The Pharma Innovation Journal 2021; 10(9): 1856-1861

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2021; 10(9): 1856-1861

www.thepharmajournal.com
Received: 17-06-2021
Accepted: 29-08-2021

Monika Banotra
Division of Agronomy, Sher-e-Kashmir University of Agricultural Sciences & Technology Jammu, Jammu and Kashmir, India

BC Sharma
Division of Agronomy, Sher-e-Kashmir University of Agricultural Sciences & Technology Jammu, Jammu and Kashmir, India

Rakesh Kumar
Division of Agronomy, Sher-e-Kashmir University of Agricultural Sciences & Technology Jammu, Jammu and Kashmir, India

RS Bochalya
Division of Agronomy, Sher-e-Kashmir University of Agricultural Sciences & Technology Jammu, Jammu and Kashmir, India

Corresponding Author:
Monika Banotra
Division of Agronomy, Sher-e-Kashmir University of Agricultural Sciences & Technology Jammu, Jammu and Kashmir, India

Review: Effect of inorganic fertilizers and organic fertilizers on green gram (*Vigna radiata* L. Wilczek) under different conditions

Monika Banotra, BC Sharma, Rakesh Kumar and RS Bochalya

Abstract
Pulses form a basic part of the vegetarian diet of the large population of India. The use of inorganic fertilizer increases yield only for some few years but on long term, it has not been effective and leads to soil degradation. On the other hand, continuous application of organic fertilizer alone causes environmental degradation, resulting in lower crop yields. Therefore, sustainable agricultural productivity might be achieved through the wise use of integrated nutrient management. Hence, soil fertility maintenance is essential in achieving and maintaining high crop yields over a period of time. Unscrupulous use of inorganic fertilizers is to meet the demands of high yielding varieties rendering the soil organic matter depletion in tropical agriculture. Integrated use of organic manure and chemical NPK fertilizers would be quite promising not only in providing greater stability in production, but also in maintaining higher soil fertility status.

Keywords: Effect, fertilizers, organic, green gram, *Vigna radiata* L.

Introduction
India has the pride of being the world's largest producer of pulses. In India pulses are grown on an area of 29.18 million hectare with total production of 25.42 million tonnes and productivity of 853 kg/ha (Anonymous, 2019) [1].
India shares about 35-37% and 27% of the total area and production of pulses, respectively in the world (Ranpariya *et al.*, 2017). The area, production and productivity of pulses in the State of Jammu and Kashmir are 15.01 thousand hectares, 93 thousand quintals and 8.78 q/ ha, respectively. Out of 93 thousand quintals of pulses production in the Jammu and Kashmir State, the contribution of Jammu region was 46 thousand quintals whereas Kashmir and Ladakh regions contributed 38 thousand quintals and 9 thousands quintals, respectively (Anonymous, 2016c) [2].
Among the pulses, moong bean (*Vigna radiata* L. Wilczek) is one of the ancient and the third important conventional pulse crop cultivated throughout India and is adopted and acclimatized over wide range of agro-climatic zones of India for its multipurpose uses as vegetable, pulse, fodder and green manure crop with soil restorative characteristics. Its seeds contain 24.7 per cent protein which is almost 2.5-3.0 times more than the cereals, 0.6 per cent fat, 0.9 per cent fibre and 3.7 per cent ash. It is a cheaper source of protein and designated as "Poor man's meat" and "rich man's vegetable'' (Abbas *et al.*, 2011) [3]. An important feature of the moong bean crop is its ability to establish a symbiotic partnership with specific bacteria for setting up the biological nitrogen fixation in root nodules that supply the plant's need for nitrogen. (Mandal *et al.*, 2009) [21].

Review
Effect of differential substitution of nutrients through organics on growth parameters of green gram
Mathur (2000) [22] conducted experiment in Hisar to study the effect of various sources of nitrogen on growth of green gram revealed that application of vermicompost @20 kg N/ha significantly increased the growth of summer moong in terms of plant height, dry matter accumulation/plant than the remaining treatments under study. Yadav *et al.*, (2001) [41] conducted field experiment at Jobner and observed that application of vermicompost or FYM significantly increased the plant height (cm) and dry matter accumulation /plant of cowpea over control. Das *et al.*, (2002) [10] experiment to study to response of green gram to integrated

application of vermicompost and chemical fertilizers on green gram and observed that application of 100% recommended dose of fertilizers to green gram through vermicompost produced significantly highest plant height (cm) and dry matter accumulation (g/plant) when compared with 100% recommended dose of nitrogen through FYM and control. Rajkhowa *et al.,* (2002) [29] conducted experiment on sandy loam soil of Johrat university in Assam to study the effect of vermicompost alone and in combination with RDF on green gram in summer and revealed that significantly highest plant height and dry matter accumulation was recorded with vermicompost @2.5t/ha which was found statistically at par with RDF. Kumar *et al.,* (2003) [18] conducted experiment to study the performance different sources of inorganic and organic sources of nutrients on mung bean and revealed that significantly highest plant height (cm) and dry matter accumulation (g/plant) of mung bean were recorded with vermicompost @5t/ha over control. Netwal *et al.,* (2003) [27] conducted experiment to study the effect of FYM and vermicompost on cowpea (*Vigna unguiculata*) and observed significantly highest plant height (cm) in cowpea with application of vermicompost @5t/ha when compared with vermicompost @2.5t/ha, FYM @5t/ha and control. Study conducted by Dahama and Poonia (2007) [12] to assess the effect of inorganic and organic fertilizers singly and in combination on growth and yield of green gram observed significantly highest plant height (cm) of green gram with NPK (20:30:20 kg/ha) + vermicompost @5t/ha. Bhatt *et al.,* (2012) [7] conducted field experiment to investigate the effect of different levels of vermicompost on growth of green gram on sandy loam soil of Gujarat and observed that significantly highest plant height of green gram was recorded with vermicompost @1.5t/ha where as significantly lowest plant height of green gram was recorded with vermicompost @1.0t/ha. Asaidpour *et al.,* (2013) [5] while working on effect of vermicompost on growth of mung bean and assessed non-significant difference in plant height (cm) of mung bean with treatment vermicompost@5t/ha, vermicompost@10t/ha, vermicompost @15ton/ha and control. Experiment conducted by Tak *et al.,* (2013) [36] on loamy sand soil of Bikaner (Rajasthan) to study growth attributes of green gram as influenced by the vermicompost revealed that significantly highest plant height (cm) and dry matter (g/plant) with the treatment vermicompost @10 t/ha whereas significantly lowest plant height (cm) and dry matter (g/plant) with the treatment FYM @10 t/ha when compared with the control. Kokani *et al.,* (2014) conducted experiment on clayey soil of Gujarat to study the growth of summer moong as influenced by FYM and phosphorus and observed significantly highest plant height (cm) of summer moong with FYM@5t/ha. Meena *et al.,* (2015) [23] in their study conducted on sandy loam soil to assess the influence of bioorganic combination on growth parameters of green gram observed significant increase in plant height of green gram with the application of 75% RDF+ vermicompost @2.5 t/ha and 100% RDF (20:40:40 N_2:P_2O_5: K_20) when compared with control. There is 8.59 per cent increase in plant height with the application of 75% RDF +vermicompost @2.5 t/ha where as there is 8.08 per cent increase in plant height with the application of 100% RDF (20:40:40 N_2:P_2O_5: K_20) when compared with control at harvest. Gadi *et al.,* 2017 [13] while studying the effect of organic manures and inorganic fertilizers on growth of green gram observed significantly highest plant height and dry weight per plant (mg) of green gram with the treatment (10-40-20 NPK kg/ha+10 kg N through vermicompost) whereas significantly lowest plant height (cm) in green gram was recorded with treatment (10-40-20 NPK kg/ha+10 kg N through FYM) where as significantly lowest dry weight per plant (mg) in green gram was recorded with RDF (20-40-20 NPK kg/ha) respectively. Singh *et al.,* (2017) [34] studied the effect of in organics and organics on the growth of mung bean and observed significantly highest plant height (cm), dry weight (g/row length) with treatment RDF+vermicompost@5.0 t/ha whereas significantly lowest plant height and dry matter (g/row length) in mung bean was recorded with RDF (20N, 40P_2O_5 and 30 K_20

Effect of differential substitution of nutrients through organics on Yield and yield attributes of green gram

Mathur (2000) [22] while studying the effect different sources of nitrogen on green gram observed significantly highest number of pods/plants, seed yield and stover yield of green gram with the treatment vermicompost @70 kg N/ha. Yadav (2001) [41] reported in his study that application of 20 kg N/ha through vermicompost significantly increased the no. of pods/plant, seeds per pod, seed yield and straw yield of cowpea than treatment 20 kg N through urea and 20 kg N through FYM. Das *et al.,* (2002) [10] conducted experiment on lateritic soil (*Alfisol*) of Orissa and observed significantly highest plant height of green gram was recorded with treatment vermicompost (100%). Kumari and Kumari (2002) [19] conducted study on the sandy loam soil of Kerala to study the influence of vermicompost, and FYM alone and in combination with the RDF on Cowpea and revealed significantly highest yield attributing characters *viz*., number of pods /plant, number of seeds per pod and 100-seed weight cow pea with vermicompost. Experimental findings of Rajkhowa *et al.,* (2002) [29] revealed significant difference in yield attributing characters of summer moong with and without vermicompost in summer moong and observed that treatment vermicompost @2.5t/ha and RDF were found statistically par at with each other in grain yield. Further application of vermicompost showed significantly positive effect on yield and dry matter production in green gram. There is 35.1 per cent increase in seed yield with vermicompost over FYM. Nadeem *et al.,* (2004) [25] while studying the different levels of fertilizer on mung bean observed significantly highest seed yield of mung bean with application of 30 kg N/ha with combination of 60 kg P_2O_5/ha. Naeem *et al.,* (2006) [26] studied the comparative effect of inorganic fertilizers and organic manures on yield and yield components of green gram (*Vigna radiata* L.) revealed significant difference in yield and yield attributes of mung bean and revealed significantly highest yield attributes *viz*., no. of pods/plant, no. of grains/pod, 1000-grain weight (g) and grain yield (kg/ha) with NPK @25:50:50 kg/ha where as significantly lowest yield attributes and yield were recorded with treatment FYM @5t/ha. Ramesh *et al.,* (2006) [30] studied the effect of different sources of nutrients on pigeon pea and revealed that among the different sources of nutrients, treatments with chemical fertilizer were found significantly superior and statistically at par with FYM in no. of pods/plant. Sheoran *et al.,* (2008) [33] while studying the effect of nitrogen levels on mung bean revealed that that application of treatment 12.5 kg N+40 kg P_2O_5 increased the seed yield of mung bean by 4.3% compared to treatment 12.5 kg N+20 kg P_2O_5 which in turn increase yield of mung bean by 15.4% over control. Mathur *et al.,* (2009) conducted study on sandy

loam soil of Jodhpur to study the effect of vermicompost and DAP on yield of moth bean and observed that RDF, FYM and vermicompost were found statistically at par with each other in yield attributing characters *viz.*, no. of pods per plant, number of seeds per pod of moth bean. Dadgale *et al.*, (2011) conducted field experiment to study the effect of various organic amendments on green gram on the clayey soil of Akola and observed that FYM and vermicompost were found statistically at par with each other in yield attributes *viz*., number of pods/plant, weight of pod/plant, number of seeds per pod and 1000-grain weight (g). Wadgare *et al.,* (2010) conducted field experiment on sandy loam soil of Anand University (Gujarat) to study the response of vermicompost on green gram and observed significant increase in number of pods per plant and number of seeds per pod with vermicompost @ 2t/ha over its respective control. Significantly highest seed (1248 kg/ha) and stover (2570kg/ha) of green gram were also recorded with vermicompost @2t/ha. A field experiment was conducted by Sutaria *et al.,* (2010) [35] for six years at main dry farming station (Gujarat) to study the response of legume crops on vermicompost observed non-significant difference in grain yield of green gram with vermicompost where as significant difference was recorded in stover yield of green gram with different treatments. Jat and Ahlawat (2010) [16] conducted an experiment on sandy loam soil of IARI, New Delhi to study the effect of FYM and revealed that yield of pigeon pea increased to the tune of 5.95 and 7.11 per cent with the application of FYM @ 5t/ha over control. Gulam *et al.*, (2011) [14] conducted experiment to study the effect of organic and inorganic fertilizers on seed yield of green gram and revealed that maximum seed yield of green gram was registered with treatment DAP @124kg/ha followed by DAP @ 62 kg/ha and FYM @10 t/ha in moong bean yield. Bhatt *et al.,* (2012) [7] observed 18.55,18.78 and 50.83 per cent increase in number of pods per plant, number of seeds per pod with treatment vermicompost @1.0 t/ha over the treatment vermicompost @1.5t/ha. Jat *et al.,* (2012) [17] conducted field experiment on sandy loam soil of Uttar Pradesh to study the effect of organic manuring on productivity of summer mung bean and observed that application of FYM and vermicompost increased the grain yield by 45.45% and @ 62.18% over control in summer moong. Patra *et al.,* (2012) [28] worked on the effect of organic sources of nutrients on yield and yield attributes of green gram and observed significant differences in number of grain per pods, 1000-seed weight and grain yield of summer moong. Significantly highest number of grains per pod (11.56), 1000-grain weight (59.37 g) and grain yield (7.93 q/ha) were recorded with RDF (N: P: K =15: 30: 30 kg/ha) whereas significantly lowest number of grains per pod (11.56), 1000-grain weight (54.34) and grain yield (7.01 q/ha) were recorded with FYM @ 5 t/ha when compared with control. Amongst the treatment FYM @ 5 t/ha, vermicompost @3 t/ha and FYM@ 2.5 t/ha and vermicompost @ 1.5 t/ha significantly highest yield and yield attributes of summer moong were recorded with treatment vermicompost @3 t/ha whereas significantly lowest yield and yield attributes of summer moong were recorded with treatment FYM @ 5 t/ha. Asadipour *et al.,* (2013) [5] conducted study on the effect of vermicompost on of mung bean and observed that significantly highest biological yield and harvest index of mung bean were recorded with treatment vermicompost@10t/ha whereas lowest biological yield and harvest index of mung bean were recorded with treatment vermicompost @5t/ha. Meena *et al.,* (2013) [24] conducted study on loamy sand soil of Bikaner to study the influence of organic and inorganic fertilizer on summer moong observed that application of NPK up to 100% recommended dose, FYM @ 10 t/ha and vermicompost up to 5 t/ha significantly increased the number of pods per plant, number of seeds per pod, test weight, seed yield and straw yield of green gram over the control. Saravanan *et al.,* (2013) [32] conducted experiment to study the effect of organic manures and chemical fertilizers on yield of green gram and observed that maximum number of pods/plant was received with treatment FYM @ 6.25 t/ha+10% RDF of NPK where as significantly lowest number of pods per plant were recorded with RDF (N: P: K-20:60:20 kg/ha). Experimental findings of Banik and Sengupta (2014) [6] while studying the production potential realization and quality enhancement of mung bean through integrated nutrient management on sandy loam soil of West Bengal observed that treatment FYM @ 8 t/ha was found significantly superior and statistically at par with treatment FYM @ 6t/ha in seed yield of mung bean where as significantly lowest seed yield (kg/ha) of mung bean was recorded with treatment FYM @ 4t/ha. Hammad *et al.,* (2014) [15] while assessing the influence of different sources of nutrients on mung bean observed that treatment recommended NPK and FYM @10t/ha were found statistically at par with each other in seed yield, stover yield and harvest index (%) of mung bean. Tak *et al.,* (2014) [37] conducted field experiment to study the influence of vermicompost on yield and yield attributes of moong bean on loamy sand soil of Bikaner and observed significant differences in yield and yield attributes of green gram with the organic manures FYM and vermicompost when compared with control. Significantly highest number of pods per plant, seeds per pod, test weight, seed yield and straw yield were recorded with treatment vermicompost @10 t/ha whereas significantly lowest number of pods per plant, seeds per pod test weight, seed yield, straw yield and harvest index were recorded with treatment FYM @10 t/ha when compared with the control. There is 11.78 per cent and 18.62 per cent increase in grain and straw yield with treatment vermicompost @10 t/ha over the treatment FYM @ 10 t/ha where as there is 74 per cent increase in grain yield of green gram with FYM @10 t/ha, 77.5 per cent increase in grain yield with vermicompost @ 5 t/ha, 91.75 per cent and 94.5 per cent increase in green gram yield with vermicompost @7.5 t/ha and vermicompost @10 t/ha respectively. Ahmad *et al.,* (2015) [4] while working on sandy loam soil of Allahabad to study the response of integrated nutrient management on soil properties and yield attributes of mung observed significantly highest seed yield (q/ha) of mung bean with 100% FYM when compared with control. Meena *et al.,* (2015) [23] conducted experiment to study the effect of bi organics on yield and yield attributes of green gram and observed that there is 22.42 per cent increase in no. of pods per plant,56.92 per cent increase in no. of seeds per pod, 58.43 per cent increase in seed yield,22.19 per cent increase in straw yield,30.39 per cent increase in biological yield with the application of 75% RDF+ Vermicompost @2.5 t/ha where as there is increase in 21.02,50.06,55.00,20.57 and 28.37 per cent increase in number of pods per plant, number of seeds per pod, seed yield, straw yield and biological yield with the application of 100% RDF (20:40:40 N_2:P_2O_5: K_20) over the control respectively. Dhakal *et al.,* (2016) [16] studied the influence of combination of inorganics and organics on yield and yield attributes of green gram on sandy clay loam soil of

Banaras Hindu University (U.P) and the results revealed that significantly highest number of pods per plant, number of pods per plant and seed index of mung bean were recorded with treatment 75% RDF+ vermicompost @ 2.5t/ha whereas significantly lowest number of pods per plant, number of pods per plant and seed index were recorded with treatment 50% RDF+ vermicompost @ 2.5t/ha. There was 58.44 per cent increase in seed yield (q/ha), 22.19 per cent increase in straw yield (q/ha) and 30.39 per cent increase in biological yield with the treatment 75% RDF+ vermicompost @ 2.5t/ha where as there is 44.71,15.56 and 20.59 per cent increase in seed yield (q/ha), straw yield (q/ha) and biological yield (q/ha) with the treatment 50% RDF+2.5 t/ha VC over the control in green gram respectively. Gadi *et al.,* (2017) [13] conducted experiment on sandy loam soil of Allahabad (U.P) to study the influence of organic manure and inorganic fertilizers on moong observed non-significant difference in seed yield of green gram with treatment (10-40-20 NPK kg/ha+ 10 kg N through vermicompost), (10-40-20 NPK kg/ha+ 10 kg N through FYM) and RDF (20-40-20 NPK kg/ha) respectively. Todawat *et al.,* (2017) [38] conducted field experiment on loamy sand soil of Rajasthan to study the influence of vermicompost on yield and yield attributes of green gram and observed that with the application of vermicompost @7.5 t/ha there is 29.81 per cent increase in number of pods per plant, 24.62 per cent increase in number of seeds per pod,15.99 per cent increase in test weight (g), 38.86 per cent increase in seed yield (kg/ha) and 50.10 per cent increase in straw yield of green gram where as there is 14.84,10.50, 4.96, 27.03 and 25.78 per cent increase in number of pods per plant, number of seeds per pod, test weight (g), grain yield (kg/ha) and straw yield (kg/ha) with the application of vermicompost @ 2.5 t/ha respectively. Singh *et al.,* (2017) [34] conducted experiment to study the effect of integrated nutrient management on productivity of summer moong observed significantly highest number of pods /plant, number of grains/ pod, test weight, seed yield and stover yield of mung bean with the application of treatment RDF+ vermicompost @5.0 t/ha where as lowest value of yield and yield attributes in mung bean were recorded with the treatment RDF(20N-30P_20_5-40K_2O).There is 8.42 per cent increase in seed yield and 5.88 per cent increase in straw yield of moong bean with the application of treatment RDF+ vermicompost @5.0 t/ha where as with the application of RDF+ vermicompost @2.5 t/ha there is 3.18 per cent increase in higher seed yield (kg/ha) and 1.76 per cent increase straw yield (kg/ha) of mung bean respectively). Banotra *et al.,* (2021) [8, 9] while studying the effect of differential substitution of nutrients through organics on yield of green gram at Skuast-Jammu for two years reported significantly highest green gram yield (9.6 and 10.4 q/ha) with recommended dose of fertilizer whereas significantly lowest green gram yield was recorded with 100% N through FYM followed by 100% N through Vermicompost and 100% N through Vermicompost and FYM (1:1) in the decreasing order.

Effect of differential substitution of nutrients through organics on Quality of green gram

Mathur (2000) [22] observed significantly highest protein content in green gram with the application of vermicompost @20 kg/ha through over rest of the treatments. Yadav *et al.,* (2001) [41] conducted experiment to study the different levels of nitrogen on quality of cowpea and observed that significantly highest protein content in cow pea was recorded with 20 kg N through vermicompost over the same dose through urea and FYM. Kumawat *et al.,* (2009) [20] while studying the influence of organic manure on quality of moong bean observed significantly highest protein content per cent in seeds of mung bean with vermicompost @2t/ha where as significantly lowest protein content percent in moong bean was recorded with treatment FYM @4t/ha. Experimental findings of Tak *et al.,* 2014 [37] registered that highest protein content per cent in seeds of summer moong was recorded with the application of vermicompost @ 10 t/ha where as significantly lowest protein content per cent in seed of moong bean was recorded with the application of FYM@10 t/ha when compared with control. Dhakal *et al.,* (2016) [11] assessed the effect of combination of in organics and organics on protein content per cent in seed of green gram and observed that significantly highest protein per cent content in seed of green gram was recorded with treatment 75% RDF+2.5 t/ha whereas lowest protein per cent content in seed of green gram was recorded with treatment 50% RDF+2.5 t/ha. There was 19.51 per cent increase in protein per cent in summer moong with treatment 75% RDF+2.5 t/ha where as 13.53 per cent increase in protein per cent of green gram with the treatment 50% RDF+2.5 t/ha over the control respectively. Singh *et al.,* (2017) [34] while studying the effect of INM on quality of moong reported highest protein per cent in seeds of moong with treatment RDF + vermicompost @5.0 t/ha, followed by treatment RDF+ vermicompost @2.5 t/ha in protein content whereas lowest protein content in seeds of summer moong was recorded with treatment RDF(20N-40P_20_5-$K_2$0) respectively.

Effect of differential substitution of nutrients through organics on Nutrient uptake of green gram

Rajkhowa *et al.,* (2000) [29] studied the effect of RDN based urea, vermicompost and FYM on green gram and observed that treatments with vermicompost were found significantly superior and statistically at par with treatment containing FYM in N uptake (kg/ha), P uptake (kg/ha) and K uptake (kg/ha) in moong bean. Kumawat *et al.,* (2009) [20] while studying the effect of organic manures on mung bean observed significantly highest nitrogen uptake (kg/ha), phosphorus uptake (kg/ha) and potassium uptake (kg/ha) in mung bean with treatment vermicompost @ 2 t/ha were as significantly lowest nitrogen uptake (kg/ha), phosphorus uptake (kg/ha) and potassium uptake (kg/ha) in mung bean was recorded with treatment FYM @4t/ha. Experimental findings of Vasanthi and Subramanian (2004) [39] revealed that highest NPK uptake in seed and stover of black gram were recorded with treatment which received vermicompost @ 2t/ha along with RDF over 100% NP and different combinations of fertilizers. Patra *et al.,* (2012) [28] while assessing the influence of organic source of nutrients on N, P and K uptake by green gram observed significantly highest N uptake (kg/ha), P uptake (kg/ha) and K uptake (kg/ha) in green gram with treatment 100 RDF (N: P: K @ 15:30:30 kg/ha) whereas significantly lowest N uptake, P uptake and K uptake was recorded with treatment FYM @ 5 t/ha. With the application of 100 RDF (N: P: K @ 15:30:30 kg/ha) there is 51.38 per cent increase in N uptake (kg/ha), 59.53 per cent increase in P uptake (kg/ha) and 77.05 per cent increase in K uptake (kg/ha) in green gram whereas with the application of FYM @ 5 t/ha there was 32.58, 34.53 and 18.84 per cent increase in N uptake (kg/ha), P uptake (kg/ha) and K uptake (kg/ha) respectively. In a field experiment, Meena *et al.,*

(2013) [24] found that with the application of NPK 100% recommended dose, FYM @10 t/ha and vermicompost @5 t/ha there is significantly increase in 86.19, 56.85 and 79.09 per cent total uptake of nitrogen, 82.22, 58.16 and 77.20 per cent total uptake of phosphorus and80.89, 57.68 and 76.59 per cent total uptake of potassium in green gram over the control respectively. Tak *et al.,* (2013) [36] revealed that in green gram significantly highest total nitrogen uptake (kg/ha), total phosphorus and total potassium uptake (kg/ha) were recorded with the application of vermicompost @10 t/ha where as significantly lowest total nitrogen uptake (kg/ha), total phosphorus and total potassium uptake (kg/ha) in green gram was recorded with the treatment FYM @ 10 t/ha when compared with the control. Meena *et al.,* (2015) [23] observed the highest total nitrogen uptake (103.12 kg/ha), phosphorus uptake (11.57 kg/ha) and potassium uptake (6.06 kg/ha) in moong bean were recorded with the application of 75% RDF + vermicompost @ 2.5 t/ha over the control whereas treatment 75% RDF + vermicompost @ 2.5 t/ha was found statistically at par with the treatment 100% RDF in total nutrient uptake.

Effect of differential substitution of nutrients through organics on Relative economics of green gram

Results of study conducted by Patra *et al.*,(2012) [28] in sandy loam soil of west Bengal revealed that highest cost of cultivation (Rs 24552.00/ha) in moong bean was recorded the treatment vermicompost @3 t/ha whereas highest net returns (Rs 40002.85/ha) and benefit cost ratio 2.58 in mung bean were recorded with 100% RDF (N: P: K 15:30:30 kg/ha) whereas lowest cost of cultivation in moong bean was recorded with treatment 100% RDF (N: P: K 15:30:30 kg/ha) whereas lowest net return and benefit cost ratio in green gram was recorded with treatment FYM @ 5 t/ha. Tak *et al.,* (2013) [36] studied the influence of vermicompost on economics of green gram and observed significantly highest net returns and benefit cost ratio in green gram with treatment FYM @10t/ha whereas lowest net returns and benefit cost ratio in green gram were was recorded with vermicompost @ 10 t/ha when compared with control. Meena *et al.,* (2015) [23] from their study on integrated nutrient management of economics of green gram and observed that highest net returns (Rs 49565.84) and benefit cost ratio (3.84) in green gram with treatment (100% RDF (20:40:40 N_2:P_2O_5: K_20) whereas lowest net returns (Rs 47497.93) and benefit cost ratio (2.92) was recorded with the application of 75% RDF + vermicompost @2.5 t/ha. Banotra *et al.,* (2021) [8, 9] on their two year study on green gram (summer 2016 and 2017) reported that highest gross returns (Rs 49951.00/ha and Rs 58203.00/ha), net returns (Rs 33689.38/ha and Rs 41941.38/ha) and B:C ratio (2.07 and 2.58) were recorded with treatment T_1 -100% NPK (Recommended dose of fertilizer) whereas lowest gross returns (Rs 32238.25/ha and Rs 40084.25/ha)were recorded with treatment 25%NPK+75% N through FYM, lowest net returns (Rs 12709.62/ha and Rs 20602.92/ha) were recorded with treatment 25% NPK+75% N through Vermicompost and lowest B:C ratio (0.65 and 1.05) were recorded with treatment 100% N through Vermicompost during both crop growing seasons.

References

1. Anonymous. Agricultural statistics at a glance 2019. Department of Agriculture, Cooperation and Farmer welfare, Directorate of Economics and statistics 2019, 60
2. Anonymous. Digest of Statistics. Directorate of economics and statistics, Government of Jammu and Kashmir 2016c, 146-153.
3. Abbas G, Abbas Z, Aslam M, Malik AU, Ishaque M, Hussain F. Effects of organic and inorganic fertilizers on mungbean (*Vigna radiata*) yield under arid climate. International Research Journal of Plant Science 2011;2(4):094-098.
4. Ahmad M, David AA, Thomas T, Akthar Z, Patidar R, Nepali A. Response of integrated nutrient management on soil properties and yield attributes of mung (*Vigna radiate*) var. SAMRAT. Indian Journal of Agriculture and Allied sciences 2015;1(1):17-18.
5. Asadipour M, Hadi MRHS. Influence of Vermicompost and plant density on some morphological traits and biological yield of mung bean (*Vigna radiata*). International Research Journal of applied and basic sciences 2013;5(3):319-323.
6. Banik NC, Sengupta K. Production potential realization and quality enhancement ofmung bean through integrated nutrient management. Journal crop and Weed 2014;10(2):287-291.
7. Bhatt PK, Patel PT, Patel BT, Vyas G. Effect of Vermicompost and phosphours levels with PSB on growth and yield of summer green gram under Gujarat conditions. Green farming 2012;3(6):666-669.
8. Banotra M, Sharma BC, Kumar A, Gupta LM, Verma A, Kumar R. Production potential and economics of green gram (*Vigna radiata)* under differential substitution of nutrients through organics in subtropics of Jammu region. Indian Journal of Agronomy 2021;66(1):51-55.
9. Banotra M, Sharma BC, Nandan B, Kumar R. Effect of Differential Substitution of Nutrients through Organics on Growth, Quality, Nutrient Uptake and Economics of Green Gram (Vigna radiata) in Shiwalik Foothill Region. Legume Research 2021. DOI: 10.18805/LR-4257.
10. Das PK, Sarangi D, Jena MK, Mohanty S. Response of green gram (*Vigna radiate L.*) to integrated application of Vermicompost and chemical fertilizers in acid lateritic soil. Indian Agriculture 2002;46(1, 2):79-87.
11. Dhakal Y, Meena RS, Kumar S. Effect of INM on nodulation, yield, quality and available nutrient status in soil after harvest of green gram. *Legume research*. 2016;39(4):590-594.
12. Dhaman AK, Poonia BL, Suman. Effect of balance fertilization on growth and yield of green gram. (*Vigna radiate*). Haryana. Journal of Agronony 2007;23(1, 2):118-119.
13. Gadi P, Dawson J, Shankar S. Effect of different organic manures, in organic fertilizers and growth regulators on growth and yield of green gram (*Vigna radiata* L.). Bulletin of Environment, pharmacology and Life sciences 2017;6(1):67-75.
14. Gulam A, Zafar A, Aslam M, Mallik AU, Hussain F. Effects of organic and inorganic fertilizers on mung bean (*Vigna radiata*) yield under arid climate. International Research of Plant Science 2011;2(4):094-098.
15. Hammad HM, Saeed S, Ahamd A, Farhad W, Nasim W. Sources of nutrients Influence Mung bean crop under Thal Environment. Applied Sciences and Business Economics 2014;1(1):44-48.
16. Jat RA, Ahlawat IPS. Effect of organic fertilization in pigeon pea +ground nut intercropping system. Indian Journal of Agronomy 2010;55(4):276-281.

17. Jat SL, Prasad K, Parihar CM. Effect of organic manuring on productivity and economics of summer moong. Annals of Agriculture Research 2012;33(1-3):17-20.
18. Kumar S, Singh RC, Kadian VS. Performance of mung bean as influenced by seed inoculation with Rhizobium and levels of inorganic sources of nutrients. Indian Journal of Pulses Research 2003;16(1):67-68.
19. Kumari MSS, Kumari KV. Effect of Vermicompost enriched with rock phosphate on growth and yield of Cowpea. Journal of Indian society of Soil Science, 2002;50(2):223-224.
20. Kumawat N, Kumar R, Sharma OP, Sharma. Nutrient uptake and Yield of mung bean *Vigna radiata* (L.) Wilczek as influenced by organic manures, PSB and Phosphorus Fertilization. Environment and ecology 2009;27(4B):2009.
21. Mandal S, Mandal M, Das A, Pati B, Ghosh A. Stimulation of indoleacetic acid production in a Rhizobium isolate of *Vigna mungo* by root nodule phenolic acids. Archives of Microbiology. 2009;191(4):389-393.
22. Mathur K. Effect of rhizobium inoculation and various sources of nitrogen on growth and yield of summer green gram (*Vigna radiata* (L.) Wilcek). M.Sc Thesis, C.C.S. HAU., Hisar 2000.
23. Meena RS, Dhakal Y, Bohra JS, Singh SP, Singh MK, Sarodiya P *et al*. Influence of Bioorganic combinations on yield quality and economics of moong bean. American Journal of Experimental Agriculture 2015;8(3):159-166.
24. Meena RS, Ramawatar, Kamlesh, Meena VS, Ram K. Effect of organic and inorganic source of nutrients on yield, nutrient uptake and nutrient status of soil after the harvest of green gram. An Asian Journal of soil science. 2013;8(1):80-83.
25. Nadeem MA, Rashid Ahmad, Ahmad MS. Effect of seed inoculation and different fertilizer levels on the growth and yield of mung bean (*Vigna radiata*). Journal of Agronomy 2004;3(1):40-42.
26. Naeem M, Iqbal J, Ahmad M. Comparative study of inorganic fertilizers and organic manures on yield and yield components of mung bean (*Vigna radiata* L.). Journal of Agriculture and social sciences. 2006;2(4):227-229.
27. Netwal LC. Effect of FYM and Vermicompost on nutrient uptake and quality of Cowpea (*Vigna ungiculata*) grown under saline condition. MSc.(Ag). Thesis, RAU, Bikaner 2003.
28. Patra PS, Sinha AS. Effects of organics on yield, uptake and economics of green gram (*Vigna radiata* L.) production under Terai region of west Bengal. Legume research 2012;35(2):169-172.
29. Rajkhowa DJ, Gogoi AK, Kandali R, Rajkhowa KM. Effect of Vermicompost on green gram nutrition. Journal of Indian Society of Soil Science 2000;48(1):207-208.
30. Ramesh P, Singh M, Panwar NR, Singh AB, Ramana S. Response of pigeon pea (*Cajanus Cajan*) varieties to organic manures and their influence on fertility and enzyme activity of soil. Indian Journal of Agricultural Sciences 2006;76(4)252-254.
31. Ranpariya VS, Polara KB, Savaliya CM, Modhvadiya VL, Bodar KH. Effect of potassium, Zinc and FYM on growth, quality and yield of summer green gram (*Vigna radiata* L.) under medium calcareous soil, International Journal of Science, Environment 2017;6(4):2242-2247.
32. Saravanan PS, Singh K, Ignesh A. Effect of organic manures and chemical fertilizers on the yield and macronutrient concentration of green gram. International Journal of Pharmaceutical Science Invention 2013;2(1):18-20.
33. Sheoran P, Sardana V, Singh S. Effect of nutrient levels on the productivity of mung bean genotypes under sub humid rain fed condition of Punjab. Journal of Food legume 2008;21(2):117-118.
34. Singh M, Deokaran, Mishra JS, Bhatt BP. Effect of integrated nutrient management on production potential and quality of summer mung bean (*Vigna radiata* L.). Journal of Krishi Vigyan 2017;5(2):39-45.
35. Sutaria GS, Akbari KN, Vora VD, Padmani DR. Response of legume crops to enriched Vermicompost on Vertic Ustochrept under rainfed Agriculture. Legume Research 2010;33(2):128-130.
36. Tak S, Sharma SK, Reager ML. Growth attributes and nutrient uptake of green gram as influenced by Vermicompost and Zinc in arid western Rajasthan. Advance Journal of crop improvement 2013;4(1):65-69.
37. Tak S, Sharma SK, Reager ML. Effect of vermicompost and Zinc on yield attributes, yield and quality of green gram [*Vigna radiata* var. *aureus* (L.) wilczek] in arid western Rajasthan. International Journal of Agricultural Sciences 2014, 131-141.
38. Todawat A, Sharma SR, Lakh Ran H, Hemraj. Effect of Vermicompost and Zinc on growth, yield attributes and yield of green gram (*Vigna radiata* L.) under semi-arid region of Rajasthan. International Journal of Microbiology and applied sciences. 2017;6(9):175-180.
39. Vasanthi D, Subramanin S. Effect of Vermicompost on nutrient uptake and protein content in black gram. Legume research 2004;27(4):293-295.
40. Wagadre N, Patel MV, Patel HK. Response of summer green gram (*Vigna radiata*) to Vermicompost and phosphorus with and without PSB inoculation. State level seminar on "Organic Farming" Navsari, Gujrat 2010, 111-113.
41. Yadav OS. Effect of Nitrogen sources and bio fertilizer on growth, yield and quality of cowpea. Msc.(Ag) Thesis, RAU, Bikaner 2001.