NUTRIENT CONTENT AND NUTRIENT UPTAKE OF CROPS AFFECTED BY INTEGRATED MANAGEMENT IN FINGER MILLET - GREENGRAM CROPPING SEQUENCE ON HILLY AREA OF SOUTH GUJARAT

PATEL, J. V.;*THANKI, J. D. AND DESAI, L. J.

DEPARTMENT OF AGRONOMY
N. M. COLLEGE OF AGRICULTURE
NAVSARI AGRICULTURAL UNIVERSITY
NAVSARI 396 450, GUJARAT, INDIA

EMAIL : jv_patel24@yahoo.com

ABSTRACT

The effect integrated nutrient management on production potential of finger millet - greengram cropping sequence on hilly area of south Gujarat was studied during kharif and rabi seasons of 2013-14 and 2014-15 at Rajendrapur Farm, Hill Millet Research Station, Navsari Agricultural University, Waghai (Dist.-Dangs), Gujarat, India. The integrated nutrient management treatments viz., T_1 - General RDF (RDF + FYM @ 10 t/ha), T_2 – 75 per cent RDN through chemical fertilizer + 25 per cent RDN through biocompost, T_3 – 75 per cent RDN through chemical fertilizer + 25 per cent RDN through vermicompost, T_4 – 75 per cent RDN through chemical fertilizer + 25 per cent RDN through FYM and T_5 - Control was given to finger millet in kharif season as main plot treatments replicated four times in randomized block design. During subsequent rabi season each main plot treatment was split into four sub plot treatments with four levels of recommended dose of fertilizers viz., S_1 - Control, S_2 – 50 per cent RDF, S_3 – 75 per cent RDF and S_4 – 100 per cent RDF to greengram resulting in twenty treatment combinations replicated four times in split plot design. The pooled analysis over two years reported maximum grain and straw yields as well as nutrient content (N, P and K) and their uptake by kharif finger millet (grain and straw) under application of general RDF (RDF + FYM @ 10 t/ha) which was at par with the application of 75 per cent RDN through chemical fertilizer + 25 per cent RDN through vermicompost. The residual effect of general RDF(RDF + FYM @10 t/ha) applied to preceding finger millets showed higher seed yield and stover yield as well as nutrient content (N, P and K) and their uptake by greengram (seed and stover) followed 75 per cent RDN through chemical fertilizer + 25 per cent RDN through vermicompost. Among the different levels of RDF directly given to greengram crop during rabi season, application of 100 per cent RDF resulted in higher seed and stover yield as well as nutrient (NPK) uptake and content.

KEY WORDS : Finger millet, Greengram, Nutrient content, Nutrient uptake

INTRODUCTION

In India, the concept of cropping systems is as old as agriculture. Farmers preferred mixed cropping, especially under dry land conditions, to minimize the risk of total crop failure. Cropping systems has to be evolved based on climate, soil and water availability for efficient use of available

natural resources. The cropping system should provide enough food for the family, fodder for cattle and generate sufficient cash income for domestic and cultivation expenses. Many intensive cereal based cropping systems are under practice in the country according to agroclimatic regions. Under rainfed condition, particularly in hilly tract of south Gujarat, finger millet-greengram cropping system is predominantly followed. Presently the trend of production of finger millet- greengram cropping system in the state is a constant or marginal decline in production. Also intensive cropping cultivation of high yielding varieties, crop residue burning and indiscriminate use of chemical fertilizers have resulted into depletion of nutrients, soil organic carbon and deterioration of soil physical conditions (Srivastava, 1998; Singh *et al*, 1999). Therefore, there is a need to manage the long term soil productivity through integrated use of both inorganic and organic sources of nutrients. The organic sources of nutrients intending farmyard manure, biocompost, vermicompost, crop residue *etc*. have potential to increase soil organic matter. Among the several factors, nutrient management is one of the most important factors responsible for low productivity. Application of chemical fertilizer can boost crop yields but it impairs soil physico-chemical properties. Therefore, an integrated use of different sources of plant nutrients is required to check nutrient depletion, maintain soil fertility and crop productivity (Rao, 1994).

Finger millet (*Eleusine coracana* L. Gaertn.) is an important small millet crop grown in India and has the pride of place in having highest productivity among millets known as "nutricereals" (Nakarani *et al*., 2018). Finger millet is an important food crops for a large section of people in the tribal hilly area, generally grown on poor and marginal soils with imbalanced nutrient management leads to lower productivity. Greengram (*Vigna radiata* L.) is one of the important pulse crops fulfils protein requirement of a vegetarian population of the country. The finger millet-greengram cropping sequence has a potential scope to enhance the soil and crop productivity with judicious use of all the major sources of plant nutrients in an integrated approach without any deleterious effect on physico-chemical and biological properties of soil. The agriculture crop production technology is micro-climate dependant and limited planned research work has been done on INM approach on finger millet – greengram cropping sequence under hilly area with respect to yield, nutrient uptake, content and residual effect on succeeding crop, Hence, the present investigation was taken up to develop on INM technology using FYM, biocompost, vermicompost in finger millet - greengram sequence in hilly tract of south Gujarat.

MATERIALS AND METHODS

The experiment was conducted during *kharif* and *rabi* seasons of 2013-14 and 2014-15 at Rajendrapur Farm, Hill Millet Research Station, Navsari Agricultural University, Waghai (Dist-Dangs), Gujarat, India. The soil of the experimental site was clayey in texture belongs to Inceptisols with medium in organic carbon (0.68 per cent), available nitrogen (285.80 kg/ha) and available phosphorus (49.60 kg/ha), whereas high in available potassium (376.12 kg/ha). The soil was slightly acidic in reaction (pH 6.9) with normal electric conductivity. The experiment comprised of five treatments of integrated nutrient management *viz*., T_1 - General RDF (RDF:40-20-00 kg NP-K/ha + FYM @ 10 t/ha), T_2 - 75 per cent RDN through chemical fertilizer + 25 per cent RDN through biocompost, T_3 - 75 per cent RDN through chemical fertilizer + 25 per cent RDN through vermicompost, T_4 - 75

per cent RDN through chemical fertilizer + 25 per cent RDN through FYM and T_5 – Control (No fertilizer) to finger millet applied in two splits during *kharif* season as main plot treatments replicated four times in randomized block design. During subsequent *rabi* season each main plot treatment was splited into four sub plot treatments with four levels of recommended dose of fertilizers *viz*., S_1 - Control, S_2 - 50 per cent RDF (10-15-00 kg N-P-K/ha), S_3 - 75 per cent RDF(15-30-00 kg N-P-K/ha) and S_4 - 100 per cent RDF (20-40-00 kg N-P-K/ha) to greengram resulting in twenty treatment combinations replicated four times in split plot design. The finger millet nursery was sown by line sowing on 12th and 20th June in 2013 and 2014, respectively using seed rate of 5 kg/ha of GN-4 variety and seedling was transplanted at 22.5 x 7.5 cm spacing on 5th and 16th July during 2013 and 2014, respectively with single seedlings per hill. All recommended practices were followed in order to ensure healthy crop growth. Pure seed of greengram variety CO-4 was used for sowing under dry condition on 26th November in 2013 and 6th December in 2014 with recommended seed rate of 25 kg/ha. Organic manures (FYM and bio-compost and vermicompost) were applied to finger millet crop as per treatments and evenly spread and mixed in that particular plot. Before application of organic manures, it was analyzed for NPK content. The chemical composition of organics (dry weight basis) was as followed:

Sr. No.	Organics	Year	Nutrient content (%)		
			N	P_2O_5	K_2O
1	FYM	2013	0.52	0.37	0.50
		2014	0.62	0.40	0.53
2	Vermicompost	2013	1.55	0.88	1.12
		2014	1.49	0.87	1.11
3	Biocompost	2013	1.35	0.85	1.20
		2014	1.36	0.86	1.23

At harvest, N concentration in finger millet grain and straw were determined by modified Kjeldahl method; P concentration by vanadomolybdophosphoric acid yellow colour method using spectrophotometer and K concentration by flame photometry method (Prasad *et al*., 2006). The data recorded were statistically analyzed using MSTATC Software. The purpose of analysis of variance was to determine the significant effect of treatments on finger millet. LSD test at 5 per cent probability level was applied when analysis of variance showed significant effect for treatments (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

The integrated nutrient management showed great impact on grain and straw yields of finger millet (Table 1). Finger millet crop produced significantly the highest grain and straw yields with application of 75 per cent RDN through chemical fertilizer + 25 per cent RDN through vermicompost, which was at par with general RDF (RDF + FYM @10 t/ha). This might be due the increased absorption of nutrients and their assimilation. Supply of N in balanced quantity enabled the finger millet plants to assimilate sufficient photosynthetic products and thus increased the dry matter accumulation. The increased grain and straw yields can also be ascribed to the effect of adequate availability of NPK in soil solution, may cause increase in root growth, thereby increasing uptake of nutrients. The earlier researcher

Arunachalam *et al.* (1995), Umesh *et al*. (2006), Chaudhari *et al*., (2011) and Pallavi *et al*., (2016) also opined the similar results for increased grain yield.

The nitrogen content was increased due to integration of inorganic and organics in finger millet. However, the effect was significant in case of nitrogen content in grain excluding nitrogen content in straw in pooled. Application of 75 per cent RDN through chemical fertilizer + 25 per cent RDN through vermicompost and general RDF (RDF + FYM @10 t/ha) registered significantly higher nitrogen content. The higher concentration of nitrogen in finger millet grain might be due to addition of nitrogen in soil through adequate quantity of inorganic fertilizers and organic manures which in turn increased efficiency of applied nitrogen by forming clay humus complex. The results are in accordance with Raman and Krishnaprabhu (2004) and Jagathjothi *et al*. (2010). The phosphorus and potassium content in finger millet grain and straw increased with integrated nutrient management treatments to finger millet, however, the differences did not attain the level of significance.

The uptake of N by finger millet crop increased significantly with integration of inorganic fertilizer and organic manures (Table 2). Significantly the maximum nitrogen, phosphorus and potassium uptake was observed with the application of 75 per cent RDN through chemical fertilizer + 25 per cent RDN through vermicompost and general RDF (RDF+ FYM @ 10 t/ha) being remained at par with each other over control. This might be due to the fact that the trend of nutrient uptake was very well resembled with dry matter accumulation and per hectare yield data of various treatments. The enhanced uptake of these nutrients in the corresponding treatments could be due to the increased and sustained availability of nutrients through organic manure and inorganic fertilizers. The increased uptake by finger millet might be due to improvement in soil physical, chemical and biological health through application of organic manure and inorganic fertilizers under integrated nutrient management. Similar results were reported by Raman and Krishnaprabhu (2004), Jagathjothi *et al.* (2010), Jagathjothi and Ramamoorthy (2015) and Pallavi *et al.* (2016).

Greengram seed and stover yields were better, when it was raised under general RDF (RDF+ FYM @ 10 t/ha) treatment given to *kharif* finger millet (Table 3). It may be ascertained to the increased availability of nutrients due to mineralization of organic materials, release of CO_2 increasing fertilizer use efficiency, accumulation of organic carbon and improvement of soil physical properties. Same results were reported earlier by Shanwad (2010) in maize-bengal gram, Nawale *et al*., (2009) in forage sorghum-chickpea and Imade (2014) in rice - greengram cropping sequence. Increased seed and stover yield of greengram due to INM to preceding *kharif* finger millet might be due to addition of BC and FYM or vermicompost resulting in improvement in soil structure which reduced the soil crusting and also serves as a source of energy for soil microflora which resulted in better root nodulation and nitrogen fixation. Utilization of inexhaustible atmospheric nitrogen through biological nitrogen fixation can help a great deal in maintaining soil productivity (Patel *et al*., 2018).

The significantly higher seed and stover yield of greengram were recorded with the application of 100 per cent RDF (S_4). This was largely attributes due to better growth of plant in terms of plant height, number of branches and dry matter accumulation per plant which resulted in adequate supply of photosynthates for development of sink. Similar findings were

reported by Jat *et al.* (2012), Imade (2014), Elamin and Madhvi (2015) and Mansuri (2016).

The residual effect of finger millet was found significant on nitrogen and phosphorus content in seed and on phosphorus content in stover (Table 3). The maximum nitrogen, phosphorus and potassium content in seed and stover of greengram was recorded under the application of general RDF (RDF + FYM @ 10 t/ha) to preceding finger millet. The uptake of nitrogen, phosphorus and potassium by greengram crop (grain and stover) was differed significantly due to residual effect of INM applied to preceding kharif finger millet crop and found the maximum with application of general RDF (Table 4). The increase in nutrient content and uptake in greengram might be due to the application of large quantity of inorganic fertilizers and integration of inorganic fertilizers with bio-compost which firstly mineralized the nutrients and slowly releasing them upon the action of microorganisms with lapse of time. Secondly, because of mineralization process, the losses of nutrients either through leaching or volatilization might have been restricted. Also it might be due to improvement in soil physical, chemical and biological properties of soil through application of organic and inorganic fertilizers due to preceding crop. Similar results were reported by Nawale *et al*. (2009) in kharif forage sorghum - rabi chickpea cropping sequence.

The direct application of fertilizer to greengram showed that the nitrogen and phosphorous content in seed and phosphorous content stover, whereas the nitrogen, phosphorose and potassium uptake was found significant. The highest nitrogen, phosphorus and potassium content and its uptake were recorded maximum under 100 per cent RDF (S_4). This might be due to the adequate supply of potassium have supplemented the beneficial residual effects *viz.*, mineralization and slow release of nutrients by organic manure and synergistic effect of balance NP fertilization resulting in higher NPK concentration in seed and stover and its uptake by crop. The results are in agreement with those reported by Gudadhe *et al.* (2011), Imade (2014) and Mansuri (2016).

CONCLUSION

On the basis of experimental results, finger millet crop should be nourished with 75 per cent RDN through chemical fertilizer + 25 per cent RDN through vermicompost through chemical fertilizer reported higher yield, nutrient uptake and content, further it showed promising residual effect on yield, nutrient uptake and content in succeeding green gram crop applied with 100 per cent RDF (20-40-00 kg NPK/ha) under finger millet-greengram cropping sequence under hilly area of south Gujarat.

REFERENCES

Arunachalam, A. A.; Veerabadran, V. and Muthusankarayanan, A. (1995). Integrated nitrogen supply system for finger millet (*Eleusine coracana*). *Indian J. Agron.,* **40**(1): 109-111.

Chaudhari, P. P.; Patel, D. A.; Virdia, H. M. and Patel, B. M. (2011). Nutrient management in finger millet (*Eleusine coracana* L.) on hilly area of south Gujarat. *Green Farming* **2**(6): 658-660.

Elamin, A. Y. and Madhvi, K. (2015). Residual effect of integrated nutrient management on growth and yield parameters of *rabi* chickpea (*Cicer arietinum* L.) under cropping system. *American J. Scientific Industrial Res.,* **6**(5): 103-109.

Gudadhe, N. N.; Khang, V. T.; Thete, N. M.; Lambade, B. M. and Jibhkate, S. B. (2011). Studies on organic and inorganic sources of nutrient

application in cotton-chickpea cropping sequence. *Omon Rice*, **18**: 121-128.

Imade, S. R. (2014). Effect of integrated nitrogen management in finger millet-green gram cropping sequence under south Gujarat condition. Ph.D. Thesis (Unpublished) Submitted to NAU, Navsari (Gujarat).

Jagathjothi, N. and Ramamoorthy, K. (2015). Integrated nutrient management and method of application on nutrient uptake, microbial population and different efficiency in rainfed direct sown finger millet (*Eleusine coracana L. Gaertn*.). *Int. J. Sci. Nature* **6**(3): 376-381.

Jagathjothi, N.; Ramamoorthy, K. and Sathya Priya, R. (2010). Influence of enriched FYM with inorganic fertilizers on nutrient uptake, soil available nutrients and productivity of rainfed finger millet. *Madras Agril. J.,* **97**(10-12): 385-387.

Jat, R. A.; Arvadia, M. K.; Tandel, B.; Patel, T. U. and Mehta, R. S. (2012). Response of saline water irrigated green gram (*Vigna radiata*) to land configuration, fertilizer and farm yard manure in Tapi command area of South Gujarat. *Indian J. Agron.*, **57**(3): 270-274.

Mansuri, R. N. (2016). Effect of integrated nutrient management in rice-chickpea cropping sequence under south Gujarat condition. Ph. D. Thesis (Unpublished) Submitted to NAU, Navsari (Gujarat).

Nakarani, U.; Singh, D. and Suthar, K. P. (2018). *Millets: The Source of Nutrient*. Krishi Jagrana, July, 2018, pp. 31-33.

Nawale, S. S.; Pawar, A. D.; Lambade, B. M. and Ugale, N. S. (2009). Yield maximization of chickpea through INM applied to sorghum-chickpea cropping sequence under irrigated condition. *Legume Res.,* **32**(4): 282-285.

Pallavi, C. H.; Joseph, B.; Ariff Khan, M. A and Hemalatha, S. (2016). Effect of integrated nutrient management on nutrient uptake, soil available nutrients and productivity of rainfed finger millet. *Int. J. Sci. Environ. Technol.,* **5**(5): 2798-2813.

Patel, J. V.; Thanki, J. D. and Desai, L. J. (2018). Residual effect of integrated nutrient management in finger millet on growth and yield parameters of *rabi* green gram under finger millet-green gram cropping sequence. Int. J. Pure Appl. Biosci., **6(**5**)**: 564-568.

Prasad, R.; Shivay, Y. S.; Kumara, D. and Sharma, S. N. (2006). *Learning by Doing Exercise in Soil Fertility: A Practical Manual for Soil Fertility,* Division of Agronomy, Indian Agricultural Research Institute, New Delhi.

Raman, R. and Krishnaprabhu, S. (2004). Effect of integrated nutrient management on nutrient uptake and yield of finger millet. *J. Ecobiol.,* **16**(3): 197-200.

Rao, S. I. V. (1994). Integrated nutrient management for sustainable productivity of oilseed in India. In : MVR Prasad *et al*. Ed. Sustainability in Oilseeds. *Indian Society of Oilseeds Research,* Hyderabad, pp. 264-270.

Shanwad, U. K.; Aravindkumar, B. N.; Hulihalli, U. K.; Surwenshi, A.; Reddy, M. and Jalageri, B.R. (2010). Integrated nutrient management (INM) in maize-bengal gram cropping System in Northern Karnataka. *Res. J. Agril. Sci.,* **1**(3): 252-254.

Singh, N. P.; Sachan, R. S.; Pandey, P. C. and Bisht, P. S. (1999). Effect of a decade long fertilizer and manure application on soil fertility and productivity of rice-wheat system in Mollisol. *J. Indian Soc. Soil Sci.*, **47**(1): 72-80.

Srivastava, O. P. (1998). Integrated nutrient management for sustained fertility of soil. *Indian J. Agril. Chem.*, **31**: 1-12

Steel, R. G. D. and Torrie, J. H. (1980). *Principles and Procedures of Statistics*, 2nd Edition, pp. 172-77. McGraw Hill Book Book Co., Singapore.

Umesh, M. R.; Sharanappa; Shrinivasa, K. R. and Kirankumar, K. C. (2006). Effect of cropping systems and integrated nutrient management on growth, yield and nutrient uptake of finger millet under rainfed conditions. *Crop Res.*, **31**(3): 366-369.

Table 1: Mean grain and straw yield of finger millet (kg/ha) and nutrient (NPK) content (%) of finger millet grain and straw at harvest as influenced by different treatments (2 years pooled data)

Treatments	Grain Yield (kg/ha)	Straw Yield (kg/ha)	NPK Content in Finger Millet Grain			NPK Content in Finger Millet Straw		
			N Content (%)	P Content (%)	K Content (%)	N Content (%)	P Content (%)	K Content (%)
T_1: General RDF (RDF + FYM @ 10 t/ha)	2264	5413	0.790	0.191	0.708	0.615	0.079	1.579
T_2: 75% RDN through chemical fertilizer + 25% RDN through biocompost	2035	5046	0.760	0.186	0.696	0.606	0.076	1.534
T_3: 75% RDN through chemical fertilizer + 25% RDN through vermicompost	2201	5134	0.774	0.189	0.700	0.611	0.078	1.554
T_4: 75% RDN through chemical fertilizer + 25% RDN through FYM	1946	4869	0.748	0.184	0.688	0.603	0.075	1.516
T_5: Control	1750	4255	0.714	0.181	0.675	0.593	0.075	1.476
S.Em $\pm$	61.69	139.65	0.011	0.006	0.023	0.012	0.001	0.032
CD (P=0.05)	178.70	404.47	0.032	NS	NS	NS	NS	NS
CV (%)	9.15	8.60	4.06	8.86	6.73	6.16	4.34	6.45
General mean	2039	4943	0.757	0.186	0.693	0.606	0.077	1.532

Table 2: NPK uptake (kg/ha) by finger millet (grain and straw) at harvest as influenced by different treatments (2 years pooled data)

Treatments	Nitrogen Uptake (kg/ha)		Phosphorus Uptake (kg/ha)		Potassium Uptake (kg/ha)	
	Grain	Straw	Grain	Straw	Grain	Straw
T_1: General RDF (RDF: 40-20-00 kg NPK/ha + FYM @ 10 t/ha)	17.90	33.33	4.32	4.27	16.68	85.54
T_2: 75% RDN through chemical fertilizer + 25% RDN through biocompost	15.50	30.63	3.79	3.85	14.96	77.57
T_3: 75% RDN through chemical fertilizer + 25% RDN through vermicompost	17.05	31.41	4.16	4.01	16.28	79.79
T_4: 75% RDN through chemical fertilizer + 25% RDN through FYM	14.56	29.41	3.59	3.67	13.91	73.87
T_5: Control (No fertilizer)	12.56	25.25	3.20	3.19	12.36	62.86
S.Em $\pm$	0.58	1.08	0.17	0.11	0.96	2.59
CD (P=0.05)	1.68	3.14	0.50	0.33	2.96	7.52
CV (%)	11.32	11.01	13.84	9.03	12.96	10.42

Table 3: Mean seed and stover yields (kg/ha) as well as nutrient content in seed and stover of greengram influenced by different treatments (2 years pooled data)

Treatments	Seed Yield (kg/ha)	Stover Yield (kg/ha)	NPK Content in Seed			NPK Content in Stover		
			N Content (%)	P Content (%)	K Content (%)	N Content (%)	P Content (%)	K Content (%)
I). Main plot treatment (*kharif* finger millet)								
T_1: General RDF (RDF + FYM @ 10 t/ha)	1023	2603	3.166	0.136	1.040	0.903	0.082	1.594
T_2: 75% RDN through chemical fertilizer + 25% RDN through biocompost	943	2373	3.131	0.132	1.023	0.894	0.081	1.576
T_3: 75% RDN through chemical fertilizer + 25% RDN through vermicompost	972	2422	3.149	0.133	1.032	0.897	0.083	1.585
T_4: 75% RDN through chemical fertilizer + 25% RDN through FYM	915	2323	3.112	0.130	1.014	0.890	0.080	1.568
T_5: Control	851	2212	3.071	0.124	0.995	0.880	0.078	1.547
S.Em $\pm$	13.97	30.38	0.010	0.002	0.009	0.008	0.001	0.011
CD (P=0.05)	40.47	87.98	0.030	0.004	NS	NS	0.003	NS
CV (%)	9.06	9.32	2.13	7.48	5.52	5.43	6.88	4.46
II). Sub plot treatment (*rabi* greengram)								
S_1 : Control	726	2011	2.988	0.116	1.003	0.879	0.079	1.557
S_2 : 50 % RDF	869	2262	3.079	0.125	1.015	0.889	0.080	1.562
S_3 : 75 % RDF	1035	2552	3.186	0.138	1.025	0.894	0.081	1.584
S_4 : 100 % RDF	1133	2722	3.250	0.146	1.041	0.910	0.082	1.594
S.Em $\pm$	12.12	34.62	0.010	0.001	0.008	0.007	0.001	0.010
CD (P=0.05)	34.09	97.40	0.029	0.004	NS	0.019	NS	NS
CV (%)	8.25	7.56	1.89	6.50	4.71	4.91	6.27	3.94
Interaction (M x S)								
S.Em $\pm$	25.76	1.33	0.022	0.003	0.016	0.015	0.002	0.021
CD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS
General mean	941	28.08	3.13	0.131	1.021	0.893	0.080	1.574

Table 4: Mean seed and stover yields (kg/ha) as well as nutrient uptake in seed and stover of green gram influenced by different treatment (2 years Pooled data)

Treatments	Nitrogen Uptake (kg/ha)		Phosphorus Uptake (kg/ha)		Potassium Uptake (kg/ha)	
	Grain	Straw	Grain	Straw	Grain	Straw
I). Main plot treatment (*kharif* finger millet)						
T_1: General RDF (RDF + FYM @ 10 t/ha)	32.61	23.54	1.42	2.15	10.69	41.56
T_2: 75% RDN through chemical fertilizer + 25% RDN through biocompost	29.76	21.25	1.26	1.92	9.70	37.48
T_3: 75% RDN through chemical fertilizer + 25% RDN through vermicompost	30.82	21.81	1.32	2.01	10.08	38.48
T_4: 75% RDN through chemical fertilizer + 25% RDN through FYM	28.68	20.74	1.21	1.85	9.32	36.49
T_5: Control	26.26	19.51	1.07	1.72	8.48	34.25
S.Em $\pm$	0.54	0.39	0.03	0.03	0.20	0.58
CD (P=0.05)	1.55	1.12	0.08	0.09	0.59	1.68
CV (%)	11.02	11.38	13.01	11.06	12.78	10.69
II). Sub plot treatment (*rabi* green gram)						
S_1 : Control	21.74	17.71	0.84	1.60	7.31	31.35
S_2 : 50 % RDF	26.82	20.11	1.09	1.81	8.85	35.36
S_3 : 75 % RDF	33.04	22.84	1.43	2.07	10.63	40.45
S_4 : 100 % RDF	36.90	24.82	1.66	2.24	11.83	43.45
S.Em $\pm$	0.48	0.38	0.02	0.03	0.18	0.63
CD (P=0.05)	1.34	1.06	0.07	0.09	0.51	1.76
CV (%)	10.27	10.94	12.23	9.01	12.01	9.25
Interaction (M x S)						
S.Em $\pm$	1.01	0.81	0.05	0.07	0.39	1.34
CD (P=0.05)	NS	NS	NS	NS	NS	NS
General mean	29.63	21.37	1.25	1.93	9.65	37.65

[MS received : October 26, 2018] ***[MS accepted :November 01, 2018]***