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Research Paper

Effect of organics and fermented organics on growth, yield and yield components of sesame

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ABSTRACT

A field experiment was carried out during *Kharif* 2007 at the Agricultural Research Station, Hanumanamatti (Ranebennur), University of Agricultural Sciences, Dharwad to find out the influence of organics and fermented organics on growth, yield and yield components of sesame crop. The experiment has five main plot treatments, Beejamrut + Jeevamrut + mulching with organic pest management(NM_1),FYM (1/3) +Vermicompost (1/3) + Green manuring (1/3) equivalent to RDN +organic pest management(NM_2),FYM (1/3) +Vermicompost (1/3) + Green manuring (1/3) equivalent to RDN + FYM + organic pest management(NM_3),RDF + FYM+*Azospirillum* + *Trichoderma* with IPM(NM_4), RDF alone with chemical plant protection(NM_5), and three sub plot treatments, no spray of panchagavya(PS_1), one spray of panchagavya at 30 DAS(PS_2), two sprays of panchagavya at 30 DAS and flowering stage (PS_3).The results of investigation showed that highest crop growth, yield, and yield components could be realized by combined application of RDF + FYM+*Azospirillum* + *Trichoderma* with IPM. The efficiency of spray of panchagavya could be increased through two sprays of panchagavya at 30 DAS and flowering stage.

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Key words : Organic manures, Fermented organics, Microbial activity, Panchagavya

INTRODUCTION

Sesame (*Sesamum indicum* L.) is an ancient oilseed crop of the world. It is recognized by various names like Gingely, Til, Simsim, Gergelim and Biniseed *etc*., it has earned a poetic label "Queen of Oilseeds" because seeds have high quality poly- unsaturated stable fatty acids which offer resistance to rancidity. Moreover, its seed is a rich source of edible oil (48-55%) and protein (20-28%) (Taware *et al.,* 2006) consisting of both methionine and tryptophane, vitamin (niacine) and minerals (Ca and P). The expeller cake not only serves as good feed concentrate for livestock but also used as organic manure. In order to increase the productivity, adoption of improved nutrient management practices is one of the crucial factors. Now-a-days there is a huge demand for organic sesame in the global market.

The excessive use of agro-chemicals for the last 50 years though helped in achieving commendable progress earlier, the least attention to ecological agricultural principles resulted in soil degradation, ground water pollution and environmental pollution leading to ecological imbalances. In this context, a keen awareness has to be created on the adoption of organic farming as a remedy to maneuver the ill effects from chemical farming. Organic manure in agriculture adds much needed organic and mineral matter to the soil. In this context, it is worth noting that nutrient management through organics play a major role in maintaining soil health due to build up of soil organic matter, beneficial microbes and enzymes, besides improving soil physical and chemical properties. To achieve sustainable soil fertility and crop productivity, the role of organic manures and other nutrient management practices like use of fermented organic nutrients *viz*., panchagavya, jeevamrut, beejamrut, sasyamrut, vermiwash *etc.*, are becoming popular among farmers.

The use of organics and fermented organics may improve nutrients status and biological activity. Keeping these facts in view, a field experiment was conducted to study the effect of organics and fermented organics on growth, yield and yield components of sesame.

MATERIALS AND METHODS

The field trial was conducted during *Kharif* 2007 at the Agricultural Research Station, Hanumanamatti (Rabebennur). The soil of the experimental site was *Alfisol* which was neutral in reaction (6.78), medium in organic carbon (0.69 g/ha), low in available N (215 %), low in available P_2O_5 (18.1 kg/ha) and medium in available K_2O (240 kg/ha) contents. The experiment was laid out in split plot Design with five main treatments and three sub treatments with three replication. 8 Treatment comprises of different manurial combination of NM_1= Beejamrut + Jeevamrut + mulching with organic pest management,NM_2 = FYM (1/3) +Vermicompost (1/3) + Green manuring (1/3) equivalent to RDN +organic pest management,NM_3 = FYM (1/3) +Vermicompost (1/3) + Green manuring (1/3) equivalent to RDN + FYM + organic pest management, NM_4 = RDF + FYM+*Azospirillum* + *Trichoderma* with IPM and NM_5 = RDF alone with chemical plant protection and spray panchagavya in the sub plot trearment, PS_1 = No spray of panchagavya, PS_2 = One spray of panchagavya at 30 DAS and PS_3 = Two sprays of panchagavya at 30 DAS and flowering stage. Recommended dose of N, P_2O_5, K_2O and FYM were applied at the time of sowing in control plot, whereas, green leaf manure, compost and vermicompost were applied before the sowing of crop as per the treatment which were in total equivalent to RDN. Beejamruth was used for soaking of seed (seed treatment), whereas jeevamruth was soil applied at the time of sowing, at 30 and 60 DAS and panchagavya was taken as foliar spray at 30 DAS and flowering stage of the crop.

RESULTS AND DISCUSSION

Among the various factors affecting the growth and yield of sesame, nutrient management practices play a vital role. Presently, the chemical fertilizers are used as a major source of nutrients. But escalating cost, coupled with increasing demand of chemical fertilizers and depleting soil health necessitates the safe and efficient use of organics in sesame production. These practices gaining much popularity to enhance and maintain soil organic carbon status for obtaining sustainable crop yield. As it excludes the use of chemical fertilizer and pesticides from the perspective of eco-service management has many advantages over conventional agriculture. We can no longer afford to ignore the need to manage ecological services more actively focusing on farming, as indicated in the "millennium ecosystem assessment report". A recent study by Pimental *et al.* (2005), at Rodale Institute over 22 years, showed greater advantage for animal based organic system than conventional system.

However, under arable production system organic manures suffer from the drawback of slow release of nutrients at initial stages, may cause significant reduction in crop yield and results in lower farm income. Which can be overcome by judicious combination of organic manure by tracing the positive aspects of green manures, crop residues, compost and liquid manures. A more synchronized system can be achieved to maintain long-term soil fertility and sustain higher productivity of crops. Hence, an integrated organic nutrient supply system provides an ideal nutrition for a crop through proper combination of various sources of nutrients. Vegetative and reproductive growth of plant plays an important role in realizing potential yield of crop. Suboptimal growth may result in adverse effect on yield attributes. On the other hand, excessive growth may also have an adverse effect on yield attributes and yield of crops.

To studies on the growth parameters of sesame such as plant height (cm), number of branches per plant, leaf area (dm²/plant), leaf area index (LAI) and Total dry matter production (g/plant) were significantly higher with integrated nutrient management (RDF +FYM + *Azospirillum* + *Trichoderma* with IPM) (98.42cm,2.16, 16.18 dm²/plant, 2.39, and 20.31g/plant, respectively). Over organic treatments but it was at par with RDF alone with chemical plant protection. Morphological characters mainly plant height and numbers of branches per plant were significantly higher in integrated nutrient management (NM_4). Thus indicated that the sesame crop showed greater response to the integrated nutrient management (NM_4). Similar findings were reported by Chandawat *et al.* (1998), Mondal *et al.* (1992) and Balasubramanian and Palaniappan (1994). Improvement in growth, dry matter production and yield of sesame due to integrated nutrient management practice (NM_4) can be attributed to sustained availability of nutrients for longer growing period. This might have led to the increased accumulation of photosynthates and relatively better yield per plant in integrated nutrient management (NM_4) as compared to other nutrient management practices. The desirable differences in LAI might have been due to differences in uptake of nutrients in different nutrient management practices (Table 1 and 2).

In the present investigation, seed yield of sesame differed significantly with different nutrient management practices (Table 3). Significantly higher seed yield of sesame was recorded with treatment receiving, integrated nutrient management practice of RDF + FYM + *Azospirillium* + *Trichoderma* with IPM (296.52 kg/ha)

Table 1 : Plant height (cm/plant), number of branches per plant and leaf area (dm²/plant) of sesame as influenced by nutrient management practices and spray of panchagavya

Nutrient management practices	Plant height (cm/plant)						Number of branches per plant						Leaf area (dm²/plant)					
Spray of panchagavya	NM_1	NM_2	NM_3	NM_4	NM_5	Mean	NM_1	NM_2	NM_3	NM_4	NM_5	Mean	NM_1	NM_2	NM_3	NM_4	NM_5	Mean
PS_1	74.43	77.43	77.53	97.17	95.17	84.43	1.20	1.63	1.70	2.07	1.93	1.71	9.87	12.37	12.40	16.00	15.13	13.15
PS_2	74.07	77.53	78.87	98.00	97.13	85.12	1.43	1.77	1.83	2.13	2.07	1.85	10.23	12.63	12.63	16.20	15.20	13.38
PS_3	74.27	78.10	80.17	100.1	98.37	86.20	1.53	1.83	1.87	2.27	2.13	1.93	10.33	12.93	13.07	16.33	15.53	13.64
Mean	74.26	77.69	78.86	98.42	97.03	85.25	1.39	1.74	1.80	2.16	2.04	1.83	10.14	12.64	12.70	16.18	15.29	13.39
Comparing the means of	S.E.		LSD (0.05)				S.E.		LSD (0.05)				S.E.		LSD (0.05)			
Nutrient management (NM)	0.44		4.97				0.08		0.26				0.23		0.75			
Spray of panchagavya (PS)	1.53		1.29				0.06		0.18				0.10		0.30			
NM at same PS	0.98		NS				0.13		NS				0.22		NS			
PS at same or different NM	1.72		NS				0.13		NS				0.29		NS			

NM_1 Beejamrut Jeevamrut mulching with organic pest management

NM_2 FYM (1/3) Vermicompost (1/3) Green manuring (1/3) equivalent to RDN organic pest management

NM_3 FYM (1/3) Vermicompost (1/3) Green manuring (1/3) equivalent to RDN FYM organic pest management

NM_4 RDF FYM *Azospirillum* *Trichoderma* with IPM. NM_5 RDF alone with chemical plant protection

PS_1 No spray of Panchagavya PS_2 One spray of Panchagavya at 30 DAS

PS_3 Two sprays of Panchagavya at 30 DAS and flowering stage

DAS Days after sowing NS Non significant

Table 2 : Leaf area index (LAI) and total dry matter production (g/plant) of sesame as influenced by nutrient management practices and spray of panchagavya

Nutrient management practices	Leaf area index (LAI)						Total dry matter production (g/plant)					
Spray of panchagavya	NM_1	NM_2	NM_3	NM_4	NM_5	Mean	NM_1	NM_2	NM_3	NM_4	NM_5	Mean
PS_1	1.46	1.83	1.83	2.36	2.24	1.94	16.37	17.75	18.04	19.90	19.52	18.32
PS_2	1.51	1.87	1.87	2.40	2.25	1.98	16.77	18.00	18.48	20.28	19.71	18.65
PS_3	1.53	1.91	1.93	2.41	2.30	2.02	17.31	18.30	18.67	20.76	20.20	19.05
Mean	1.50	1.87	1.88	2.39	2.26	1.98	16.82	18.02	18.40	20.31	19.81	18.67
Comparing the means of		S.E.		LSD (0.05)				S.E.			LSD (0.05)	
Nutrient management (NM)		0.03		0.11				0.25			0.80	
Spray of panchagavya (PS)		0.01		0.04				0.17			0.50	
NM at same PS		0.03		NS				0.38			NS	
PS at same or different NM		0.04		NS				0.40			NS	

NM_1 Beejamrut Jeevamrut mulching with organic pest management

NM_2 FYM (1/3) Vermicompost (1/3) Green manuring (1/3) equivalent to RDN organic pest management

NM_3 FYM (1/3) Vermicompost (1/3) Green manuring (1/3) equivalent to RDN FYM organic pest management

NM_4 RDF FYM *Azospirillum* *Trichoderma* with IPM. NM_5 RDF alone with chemical plant protection

PS_1 No spray of Panchagavya PS_2 One spray of Panchagavya at 30 DAS.

PS_3 Two sprays of Panchagavya at 30 DAS and flowering stage.

DAS Days after sowing NS Non significant

over RDF alone with chemical plant protection and all the organic nutrient management practices. The higher seed yield in integrated nutrient management could be attributed to the availability of nutrients throughout the crop growth and its higher uptake by the crop apart from favourable effect of FYM on soil physico-chemical and biological properties. These results are in conformity with the findings of Deshmukh *et al.* (2002) and Imayavaramban (2002) in sesame.

In the present investigation, the yield parameters of sesame such as stalk yield(kg/ha), number of capsules per plant, capsule weight (g), seed weight per plant (g), and seed oil content(%) were significantly higher with integrated nutrient management (RDF +FYM + *Azospirillum* + *Trichoderma* with IPM) (1407.11kg/ha, 20.28, 1.28g/plant, 6.39 g, and 50.78%, respectively) over organic treatments (Table 3 and 4). The nutrient management through inorganic practices alone (RDF) with chemical plant protection had a similar effect with respect to above yield components. However, the nutrient management through inorganic fertilizer alone failed to increase seed yield significantly over integrated nutrient management practices. Which might be integrated nutrient management practice (NM_4) can be attributed to sustained availability of nutrients for longer growing period. Similar findings were reported by Arunachalam and Venkatesan (1984) and Reddy and Sudhakara Babu (1996),

Similarly, nutrient management through organics alone also failed to produce higher yield over INM practices due to its slow release pattern and in the short sight, it is difficult to accept the immediately response of yield components such as stalk yield, number of capsules per plant, capsule weight, seed weight per plant (g) and seed oil content (%) were significantly superior over either nutrient management through inorganic alone or organic nutrient management practices.

Effect of spray of panchagavya on growth and yield of sesame:

In the present investigation, the growth parameters of sesame such as plant height (cm), number of branches per plant, leaf area (dm²/plant), leaf area index (LAI) and total dry matter production (g/plant) were significantly higher with two sprays of panchagavaya at 30 DAS and flowering stage(86.20cm,1.93,13.39 dm²/ plant ,2.02 and19.05g/plant, respectively) over no spry of panchagavya but it was at par with one spray of panchagavya at 30 DAS. Total dry matter production per plant and its accumulation in different parts of plant is the manifestation of the magnitude and persistence

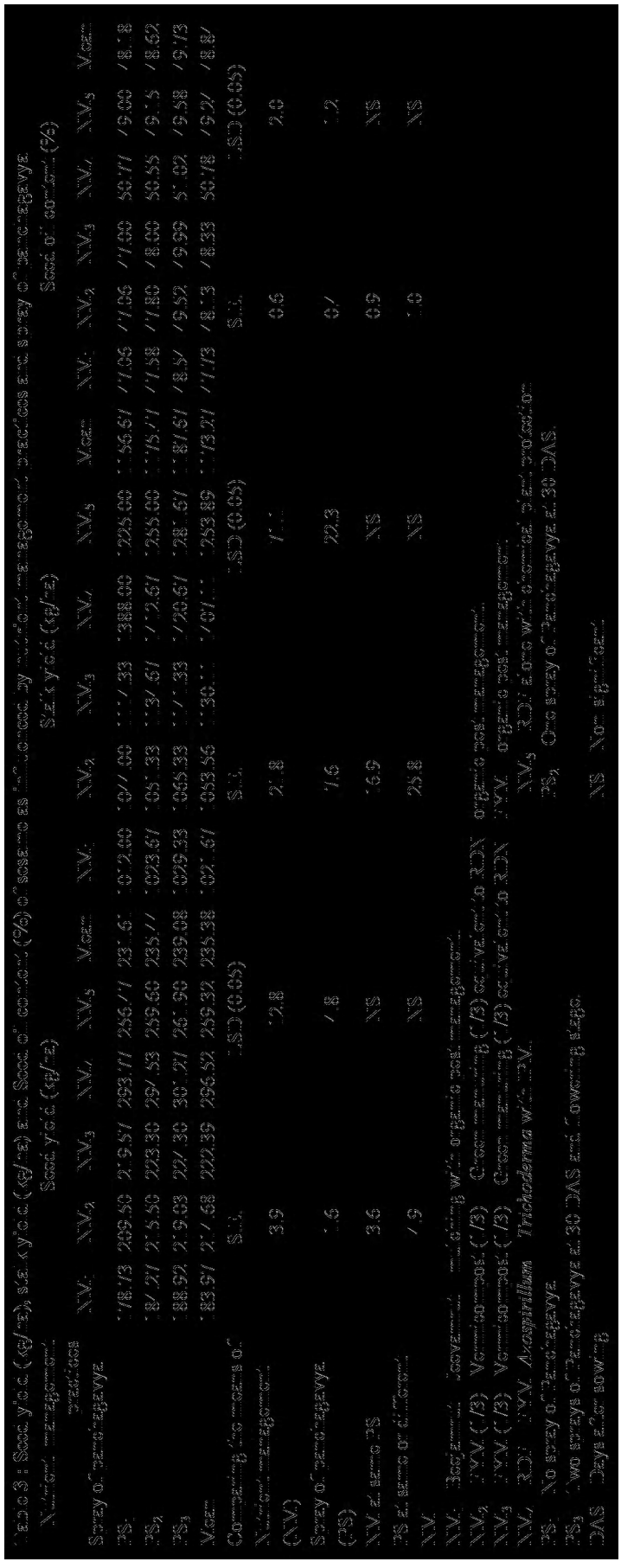

Table 4 : Seed weight per capsule (g), seed weight per plant (g), number of capsules per plant and capsule weight (g/plant) of sesame as influenced by nutrient management practices and spray of panchagavya

Nutrient management practices / Spray of panchagavya	Seed weight per capsule (g)						Seed weight per plant (g)						Number of capsules per plant						Capsule weight (g/plant)					
	NM_1	NM_2	NM_3	NM_4	NM_5	Mean	NM_1	NM_2	NM_3	NM_4	NM_5	Mean	NM_1	NM_2	NM_3	NM_4	NM_5	Mean	NM_1	NM_2	NM_3	NM_4	NM_5	Mean
PS_1	0.12	0.12	0.13	0.13	0.13	0.12	4.62	5.19	5.21	6.30	6.21	5.50	13.93	15.00	15.67	18.83	17.97	16.28	1.14	1.15	1.18	1.27	1.21	1.19
PS_2	0.12	0.13	0.13	0.13	0.13	0.13	4.70	5.31	5.32	6.35	6.17	5.57	14.27	15.53	16.47	20.00	18.87	17.03	1.15	1.19	1.19	1.28	1.24	1.21
PS_3	0.13	0.13	0.13	0.13	0.13	0.13	4.93	5.42	5.49	6.51	6.16	5.70	15.20	16.13	17.13	22.00	20.20	18.13	1.19	1.20	1.21	1.30	1.27	1.23
Mean	0.12	0.13	0.13	0.13	0.13	0.13	4.75	5.31	5.34	6.39	6.18	5.59	14.47	15.56	16.42	20.28	19.01	17.15	1.16	1.18	1.19	1.28	1.24	1.21
Comparing the means of	S.E.			LSD (0.05)			S.E.			LSD (0.05)			S.E.			LSD (0.05)			S.E.			LSD (0.05)		
Nutrient management (NM)	0.002			NS			0.11			0.36			0.58			1.90			0.02			0.07		
Spray of panchagavya (PS)	0.001			0.003			0.08			NS			0.50			1.47			0.02			NS		
NM at same PS	0.002			NS			0.17			NS			1.11			NS			0.04			NS		
PS at same or different NM	0.003			NS			0.18			NS			1.08			NS			0.04			NS		

NM_1 Beejamrut Jeevamrut mulching with organic pest management.
NM_2 FYM (1/3) Vermicompost (1/3) Green manuring (1/3) equivalent to RDN organic pest management.
NM_3 FYM (1/3) Vermicompost (1/3) Green manuring (1/3) equivalent to RDN FYM organic pest management.
NM_4 RDF FYM *Azospirillum* *Trichoderma* with IPM. NM_5 RDF alone with chemical plant protection
PS_1 No spray of Panchagavya. PS_2 One spray of Panchagavya at 30 DAS.
PS_3 Two sprays of Panchagavya at 30 DAS and flowering stage.
DAS Days after sowing NS Non significant

of photosynthetic capacity of the plant and its translocation to different parts. Photosynthetic capacity of plants is a function of photosynthetically active leaf area which is indicated by LAI. This might be ascribed to beneficial effect of panchagavya as plant nutrients, bio richness and growth regulator showing substantial increase in assimilatory surface area and its functions. The better source and sink capacity was developed due to foliar application of panchagava as indicated by better dry matter production and its accumulation in assimilatory surface area and reproductive parts during the vegetative and reproductive phases of crop growth.The beneficial effect of panchagavya was mainly attributed to the presence of large quantities of IAA and GA which are physiologically active in photosynthesis and other processes (Somasundaram, 2003). He also reported that when it was sprayed, it has created stimuli in the plant system which, in turn, increased the production of growth regulating substances in the cell system.

In the present investigation, seed yield and stalk yield of sesame differed significantly with different sprays of panchagavya. Two sprays of panchagavya at 30 DAS and flowering stage recorded significantly higher seed yield and stalk yield (239 kg/ha and1187.67 kg/ha, respectively), over no spray of panchagavya and was at par with one spray of panchagavya at 30 DAS. The significant effect of panchagavya was mainly attributed to its nutrient content, higher biological activity and plant growth promoting substances. Similar beneficial effect of panchagavya has been reported by Hazarika *et al.* (2006). It also acts as manure (75%) and biopesticide (25%) helps in management of pests if sprayed at flowering and fruiting stages of crop growth.

The grain yield is the manifestation of various growth and yield attributing characters. The important yield parameters of sesame such as number of capsule per plant, seed weight per capsule(g) and oil seed content(%) were higher with two spray of Panchagavya at 30 DAS and flowering stage (18.13 , 0.13 g, and 49.73%, respectively) over no spray of panchagavya but it was at par with one spray of panchagavya at 30 DAS.These results are in conformity with the findings of the Boomiraj (2003) who found that increase in fruit weight of bhindi due to

panchagavya spray.

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