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Comparative study on improved organic practices of summer greengram (*Vigna radiata* L.) at Bharuch district of Gujarat

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Abstract

A field investigation was conducted during the summer season of 2019-20 at the five farmer's field of Bharuch district of Gujarat to evaluate improved organic practices in greengram. The results revealed that greengram seeds treated with *Rhizobium* (5 ml/kg seed), PSB (5 ml/kg seed) and *Trichoderma viride* (3g/kg seed) + NPK: 9:23:00 with DAP 50 kg/ha + FYM: 2 tonnes/ha + Vermicompost (1.0 ton/ha) and need base spray with Agniastra, Dashparni and Chemical insecticides was found superior in terms of increasing growth parameters, yield attributes, yield, economic parameters and nutrient status of soil.

Keywords: Organic practices, INM, growth, yield, greengram

Introduction

Greengram commonly known as 'Moong bean' is an important pulse crop in Gujarat state. Greengram is cultivated in the countries of India, Burma, Srilanka, Pakistan, China, Fiji, Queens land and Africa. India is the major producer of green gram in the world and grown in almost all the States. It is grown in about 29.45 million hectares with the total production of about 23.13 million tonnes of grain with a productivity of about 786 kg/ha. In Gujarat, it is cultivated in an area of about 0.94 million hectares with the production of 0.82 MT with an average yield of 868 kg/ha (Anon., 2018) [8]. Greengram is an excellent source of high quality protein (25%) having high digestibility. It is consumed as whole grains as well as "Dal" in a variety of ways in our food. It is supposed to be easily digestible and hence the patients prefer it. Greengram is also used as green manure crop. It being a leguminous crop has capacity to fix the atmospheric nitrogen (30-40 kg N/ha). Being a short duration crop, it fits well in many intensive crop rotations. Organic farming is a real opportunity for pulses production, expanding the market for organic food. Lower costs of production and good price premium cover any yield reductions under organic production system. Organic farming is targeted to produce nutritive, healthy and pollution free food. It maximizes the use of on-farm resources and minimizes the use of off-farm resources. In organic farming entire system i.e., plant, animal, soil, water and micro-organism are to be protected. Keeping these points in view, the present investigation was undertaken to study the improved organic practices of summer green gram (*Vigna radiata* L.).

Materials and Methods

A field experiment was conducted at five farmer's field of Bharuch district, Gujarat during 2019 in summer season. The treatments were T₁ - Farmers practice [NPK: 09:23:00 with DAP 50 kg/ha with chemical insecticides spray as per need], T₂ - Improved organic package [Seed treatment with *Rhizobium* (5 ml/kg seed), PSB (5 ml/kg seed) and *Trichoderma viride* (3g/kg seed); FYM: 4 tonnes/ha, Phosphate Rich Organic Matter(PROM): 120 kg/ha, and need based application of Neem Oil (2 lit/ha) and *Beauveria basiana* (2.5 kg/ha)], T₃ - Natural farming package [Ghanjeevamrit (250 kg/ha), Jeevamrit (500 lit/ha) at 25 days interval and need based spray of Agniastra and Dashparni] and T₄ - Toward organic package [Seed treatment with *Rhizobium* (5 ml/kg seed), PSB (5 ml/kg seed) and *Trichoderma viride* (3g/kg seed); NPK: 9:23:00 with DAP 50 kg/ha, FYM: 2 tonnes/ha, Vermicompost (1.0 ton/ha) and need base spray of Agniastra, Dashparni and Chemical insecticides].

These treatments were tested in randomized block design with four treatments and five replications. Greengram cv. GAM-5 was sown with spacing of 30 cm x 10 cm on first week of March. Other cultural practices and plant protection measures were taken as per requirements. The data on grain and Stover yield were recorded from net plot and converted on hectare basis. The cost of cultivation was calculated based on the ruling market price of inputs that was prevailed at the time of their use. The net returns per hectare were calculated by reducing the cost of cultivation from the gross income and expressed in rupees per ha (Rs.ha⁻¹). Benefit: Cost ratio was worked out as follows:

$$\text{B: C ratio} = \frac{\text{Gross returns (Rs.ha}^{-1}\text{)}}{\text{Total cost of cultivation (Rs.ha}^{-1}\text{)}}$$

Chemical studies pertaining available nitrogen, phosphorus, potassium and soil organic carbon status in soil before and after harvest of crop were determined as per different methods.

Results and Discussion

1. Effect on growth parameter: The data pertaining to growth parameters are presented in Table 1. Application of different improved organic practices along with the combination of inorganic fertilizers had significant influence on plant height and number of branches per plant at different growth stages of crop. Significantly the highest plant height at 30 DAS (36.04 cm), 60 DAS (53.52 cm) and at harvest (73.12 cm) was recorded under the treatment T₄ - Toward organic package [Seed treatment with *Rhizobium* (5 ml/kg seed), PSB (5 ml/kg seed) and *Trichoderma viride* (3g/kg seed); NPK: 9:23:00 with DAP 50 kg/ha, FYM: 2 t/ha, Vermicompost (1.0 t/ha) and need base spray with Agniastra, Dashparni and Chemical insecticides]. While, lowest plant height of green gram at all the periodical stages was found under the treatments T₁ that received Farmers practice [NPK: 09:23:00 with DAP 50 kg/ha with chemical insecticides spray as per need]. As far as number of branches is concern, significantly higher number of branches per plant at 30 DAS, 60 DAS and at harvest (2.80, 4.95 & 5.70 and 2.68, 4.71 & 5.43) was recorded under the treatment T₄ - Toward organic package [Seed treatment with *Rhizobium* (5 ml/kg seed), PSB (5 ml/kg seed) and *Trichoderma viride* (3g/kg seed); NPK: 9:23:00 with DAP 50 kg/ha, FYM: 2 t/ha, Vermicompost (1.0 ton/ha) and need base spray with Agniastra, Dashparni and Chemical insecticides] and it was remained at par with treatments T₂ - Improved organic package [Seed treatment with *Rhizobium* (5 ml/kg seed), PSB (5 ml/kg seed) and *Trichoderma viride* (3g/kg seed); FYM: 4 t/ha, PROM: 120 kg/ha, and need based application of Neem Oil (2 lit/ha) and *Beauveria basiana* (2.5 kg/ha)], respectively. This might be due to the supply of balanced nutrition and there by availability of major essential nutrients in sufficient quantities to the crop through these nutrient management treatments. Furthermore, the effect observed with the dual inoculation of both the bio-inoculants along with inorganic might be due to the provision of fixation of nitrogen by *Rhizobium* and possible solubilization of fixed P (as well as applied P besides synthesis of growth promoting substances like auxins and gibberellins and produced vitamins which

augmented plant growth by phosphorus solubilizing species, might have improved vigour and resulted in recording higher values of morphological parameters which increased photosynthetic capacity of plant thereby increasing the biological yield in terms of dry matter production. The increase in various growth parameters due to balanced nutrition in green gram were also reported by Rudreshapa and Halikatti (2002)^[2] and Das *et al.* (2002)^[1].

- 2. Effect on yield parameter:** The data pertaining to yield parameters are presented in Table 1. The grain yield of green gram per unit area is contributed by yield attributes *viz.*, number of pods per plant, number of seed per pod, test weight and ultimately the grain and Stover yield obtained from the plant. The results revealed that highest no. of pods per plants (36.16), number of seeds per pod (7.36), test weight (49.1), grain yield (1302 kg/ha) and Stover yield (2619 kg/ha) was found under the treatment T₄ - Toward organic package [Seed treatment with *Rhizobium* (5 ml/kg seed), PSB (5 ml/kg seed) and *Trichoderma viride* (3g/kg seed); NPK: 9:23:00 with DAP 50 kg/ha, FYM: 2 t/ha, Vermicompost (1.0 ton/ha) and need base spray with Agniastra, Dashparni and Chemical insecticides] and Stover yield was found at par with treatments T₂. While, all yield attributing characters was found lowest under the treatment T₁ - Farmers practice [NPK: 09:23:00 with DAP 50 kg/ha with chemical insecticides spray as per need]. This was happen due to improvement in yield attributes and significant improvement in growth parameters which favorably reflected on the yield attributes of the green gram due to the application of treatment T₄. These results are supported by Badole and Umale (1995)^[7], Shukla and Dixit (1996)^[3] and Singh *et al.* (2002)^[4] and Gorade *et al.* (2014)^[5].
- 3. Economics of organic practices:** The data on economics are presented in Table 2. The gross cost, gross return, net return and benefit cost ratio were calculated. The results revealed that highest gross cost(37100 Rs/ha), gross return(98997 Rs/ha), net return(61897 Rs/ha) and benefit cost ratio(2.67) was found under the treatment T₄ - Toward organic package [Seed treatment with *Rhizobium* (5 ml/kg seed), PSB (5 ml/kg seed) and *Trichoderma viride* (3g/kg seed); NPK: 9:23:00 with DAP 50 kg/ha, FYM: 2 t/ha, Vermicompost (1.0 ton/ha) and need base spray with Agniastra, Dashparni and Chemical insecticides] While lowest gross cost(32750 Rs/ha) was found in T₃ - Natural farming package [Ghanjeevamrit (250 kg/ha), Jeevamrit (500 lit/ha) at 25 days interval and need based spray of Agniastra and Dashparni] whereas net return(32246 Rs/ha) and B:C ratio(1.97) were found lowest under the treatment T₁ - Farmers practice [NPK: 09:23:00 with DAP 50 kg/ha with chemical insecticides spray as per need].
- 4. Effect on soil nutrient status after harvest of crop:** A perusal of data presented in Table 3 and revealed that higher soil available nitrogen (239.20 kg/ha) and soil organic carbon (0.42%) was recorded under the treatment T₂ - Improved organic package [Seed treatment with *Rhizobium* (5 ml/kg seed), PSB (5 ml/kg seed) and *Trichoderma viride* (3g/kg seed); FYM: 4 tonnes/ha, PROM: 120 kg/ha and need based application of Neem Oil (2 lit/ha) and *Beauveria basiana* (2.5 kg/ha)] and it was remained at par with treatment T₄ and T₃. Further, there is a no significant difference with respect to soil

available phosphorus and soil available sulphur after harvest of crop. While, all the available soil nutrient was found lowest under the treatment T₁ as compared to rest of the treatments. The increase in availability of nitrogen and organic carbon after harvest of green gram might be

due to addition of these nutrients through inorganic fertilizers and improvement in nitrogen and soil organic carbon due to *Rhizobium* and phosphorus solubilizing bacteria, respectively. The similar results were reported by Kaswala and Raman (1996).

Table 1: Effect of various improved organic practices on growth, yield attributes and yield

Treatments	Plant height (cm)			No. of Branches			No. of pods at harvest	No. of seed per pod	Test weight (g)	Grain yield (kg/ha)	Stover yield (kg/ha)
	30 DAS	60 DAS	At Harvest	30 DAS	60 DAS	At Harvest					
T ₁	24.58	33.84	43.60	2.16	3.44	3.96	23.76	7.16	41.0	855	1882
T ₂	31.30	46.48	62.44	2.68	4.71	5.43	30.04	7.32	47.4	1081	2271
T ₃	29.46	42.72	57.64	2.44	4.24	4.66	26.76	7.24	46.4	963	2119
T ₄	36.04	53.52	73.12	2.80	4.95	5.70	36.16	7.36	49.1	1302	2619
S.Em.±	1.46	2.21	2.75	0.09	0.17	0.19	1.55	0.16	0.75	55.79	119.28
C.D. at 5%	4.51	6.80	8.46	0.28	0.51	0.59	4.78	NS	NS	171.91	367.56
C.V. %	10.78	11.18	10.37	8.10	8.52	8.64	11.87	4.91	3.68	11.87	12.00

Table 2: Economics of various improved organic practices

Treatment	Grain yield (kg/ha)	Stover yield (kg/ha)	Gross Cost (Rs/ha)	Gross Return (Rs/ha)	Net Return (Rs/ha)	BCR (R/C)
T ₁	855	1882	33250	65496	32246	1.97
T ₂	1081	2271	35250	82483	47233	2.34
T ₃	963	2119	32750	73767	41017	2.25
T ₄	1302	2619	37100	98997	61897	2.67

Table 3: Effect of various improved organic practices on soil nutrient status after harvest of crop

Treatments	Soil Available N (kg/ha)	Soil Available P (kg/ha)	Soil Available S (kg/ha)	Organic carbon (%)
Initial	193.20	16.58	21.43	0.36
T ₁	217.20	17.38	22.47	0.35
T ₂	239.20	19.14	24.88	0.42
T ₃	226.00	18.08	23.50	0.38
T ₄	232.60	18.61	24.19	0.40
S.Em.±	4.43	0.46	0.65	0.01
C.D. at 5%	13.66	NS	NS	0.03
C.V. %	4.33	5.64	6.12	5.80

Conclusion

Based on the results of one year field experimentation, it is concluded that profitable seed yield can be achieved in greengram by seed treatment with *Rhizobium* (5 ml/kg seed), PSB (5 ml/kg seed) and *Trichoderma viride* (3g/kg seed) along with application of NPK: 9:23:00, FYM: 2 t/ha, Vermicompost (1.0 ton/ha) and need base spray of Agniastra, Dashparni and Chemical insecticides.

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