¹) and K₃ (25 K₂O Kg ha⁻¹). Yield and economics of summer green were influenced significantly by different NP fertilizer levels. The grain yield (15.14 q ha⁻¹) and stover yield (34.17 q ha⁻¹) of green gram were recorded significantly highest with treatment NP₃ (125% of RDF) which was followed by NP₂ (100% of RDF) (14.21 q ha⁻¹ grain and 31.55 q ha⁻¹ stover yield respectively). Harvest index (%) of green gram was found non-significant, whereas the highest harvest index 30.69% was found with treatment NP₃ (125% of RDF). Economics of summer green production viz., gross and net monetary returns as well as benefit cost ratio were found significantly beneficial with the treatment NP₃ (125% of RDF) and which was found at par with treatment NP₂ (100% of RDF). Among the potassium levels application of K₃- 25 K₂O Kg ha⁻¹ was recorded significantly maximum grain yield (15.19 q ha⁻¹) and stover yield (33.32 q ha⁻¹) however, it was found at par with K₂- 25 K₂O Kg ha⁻¹ (14.67 q ha⁻¹ grain and 32.25q ha⁻¹ stover yield respectively). Harvest index remain unaffected due to different potassium levels. Economics of summer green production viz., gross and net monetary returns as well as benefit cost ratio were found significantly beneficial with the treatment application of K₃- 25 K₂O Kg ha⁻¹ which was found at par K₂- 20 K₂O Kg ha⁻¹.

Keywords: NP fertilizer levels, potassium levels, yield, economics

Introduction

Green gram (*Vigna radiata* L.) is commonly known as moong, golden gram, mug or mung belongs to the family *leguminosae*. According to Vavilov (1926) [16] it was originated from India and central Asia. Green gram is one of the important pulse crop and rank third in area and production after pigeon pea and chickpea. It is one of the most important pulse crop, grown in almost all parts of the country over a wide range of agro-climatic condition. Green gram (*Vigna radiata* L. Wilczec) is one of the most ancient and extensively grown leguminous crops of India. It is valued for the protein enriched seed as an important dietary ingredient to overcome protein malnutrition of human beings. It occupies prime position among pulses by virtue of its short growth period, high biomass and outstanding nutrient value as food, feed and forage. It is an ideal source of protein and amino acids and its seed contain, 24.7% protein, 0.6% fat, 0.9% fiber and 3.7% ash as well as sufficient quantity of calcium, phosphorus and important vitamins. Due to cheaper protein source it is designated as "poor man's meat" Aslam *et al.*, (2010) [5]. It does not produce heaviness or flatulence is fairly rich in carbohydrate and appreciable amount of riboflavin and thiamine. In sprouted seeds of green gram synthesized Vitamin C and it is consumed as salad and also after roasting. Looking to the food habit of majority of Indian population, which is vegetarian, it becomes more important because it full-fill the protein requirement of the peoples. It is consumed as *dal*, *halwa*, *namkeen*, snack and many other preparations. It also provides nutritive and laxative green and dry fodder to cattle.

In India, green gram occupies an area of about 3.51 million hectare, producing 1.80 million tones with the productivity of 511 kg ha⁻¹ (Anonymous, 2012)^[2]. Whereas in Maharashtra it is grown over 6.71 lakh hectare with production of 3.71 lakh tones and productivity of 552.91 kg ha⁻¹ (Anonymous, 2012)^[2]. Green gram has tremendous scope for improving pulse production and area, because green gram cultivation is done during summer season has received wider acceptance from farming community as it provides extra income, improve soil fertility, efficient land utilization, low incidence of pest and diseases and long term sustainability of agriculture without any harm to main crops (Idnani and Gautam, 2008)^[8] as well as it is good for sowing because of its short duration and good quality protein (Dewangan *et al.* 1992)^[6].

In India, the major green gram growing states are Madhya Pradesh, Maharashtra, Andhra Pradesh, Rajasthan, Bihar, Orissa, Karnataka, Gujarat and Tamil Nadu. In Maharashtra, area under total pulses is 26.31 lakh ha with the production of 19.12 lakh tones and area under green gram is 6.15 lakh ha with production of 4.05 lakh tones during the year 2016-17 (Anonymous, 2017)^[1].

The increase in productivity is not according to hope. Though, there are many reasons of low productivity including cultivation by small and poor farmers on marginal lands but lack of scientific cultivation is also a major factor responsible for low yields, so adoption of scientific methods for pulse cultivation is necessary. Being a short duration crop and having wider adaptability, it can be grown in summer as well as in *Kharif* season. It is an important ruling crop in summer season, locally known as '*Vaishakhi Mug*'. In summer season green gram crop gives good production with lustrous and bold seeds. This is only due to ideal weather conditions and absence of insect-pest and diseases during the crop season.

Phosphorus is an integral component of virtually all the biochemical compounds that make plant life possible. Its response is known in presently available green gram varieties. Nitrogen as well as phosphorus is essential for normal growth and development of green gram. Phosphorus application to green gram increases plant growth, yield attributes and grain yield. Phosphorus promotes early root formation and the formation of lateral, fibrous and healthy roots which is very important for nodule formation and to fix atmospheric nitrogen.

Materials and methods

The experiment was laid out in a factorial randomized block design replicated thrice with twelve treatment combinations comprising of NP fertilizer levels NP₁-75% of RDF (15, 30 kg ha⁻¹ N and P₂O₅), NP₂-100% of RDF (20, 40 kg ha⁻¹ N and P₂O₅), and NP₃-125% of RDF (25, 50 kg ha⁻¹ N and P₂O₅) and four potassium levels as a K₀- 00 K₂O Kg ha⁻¹, K₁- 15 K₂O Kg ha⁻¹, K₂- 20 K₂O Kg ha⁻¹ and K₃- 25 K₂O Kg ha⁻¹. The gross and net plot size were 5.4 m x 4.5 m and 4.2 m x 3.6 m, respectively. The lines were marked by marker at the spacing of 30 cm apart from each other and seeds were sown in these lines at spacing of 10 cm. The soil of the experimental field was silty clay in texture, slightly alkaline in reaction (pH 7.70), having electrical conductivity 0.31 dS m⁻¹ and organic carbon content was very low (0.18%), low in available nitrogen (238.84 kg ha⁻¹), moderate in available phosphorus (23.65 kg ha⁻¹) and high in available potassium (249.10 kg ha⁻¹). The crop was sown on 15th February, 2019 by line sowing method with different fertilizer levels. The crop was fertilized as per treatments by using urea, single super phosphate and muriate of potash by placement method.

Result and discussion

1) Effect on yield of green gram

A. Effect of NP fertilizer levels

The data presented in (Table 1) revealed that, the treatment NP₃ (125% of RDF) recorded higher grain yield (15.14 q ha⁻¹) which was significantly more over NP₁, while NP₃ and NP₂ and NP₂ and NP₁ found statistically at par with each other. The lowest grain yield (13.29 q ha⁻¹) was recorded in NP₁ treatment. Harvest index (%) of green gram was found non-significant with the application of NP fertilizer levels. The positive influence of these treatments through immediate supply of fertilizer at the early stage of the crop, which might have improved adequate biomass production and improvement in yield parameters resulting in higher grain yield. Similar results reported by Himani B. Patel *et al.* (2017)^[7] and Sanaullah Jamro *et al.* (2017)^[13]. Stover yield (32.99 q ha⁻¹) of green gram was recorded significantly more by treatment NP₃ over NP₁, while NP₃ and NP₂ and NP₂ and NP₁ found statistically at par with each other. The lowest stover yield (29.65 q ha⁻¹) was recorded in NP₁ treatment. Similar results reported by Himani B. Patel *et al.* (2017)^[7]. The data on harvest index (%) in given table by application of different NP levels shown not significant difference.

B. Effect of potassium levels

The potassium levels affect significantly on grain and stover yield (Table 1) of summer green gram. The maximum grain yield (15.19 q ha⁻¹) was recorded by treatment K₃ (25 kg K₂O ha⁻¹) which was significantly higher over K₀ (00 kg K₂O ha⁻¹). However K₃, K₂ and K₁ was found to be at par with each other. The positive influence of these treatments through immediate supply of potassium at the early stage of the crop, which might have improved adequate biomass production and improvement in yield parameters resulting in higher grain yield. Harvest index remain unaffected due to different potassium levels. These findings are in conformity with Patil and Dhonde (2009)^[12]. The maximum stover yield (33.32 q ha⁻¹) was recorded by application of K₃ (25 kg K₂O ha⁻¹) and which was significantly higher over K₀ (00 kg K₂O ha⁻¹). However it was found at par with treatment K₂ (20 kg K₂O ha⁻¹) and K₁ (15 kg K₂O ha⁻¹). These findings are in conformity with Oad *et al.* (2003)^[10]. The data in table 1 revealed that the harvest index (%) by application of different potassium levels was also found non-significant.

C. Effect of interaction

Effect of interaction among the NP levels and potassium levels were found non-significant in respect of grain yield (q ha⁻¹), stover yield (q ha⁻¹) and harvest index (%) of green gram after harvest.

2) Effect on economics of green gram

A. Effect of NP fertilizer levels

The data given in (Table 2) shows that, the economics of summer green gram production was influenced significantly by different NP fertilizer levels. The highest gross monetary returns (73765 Rs ha⁻¹) recorded with NP₃ level among fertilizer levels which was statistically superior over the NP₁ treatment (67864 Rs ha⁻¹), but it was found comparable with treatment of NP₂ (71726 Rs ha⁻¹). Similar results revealed by Sharma *et al.* (2010)^[15]. The highest net monetary return (41332 Rs ha⁻¹) recorded with treatment NP₃, which was found statistically superior over the NP₁ treatment, but it was found comparable with treatment NP₂ (39731 Rs ha⁻¹). Similar results revealed by Sharma *et al.* (2010)^[15]. The highest B:C

ratio (1.93) recorded by treatment of NP₃ and which was found significantly superior over the treatment NP₁ (1.82), but it was comparable with treatment NP₂ (1.90).

B. Effect of potassium levels

The economics of summer green gram production (Table 2) was influenced significantly by different potassium levels. The highest gross monetary return (76105 Rs ha⁻¹) were recorded at application of K₃ (25 kg K₂O ha⁻¹) which was significantly superior over the K₀ and K₁ treatments, however comparable with treatment of K₂ (74238 Rs ha⁻¹). Similar results reported by Patel *et al.*, (1998) [11] and Samui *et al.*, (2004) [14]. The highest net monetary return (43460 Rs ha⁻¹) were recorded by application of K₃ (25 kg K₂O ha⁻¹) and

which was found significantly superior over the K₀ and K₁ treatments, however it was found comparable with treatment K₂ (41949 Rs ha⁻¹). Similar results reported by Patel *et al.*, (1998) [11]. The highest B:C ratio (1.98) were recorded by application of K₃ (25 kg K₂O ha⁻¹) which was significantly superior over the treatment K₀ and K₁, however it was found on par with treatment K₂(1.95). Here the B:C ratio increases with increasing potassium levels. Similar results reported by Samui *et al.*, (2004) [14].

C. Effect of interaction

Effect of interaction of NP and potassium fertilizer levels were non-significant in respect of gross monetary return (Rs ha⁻¹), net monetary return (Rs ha⁻¹) and B:C ratio.

Table 1: Grain, stover, biological yield and harvest index of green gram as influenced by different treatments

Treatments	Grain yield (q ha ⁻¹)	Stover yield (q ha ⁻¹)	Biological yield (q ha ⁻¹)	Harvest index (%)
Nitrogen and Phosphorus levels				
NP ₁ -75% of RDF (15, 30 kg N, P ₂ O ₅ ha ⁻¹)	13.29	29.65	42.94	30.94
NP ₂ -100% of RDF (20, 40 kg N, P ₂ O ₅ ha ⁻¹)	14.29	32.31	46.52	30.56
NP ₃ -125% of RDF (25, 50 kg N, P ₂ O ₅ ha ⁻¹)	15.14	34.17	49.30	30.69
S. Em±	0.34	0.66	0.95	0.32
C. D. at 5%	1.00	1.96	2.82	NS
Potassium levels				
K ₀ - 00 (kg K ₂ O ha ⁻¹)	12.95	28.92	41.87	34.92
K ₁ - 15 (kg K ₂ O ha ⁻¹)	14.04	31.62	45.67	30.72
K ₂ - 20 (kg K ₂ O ha ⁻¹)	14.67	33.00	47.67	30.79
K ₃ - 25 (kg K ₂ O ha ⁻¹)	15.19	34.62	49.81	30.49
S. Em±	0.39	0.77	0.110	0.37
C. D. at 5%	1.15	2.26	3.25	NS
Interactions (NP × K)				
S. E m±	0.68	1.33	1.91	0.65
C. D. at 5%	NS	NS	NS	NS
General mean	14.21	32.04	46.25	30.73

Table 2: Mean cost of cultivation, gross monetary returns and net monetary returns as influenced by different treatments

Treatments	Cost of Cultivation (Rs ha ⁻¹)	Gross monetary returns (Rs ha ⁻¹)	Net monetary returns (Rs ha ⁻¹)	B:C ratio
Nitrogen and Phosphorus levels				
NP ₁ -75% of RDF (15, 30 kg N, P ₂ O ₅ ha ⁻¹)	37090	67864	36357	1.82
NP ₂ -100% of RDF (20, 40 kg N, P ₂ O ₅ ha ⁻¹)	37581	71726	39731	1.90
NP ₃ -125% of RDF (25, 50 kg N, P ₂ O ₅ ha ⁻¹)	38156	73765	41332	1.93
S. Em±	-	697	697	-
C. D. at 5%	-	2092	2092	-
Potassium levels:				
K ₀ - 00 (kg K ₂ O ha ⁻¹)	36478	61677	30631	1.69
K ₁ - 15 (kg K ₂ O ha ⁻¹)	36962	69089	37672	1.82
K ₂ - 20 (kg K ₂ O ha ⁻¹)	37975	74238	41949	1.95
K ₃ - 25 (kg K ₂ O ha ⁻¹)	38406	76105	43460	1.98
S. Em±	-	639.6	639.6	-
C. D. at 5%	-	1875	1875	-
Interactions (NP × K):				
S. E m±	-	1107	1107	-
C. D. at 5%	-	NS	NS	-
General mean	37521.43	71127.46	39234.24	2.20

Conclusion

Based on the investigation of one year data the following conclusions were drawn as:

The application of 100% of RDF (20: 40 N, P₂O₅ kg ha⁻¹) was found beneficial in increasing the grain yield and highest gross and net returns and B: C ratio of summer green gram. Among the potassium levels application of 20 K₂O kg ha⁻¹ was found maximum grain yield and highest gross and net returns and B:C ratio of summer green gram.

Summer green gram is more responsive to application of 100% RDF and 20 K₂O kg ha⁻¹ and it can be recommended for obtaining better yield and getting highest gross and net returns and B: C ratio.

References

- Anonymous. Economic survey of Maharashtra, 2017.
- Anonymous. Economic Survey, Ministry of Information and Broadcasting, Govt. of India, New Delhi, 2012.

3. Ardeshana RB, Modhwadia MM, Khanparal VD, Patel JC. Response of green gram (*Phaseolus radiatus*) to nitrogen, phosphorus and Rhizobium inoculation. Indian J Agron 1993;38(3):490-492.
4. Asgar Ali, Malik MA, Rashid Ahmed, Alif TS. Response of mung bean (*Vigna radiata*) to potassium fertilization. Pakistan J Agric. Sci 1996;33(1-4):44-45.
5. Aslam M, Hussain N, Zubair M, Hussain SB, Baloch MS. Integration of organic & inorganic sources of phosphorus for increased productivity of mung bean (*vigna radiata* L.). Pakistan Journal of Agriculture Science 2010;47(2):111-114.
6. Dewangan MK, Pandey N, Tripathi RS. Yield and water use efficiency of summer green gram (*Phaseolus radiatus*) as influenced by row spacing, irrigation schedule and phosphorus level. Indian Journal of Agronomy 1992a;37(3):587-588.
7. Himani B Patel, Shah KA, Barvaliya MM, Patel SA. Response of Green gram (*Vigna radiata* L.) to Different Level of Phosphorus and Organic Liquid Fertilizer. Int. J. Curr. Microbiol. App. Sci 2017;6(10):3443-3451.
8. Idnani LK, Gautam HK. Water economization in summer green gram (*Vigna radiata var radiata*) as influenced by irrigation regimes and land configuration. Indian Journal of Agricultural Sciences 2008;78(3):214-219.
9. and yield of green gram. J Maharashtra agric. Univ 34(2):215-216.
10. Oad FC, A Nadi Shah, Jamro GH, Galoo SH. Phosphorus and potassium requirements of mung bean (*Vigna radiata*). Pak. J. Applied Sci 2003;3(6):428-431.
11. Patel JS, Parmar MT. Response of green gram to varying levels of nitrogen and phosphorus. Madras Agric. J 1986;73(6):355-356.
12. Patil SM, Dhonde MB. Effect of potash levels and foliar spray of cow urine on growth and yield of summer green gram. J Maha. Agric. Univ 2009;34(1):106-107.
13. Sanaullah Jamro, Muhammad Ali Ansari, Majid Ali Jamro, Muhmmad Irfan Ahmad, Waheed Ahmed Siddiqui, Shahid Ahmad Junejo, *et al.* Growth and Yield Response of Mungbean Under the Influence of Nitrogen and Phosphorus Combination levels J Appl. Environ. Biol. Sci 2017-2018;8(7):01-91.
14. Samui RC, Subhendu Mandal, Anirban Mondal. Effect of potassium fertilization on growth, yield and yield attributes of groundnut, (*Arachis hypogaea* L.) cultivars in new alluvial zone of West Bengal. J Oilseeds Res 2004;21(1):173-174.
15. Sharma A, Rahtod PS, Basavraj K. Agronomic management of pigeon pea (*Cajanus cajan* L.) based intercropping systems for improving productivity under rainfed conditions. Karnataka J Agric Sci 2010;23(4):570-574.
16. Vavilov NI. Studies on origins of cultivated plants. Bulletin of Applied Botany and Plant Breeding 1926;16:1-245.
17. Vidhate, Jana PK. Effect of phosphorus, Rhizobium inoculation and irrigation on growth, yield and water-use efficiency of summer black gram (*Phaseolus radiatus*). Indian J Agron 1986;36(4):536- 540.