

Yield and nutrient uptake of ginger (*Zingiber officinale* Rosc.) as affected by organic manures and fertilizers

A.A. SHAIKH*, M.M. DESAI, S.B.SHINDE AND A.D. TAMBE

Department of Agronomy, Mahatma Phule Krishi Vidyapeeth, Rahuri, AHMEDNAGAR (M.S.) INDIA

ABSTRACT

A field experiment entitled "Response of organic manures and fertilizers to yield and nutrient uptake of ginger (*Zingiber officinale* Rosc.)" was conducted at Agronomy Farm, College of Agriculture, Pune during summer 2006. The data revealed that recommended dose of fertilizer + 25 t FYM/ha favorably influenced yield and uptake of nutrients by ginger followed by the application of 50 % N through recommended dose + 50 % N through poultry manure. It is, therefore suggested that application of recommended dose of fertilizer + 25 t FYM/ha to ginger planted on flat bed in clay loam soil is best combination.

Key words : Organic manures, Fertilizers, Yield, Uptake, Ginger

INTRODUCTION

The use of organic manures held a very prestigious position with farmers in the past but subsequently, the introduction of high analysis chemical fertilizers cast a shadow on their spread. It is well known that addition of organic manures has shown considerable increase in crop yield, quality and exert significant influence on physical, chemical and biological properties of soil. Use of organic and biofertilizers not only improve soil health but also help to sustain crop productivity.

Ginger (*Zingiber officinale* Rosc.) is one among the five important major spices of India which play an important role in national economy. The high yield of ginger is function of adequate and timely supply of plant nutrients. Among the various agronomic technologies influencing the production of ginger, nutrition is found to exert a great influence on growth and yield of ginger. Imbalance, low or no fertilizer application is one of the most important factors in obtaining the poor yield. Keeping all these points in view, field experiments were carried out to investigate the "Response of organic manure and fertilizers to yield and nutrient uptake of ginger (*Zingiber officinale* Rosc.)".

MATERIALS AND METHODS

The present investigation was carried out at Agronomy Farm College of Agriculture, Pune during summer 2006. The experiment was laid down in a Randomized Block Design with three replications. There were 13 treatments *viz.*, absolute control, only recommended dose of FYM (25 t/ha), recommended dose of fertilizer (RDF-75:50:50 kg NPK/ha.), RDF + 25 t FYM/ha, 10 t FYM/ha + *Azotobacter* + *Acetobacter* + PSB, 50 % RDN (Inorganic) + 50 % N through neem

cake, 75 % RDN (Inorganic) + 25 % N through neem cake, 50 % N RDN (Inorganic) + 50 % N through vermicompost, 75 % RDN (Inorganic) + 25 % N through vermicompost, 50 % RDN (Inorganic) + 50 % N through FYM, 75 % RDN (Inorganic) + 25 % N through FYM, 50 % RDN (Inorganic) + 50 % N through poultry manure, 75 % RDN (Inorganic) + 25 % N through poultry manure. The gross and net plot sizes were 3.60 x 1.60 m² and 3.20 x 1.20 m², respectively. Soil of experimental field was clay loam with available N, P and K of 147.50, 17.20 and 280.00 kg/ha, respectively. The soil pH was 7.89. The total rainfall received during the period of investigation was 1249.5 mm in a 10 rainy days. A ginger was planted on 20th May 2006 at a spacing 20 x 20 cm² on flat bed. Organic manures are applied before planting. Half dose of nitrogen and full phosphorous and potassium were applied as a basal dose of phosphorous and remaining half dose of nitrogen was applied at 6 and 12 weeks after planting. The total dose of nitrogen, phosphorous and potassium were 75, 50 and 50 kg/ha, respectively. The crop was harvested on 21st January, 2007.

The data regarding mean green (fresh) rhizome yield, total uptake of N, P₂O₅ and K₂O as influenced by different treatments are presented in Table 1.

RESULTS AND DISCUSSION

The findings obtained from the present study as well as relevant discussions have been presented under following heads:

Effect on green rhizome yield :

The mean green rhizome yield was significantly influenced by different treatments. The maximum green rhizome yield (30.50 t/ha) was obtained with the application of RDF + 25 t FYM/ha and minimum with the

* Author for correspondence.

control plot (12.50 t/ha). The application of RDF + 25 t FYM/ha was found significantly superior followed by the use of 50 % N through RDF + 50 % N through RDF + 50 % N through poultry manure. The poultry manure application as a component of integration in a integrated nutrient management of ginger may set as nitrogen inhibitor and slow release of nitrogen. As results, there was continuous balanced supply of nutrients to ginger. The integrated use of organic sources consists of bulky and concentrated organic manures which provides adequate amount of organic matter and mineral matter to ginger, hence ginger produced higher green rhizome yield. These results are corroborated with the results of Darley (1984) and Dalavi (2006).

Effect on nitrogen uptake :

The mean total nitrogen uptake by ginger was 113.05 kg/ha. Mean total nitrogen uptake by ginger was significantly affected due to different treatments. Uptake of nitrogen was the highest with the application of RDF + 25 t FYM/ha (144.8 kg/ha) followed by the application of 50 % N through RDF + 50 % N through poultry manure. However, total uptake of nitrogen by ginger was significantly lower where only FYM was applied and in control. This may be due to more nutrient availability from inorganic fertilizers and decomposed FYM. Similar results were observed by Haag *et al.* (1990), Konde *et al.* (1990), Pawar and Gawande *et al.* (1992), Prasad *et al.* (1997), Thakur and Sharma (1997) and Joseph *et al.* (1998).

Effect on phosphorous uptake :

The mean total phosphorous uptake by ginger was 29.20 kg/ha. Phosphorous uptake by ginger was significantly influenced. Uptake of phosphorous was the highest with RDF + 25t FYM/ha followed by application of 50 % N through RDF + 50 % N through poultry manure.

Application in combination of organic and inorganic fertilizers provides adequate amount of macro and micro nutrients as well as higher yield and phosphorus uptake. Similar findings were reported by Haag *et al.* (1990), Kohde *et al.* (1990), Pawar and Gavande *et al.* (1992), Prasad *et al.* (1997), Thakur and Sharma (1997) and Joseph *et al.* (1998).

Effect on potassium uptake:

The mean potassium uptake by ginger was 158.38 kg/ha. Mean total potassium uptake by ginger was significantly influenced due to different treatments. Uptake of potassium was the highest with the application of RDF + 25 t FYM/ha (178.22 kg/ha) followed by the application of 50 % N through RDF + 50 % N through poultry manure (162.35 kg/ha). The minimum potassium uptake was found where no fertilizer were applied. The inorganic fertilizers provides readily available nutrients during early growth stages where the organic manures slowly release the nutrients throughout the period which result in continuous supply of macro and micro nutrients to the crops. The well decomposed organic manures improves the soil condition which was favourable to

Table 1 : Mean green (fresh) ginger rhizome yield t/ha and uptake of N, P₂O₅ and K₂O (kg/ha) by ginger influenced by different treatments

Treatments	Green rhizome yield (t/ha)	Uptake (kg/ha)		
		N	P ₂ O ₅	K ₂ O
Absolute control	12.50	92.26	22.17	140.88
Only recommended dose of FYM (25 t/ha)	13.22	94.52	24.45	144.93
Recommended dose of fertilizer (RDF 75:50:50 kg NPK/ha)	22.37	115.24	28.51	160.47
RDF+25 t FYM/ha	30.50	144.87	40.83	178.22
10 t FYM/ha + <i>Azotobacter</i> + <i>Acetobacter</i> + PSB	15.28	95.13	24.93	146.35
50 % RDN (Inorganic) + 50 % N through neem cake	29.43	128.57	34.43	168.93
75 % RDN (Inorganic) + 25 % N through neem cake	19.18	107.27	26.23	157.24
50 % RDN (Inorganic) + 50 % N through vermicompost	27.22	123.22	32.79	167.52
75 % RDN (Inorganic) + 25 % N through vermicompost	18.24	101.88	25.79	153.87
50 % RDN (Inorganic) + 50 % N through FYM	25.33	119.86	30.27	162.35
75 % RDN (Inorganic) + 25 % N through FYM	17.17	98.34	35.27	148.24
50 % RDN (Inorganic) + 50 % N through poultry manure	30.18	136.42	35.98	170.24
75 % RDN (Inorganic) + 25 % N through poultry manure	20.42	112.11	26.97	159.15
S.E. ±	0.64	0.55	0.05	0.07
C.D. (P=0.05)	1.87	1.62	0.137	0.21
General mean	21.66	113.05	29.20	158.38

rhizome development. It leads to the higher yield and the nutrient uptake of ginger. Similar results were reported by Hagg *et al.* (1990), Konde *et al.* (1990), Pawar and Gavande (1992), Prasad *et al.* (1997), Thakur and Sharma (1997) and Joseph *et al.* (1998).

Conclusion:

The data revealed that the application of recommended dose of fertilizer + 25 t FYM/ha favorably influenced yield and uptake of nutrients by ginger followed by 50 % N through recommended dose + 50 % N through poultry manure. It is, therefore, suggested that application of recommended dose of fertilizer + 25 t FYM/ha to ginger planted on flat bed in clay loam soil is best combination.

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