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RESEARCH PAPER

Evaluation of different modules on yield and yield attributes of mothbean (*Vigna aconitifolia* Jacq.) marchel grown on light textured soil of Kachchh region

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

Key Words : Yield, Yield attributes, FYM, Vermi compost, VAM

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INTRODUCTION

Mothbean is one of the important legumes widely grown in arid and semi arid parts of the country. Mothbean are a good source of protein (24%) and are high in dietary fibres. In India it is mostly confined to Gujarat, Karnataka, Rajasthan, Maharashtra and Haryana. In Gujarat Kachchh is the largest district and covers one third part of the Gujarat. Pulses are becoming major crops growing under Kachchh region. 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. Mothbean is minor *Kharif* pulse crop and considered as one of the most drought tolerant among the grain legumes (Arunakumar and Uppar, 2007).

Yield of mothbean is much less as compared to other pulse crops. Hence, there is a need to enhance the

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production potential of this crop by use of organic manures, biofertilizers and micronutrients in combination. Chemical fertilizers play an important role to meet nutrient requirement of the crop but continuous use of these on lands will have deleterious effects on physical chemical and biological properties of soil, which in turn reflects on yield (Sarkar *et al*., 1997). Therefore, there is an urgent need to reduce the usage of chemical fertilizers and in turn increase the usage of organic manures which are known to improve physico-chemical properties of soil and supply the nutrients in available form to the plants. In recent years organic farming is becoming great importance for sustainable agriculture to stop deterioration of the agricultural lands and environment, to get yield safer for human beings and animals and to encourage the natural enemies of harmful insects and soil borne diseases (Gomaa *et al.*, 2005).

Application of vermicompost favorably improves the physical properties of soil. This might be due to higher addition of humus through organics (Pandey *et al*., 2007). FYM is known to play an important role in improving the fertility and productivity of soils through its positive effects on soil physical, chemical and biological properties and balanced plant nutrition. It improves the structure and water holding capacity of soil (Kumar *et al.*, 2011). Hence, the present study on effect of different modules on yield and yield attributes of mothbean grown on light textured soil of Kachchh region was under taken.

MATERIAL AND 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 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.

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 @ 40 kg/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 @ 40 kg/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-IV (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

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. Mothbean variety GM-2 was sown at the seed rate of 15-20 kg/ha with the spacing of 45 cm x 10 cm. Gross plot size was 14.5 m x 20.5 m. Further observations were recorded and statistical analysis was done. The BCR value was computed by dividing net return by total expenditure of each modules.

RESULTS AND DISCUSSION

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

Effect of different modules on yield attributes :

In the Table 1 the pooled data of yield attributes from year 2009-10 to 2014-15 are presented. The results

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

Treatments	Plant height (cm)	Branches/plant	Pod/plant	Pod length (cm)	Seeds/pod
Modules-T_1	29	22.31	61	4.48	5.09
Modules-T_2	31	23.16	66	4.83	5.46
Modules-T_3	30	21.73	63	4.63	5.16
Modules-T_4	33	24.39	68	5.08	5.64
Modules-T_5 (Control)	24	16.59	50	3.84	4.65
S.E.±	0.612	0.435	1.065	0.066	0.107
C.D. (P=0.05)	1.70	1.21	2.95	0.18	0.30
CV%	10.81	9.67	8.40	7.35	10.98

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

Treatments	Seed yield (kg ha^{-1})						Straw yield (kg ha^{-1})					
	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	893	1254	1250	1278	1205	1176	1290	1708	1725	1751	1657	1626
Modules-T_2	969	1304	1344	1379	1268	1253	1624	1802	1820	1856	1707	1762
Modules-T_3	945	1269	1290	1315	1079	1180	1431	1763	1780	1805	1482	1652
Modules-T_4	1177	1325	1375	1407	1293	1316	1712	1851	1890	1921	1767	1828
Modules-T_5 (Control)	814	899	908	931	841	879	1047	1202	1258	1280	1171	1192
S.E.±	66.54	67.63	60.63	70.75	69.33	29.168	69.47	93.71	104.16	91.15	95.07	37.25
C.D.(P=0.05)	199.48	202.75	181.78	212.14	207.86	80.85	208.29	280.95	312.27	273.29	285.02	103.25
YXT S.E.±						65.96						86.45
C.D. (P=0.05)						NS						NS
CV%	15.50	12.49	10.99	12.53	13.63	12.72	10.93	12.59	13.74	11.83	13.65	11.99
Av.rainfall (mm) and rain day	102.5 (11)	981.5 (28)	917.0 (27)	901.0 (27)	319.0 (19)	644.2 (22.4)	102.5 (11)	981.5 (28)	917.0 (27)	901.0 (27)	319.0 (19)	644.2 (22.4)

Table 3: Effect of different modules on economics of mothbean crop (pooled)

Treatments	Gross income Rs. ha^{-1}	Total expenditure Rs. ha^{-1}	Net return Rs. ha^{-1}	BCR
Modules-T_1	78378	12200	66178	5.42
Modules-T_2	83598	18525	65073	3.51
Modules-T_3	78706	22275	56431	2.53
Modules-T_4	71284	9358	61926	6.62
Modules-T_5 (Control)	58514	7050	51464	7.30

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 (33 cm), followed by modules T_2 (31cm), T_3 (30cm) which were at par with each other and least plant height that is 24 cm was recorded with the module T_5 (control). Regarding the number of branches per plant, module T_4 recorded the maximum number of branches per plant (24.39), followed by modules T_2 (23.16) and least number of branches were recorded with the module T_5 (control). Module T_4 (68) and T_2 (66) 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 recorded the maximum pod length that is 5.08 cm followed by module T_2 (4.83) and least pod length was recorded with the module T_5 (control). Module T_4 (5.64), T_2 (5.46) recorded the highest number of seeds per pod and these are at par with each other, least number of seeds per pod were recorded with the module T_5 (control) that is 4.65. The significant improvement in growth parameters with the module T_4 that is application of recommended dose of fertilizers was observed this might be attributed to quick and easy availability of nutrients through fertilizers. In organic modules T_2 followed by T_3 found best for good growth of the plant due to adequate supply of photosynthates for development of sink. Similar results were obtained by Chaudhari *et al*. (2016) in greengram. results are also in agreement with the Gopinathan and Prakash (2015), who reported that vermicompost produced with earthworm digested organic waste are rich in NPK, micronutrients, beneficial soil microbes- nitrogen fixing and phosphate solubilizing bacteria and actinomycets. They are proving as excellent growth promoter and protector. Hence, the maximum plant growth can be obtained by using vermicompost.

Effect of different modules on yield :

Results in the Table 2 showed 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. The increase in seed yield might be due to higher number of pods per plant (68), more number of seeds per pod (5.64), maximum pod length that is 5.08 cm. 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 mothbean crop, results are in agreement with the findings of Gopinathan and Prakash (2015). Sitaram *et. al.* (2014) reported that vermicompost improves the physical, chemical and biological properties of the soil including supply of almost all the essential plant nutrients for the growth and development of plant. Humic acid in vermicompost enhances the availability of both native and added micro- nutrients in soil and thus, plant growth, yield attributes and yield increases.

Economical analysis of the treatments (Table 3) showed that significantly higher net returns was obtained with the module T_1 and T_2 because as compared to chemical module and control. These results are in confirmation with the Dadgale *et al*. (2011) in greengram. All these observation showed that module T_2 can be effectively used to get higher seed and straw yield for organic farming. It improves the soil fertility and save the environment from the ill effects of chemical compound.

Conclusion :

Among all the different modules, module T_4 was found best for growth characters and yield. Among all the organic modules T_2 followed by T_3 recorded the maximum yield and yield attributes. T_2 can be recommended to farmers to insure the public health and a sustainable agriculture. This helps in the realization of environmental friendly and sustainable agriculture.

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