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Integrated nutrient management in greengram [*Vignaradiata* (L.) Wilczek] cultivars

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Abstract
A field experiment was conducted during *kharif*, 2014 at Agronomy Instructional Farm, C.P. College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, to study the "yield attributes and yield ofgreengram [*Vignaradiata* (L) Wilczek] cultivars as influenced by integrated nutrient management." Fourteen treatment combinations comprising of two varieties of greengram viz., Meha(V_1) and GM 4(V_2) and seven treatments of integrated nutrient management viz., 100% RDF(N_1), 75% RDF + 2 t FYM/ha(N_2), 75% RDF+Rhizobium+PSB,75% RDF + 2 t FYM/ha + Rhizobium + PSB, 50% RDF+ 4 t FYM/ha, 50% RDF + Rhizobium + PSB and 50% RDF + 4 t FYM/ha + Rhizobium + PSB were evaluated. The results revealed that greengram cultivar Meha performed better by recording 17.3 and 15.3 per cent higher seedand stover yield, respectively over GM 4. Variety GM 4 registered maximum nitrogen content while phosphorus content and uptake of N & P were recorded significantly higher with variety Meha. Combined application of 75% RDF from urea+2 t FYM/ha + Rhizobium + PSB recorded higher values for number of plant height, number of branches per plant, pods per plant, fresh and dry weight of root nodules, number of seeds per pod, pod length, number of seed per pod, 1000-seeds weight which resulted higherseed (746 kg/ha) and stover (1806) yield over other combination and sole application of organic and inorganic source of nitrogen. Maximum content and uptake of N and P were registered with combined application of 75% RDF from urea+2 t FYM/ha + Rhizobium + PSB.

Keywords: Greengram, INM, yield, content, uptake

Introduction
Contribution of pulses to agriculture and daily life has been tremendous besides being one of the important constituent of our diet.Greengram is one of the most ancient and extensively grown pulse crops of India. The agronomical importance of greengram is linked to its high protein content and other essential minerals, especially micronutrients. The productivity of greengram in India is very low and far below the other greengram-growing countries. Development of short duration as well as photo and thermo insensitive as well as yellow vein mosaic resistant varieties provided excellent opportunity for greengramcultivation.The adoption of modern farming practices and integrated nutrient management is essential to produce crops in line with the observed global standards of quantity and quality. The high cost of chemical nitrogen fertilizer and low purchasing power of Indian farmers restricts its use on proper amounts, hampering crop production. Reliance on the increased use of chemical fertilizers and associated hazards put back attention on organic sources which are effective in promoting health and productivity of the soil. In addition to supply of nutrients, organic source improves the physical condition and biological health of soil, which improves the availability of applied and native nutrients (Dick and Gregorich, 2004) [2]. With a view to reduce the losses and indiscriminate use of chemical fertilizers, substitution of part of the chemical fertilizer by locally available organic sources of nutrients (Farmyard manure) andbiofertilizers(*Rhzobium* and PSB) is inevitable. Therefore, in the present context, a judicious combination of organic, inorganic fertilizers and biofertilzers helps to maintain soil and crop productivity. The lack of information on these aspects under *kharif* conditions made as impetus to undertake the present study.

Materials and Methods
A field experiment was conducted during *kharif*season of 2014 at Agronomy Instructional Farm, Department of Agronomy, Chimanbhai Patel College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, to study the "yield

attributes and yield ofgreengram (*Vignaradiata* (L.) Wilczek) cultivars as influenced by integrated nutrient management".The soil of the experimental field was loamy sand in texture, low in organic carbon (0.17 %) and available nitrogen (160.7 kg/ha), medium in available phosphorus (38.9 kg/ha) and available potash (286.0 kg/ha) with 7.2 soilp H. Fourteen treatment combinations comprising of two varieties of greengram viz., Meha and GM 4 and seven treatments of integrated nutrient management viz., 100% RDF(20:40:0 kg NPK/ha),75% RDF + 2 t FYM/ha, 75% RDF+Rhizobium+PSB), 75% RDF+ 2 t FYM/ha + Rhizobium+PSB, 50% RDF+ 4 t FYM/ha, 50% RDF + Rhizobium + PSB and 50% RDF + 4 t FYM/ha + Rhizobium+PSB) were evaluated in factorial randomized block design replicating three times. Recommended dose of phosphorus @40 kg P_2O_5/ha was supplemented through single supper phosphate and applied at the time of sowing. All other cultural practices were performed uniformly for all treatments. Greengram varieties were sown manually on 3rd July, 2014 using recommended seed rate of 18 kg/ha and keeping 45 cm distance between two rows at the depth of about 4-5 cm. Weeding and plant protection measures were undertaken as per the need and the required plant population was maintained.

Result and Discussion

Effect of Varieties

Growth, yield attributes and yield of greengram were significantly influenced due to different varieties. Variety GM 4 recorded significantly higher plant height (54.66 cm),weight of fresh(0.37 g) and dry(0.094 g) nodules per plant, length of pod (6.76 cm), number of seeds per pod(9.78) and 1000 seeds weight(39.36 g) as compared to variety Meha, but more number of branches per plant (7.24),number of pods per plant(25.61) and seed yield per plant(5.14 g) was noted with Meha as compared to GM 4(Table 1). This difference in yield attributing characters between two varieties might be due to genetic constitution of these varieties.The variety Meha registered significantly higher seed (656 kg/ha) and stover yields (1693 kg/ha) as compared to variety GM 4(Table 2). Variety Meha increased the seed and stover yield to the tune of 17.3 and 15.3 per cent over variety GM 4. This might be due to a variety of crop differed in its genetic built up and registered more numbers of pods per plant and seed yield per plant hence resulted in the yield potential. The above findings are in complete agreement with earlier work of Uddin *et al.*, (2009) [10], Patel *et al.*,(2013) [6], Gorade *et al.*,(2014) [4] and Rathod *et al.*, (2014) [8]. The content and uptake of N and P were affected significantly due to different varieties. Significantly maximum N content in seed(3.54%) and stover(0.76%) was registered in variety GM 4 compared to Meha. While maximum P content in seed(0.62 %) and stover(0.23 %) was recorded in variety Meha(Table 2). In case of uptake of N and P, Variety Meha recorded higher N and P uptake by seed, stover and total by the crop than variety GM 4.Total N and P uptake by Meha variety was 11.03 and 28.96 per cent higher than variety GM 4. These differential uptakes by different varieties were might be due to the significant yield variation between varieties. Similar results were also reported by Patel *et al.,* (2013) [6] and Gorade *et al.,* (2014) [4].

Effect of Integrated nutrient management

Application of 75 % RDF + 2 t FYM / ha + *Rhizobium* + PSB registered maximum plant height(58.20 cm),branches per plant(7.73),fresh(0.48 g) and dry weight(0.122 g) of root nodules, pods per plant (26.00), length of pod(6.95 cm), no of seeds per pod (10.23) and seed yield per plant(5.97 g) over rest of the treatment combinations(Table 1).Maximum seed(746 kg/ha) and stover yield (1806 kg/ha) of greengram were recorded from plot fertilized with treatment combination of 75 % RDF + 2 t FYM / ha + *Rhizobium* + PSB followed by 50% RDF+ 4 t FYM/ha+*Rhizobium*+PSB(Table 2). Both the treatments were found significantly superior over the rest of all other treatment combination for yield and yield attributing parameters. The highest seed yield per hectare gained under these treatments might be due to chemical fertilizer in conjunction with FYM and bio fertilizers might have provided favorable soil environment and nourishment for better plant growth resulted in maximum seed yield per hectare. Positive response in terms of yield attributes to integrated nutrient management have also been reported by Rajkhowa *et al.* (2002) [7], Yakadri *et al.* (2002) [11], Chaudhary *et al.* (2003) [1], Reddy *et al.,* (2011) [9] and Patel *et al.* (2013) [6]. Different integrated nutrient management treatment did not express significant influence on 1000 seed weight of greengram.

N and P content and uptake were affected significantly due to different integrated nutrient management treatment(Table 2). Maximum N and P content in seed and stover as well as nitrogen uptake and phosphorus uptake by seed, stover and total by the crop were registered when crop fertilized with 75% RDF+ 2 t FYM/ha + *Rhizobium* + PSB (N_4) followed by N_7 (50% RDF+ 4 t FYM/ha +*Rhizobium* +PSB). This increased content and uptake by seed and stover might be due to increased yield of seed and stover under treatment N_4. These results are in accordance with the results of those reported by Ghanshyam *et al.* (2010) [3], Jat *et al.*,(2012) [3] and Patel *et al.* (2013) [6] with respect to N and P content as well as uptake.

Table 1: Growth and Yield attributes of greengram as influenced by integrated nutrient management.

Treatment	Plant Height (cm)	No. of Branches / plant	Weight of Root Nodules (g)		No. of Pods/ plant	Pod length (cm)	No. of seeds / pod	Seed yield/ plant (g)	1000 seed weight (g)	Seed yield (kg/ha)	Stover Yield (kg/ha)
			Fresh	Dry							
[A] Varieties											
V_1 : Meha	50.96	7.24	0.35	0.089	25.61	6.26	9.34	5.14	37.64	656	1693
V_2 : GM 4	54.66	6.83	0.37	0.094	21.22	6.76	9.78	4.60	39.36	559	1468
C.D.(P=0.05)	2.93	0.40	0.017	0.005	1.48	0.21	0.41	0.24	1.11	39	120
[B] Integrated nutrient management											
N_1 :100% RDF(20:40:0 kg NPK/ha)	51.47	6.27	0.27	0.068	23.10	6.41	9.40	4.53	37.79	565	1528
N_2 :75% RDF+2 t FYM/ha	52.60	6.68	0.22	0.056	23.57	6.43	9.23	4.97	38.55	624	1621
N_3 : 75% RDF+*Rhizobium* + PSB	52.10	7.13	0.44	0.112	23.23	6.49	9.70	4.81	38.55	602	1559
N_4:75%RDF+2tFYM/ha+*Rhizobium*+PSB	58.20	7.73	0.48	0.122	26.00	6.95	10.23	5.97	39.55	746	1806
N_5 :50% RDF + 4 t FYM/ha	50.33	6.93	0.26	0.066	21.60	6.31	9.20	4.49	37.60	543	1404

N_6:50% RDF+*Rhizobium* + PSB	49.37	7.03	0.43	0.109	21.73	6.30	9.17	4.02	38.14	499	1435
N_7:50%RDF+4tFYM/ha+*Rhizobium*+PSB	55.60	7.47	0.42	0.106	24.67	6.67	10.00	5.27	39.35	675	1713
C.D.(P=0.05)	5.49	0.75	0.03	0.009	2.78	0.40	0.76	0.44	NS	73	225

Table 2: Nutrient content and uptake by greengram as influenced by various treatments.

Treatment	N content (%)		P content (%)		Nitrogen Uptake (kg/ha)			Phosphorus Uptake (kg/ha)		
	Seed	Stover	Seed	Stover	Seed	Stover	Total	Seed	Stover	Total
[A] Varieties										
V_1 : Meha	3.39	0.72	0.62	0.23	22.30	12.12	34.42	4.06	3.91	7.97
V_2 : GM 4	3.54	0.76	0.58	0.20	19.86	11.15	31.01	3.29	2.90	6.19
S.Em.±	0.04	0.01	0.01	0.003	0.53	0.29	0.66	0.10	0.10	0.18
C.D.(P=0.05)	0.12	0.03	0.02	0.01	1.53	0.86	1.91	0.29	0.30	0.51
[B] Integrated Nutrient Management										
N_1: 100% RDF(20:40:0 kg NPK/ha)	3.50	0.67	0.52	0.20	19.67	10.18	29.85	2.91	3.02	5.93
N_2: 75% RDF+2 t FYM/ha	3.31	0.72	0.51	0.19	20.58	11.51	32.09	3.16	3.09	6.25
N_3: 75% RDF+*Rhizobium* + PSB	3.49	0.76	0.64	0.23	20.95	11.78	32.73	3.85	3.62	7.47
N_4: 75%RDF+2tFYM/ha+*Rhizobium*+PSB	3.63	0.79	0.66	0.24	27.00	14.21	41.21	4.94	4.42	9.36
N_5: 50% RDF + 4 t FYM/ha	3.35	0.69	0.58	0.20	18.16	9.63	27.79	3.19	2.84	6.03
N_6: 50% RDF+*Rhizobium* + PSB	3.40	0.76	0.65	0.21	17.01	10.96	27.97	3.24	3.05	6.29
N_7: 50%RDF+4tFYM/ha+*Rhizobium*+PSB	3.60	0.77	0.65	0.22	24.19	13.16	37.35	4.44	3.76	8.20
S.Em.±	0.07	0.02	0.02	0.01	0.98	0.55	1.23	0.18	0.20	0.33
C.D. (P=0.05)	0.22	0.06	0.05	0.02	2.86	1.60	3.58	0.53	0.57	0.96

Conclusion

Based on the results from one year experimentation it is concluded that quantitative and economical production from *kharif*greengram in loamy sand soil can be secured by growing variety Meha and fertilized with 75% RDF (20:40:0 kg NPK/ha)+2 t FYM / ha + Rhizobium + PSB.

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