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Organic production of greengram through nitrogen management using different sources of compost

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ABSTRACT

The field experiment to evaluate the response of green gram to different sources of compost was conducted at farm of Department of Agronomy, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during *Kharif* season of 2007-08. The results of experiment indicated that application of recommended dose of fertilizer significantly improved growth attributes, yield and consequently resulted in highest monetary gain which was followed by application of recommended dose of nitrogen through soybean straw compost. However, application of recommended dose of nitrogen through FYM favourably influenced on soil physic chemical properties.

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Key words : Compost, Greengram, Growth, Nitrogen management, Soil properties, Yield

INTRODUCTION

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, 2007). Vermicomposting 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 vermicomposting. Greengram [*Vigna radiata* (L.) Wilczek] is one of the most important pulse crop in India. It is highly nutritious and easily digestible and it is also used as green manuring crop. It has the capacity to fix atmospheric nitrogen and also helps in preventing soil erosion. Greengram has been cultivated in almost all states of India. It is the most important crop next to pigeonpea among the *Kharif* pulses in Vidarbha cultivated on an area of 0.309 million ha which accounted 46.67 per cent of total green gram growing area of Maharashtra.

MATERIALS AND METHODS

A field experiment was conducted at farm of Department of Agronomy, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during *Kharif* season of 2007-2008. The soil of experimental field was clayey, having pH 7.8 with electric conductivity 0.25 dSm^{-1}, organic carbon 0.40% and available N, P_2O_5 and K_2O 234.58, 20.86 and 322.94 kg ha^{-1}, respectively. The experiment comprised of nine treatments *viz.*, T_1- Recommended dose of fertilizer (20:40:00 NPK kg ha^{-1}), T_2- Recommended dose of N (RDN) through FYM (2.47 t ha^{-1}), T_3- RDN through vermicompost (1.61 t ha^{-1}), T_4- RDN through soybean straw compost (1.87 t ha^{-1}), T_5- RDN through wheat straw compost (3.70 t ha^{-1}), T_6- RDN through

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Table 1 : The major nutrient content of FYM, vermicompost, crop residue compost and weed biomass used during study

Particulars	Nutrient content (%)		
	N	P	K
FYM	0.81	0.57	1.19
Vermicompost	1.24	1.57	1.46
Compost of soybean straw	1.07	0.52	1.76
Compost of wheat straw	0.54	0.14	1.21
Compost of jowar stubbles	0.49	0.28	1.25
Compost of *parthenium* weed	0.37	0.14	0.64
Weed biomass compost	0.55	0.18	0.67

Jowar stubbles compost (4.08 t ha^{-1}), T_7- RDN through *Parthenium* weed compost (5.40 t ha^{-1}), T_8- RDN through weed biomass compost (3.64 t ha^{-1}) and T_8- Control. The experiment with these treatments was laid out in randomized block design with four replications. Sowing was done at the spacing of 30 x 10 cm with drilling method and variety used was PKV *Moong* 8802. Well decomposed air dried organic manures *viz*., FYM, vermicompost, crop residue compost and weed biomass compost were applied as per treatment in experimental plots before last harrowing. The nutrient content in organic manure used during experimentation is given in Table 1. The recommended dose of fertilizer as per the treatment was applied at the time of sowing. Common seed treatment of *Rhizobium* + PSB to green gram seed was done @ 25 g each kg^{-1} of seed just before sowing. The crop was sown on 2nd July and harvested on 3rd September of 2007. The crop received 388.1 mm rainfall during crop season in 24 rainy days. The plants which were taken for dry matter accumulation at harvest were used for the determination of N, P and K content. Available nitrogen in soil was determined by alkaline permanganate method, phosphorus by Olsen's method and potassium by flame photometer method (Jackson, 1967). Economics of treatments were work out and NMR and B:C ratio was calculated to study the economics of the treatments.

RESULTS AND DISCUSSION

The results of the present study alongwith relevant discussion have been presented as under :

Growth attributes:

Growth attributes significantly differed due to different sources of nutrients under study. The data presented in Table 2 indicated that maximum plant height was recorded in treatment of recommended dose of fertilizer followed by recommended nitrogen through soybean straw compost, recommended nitrogen through vermicompost and recommended nitrogen through FYM. The growth parameters *viz.,* number of branches, number of leaves, leaf area and dry matter accumulation were significantly highest with recommended dose of fertilizer which followed by application of recommended nitrogen through soybean straw compost. However, application of recommended nitrogen through soybean straw compost recorded significantly highest number of root nodules per plant at 60 days followed by recommended nitrogen through vermicompost.

The significant improvement in growth parameters with application of recommended dose of fertilizer might be attributed to quick and easy availability of nutrients through fertilizer. However, significant improvement in number of root nodules with the application of recommended nitrogen through soybean straw compost indicated positive effects of organics on nodulation. The above results are in agreement with the findngs of Owla *et al.* (2006) and Yakadri *et al.* (2002).

Table 2 : Effect of different sources of organic manures on growth attributes of greengram at harvest

Treatments	Plant ht. (cm)	Branches $plant^{-1}$	Leaves $plant^{-1}$	Leaf area (dm^2)	Dry matter (g $plant^{-1}$)	Root nodules $plant^{-1}$
T_1 - RDF	40.15	7.45	23.48	10.58	12.97	42.25
T_2 – RDN through FYM	39.11	7.17	22.22	9.78	10.30	41.50
T_3 – RDN through vermicompost	39.94	7.22	22.74	10.00	10.38	42.50
T_4 – RDN through soybean straw compost	39.96	7.32	22.94	10.23	10.92	43.25
T_5 – RDN through wheat straw compost	38.89	7.10	22.32	9.53	9.52	40.50
T_6 – RDN through jowar stubbles compost	38.82	7.10	21.53	9.05	10.02	39.00
T_7 – RDN through *parthenium* weed compost	38.69	6.88	20.98	9.29	8.62	39.50
T_8 – RDN through weed biomass compost	37.86	6.77	21.01	9.45	9.21	40.00
T_9 – Control	37.01	6.73	20.09	8.89	8.31	38.50
S.E. (m) ±	0.64	0.17	0.60	0.35	0.13	1.50
C.D. (P=0.05)	1.87	0.49	1.76	1.03	0.37	4.39

Table 3 : Effect of different sources of organic manures on yield and economics of greengram

Treatments	Grain yield (q ha^{-1})	Straw yield (q ha^{-1})	Gross monetary returns (Rs.ha^{-1})	Net monetary returns (Rs.ha^{-1})	Benefit cost ratio
T_1 - RDF	9.36	22.60	26441	18030	3.14
T_2 – RDN through FYM	7.93	20.47	22787	14082	2.62
T_3 – RDN through vermicompost	8.13	20.87	23339	12149	2.09
T_4 – RDN through soybean straw compost	8.48	21.25	24181	16069	2.98
T_5 – RDN through wheat straw compost	7.51	20.05	21779	13985	2.79
T_6 – RDN through jowar stubbles compost	7.41	19.87	21522	13758	2.77
T_7 – RDN through *parthenium* weed compost	6.67	19.66	19910	12218	2.59
T_8 – RDN through weed biomass compost	6.91	19.30	20301	12501	2.60
T_9 – Control	5.54	18.85	17292	9822	2.31
S.E. (m) ±	0.37	0.73	819	819	0.10
C.D. (P=0.05)	1.09	2.12	2390	2390	0.30

Yield and economics:

Application of RDF recorded significantly highest grain and straw yield over recommended dose of nitrogen through organic sources and control, except in case of RDN through soybean straw compost for grain and straw and RDN through vermicompost for straw yield, which were found to be comparable with RDF (Table 3). This result illustrates the role of soybean straw compost in the improvement of soil physical, chemical and biological properties besides nutrition aspects, which cumulatively benefitted green gram.

Economical analysis of the treatments (Table 3) shows that significantly higher GMR, NMR and B:C ratio were obtained with the application of recommended dose of fertilizer which was closely followed by recommended dose of nitrogen through soybean straw compost. The higher values of NMR and B:C ratio in the plots of recommended dose of fertilizer application are due to better productivity of the crop and comparatively low cost of cultivation in this treatment. Similar remunerative gain in yield and monetary returns with the application of RDF was also reported by Suman *et al*. (2006).

Physico-chemical properties:

The data (Table 4) revealed that the organic manure treatments significantly improved the chemical properties of soil. Application of recommended dose of nitrogen through FYM significantly improved the available nitrogen and phosphorus in soil which was comparable with application of recommended dose of nitrogen through vermicompost (T_3), soybean straw compost (T_4) and wheat straw compost (T_5) for available nitrogen in soil and with recommended dose of nitrogen through vermicompost (T_3) and soybean straw compost (T_4) for available phosphorus in soil. However, the application of recommended dose of nitrogen through soybean straw compost resulted in significant gain in available potassium in soil found to be at par with application of recommended

Table 4 : Physico-chemical properties of soil as influenced by different sources of organic manures

Treatments	Available nutrients (kg ha^{-1})			pH	Ec (dSm^{-1})	Organic carbon (%)	Bulk density
	N	P_2O_5	K_2O				
T_1 - RDF	237.81	21.46	321.70	7.8	0.30	0.41	1.33
T_2 – RDN through FYM	256.60	31.23	340.32	7.6	0.29	0.44	1.26
T_3 – RDN through vermicompost	253.82	29.94	338.46	7.7	0.28	0.43	1.24
T_4 – RDN through soybean straw compost	254.11	30.19	341.86	7.7	0.28	0.44	1.25
T_5 – RDN through wheat straw compost	250.70	28.26	336.59	7.8	0.26	0.42	1.27
T_6 – RDN through jowar stubbles compost	249.76	27.55	334.51	7.7	0.27	0.43	1.27
T_7 – RDN through *parthenium* weed compost	244.55	25.82	333.66	7.8	0.27	0.42	1.28
T_8 – RDN through weed biomass compost	247.32	26.48	333.37	7.8	0.26	0.42	1.28
T_9 – Control	226.58	18.67	315.03	7.9	0.24	0.39	1.31
S.E. (m) ±	2.07	1.69	2.20	0.05	0.01	0.01	0.01
C.D. (P=0.05)	6.05	2.40	6.43	0.15	0.03	0.02	0.03
Initial value	234.58	20.86	322.94	7.8	0.25	0.41	1.34

dose of nitrogen through FYM, vermicompost and wheat straw compost.

Marked variation in soil pH due to organic and inorganic were observed. Application of recommended dose on nitrogen through FYM helps to maintain soil pH which recorded significantly lowest value of soil pH than different sources of organics, RDF and control. Application of recommended dose of fertilizer registered significantly increased in electrical conductivity as compared to organic treatments and control. Significantly highest organic carbon content was recorded by recommended nitrogen through FYM and recommended nitrogen through soybean straw compost followed by recommended nitrogen through vermicompost and sorghum stubbles compost. There was marked increase in organic carbon status in the treatments where organic component were applied.

Application of recommended dose of nitrogen through vermicompost significantly lowered the bulk density than control and RDF which was followed by recommended dose of nitrogen through soybean straw compost (T_4), FYM (T_2), wheat straw compost (T_5) and sorghum stubbles compost (T_6).

The results regarding chemical properties of soil are in conformity with the findings reported by several workers like Vyas *et al*. (2003) and Katkar *et al*. (2005) who revealed that pH and electrical conductivity slightly decreased with the application of FYM as compared to no FYM treatment. Reddy *et al.* (2007) also recorded more N, P and K balance in soil after harvest of sorghum due to application of FYM over RDF and other organic manure treatments.

REFERENCES

Barley, K.P. and Jennings, A.C. (1959). Earthworms and soil fertility the influence of earthworms on the availability of nitrogen. *Australian J. Agric. Res.*, **10**: 364-370.

Jackson, M.L. (1967). *Soil chemical analysis*. Prentice Hall, India Pvt. Ltd. New Delhi.

Katkar, R.N., Wankhade, S.T., Turkhade, A.B. and Lambe, S.P. (2005). Effect of INM in cotton on shallow soil on growth, seed yield and physico-chemical properties. *PKV Res. J.*, **29** (2): 210-214.

Owla, R. L., Chavan, B. N. and Singh, U. (2006). Effect of plant densities and levels of phosphorus on growth and yield of greengram. *Agron. Digest*, **6 & 7**: 37-39.

Parr, J.F., Stewart, B.A., Hornic S.B. and Singh, R.P. (1990). Improving the sustainability of dryland farming systems: a global perspective. In: Singh R. P., Parr, J. F., and Stewart, B. A (eds) *Advances in soil science*, pp. 13-18.

Reddy, S.R., Reddy, V.C., Parama, V.R.R. and Pampa, S. (2007). Effect of sewage sludge, urban compost and FYM on juice quality and soil nutrient status of sweet sorghum. *J. Soils & Crops*, **17** (1): 30-34.

Singh, A.K., Tripathi, P.N. and Singh, R. (2007). Effect of *Rhizobium* Inoculation, nitrogen and phosphorus levels on growth, yield and quality of *Kharif* cowpea". [*Vigna unguiculata* (L.) Walp]. *Crop Res.*, **33** (1, 2 & 3): 71-73.

Suman, Dahama, A.K. and Poonia, S.L. (2006). Effect of nutrient management on yield and economics of greengram. *Agron. Digest.*, **6 &7**: 55-57.

Vyas, M.D., Jain A.K. and Tiwari, R.J. (2003). Long term effect of micronutrients and FYM on yield and nutrient uptake of soybean on a Typic chromustert. *J. Indian Soc. Soil Sci.*, **51** (1): 45-47.

Yakadri, M., Thatikunta, R. and Rao, L.M. (2002). Effect of nitrogen and phosphorus on growth and yield of greengram. *Legume Res.*, **25**(2): 139-141.

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