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## Effect of inorganic fertilizers, organic manures and trichoderma on growth, quality and yield of ridge gourd (*Luffa acutangula*) cv. Kashi Shivani

Puranam Yogita, VM Prasad, Vijay Bahadur and Taraka Gaddam

### Abstract

The experiment was conducted on “Effect of Inorganic fertilizers, Organic manures and Trichoderma on growth, quality and yield of ridge gourd (*Luffa acutangula*) cv. Kashi Shivani” conducted during the period of February to May, 2021 at Horticulture Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom, University of Agriculture, Technology and Sciences, Prayagraj (Uttar Pradesh). The experiment was planned in randomized block design with three replications and sixteen treatments. The observations were recorded on various growth, yield and quality contributing characters. Based on the results obtained from the present investigation, it is concluded that the T<sub>10</sub>(100% RDF of NPK + Compost@ 10t/ha+ Vermicompost @5t/ha+ Rock phosphate@ 1.25q/ha) was found superior in growth and higher yield with quality factors. In this investigation the T<sub>10</sub> was found suitable for cultivation in Zaid season for better yield per hectare, higher TSS and Ascorbic acid content and best returns in terms of economics of the crop.

**Keywords:** Ridge gourd, compost, vermicompost, rock phosphate, yield, TSS, ascorbic acid, economics

### Introduction

Ridge gourd (*Luffa acutangula*) is a popular warm-season vegetable that may be grown commercially from seeds. Ridge gourd blooms are hermaphrodite, and monoecious, and gynoecious. The anthers are unattached, and the pistil has three placentas and numerous ovules. There are three bilobate stigmas. The fruit is angled and club-shaped, with 10 conspicuous ribs and many seeds. As it matures, it becomes hard, bitter, and inedible. The seeds are wrinkled, flattened, and black. A thousand seeds weigh between 150 and 170 grammes (Doijode, 2002) <sup>[11]</sup>.

Organic fertilizers are made up of a wide range of plant-derived resources, including fresh or dried plant material, animal dung and litter, and agricultural by-products (Wohlfarth and Schroeder, 1979; Das and Jana, 2003; Kumar *et al.*, 2004) <sup>[40, 9, 20]</sup>. Organic fertilizers are supposed to be slow-release fertilizers that contain a variety of trace components. They eliminate the need to apply synthetic fertilizers on a regular basis to maintain soil fertility. They release nutrients gradually into the soil solution and maintain nutrient balance for crop plant growth. They also provide a reliable supply of energy for soil bacteria, which improves soil structure and crop growth. They're a better option than chemical fertilizers.

Compost is made up of a variety of materials that are used to enrich and enhance soil. Apart from providing plant nutrients, they encourage the aggregation of fine soil particles, which promotes good soil structure. It is also necessary for the healthy development of soil microorganisms, which then carry out biochemical transformations, assist in the decomposition of organic matter, and aid in the release of essential plant nutrients (Sureshkumar and Karuppaiah, 2008) <sup>[34]</sup>.

Phosphate rock (RP) is a valuable natural source of P that is used to make chemical phosphatic fertilizers (Reddy *et al.* 2002) <sup>[36]</sup>. The direct application of RP to acidic soils has been proven to be beneficial since the low pH helps to solubilize the RP and increases the amount of accessible P to the plants.

Vermicompost stimulates soil microbial activity, enhances oxygen availability, maintains normal soil temperature, improves soil porosity and water infiltration, improves nutrient content, and boosts plant growth, yield, and quality (Arora *et al.* 2011) <sup>[6]</sup>. Vermicompost are compounds created by earthworms and microorganisms accelerating the biological decomposition of organic wastes.

Inorganic fertilizers provide a quick infusion of nutrients, allowing you to feed your plants when and how you wish. The continued use of high levels of chemical fertilizers causes a decline in plant nutrient uptake efficiency, resulting in production stagnation or loss, as well as pollution (Singh and Kalloo, 2000) [32]. One of the key components of AI (Firbank *et al.*, 2008; Tivy, 1990) [14, 38] is inorganic fertilizer input, which has a range of possible direct and indirect consequences on biodiversity (Robinson and Sutherland, 2002) [40].

*Trichoderma spp.* are known to minimize plant pathogenic assault while simultaneously increasing plant growth and yield. *Trichoderma harzianum*, a filamentous fungus, is employed as a successful biological control agent to manage *Pythium spp.*, *Rhizoctonia solani*, *Fusarium spp.*, and *Sclerotium rolfsii*, among other soil-borne plant infections. *T. harzianum* was found to produce defense responses and systemic resistance in addition to controlling plant diseases.

## Materials and Methods

### Experimental site

The present investigation “Effect of inorganic fertilizers, organic manures and *Trichoderma* on growth, quality and

yield of Ridge gourd (*Luffa acutangula*) cv. Kashi Shivani” was conducted during February-May, 2021 at Horticulture Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom, University of Agriculture, Technology and Sciences, Prayagraj (Uttar Pradesh). All the facilities necessary for cultivation, including labour were made available in the department.

Prayagraj is situated at an elevation of 78 meters above sea level at 25.87° North latitude and 81.15° E longitudes. This region has a sub-tropical climate prevailing in the South-East part of U.P. with both the extremes in temperature, i.e., the winter and the summer. In cold winters, the temperature sometimes is as low as 0°C in December – January and very hot summer with temperature reaching up to 46°C in the months of May and June. During winter, frosts and during summer, hot scorching winds are also not uncommon. The average rainfall is around 1013.4 (cm) with maximum concentration during July to September months with occasional showers in winters. The meteorological data for the experimental period collected from Meteorological Observatory at College of Forestry and Environment, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj.

### Treatment details

Treatment	Treatment details
T <sub>0</sub>	RDF- 100Kg of N, 80Kg of P <sub>2</sub> O <sub>5</sub> ,60Kg of K <sub>2</sub> O
T <sub>1</sub>	Compost @ 20t/ha
T <sub>2</sub>	Vermicompost @10t/ha
T <sub>3</sub>	Rock phosphate@ 2.5q/ha
T <sub>4</sub>	50% RDF of NPK + Compost@20t/ha
T <sub>5</sub>	100% RDF of NPK + Compost @ 10t/ha+ Vermicompost @5t/ha
T <sub>6</sub>	50%RDF of NPK+ Vermicompost@ 2.5t/ha+ Rock phosphate@ 1.25q/ha
T <sub>7</sub>	100%RDF of NPK + Compost@ 5t/ha+ <i>Trichoderma harzianum</i> @1Kg/ha
T <sub>8</sub>	100%RDF of NPK + Compost@ 5t/ha+ Vermicompost@ 10t/ha
T <sub>9</sub>	100%RDF of NPK + Compost@ 5t/ha+ Vermicompost @2.5t/ha+ <i>Trichoderma harzianum</i> @1Kg/ha
T <sub>10</sub>	100%RDF of NPK + Compost@ 10t/ha+ Vermicompost @5t/ha+ Rock phosphate@ 1.25qha
T <sub>11</sub>	100%RDF of NPK + Compost@ 5t/ha+ Vermicompost @2.5t/ha+ Rock phosphate@ 0.625q/ha
T <sub>12</sub>	50%RDF of NPK+ Vermicompost@ 10t/ha
T <sub>13</sub>	100%RDF of NPK+ Vermicompost@ 5t/ha
T <sub>14</sub>	100%RDF of NPK+ Vermicompost@2.5t/ha
T <sub>15</sub>	<i>Trichoderma harzianum</i> @2Kg/ha

## Results and Discussion

### Growth parameters

In terms of vine length recorded (30DAS) highest was recorded in T<sub>1</sub> (17.12 cm) treatment whereas lowest was recorded in T<sub>14</sub> (7.96 cm). Vine length (45 days) was recorded highest in T<sub>9</sub> (104.45cm) whereas lowest in T<sub>1</sub> (58.9 cm). Vine length (At harvest) was recorded highest in T<sub>9</sub> (119.33 cm) whereas lowest in T<sub>12</sub> (74.42 cm).

In terms of number of nodes per branch, length of internodes and number of branches per plant among the treatments T<sub>10</sub> treatment recorded significantly higher values 18.53, 13.90cm & 4.91 respectively. Low value of number of nodes per branch was recorded in T<sub>0</sub> (12.82) whereas length of internodes and number of branches per plant was recorded in T<sub>15</sub> treatment 6.38cm & 1.92 respectively.

### Earliness parameters

Days to male flower initiation, days to female flower initiation, days to 50% flowering, days to first fruit setting & days to first picking best values were recorded in T<sub>10</sub> treatment 32.06days, 35.77days, 42.39days, 46.66 & 50.02

respectively, and least values were recorded in T<sub>15</sub> treatment 44.35 days, 46.66 days, 59.02 days, 67.72 days & 74.85 days respectively.

### Yield attributing characters

In terms of fruit length(cm), & pedicle length best reading were recorded in T<sub>10</sub> treatment 29.12 cm & 2.76cm respectively whereas fruit girth (cm) was recorded highest (16.26 cm) in T<sub>9</sub> and least concerned values for fruit length(cm), & pedicle length were recorded in T<sub>15</sub> treatment 13.83 cm, 17.53 cm and lowest fruit girth (cm) was recorded in T<sub>0</sub> (11.71cm).

### Yield parameters

In terms of no. of fruits per plant, fruit weight, fruit yield per plot & fruit yield (q/ha) maximum readings were recorded in T<sub>10</sub> treatment 11.58, 153kg, 14.19 and 157.64q/ha respectively, and minimum readings were recorded in T<sub>15</sub> treatment 1.82, 49.7gm, 0.75Kg, 0.1 & 8.3q/ha respectively.

### Quality parameters

In terms of vitamin C maximum value was recorded in T<sub>9</sub> treatment (13.68 mg/100 gm), and minimum value recorded in T<sub>15</sub> (8.09 mg/100 gm). In TSS maximum reading was recorded in T<sub>10</sub> treatment (3.15°B) and minimum reading was recorded in T<sub>15</sub> treatment (2.45°B).

### Economics

Economically best treatment was T<sub>10</sub>, gave the highest net return up to 300979.00 Rs/ha as well as B:C ratio 4.24, and T<sub>2</sub> lowest net return was at 1557.00 Rs/ha as well as B:C ratio 1.02.

**Table 1:** Effect of inorganic fertilizers, organic manures and Trichoderma on growth and earliness parameters on ridge gourd

Treatments	Vine length at 30 days	Vine length at 45 days	Vine length at harvest (cm)	Number of nodes per branch	Length of internodes (cm)	Number of branches per plant	Days to first male flower	Days to first female flower	Days to 50% flowering	Days to fruit setting	Days to 1 <sup>st</sup> fruit picking
T <sub>0</sub>	15.89	74.15	101.13	12.82	8.84	2.10	41.46	43.02	54.70	63.73	69.45
T <sub>1</sub>	17.12	58.9	76.01	13.36	8.70	2.55	39.91	41.24	52.10	60.73	63.52
T <sub>2</sub>	13.43	98.89	106.12	15.72	9.11	2.63	38.67	39.69	47.76	54.73	62.50
T <sub>3</sub>	12.77	68.02	96.98	15.01	8.81	2.51	39.36	41.44	46.45	54.87	61.32
T <sub>4</sub>	11.68	76.88	91.45	14.95	8.58	2.927	37.89	41.5	50.56	56.26	61.97
T <sub>5</sub>	12.99	83.77	94.20	15.89	10.99	3.98	37.58	38.35	45.29	51.21	54.83
T <sub>6</sub>	14.04	73.47	92.40	15.01	8.75	2.25	41.7	41.21	53.86	65.11	69.65
T <sub>7</sub>	12.22	90.65	94.86	16.32	9.09	2.68	37.87	39.48	46.74	54.15	58.94
T <sub>8</sub>	14.42	80.8	98.07	18.46	11.27	3.77	33.47	36.88	44.26	47.96	51.82
T <sub>9</sub>	13.44	104.45	119.33	17.32	9.99	3.88	34.71	38.88	45.40	49.24	52.77
T <sub>10</sub>	10.21	91.74	104.77	18.53	13.90	4.91	32.06	35.77	42.39	46.66	50.02
T <sub>11</sub>	10.56	79.13	97.36	18.19	9.95	2.62	37.83	38.54	46.59	53.35	57.20
T <sub>12</sub>	11.51	67.8	74.42	16.89	9.65	3.41	38.38	39.27	48.51	56.68	62.35
T <sub>13</sub>	10.31	72.41	85.33	17.13	9.87	3.09	36.87	38.83	46.42	52.25	56.58
T <sub>14</sub>	7.96	67.67	83.09	16.09	9.48	2.95	38.01	39.52	47.32	55.58	61.84
T <sub>15</sub>	15.89	74.15	101.13	14.05	6.38	1.92	44.35	46.66	59.02	67.72	74.85
F	S	S	S	S	S	S	S	S	S	S	S
SE(d)	2.10	8.65	9.21	0.60	0.06	0.54	1.11	0.90	1.38	1.14	1.25
CD at 5%	4.29	17.66	18.80	1.23	0.12	1.10	2.26	1.84	2.81	2.34	2.55
CV	20.59	13.66	12.20	4.62	0.72	21.87	3.56	2.76	3.47	2.52	2.52

**Table 2:** Effect of inorganic fertilizers, organic manures and Trichoderma on yield attributing characters, yield and quality parameters on ridge gourd

Treatments	Fruit length (cm)	Fruit girth (cm)	Pedicle length (cm)	Number of fruits per plant	Fruit weight (g)	Fruit yield per plot (kg)	Fruit yield (q/ha)	T.S.S (°B)	Ascorbic acid (mg/100g)
T <sub>0</sub>	15.56	11.41	16.3	2.99	103.57	2.51	27.86	2.58	11.44
T <sub>1</sub>	18.62	12.88	16.3	2.71	99.86	2.19	24.3	2.57	9.03
T <sub>2</sub>	22.26	13.99	13.5	4.23	100.88	3.44	38.23	2.52	8.44
T <sub>3</sub>	20.80	12.90	7.3	4.83	70.95	2.86	31.71	2.58	8.81
T <sub>4</sub>	20.02	13.38	15.5	4.43	102.94	3.68	40.89	2.65	8.81
T <sub>5</sub>	27.64	15.60	5.86	6.08	140.01	6.86	76.15	2.69	11.75
T <sub>6</sub>	21.63	13.63	13.76	4.47	119.6	4.32	48.01	2.93	12.23
T <sub>7</sub>	23.41	14.51	10.6	4.15	123.25	4.14	45.93	3.06	13.38
T <sub>8</sub>	28.53	15.28	3.66	10.12	147.54	11.71	130.08	2.75	12.18
T <sub>9</sub>	28.52	16.26	10.5	6.51	127.86	6.16	68.45	3.13	13.68
T <sub>10</sub>	29.12	15.80	2.76	11.58	153	14.19	157.64	3.15	12.82
T <sub>11</sub>	28.40	15.23	5.96	7.71	132.82	7.42	82.38	2.97	12.34
T <sub>12</sub>	26.14	13.64	6.76	6.71	126.18	6.8	75.56	2.79	9.77
T <sub>13</sub>	26.3	14.5	11.1	6.77	133.04	7.2	80.01	2.66	9.71
T <sub>14</sub>	23.55	14.54	11.06	5.81	115.38	5.28	58.67	2.80	9.87
T <sub>15</sub>	13.83	11.49	17.53	1.82	49.7	0.75	8.3	2.45	8.09
F	S	S	S	S	S	S	S	S	S
SE(d)	0.90	0.67	0.53	0.64	3.33	0.59	6.59	0.19	0.49
CD at 5%	1.84	1.36	1.08	1.31	6.79	1.21	13.45	0.39	1.00
CV	4.71	5.81	6.11	13.81	3.53	12.99	12.99	8.37	5.58

### Conclusion

In this study, T<sub>10</sub> was found superior combination in minimum days to male and female flower emergence, days to 50%, days to first fruit setting, days to first fruit picking, pedicle length and with maximum number of nodes per branch, length of internodes, number of branches per plant, fruit length, number of fruits per plant, fruit weight, fruit yield per plot, fruit yield(q/ha), total soluble solids with high net return and B:C

ratio including T<sub>9</sub> superior combination in maximum vine length at 45days and at harvest, fruit girth and Ascorbic acid(mg/100g) was maximum in 100grams of edible portion. From this it can be concluded that the T<sub>10</sub>, was the most promising treatment amongst all the other treatments.

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