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Research Article

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Effect of different modules on yield and yield attributes of greengram (*Vigna radiata* L.) grown on light textured soil of Kachchh region

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Summary

A field experiment consisting of five different modules among three organic module, one chemical module and control was conducted during *Kharif* season from 2009-10 to 2014-15 with five quadrates in each module (2m×2m) under Randomized Block Design at Regional Research Station, SDAU, Bhachau, Kachchh to study the effect of different modules on yield and yield attributes of greengram grown on light textured soil of Kachchh. The results of the experiments differed significantly. The significant improvement in yield attributes and yield was recorded with the chemical moduleT_4. Organic modules T_2 and T_3 recorded the highest growth improvement and yield as compared to control.

Key words : Greengram, Organic module, Chemical module, Yield, Yield attributes

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Introduction

Kachchh is the largest district and covers one third part of the Gujarat. Pulses are becoming major crops growing under Kachchh region. Among the pulses greengram (*Vigna radiata* L.) is one of the most important and extensively cultivated pulse crops, whose nutrient requirement is very low. Compared to other parts of Gujarat, Kachchh contains highest amount of degraded lands. Main cause for the degradation of land are the arid and semi-arid climatic condition, salinization, alkalinization, light texture soil with low organic carbon content and poor water holding capacity. The soils of arid and semi-arid regions have very low inherent productivity potential due to physical and nutritional constraints and are highly vulnerable to various degradation processes.

Presently the crops are grown under the application of chemical fertilizers and pesticides which in turn increase land degradation and health hazards of living organisms. Most of the increase in agricultural production will have to be obtained through increased productivity from the existing agricultural land. This can be achieved by improved management practices through organic farming. Use of organic manures in soil plays vital role in maintenance of native soil fertility. It not only increases the moisture holding capacity of the soil but also plays an important role in soil and water conservation by their binding and aggregation properties. Moreover, they also help in balancing the nutrient availability to growing as well as succeeding crop plants and boost up the

production and quality of crop. Organic manures supplies substantial amounts of humus substances. Humus improves the structure, drainage, aeration of the soil, water holding capacity, buffer and exchange capacity and solubility of soil minerals. One of the important features of sustainable agriculture is less dependence on chemical fertilizers, which can be achieved by recycling of on-farm wastes to maintain and improve fertility of the soil (Parr *et al.,* 1990). Any strategy facilitating recycling of organic materials in these soils through application of organic manures could prove as panacea to the soil related constraints. Indian subcontinent, which feeds more than a billion people, generates huge quantity of recyclable crop residues. If these organic wastes are not recycled appropriately, it may pose serious environmental problems. Organic materials can easily be converted to a high quality manure in combination with other farm based organic materials such as sorghum stubbles, wheat straw, soybean straw, weed biomass and cattle dung using efficient strains of earthworms. Biofertilizers in combination with fertilizers are very effective for increasing crop productivity (Singh *et al*., 2007). Vermi composting is particularly effective when measured in terms of fertilizer equivalent, because it produces castings of high fertilizer value. Barley and Jennings (1959) showed that a vast portion of non-available nitrogen present in organic matter became available to the plant through the process of vermi composting.

The use of organic manures and bio-pesticides in greengram in preference to chemical fertilizers and pesticides provides quality food for patient's and produce export quality pulses. Greengram seeds contain about 25 per cent protein of high digestibility and better quality. Sprouted seeds synthesize vitamin C in them. It is also a good source of riboflavin and thiamin. The pulses are the chief sources of protein in a balanced diet in Indian conditions and contribute about 15 per cent of diet (Kumar and Ali, 2001).Organic farming has special importance in Kachchh district in response to less awareness regarding the crop residue and animal waste management and drastic soil and climatic condition. Since greengram is low nutrient demanding crop, organic manuring and biofertilizers are feasible for cultivation of this crop. Hence, the present study on effect of different modules on yield and yield attributes of greengram grown on light textured soil of Kachchh region was under taken.

Resource and Research Methods

The experiment was conducted at Regional Research Station, SDAU, Bhachau during the *Kharif* season from 2009-10 to 2014-15. The soil was sandy

Table A : Details of the module

Treatments	Module details
T_1 (Module1)	**Organic module-I (OFM-I)** Soil application of 20 kg N/ha through FYM + *Trichoderma viride* @ 1.5kg/ha Soil application of phosphorus through enriched compost through PROM @ 40kg/ha Seed treatment with *Rhizobium* @ 30 g/kg seed Install 50 bird perches /ha Application of bio pesticides as per need
T_2 (Module 2)	**Organic module-II (OFM-II)** Soil application of 20 kg N/ha through vermicompost + *Trichoderma viride* @ 1.5kg/ha Soil application of phosphorus through enriched compost through PROM @ 40kg/ha Seed treatment with *Rhizobium* @ 30 g/kg seed Install 50 bird perches /ha Application of bio pesticides as per need
T_3 (Module 3)	**Organic module-III (OFM-III)** Soil application of 20 kg N/ha through FYM + *Trichoderma viride* @ 1.5kg/ha Soil application of phosphorus through enriched compost through PROM + VAM @ 40kg/ha Seed treatment with *Rhizobium* @ 30 g/kg seed Install 50 bird perches /ha Application of bio pesticides as per need
T_4 (Module 4)	**Chemical module-I**V **(CM-IV)** Seed treatment with carbendazim + thiram @ 3 g/kg seed Apply 20 kg N and 40 kg P_2O_5/ha in the form of chemical fertilizer Apply prophenophos 50% EC @ 0.05% when *Helicoverpa* population exceeds 5 larvae/meter row length Spray mancozeb 0.2% if incidence of Aschochyta leaf blight is observed
T_5 (Module 5)	Control

PROM:- Phosphorus enrich organic manure VAM- Vesicular arbuscular mychorizae FYM – Farm yard manure

loam and low in organic matter. The soil pH was 8.03 and having organic carbon (0.27 %), available nitrogen (172.48kg ha^{-1}) and available phosphorus (36.60kg ha^{-1}) and medium in potassium (308.40kg ha^{-1}). The treatments comprised of three organic modules, one chemical module and control, the details of the module are presented in the following Table A.

The experiment was laid out in Randomized Block Design with five quadrates in each module (2m×2m). Manures and fertilizers were applied as per the treatment. Greengram variety GM-4 was sown at the seed rate of 15-20 kg/ha with the spacing of 45cm x 10cm. Gross plot size was 14.5m x 20.5m. Further observations were recorded and statistical analysis was done. The BCR value was computed by dividing net return by total expenditure of each module.

Research Findings and Discussion

The results obtained from the present investigation as well as relevant discussion have been summarized under following head :

Effect of different modules on yield attributes :

The pooled data of yield attributes from year 2009-10 to 2014-15 are presented in Table 1. The results from the Table 1 indicated that there was significant difference among the treatments regarding the yield attributes *viz.*, plant height, number of branches per plant, number of pods per plant, pod length and number of seeds per pod. Module T_4 recorded the maximum plant height (47cm), followed by modules T_2 (43cm), T_3 (42cm), T_1 (41cm) which were at par with each other and least plant height that is 38 cm was recorded with the module T_5 (control). Regarding the number of branches module T_4 recorded the maximum number of branches per plant (6.08), followed by modules T_2 (5.62) and T_3 (5.40) which were at par with each other and least number of branches were recorded with the module T_5 (control). Module T_4

Table 1 : Effect of different modules on yield attributes of greengram (Pooled data)

Treatments	Plant height (cm)	Branches/plant	Pods/plant	Pod length	Seeds/pod
Modules-1	41	5.22	29	8.00	9.56
Modules-2	43	5.62	34	8.89	9.90
Modules-3	42	5.40	30	8.23	9.93
Modules-4	47	6.08	35	8.97	10.29
Modules-5	38	4.81	25	7.59	9.13
S.E.±	0.72	0.09	1.10	0.14	0.15
C.D. (P=0.05)	2.02	0.25	3.08	0.40	0.43
CV%	9.30	8.85	8.02	8.92	7.86

Table 2 : Effect of different modules on seed and straw yield of greengram

Seed yield (kg ha^{-1})							Straw yield (kg ha^{-1})					
Treatments	2009-10	2010-11	2011-12	2013-14	2014-15	Pooled	2009-10	2010-11	2011-12	2013-14	2014-15	Pooled
Modules-T_1	395	593	609	765	876	648	443	750	843	950	1129	823
Modules-T_2	579	868	964	1050	967	886	779	1081	1174	1239	1144	1083
Modules-T_3	499	751	768	880	718	723	592	950	1042	1124	882	918
Modules-T_4	726	991	1074	1135	1046	995	846	1264	1356	1445	1328	1248
Modules-T_5 (Control)	329	494	503	580	525	486	390	690	779	825	751	687
S.E.±	35.09	42.72	39.31	56.90	59.25	22.50	32.17	60.19	57.28	67.65	66.59	27.45
C.D. (P=0.05)	105.20	128.09	117.85	170.60	177.64	62.37	96.44	180.46	171.74	202.84	199.56	76.09
YXT S.E.±						47.64						58.22
C.D. (P=0.05)						NS						NS
CV%	15.52	12.92	11.22	14.42	16.03	14.25	11.78	14.21	12.33	13.55	14.22	13.68
Av. rainfall (mm)	102.5	981.5	917.0	901.0	319.0	644.2	102.5	981.5	917.0	901.0	319.0	644.2
and rain day	(11)	(28)	(27)	(27)	(19)	22.4	(11)	(28)	(27)	(27)	(19)	22.4

NS= Non-significant

Table 3 : Effect of different modules on yield and economics of greengram crop (pooled)

Treatments	Gross income (Rs. ha^{-1})	Total expenditure Rs. ha^{-1}	Net return Rs. ha^{-1}	BCR
Modules-T_1	42969	12200	30769	2.52
Modules-T_2	58624	18525	40099	2.16
Modules-T_3	47942	22275	25667	1.15
Modules-T_4	53494	9358	44136	4.71
Modules-T_5 (Control)	32436	7050	25386	3.60

(35) and T_2 (34) recorded the maximum number of pods per plant and these were at par with each other, followed by modules T_3 and T_1 which were at par with each other and least number of pods per plant were recorded with the module T_5 (control). Module T_4 and T_2 recorded the maximum pod length and these were at par with each other and least pod length was recorded with the module T_5 (control). Module T_4 (10.29), T_3 (9.93) and T_2 (9.90) recorded the maximum number of seeds per pod and these were at par with each other, least number of seeds per pod was recorded with the module T_5 (control) that is 9.13. The significant improvement in growth parameters with the module T_4 that is application of recommended dose of fertilizers might be attributed to quick and easy availability of nutrients through fertilizers. The above results are in agreement with the findings of Dadgale *et al*. (2011); Owla *et al*. (2006) and Yakadri *et al*. (2002).

Effect of different modules on yield :

Results of Table 2 show that there was significant difference among the different treatments for seed and straw yield in both individual years as well as in pooled data. The maximum seed and straw yield were recorded in module T_4 in both individual years and pooled data as compared to organic module and control. In case of organic modules T_2 followed by T_3 were found best for seed and straw yield, due to improvement of soil physical, chemical and biological properties cumulatively benefited the greengram crop.

Economical analysis of the treatments (Table 3) shows that significantly higher net returns and higher B:C ratio were obtained with the application of recommended dose of fertilizer (T_4- Chemical module) because of less total expenditure. Similar results were also recorded by the Suman *et al*. (2006). In case of organic modules T_2 recorded the maximum net returns compared to other organic modules and control these results are in confirmation with the Dadgale *et al*. (2011).

Conclusion :

Among the different modules experiment, application of recommend dose of fertilizer,(module T_4), contributed for maximum growth and yield of the greengram. In case of among all organic modules, soil application of vermicompost (moduleT_2) recorded the maximum growth, yield and economic benefits along with maintaining the soil fertility and protect the environment from the ill effects of chemical fertilizers.

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