

Effect of Organic Manures and Bioenhancers on Growth and Yield of *Kharif* Groundnut under Organic Farming

M. K. Chaudhary, C. K. Desai, J. S. Desai, N. A. Desai

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ABSTRACT

A field experiment on effect of organic manures and bioenhancers on growth and yield of *kharif* groundnut under organic farming” was conducted at organic unit, Agronomy Instructional Farm, Chimanbhai Patel College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar during *kharif* 2020. The results of experiment indicated that significantly higher number of pods per plant, pod yield per plant and pod yield were recorded with the application of vermicompost @ 2 t/ha which remained at par with application of FYM @ 5 t/ha. Shelling percentage of groundnut recorded significantly higher with the application of vermicompost

@ 2 t/ha which was at par with *Ghan jivamrut* @ 0.25 t/ha + FYM @ 2.5 t/ha. Haulm yield of groundnut recorded significantly the highest with application of vermicompost @ 2 t/ha. While in case of application of bioenhancers, significantly higher number of pods per plant, pod yield per plant and pod yield recorded with the application of *Panchgavya* @ 4 % spray at 25 and 40 DAS which was at par with the *Jivamrut* @ 500 l/ha. While *Rhizobium* @ 1 l/ha + PSB @ 1 l/ha was also at par in case of number of pod per plant at harvest. Result showed that among the organic manures, application of vermicompost @ 2 t/ha secured maximum net realization as well as benefit cost ratio. While in case of bioenhancers, application of the *Panchgavya* @ 4 % spray at 25 and 40 DAS gave maximum net realization and benefit cost ratio.

Keywords Groundnut, Bioenhancers, Vermicompost, Panchgavya.

INTRODUCTION

Groundnut (*Arachis hypogaea* L.) is a leguminous plant that is widely cultivated in the tropics and subtropics area. It is the fourth most important source of edible oil and a third most important source of vegetable protein in the world. Groundnut is not only an important oilseed crop of India but also an important agricultural export commodity. Globally, Groundnut covers 295 lakh hectares with the production of 487 lakh tonnes with the productivity of 1647 kg per hectare (FAOSTAT 2020). Groundnut is cultivated in

M. K. Chaudhary^{1*}, C. K. Desai², J. S. Desai³, N. A. Desai⁴

^{1,3,4}Department of Agronomy, C. P. College of Agriculture, SDAU, S. K. Nagar 385506, India

²Assistant Professor, Dry Farming Research Station, SDAU, Radhanpur 385340, India

Email: chaudharymandip12@gmail.com

*Corresponding author

one or more (*kharif* and summer) seasons, but nearly 80% of acre and production comes from *kharif* crop (June-October). In India, total groundnut area was 4.81 million hectare and production of 6.69 million tonnes with productivity of 1393 kg/ha while, in Gujarat total groundnut area, production and productivity were 2.55 million hectare, 3.72 MT and 1456 kg/ha, respectively, during the year of 2018-19 (Anonymous 2019). Among the oilseed crop grown in India, groundnut occupies pre-dominant position. In recent years, crop cultivation requires the use of chemical fertilizer, but it is expensive for people who have not capacity to buy fertilizer. Therefore, the current trend is to explore the possibilities of supplementing organic manure and bioenhancers like FYM, *Ghan jivamrut*, Vermicompost, *Panchgavya*, *Jivamrut*, *Amritpani*, and biofertilizers. Now a days people are more concern about their health and ill effect caused by residue of agrochemicals on soil, human and environment. The Government of Gujarat declared "Gujarat Organic Farming Policy – 2015" to support and encourage the farmers toward organic farming. Organic manure in conjunction with bioenhancers will sustain and maintain the productivity of soil.

MATERIALS AND METHODS

A field experiment was conducted during *kharif* season of the year 2020 on Plot no. B-3, organic unit, Agronomy Instructional Farm, Chimanbhai Patel College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Dist.: Banaskantha (Gujarat). The texture of the soil was loamy sand. It is alluvial in origin, light brown in color, well drained, fairly retentive of moisture, low in organic carbon (0.22%) and available nitrogen (142.5 kg/ha), while medium in available phosphorus (41.8 kg/ha) and potassium (236.6 kg/ha). The present experiment comprising of twelve treatments combinations of three levels of organic manure (FYM @ 5 t/ha, Vermicompost @ 2 t/ha and *Ghan jivamrut* @ 0.25 t/ha + FYM @ 2.5 t/ha) and four level of *bioenhancer* [*Jivamrut* @ 500 l/ha, *Panchgavya* @ 4 % spray at 25 DAS and 40 DAS (foliar spray), *Amritpani* @ 500 l/ha, and *Rhizobium* @ 1 l/ha + PSB @ 1 l/ha (soil application)]. *Jivamrut* and *amritpani* were applied at the time of sowing and 30 DAS as soil application. The data were statistically analyzed for various char-

acters as described by Panse and Sukhatme (1967).

RESULTS AND DISCUSSION

Effect of organic manures

The data exhibited in Table 1 showed that plant population per metre row length (30 DAS and at harvest) and plant height (30, 60 DAS and at harvest) were not influenced significantly under the different

Table 1: Effect of organic manures and bioenhancers on plant population (30 DAS and at harvest) and plant height (30, 60 DAS and at harvest) in *kharif* groundnut under organic farming.

Treatments	Plant population (per metre row length)		Plant height (cm)		
	30 DAS	At harvest	30 DAS	60 DAS	At harvest
Organic manures (O)					
O ₁ : FYM @ 5 t/ha	8.28	8.13	17.51	32.62	46.77
O ₂ : Vermicompost @ 2 t/ha	8.33	8.2	17.7	33.66	46.34
O ₃ : <i>Ghan jivamrut</i> @ 0.25 t/ha + FYM @ 2.5t/ha	8.43	8.21	17.39	32.66	46.76
SEm±	0.20	0.20	0.46	0.77	1.09
CD (p=0.05)	NS	NS	NS	NS	NS
Bioenhancers (B)					
B ₁ : <i>Jivamrut</i> @ 500 l/ha	8.32	8.17	18.2	33.39	46.41
B ₂ : <i>Panchgavya</i> @ 4 % spray at 25 and 40 DAS (foliar spray)	8.43	8.17	17.2	32.71	47.20
B ₃ : <i>Amritpani</i> @ 500 l/ha	8.36	8.16	17.58	32.84	46.56
B ₄ : <i>Rhizobium</i> @ 1 l/ha + PSB @ 1 l/ha (soil application)	8.29	8.21	17.14	32.98	46.31
SEm±	0.23	0.23	0.53	0.89	1.26
CD (p=0.05)	NS	NS	NS	NS	NS
Interaction (O x B)	NS	NS	NS	NS	NS
CV %	8.14	8.24	9.06	8.11	8.10

Note. *Jivamrut* and *Amritpani* were applied at the time of sowing and 30 DAS as soil application.

Table 2. Effect of organic manures and bioenhancers on yield attributes and yield of *kharif* groundnut under organic farming.

Treatments	At harvest		Pod yield per plant (g)	Seed index (g)	Shelling (%)	Pod yield (kg/ha)	Haulm yield (kg/ha)
	No. of pods per plant	No. of kernel per pod					
Organic manures (O)							
O ₁ : FYM @ 5 t/ha	13.17	1.84	19.74	45.27	62.3	1354	1875
O ₂ : Vermicompost @ 2 t/ha	13.91	1.87	20.35	45.05	64.8	1431	2073
O ₃ : <i>Ghan jivamrut</i> @ 0.25 t/ha + FYM @ 2.5t/ha	12.17	1.85	18.58	44.82	63.59	1215	1587
SEm±	0.30	0.04	0.46	0.67	0.64	34.70	45.18
CD (P=0.05)	0.89	NS	1.34	NS	1.88	102	133
Bioenhancers (B)							
B ₁ : <i>Jivamrut</i> @ 500 l/ha	13.23	1.84	19.64	45.19	62.52	1334	1864
B ₂ : <i>Panchgavya</i> @ 4 % spray at 25 and 40 DAS (foliar spray)	13.82	1.88	20.88	45.06	63.9	1429	2060
B ₃ : <i>Amritpani</i> @ 500 l/ha	12.31	1.82	18.73	45.31	62.71	1263	1656
B ₄ : <i>Rhizobium</i> @ 1 l/ha + PSB @ 1 l/ha (soil application)	12.96	1.86	18.97	44.63	65.12	1308	1801
SEm±	0.35	0.05	0.53	0.78	0.74	40.07	52.17
CD (P=0.05)	1.03	NS	1.55	NS	NS	118	153
Interaction (O x B)	NS	NS	NS	NS	NS	NS	NS
CV %	8.01	8.03	8.12	5.18	3.50	9.02	8.48

application of organic manures on *kharif* groundnut under organic farming. The data presented in Table 2 indicated that among the different organic manures application of vermicompost @ 2 t/ha gave significantly higher number of pods per plant at harvest, pod yield per plant and pod yield which was at par with application of FYM @ 5 t/ha. While in case of haulm yield, vermicompost @ 2 t/ha at the time of sowing recorded significantly the highest among the different organic manures. Significantly higher shelling percentage was observed with the application of vermicompost @ 2 t/ha which was found at par with *Ghan jivamrut* @ 0.25 t/ha + FYM @ 2.5 t/ha. This might be due to vermicompost supply balanced and favorable soil environment, better plant growth and ultimately increase photosynthesis which leads to maximum number of pods per plant at harvest. In addition to that vermicompost increase the water holding capacity of soil and this has special reference in groundnut used beneficial effect of sub-surface soil moisture. It might be due to vermicompost also increase the yield attributes like number of pods per

plant and pod yield per plant which reflected in higher yield of groundnut. These results are in close vicinity with the findings of Zalate and Padamini (2009), Kumar *et al.* (2012), Chaudhary *et al.* (2015) and Desai *et al.* (2019).

Effect of bioenhancers

The data presented in Table 1 showed that plant population per metre row length (30 DAS and at harvest) and plant height (30, 60 DAS and at harvest) were not influenced significantly by the different application of bioenhancers on *kharif* groundnut under organic farming. The data exhibited in Table 2 showed that application of panchgavya @ 4 % spray at 25 and 40 DAS was resulted higher number of pods per plant at harvest and it was at par with *jivamrut* @ 500 l/ha at the time of sowing and 30 DAS and *rhizobium* @ 1 l/ha + PSB @ 1 l/ha. Significantly higher pod yield per plant and pod yield were recorded with application of panchgavya @ 4 % spray at 25 and 40 DAS which was at par with the soil application of *jivamrut* @ 500

Table 3. Economics of different treatments influenced by the organic manures and bioenhancers on *kharif* groundnut under organic farming

Treatments	Yield (kg/ha)		Total cost of cultivation (₹/ha)	Gross realization (₹/ha)	Net realization (₹/ha)	BCR
	Pod	Haulm				
Organic manures (O)						
O ₁	1354	1876	41870	83848	41978	2.00
O ₂	1431	2073	42390	89053	46662	2.10
O ₃	1215	1587	38490	74784	36294	1.94
Bioenhancers (B)						
B ₁	1334	1864	35743	82679	46936	2.31
B ₂	1429	2060	36367	88889	52522	2.44
B ₃	1263	1656	36783	77759	40976	2.11
B ₄	1308	1801	33975	80920	46945	2.38

l/ha at the time of sowing and 30 DAS. Application of two spray of 4 % *panchgavya* at 25 and 40 DAS recorded significantly the highest haulm yield. The magnitude of increase in pod yield per hectare due to foliar application of *panchgavya* @ 4 % spray at 25 and 40 DAS to the tune of 13.14, 9.25 and 7.12 % over the application *amritpani* @ 500 l/ha at the time of sowing and 30 DAS, *rhizobium* @ 1 l/ha + PSB @ 1 l/ha and *jivamrut* @ 500 l/ha at the time of sowing and 30 DAS, respectively. A perusal data presented on number of kernel per pod at harvest, seed index and shelling percentage did not differ significantly due to application of different bioenhancers. This might be due to foliar spray of *panchgavya* enhanced the growth rate of plant since it contain the favourable macro and micro nutrients and growth hormone in liquid formulation. It resulted in stimuli in the plant system and turn increased the production of growth regulator in the cell system favoring cell division and elongation which ultimately increased pod per plant. When this liquid manure was sprayed two times i.e. at branching and flowering stages, it resulted in increase of leaf area which captured more solar radiation and increased photosynthetic capacity of crop and there by more production of photosynthates resulted in better plant growth in terms of more number of pod yield and haulm yield. These results are in close vicinity with the findings of Kumawat *et al.* (2009), Kumar *et al.* (2011), Kumar *et al.* (2012) and Sutar *et al.* (2018).

Interaction effect

The results clearly indicated that interaction effect of different organic manures and bioenhancers was found non-significant in *kharif* groundnut under organic farming.

Economics

Result showed that among the application of different organic manures in *kharif* groundnut, application of vermicompost @ 2 t/ha secured maximum net realization as well as benefit cost ratio. While in case of different bioenhancers, application of the *panchgavya* @ 4 % spray at 25 and 40 DAS gave maximum net realization and benefit cost ratio (Table 3).

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