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Effect of organic manures on the performance of ginger under Northern Dry Zone of Karnataka

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Abstract

A field trial was conducted to assess the effect of different organic manures on the performance of ginger cv. Humnabad. Higher growth, yield and quality attributes were observed in the treatment receiving FYM (25 t ha^{-1}) along with recommended dose of fertilizer (RDF) (100 : 50 : 50 kg NPK ha^{-1}) followed by poultry manure (5 t ha^{-1}) along with RDF. Among the treatments, significantly higher fresh rhizome yield was recorded in FYM + RDF (16.52 t ha^{-1}) followed by poultry manure (5 t ha^{-1}) + RDF (16.23 t ha^{-1}) and press mud (10 t ha^{-1}) + RDF (15.47 t ha^{-1}). Net returns per ha ranged between Rs. 1.30 lakh (FYM+RDF) and Rs. 0.48 lakh (Neem cake @ 2 t ha^{-1}).

Keywords: farmyard manure, ginger, net return, rhizome yield, *Zingiber officinale*

Ginger (*Zingiber officinale* Rosc.) is one of the most important and widely used spice throughout the world. Due to indiscriminate use of chemical fertilizers, the organic matter status of soil has come down affecting the productivity of crops. The role of organic manures in improving soil structure and fertility is well understood. Ginger being a crop of 7-8 months duration responds well to the application of organic manures (Sadanandan & Hamza 1996). The present study was under taken to assess the response of ginger to different organic manures individually and in combination with inorganic fertilizers under irrigated ecosystem of northern dry zone of Karnataka.

The study was carried out at K.R.C. College of Horticulture, Arabhavi, Karnataka, during 2005–06 on ginger cv. Humnabad. Arabhavi is situated in northern dry zone of Karnataka state at 16° 15' latitude and 74° 45' longitude at an altitude of 612 m above MSL with average annual rainfall of 530 mm. The experimental site was having sandy clay loam soil with a pH of 7.8. The initial available major nutrients (kg ha^{-1}) were nitrogen 128, phosphorus 9.6, potassium 140. Calcium and magnesium contents were 1.79 and 0.42 kg ha^{-1} respectively. The trial consisted of thirteen treatments replicated thrice laid out in RBD using different organic manures *viz*., FYM, poultry manure, sheep manure, vermicompost, press mud, neem cake

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individually (Table 1) and in combination with RDF (100:50:50 kg NPK ha^{-1}) RDF alone served as control. Rhizome bits of about 15-20 g were sown at a spacing of 30 cm × 20 cm in raised beds of 3 m × 1 m, accommodating 40 plants. The organic manures were applied to plots according to treatment details before planting of seed rhizome bits and well mixed with soil. The inorganic fertilizers were applied in 3 split doses as per treatment requirements. Full dose of phosphorus and potassium were applied as basal dose. Fifty per cent of nitrogen was applied at 30 days after planting (DAP) as first top dressing and remaining at 60 DAP. The observations on growth attributes *viz*., plant height, number of leaves, leaf size and number of tillers were recorded from 15 randomly selected plants from each plot from 30 DAP till 180 DAP at an interval of 30 days. The leaf size was recorded from the third leaf from the top in tallest tiller and computed by multiplying leaf length, leaf width and conversion factor (0.666) to arrive at the actual leaf size (Reddy & Reddy 1995). The leaf area index (LAI) was computed using the formula of Sestak *et al.* (1971). Cumulative yield of randomly selected clumps along with the remaining clumps of the plot were expressed as fresh rhizome yield per plot converted as yield per hectare based on standard number of $3m^2$ beds ha^{-1} (2000). Fisher's method of analysis of variance was applied for analysis and interpretation of data as given by Panse & Sukhatme (1967). The level of significance used in 'F' and 't' test was at P=0.05. The economic analysis of different organic manures was worked out based on corresponding cost of inputs and market prices.

Growth attributes recorded at 180 DAP differed significantly among treatments (Table 1). Application of FYM (25 t ha^{-1}) with RDF resulted in significantly higher growth attributes *viz*., plant height (50.92 cm), number of tillers (18.50) and leaf area index (8.18) compared to neem cake alone (33.29 cm, 10.70 cm and 4.01 cm, respectively) which recorded

Table 1. Effect of different organic manures on growth attributes of ginger cv. Humnabad at 180 days after planting and yield

Sl. No.	Treatments	Plant height (cm)	Number of leaves $clump^{-1}$	Leaf size (cm^2)	Number of tillers $clump^{-1}$	Leaf area index	Fresh yield (g $clump^{-1}$)	Fresh rhizome yield (t ha^{-1})
1.	FYM (25 t ha^{-1})	42.32	102.93	29.90	13.20	5.18	169.67	15.20
2.	FYM (25 t ha^{-1}) + RDF	50.92	176.53	36.86	18.55	8.18	180.73	16.52
3.	Poultry manure (5 t ha^{-1})	38.41	109.40	26.95	12.47	4.85	154.13	13.70
4.	Poultry manure (5 t ha^{-1}) + RDF	49.26	169.87	35.99	16.60	7.94	174.73	16.23
5.	Sheep manure (10 t ha^{-1})	34.29	97.07	24.73	11.60	4.00	145.00	12.41
6.	Sheep manure (10 t ha^{-1}) + RDF	40.46	112.47	29.63	12.87	5.54	167.40	14.95
7.	Vermicompost (5 t ha^{-1})	35.83	99.47	27.53	11.93	4.63	147.13	13.08
8.	Vermicompost (5 t ha^{-1}) + RDF	47.69	132.87	29.20	14.33	6.47	171.13	15.29
9.	Press mud (10 t ha^{-1})	37.97	101.33	25.85	12.00	4.36	149.67	13.57
10.	Press mud (10 t ha^{-1}) + RDF	48.21	147.60	34.74	15.75	7.79	172.27	15.47
11.	Neem cake (2 t ha^{-1})	33.29	101.13	23.89	10.67	4.01	127.87	9.21
12.	Neem cake (2 t ha^{-1}) + RDF	39.21	111.47	28.12	12.47	5.19	161.27	14.10
13.	RDF alone (control)	34.43	87.13	23.03	11.00	3.30	137.47	10.12
Mean		40.94	119.17	28.96	13.34	5.50	158.34	13.84
SEm±		1.55	10.09	1.90	0.68	0.68	4.09	0.45
CD (P<0.05)		4.51	29.44	5.55	1.99	1.99	11.94	1.32
CV (%)		6.54	14.66	11.37	21.49	21.49	4.47	5.65

the lowest. Higher growth attributes in FYM + RDF may be due to adequate supply of macronutrients (NPK) through RDF in initial stages and gradual release of both macro and micro nutrients from FYM by continuous mineralization coupled with favourable effects on physico-chemical properties. Srinivasan *et al.* (2000) reported that application of FYM with rock phosphate gave maximum number of tillers per clump (476.3 $3m^{-2}$) compared to the minimum in RDF only (103.3 $3m^{-2}$). Significantly higher fresh rhizome yield per ha was obtained by the application of FYM + RDF (16.52 t ha^{-1}) closely followed by poultry manure with RDF (16.23 t ha^{-1}), press mud + RDF (15.47 t ha^{-1}), vermicompost with RDF (15.29 t ha^{-1}) and farmyard alone (15.20 t ha^{-1}) compared to neem cake alone (9.21 t ha^{-1}) as indicated in Table 2. Cured rhizome yield ranged between 4.18 t per ha (FYM + RDF) to 1.98 t per ha (Neem cake alone). Favourable growth attributes resulted in higher biomass production which in turn resulted in higher rhizome yield due to the application of FYM + RDF. Ginger being crop of 7 to 8 months duration, application of organic manures in the form of FYM would have taken care of the nutrition requirements throughout the crop period. Pawar & Patil (1987) also reported a higher fresh rhizome yield due to application of FYM (30 t ha^{-1}) along with RDF (16.42 t ha^{-1}) compared to RDF alone (10.45 t ha^{-1}). Khandakar & Nigam (1996) had also observed increase in fresh rhizome yield from 2.26 to 3.30 t per ha with increase in FYM application from 3 to 6 t per ha. Similarly, Vastrad (1999) and Pradeepa (2003) obtained higher fresh rhizome yield in ginger by the application of vermicompost (2.5 t ha^{-1}) with RDF.

Significantly higher content of essential oil (1.80%), oleoresin (5.50%) and lower crude fibre (3.14%) was observed due to application of sheep manure (10 t ha^{-1}) + RDF compared to RDF alone (1.12%, 4.36% and 4.54%, respectively) as indicated in Table 2. Similar better quality parameters were observed in

Table 2. Effect of different organic manures on quality attributes and economics in ginger cv. Humnabad

Sl. No.	Treatments	Curing per cent	Cured yield (t ha^{-1})	Essential oil(%)	Oleo resin (%)	Crude fibre (%)	Total cost (Rs. ha^{-1})	Net returns (Rs. ha^{-1})	Net returns per rupee (B:C Ratio)
1.	FYM (25 t ha^{-1})	24.21	3.68	1.56	4.47	4.51	59490	117894	1.98
2.	FYM (25 t ha^{-1}) + RDF	25.31	4.18	1.48	4.62	4.35	62390	130376	2.09
3.	Poultry manure (5 t ha^{-1})	22.81	3.12	1.45	4.78	4.12	71990	87879	1.22
4.	Poultry manure (5 t ha^{-1}) + RDF	24.72	4.01	1.80	5.11	4.07	74890	114441	1.53
5.	Sheep manure (10 t ha^{-1})	21.87	2.72	1.54	4.99	4.11	76990	67850	0.88
6.	Sheep manure (10 t ha^{-1}) + RDF	23.73	3.55	1.80	5.50	3.14	79890	94541	1.18
7.	Vermicompost (5 t ha^{-1})	22.66	2.97	1.30	4.35	4.64	66990	85649	1.28
8.	Vermicompost (5 t ha^{-1}) + RDF	24.42	3.73	1.54	5.46	3.60	69890	108466	1.55
9.	Press mud (10 t ha^{-1})	22.72	3.09	1.31	4.21	4.28	81990	76374	0.93
10.	Press mud (10 t ha^{-1}) + RDF	24.51	3.79	1.44	4.67	4.68	84890	95641	1.13
11.	Neem cake (2 t ha^{-1})	21.47	1.98	1.54	4.67	4.32	58990	48423	0.82
12.	Neem cake (2 t ha^{-1}) + RDF	23.40	3.30	1.71	4.72	4.14	61890	102574	1.66
13.	RDF alone (control)	21.63	2.19	1.12	4.36	4.54	49890	68152	1.37
Mean		23.34	3.25	1.51	4.76	4.19	69244	92174	1.36
SEm±		0.40	0.13	0.12	0.24	0.16			
CD (P<0.05)		1.18	0.38	0.35	0.71	0.47			
CV (%)		2.43	6.96	2.96	3.37	2.35			

treatments with organic manures *viz*., vermicompost, poultry manure and neem cake along with RDF. Earlier workers have also reported about higher content of essential oil and oleoresin in ginger due to application of organics along with RDF (Sadanandan & Hamza 1996; Vastrad 1999; Pradeepa 2003).

Highest net returns (Rs. 1.31 lakh ha^{-1}) and B:C ratio (2.09) were recorded in the treatment receiving FYM + RDF followed by FYM alone (Rs. 1.18 lakh ha^{-1} and 1.98, respectively) compared to lowest recorded in neem cake alone (Rs. 0.48 lakh ha^{-1} and 0.82, respectively), due to higher rhizome yield and lower cost of FYM (Table 2). Vishwanath (2002) also reported the highest profit (Rs. 11.10 lakh ha^{-1}) by the application of FYM (25 t ha^{-1}) along with RDF in turmeric under Arabhavi conditions. Several workers have also reported the profitability of using organics in ginger cultivation (Vastrad 1999; Pradeepa 2003).

This study revealed that application of FYM (25 t ha^{-1}) is beneficial as compared to poultry manure, sheep manure, vermicompost, pressmud and neem cake to get higher yield in cv. Humnabad local. Though the rhizome yield of FYM + RDF, poultry manure + RDF, press mud + RDF and vermicompost + RDF was at par, higher net profit was obtained with FYM + RDF due to lower cost of FYM. i.e., FYM 25 t + RDF at 100: 50:50 kg NPK ha^{-1} was more beneficial for obtaining higher yield and net returns.

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