

## Original Research Article

### **EFFECT OF ORGANIC MANURES AND INORGANIC FERTILIZERS ON GROWTH, YIELD AND QUALITY OF BROCCOLI (*Brassica oleraceae* var. *italica* L.) cv. Green Magic”**

#### **Abstract**

The experiment was conducted in the Horticulture Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture Technology and Science, Prayagraj (UP) During October 2021 to February 2022. The experiment was laid out in RBD with 8 treatments with 3 replications. The results revealed that Treatment T<sub>6</sub> (50% RDF+ 25% Vermicompost + 25% Poultry Manure) – performed the best in terms of days to Plant Height (55.17), No. of Leaves (21.25), Leaf width (18.76), leaf area (238.17), leaf area index (19.16), days to initiation (56.83), Head weight (308.33), Head yield per plot (3.03), Head yield per hectare (11.36), Head diameter (15.5), TSS Brix (13), Vitamin C (103.97), B:C Ratio (3.04:1). Therefore, the Treatment T<sub>6</sub> (50% RDF + 25% Vermicompost + 25% Poultry Manure) is the best when compared to other treatments. As, the highest benefit cost ratio was observed in treatment T<sub>6</sub> (50% RDF + 25% Vermicompost + 25% Poultry Manure) i.e., (3.04:1) which states that it is economically profitable compared to all other treatments.

**Keywords:** Broccoli, Growth, yield, Quality, NPK, vermicompost, poultry manure.

#### **Introduction:**

Broccoli (*Brassica oleraceae* L. var. *italica*) is an important Cole crop of Europe and USA. Being a native of Italy, it was introduced by Italian immigrants around 1925 in US (Nieuwhof, 1969). Broccoli is an Italian word from Latin *Brachium* meaning an arm on branch (Choudhary, 1970). It belongs to family **Cruciferae** and US is the world's largest producer of broccoli, other major growing areas are Italy, Northern Europe and cooler regions of the far East. It resembles cauliflower in its morphology except for secondary head which develops in the axil of leaves and may contribute up to 50% of total yield. Broccoli is fairly high in protein (3.3%), vitamin 'A' (9000 IU) and Ascorbic Acid (137 mg/ 100g). It also contains appreciable quantities of carbohydrates (5.5%), thiamine, riboflavin, niacin and iron (Rampal,

2000). Broccoli has the maximum content of glucosinate (0.05 – 0.2 %) on fresh weight basis. Broccoli is used in a variety of ways viz., salad in making curry, soup, pickles and for freezing. Broccoli is of 3 types i.e. heading, purple and green sprouting, out of which green type is highly nutritious.

Throughout their lifecycles, Brassica crops requires particular nutrients in varying quantities to support optimal growth and reproduction. Nitrogen is the nutritional element that ~~not~~ cultivated crops need in the greatest amount. Plants use it to form proteins, cultivated crops need in the greatest amount. Plants use it to form proteins, chlorophyll, protoplasm and enzymes. In Cole crops, it is most important for overall growth and adequate amount are necessary for best yield. Usually the initial nitrogen available from organic source is enough, but as the plant develops; it may need supplemental nitrogen. The mineralization of nitrogen its availability to plants varies greatly, depending on the nitrogen source. Composted manure usually provides enough phosphorus for Brassicas, Potassium requirement for Cole crops is high. Composted manures are acceptable source of potassium. Micronutrients like calcium, boron, manganese, molybdenum and iron are important for Cole crops development. Biologically active soils with adequate organic matter usually supply enough of these nutrients. Compost is a rich source of supplemental micronutrient.

### Materials and methods

The field experiment entitled, “Effect of organic manures and inorganic fertilizers on growth, yield and quality of broccoli (*Brassica oleracea* var. *italica* L.)” was conducted in winter season adapting randomized block design consisting of 8 treatments and three replications during October 2021 to February 2022. Horticulture Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.). The experiment includes the following treatments. T<sub>0</sub> : 100% RDF (120Kg/ha N+ 80Kg/ha P+ 80Kg/ha K) T<sub>1</sub> :33.3% FYM + 33.3% Vermicompost + 33.3% Poultry Manure T<sub>2</sub> :50% RDF+ 50% FYM T<sub>3</sub> :50% RDF+ 50% Vermicompost T<sub>4</sub> :50% RDF+50% Poultry Manure T<sub>5</sub> :50% RDF+ 25% FYM+ 25% Vermicompost T<sub>6</sub> :50% RDF+ 25% Vermicompost+25% Poultry Manure T<sub>7</sub> :50% RDF+25% FYM+ 25% Poultry Manure. The mean (maximum and minimum) temperature was 35.77°C and 8.28°C respectively, mean (maximum and minimum) relative humidity was 93.5percent and 43.71 percent during the crop growing season. The experimental soil was sandy loam in texture, nearly neutral in soil reaction (pH 7.1), low in organic carbon (0.318%), medium in available N (87Kg/ha), medium available P (375Kg/ha) and medium available K (50Kg/ha). Fertilizers were applied in the form of urea, single super phosphate and murate of potassium, respectively.

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### Results and discussion

## GROWTH PARAMETERS

The maximum Plant height was found in T<sub>6</sub> (50% RDF + 25% Vermicompost + 25% Poultry Manure) which was 14.33, 38.00 and 55.17 cm in 25, 50 and 75 DAT and the minimum plant height was found in T<sub>0</sub> (100% RDF (120:80:80) kg ha<sup>-1</sup> which was 9.5, 20.88 and 31.44 in 25, 50 and 75 DAT.

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The maximum No. of leaves plant<sup>-1</sup> was found in T<sub>6</sub> (50% RDF + 25% Vermicompost + 25% Poultry Manure) which was 4.83, 8.97 and 21.25 in 25, 50 and 75 DAT and the minimum No. of leaves plant<sup>-1</sup> was found in T<sub>0</sub> (100% RDF (120:80:80) kg ha<sup>-1</sup> which was 3.75, 7.38 and 16.67 in 25, 50 and 75 DAT.

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The maximum Leaf width was found in T<sub>6</sub> (50% RDF + 25% Vermicompost + 25% Poultry Manure) which was 5.62, 14.03 and 18.76 in 25, 50 and 75 DAT and the minimum Leaf width was found in T<sub>0</sub> (100% RDF (120:80:80) kg ha<sup>-1</sup> which was 3.82, 11.43 and 14.96 in 25, 50 and 75 DAT.

The maximum leaf area was found in T<sub>6</sub> (50% RDF + 25% Vermicompost + 25% Poultry Manure) which was 132.5, 220.83 and 238.17 cm in 25, 50 and 75 DAT and the minimum leaf area was found in T<sub>0</sub> (100% RDF (120:80:80) kg ha<sup>-1</sup> which was 88.66, 117.16 and 205.50 in 25, 50 and 75 DAT.

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The maximum leaf area index was found in T<sub>6</sub> (50% RDF + 25% Vermicompost + 25% Poultry Manure) which was 5, 10.5 and 19.16 cm in 25, 50 and 75 DAT and the minimum leaf area was found in T<sub>0</sub> (100% RDF (120:80:80) kg ha<sup>-1</sup> which was 3.23, 6.27 and 12.3 in 25, 50 and 75 DAT.

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The maximum Days taken for head initiation was found in T<sub>0</sub> (100% RDF (120:80:80) which was 61.4 75 DAT and the minimum Days taken for head initiation was found in T<sub>6</sub> (50% RDF + 25% Vermicompost + 25% Poultry Manure) kg ha<sup>-1</sup> which was 56.83 in 75 DAT.

## YIELD & QUALITY PARAMETERS

The maximum Head weight was found in T<sub>6</sub> (50% RDF + 25% Vermicompost + 25% Poultry Manure) which was 308.33 in 75 DAT and the minimum Head weight was found in T<sub>0</sub> (100% RDF (120:80:80) kg ha<sup>-1</sup> which was 151.93 in 75 DAT.

The maximum Head yield plot<sup>-1</sup> was found in T<sub>6</sub> (50% RDF + 25% Vermicompost + 25% Poultry Manure) which was 3.03 in 75 DAT and the minimum Head yield plot<sup>-1</sup> was found in T<sub>0</sub> (100% RDF (120:80:80) kg ha<sup>-1</sup> which was 1.77 in 75 DAT.

The maximum Head yield hec<sup>-1</sup> was found in T<sub>6</sub> (50% RDF + 25% Vermicompost + 25% Poultry Manure) which was 11.36 in 75 DAT and the minimum Head yield hec<sup>-1</sup> was found in T<sub>0</sub> (100% RDF (120:80:80) kg ha<sup>-1</sup> which was 4.46 in 75 DAT.

The maximum Head Diameter was found in T<sub>6</sub> (50% RDF + 25% Vermicompost + 25% Poultry Manure) which was 15.5 in 75 DAT and the minimum Head Diameter was found in T<sub>0</sub> (100% RDF (120:80:80) kg ha<sup>-1</sup> which was 10.46 in 75 DAT.

The maximum TSS was found in T<sub>6</sub> (50% RDF + 25% Vermicompost + 25% Poultry Manure) which was 13 in 75DAT and the minimum TSS was found in T<sub>0</sub> (100% RDF (120:80:80) kg ha<sup>-1</sup> which was 12 in 75 DAT.

The maximum Vitamin C was found in T<sub>6</sub> (50% RDF + 25% Vermicompost + 25% Poultry Manure) which was 103.97 in 75DAT and the minimum Vitamin C was found in T<sub>0</sub> (100% RDF (120:80:80) kg ha<sup>-1</sup> which was 83.93 in 75 DAT.

The Maximum benefit cost Ratio was found in T<sub>6</sub> (50% RDF + 25% Vermicompost + 25% Poultry Manure) which was 3.04 and the net Return INR 267133.

#### **Conclusion:**

On the basis of present investigation, it is concluded that the treatment T<sub>6</sub> (50% RDNF+ 25% Vermicompost + 25% Poultry Manure) was found best in respect to growth, yield and quality. Along with the net Return ₹267133 and 3.04 as Benefit Cost Ratio.

**Table 1:- Effect of organic manures and inorganic fertilizers on Plant height , No. of leaves per plant, Leaf width, Leaf area, Leaf area index, Day taken to head initiation**

No tation	Treatment	Plant height			No. of leaves per plant			Leaf width			Leaf Area			Leaf area index			Day taken to head initiation
		25 DAT	50 DAT	75 DAT	30 DAT	60 DAT	90 DAT	25 DAT	50 DAT	75 DAT	25 DAT	50 DAT	75 DAT	25 DAT	50 DAT	75 DAT	
T1	100% RDF (120:80:80) kg ha <sup>-1</sup>	9.5	20.88	31.44	3.75	7.38	16.67	3.82	11.43	14.96	88.66	117.16	205.50	3.23	6.27	12.3	61.4
T2	33.33% FYM + 33.33% Vermicompost + 33.33% Poultry Manure	10.26	25.73	47.93	3.8	7.50	18.56	4.25	11.46	15.33	112.66	192.16	210.50	3.3	6.7	12.5	61.1
T3	50% RDF + 50% FYM	10.46	29.37	50.17	4.1	7.78	18.73	4.34	12.10	15.5	116.33	194.16	220.50	3.66	7.03	13.53	60.4
T4	50% RDF + 50% Vermicompost	13.5	37.37	54.80	4.63	8.53	20.6	5.5	14.00	18.13	129.83	216.83	235.50	4.9	9.8	18.03	57.5
T5	50% RDF + 50% Poultry Manure	13.03	34.60	54.70	4.46	8.41	19.73	5.13	13.97	17.8	125.5	213.66	231.50	4.66	9.2	17.3	58.5
T6	50% RDF + 25% FYM + 25% Vermicompost	12.76	34.18	54.47	4.43	8.27	19.17	5.07	13.40	17.43	121.66	200.83	227.50	4	8.7	17	59.53
T7	50% RDF + 25% Vermicompost + 25% Poultry Manure	14.33	38.00	55.17	4.83	8.97	21.25	5.62	14.03	18.76	132.5	220.83	238.17	5	10.5	19.16	56.83
T8	50% RDF + 25% FYM + 25% Poultry Manure	11.5	31.53	50.30	4.39	7.83	18.83	4.6	12.77	15.76	117.83	197.5	225.83	3.9	7.2	16	59.6
	'F' test	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
	SE.d(±)	0.29	0.80	0.90	0.08	0.20	0.46	0.13	0.35	0.29	1.13	0.80	0.44	0.09	0.15	0.32	0.31
	C.D. at 5%	0.60	1.68	1.93	0.18	0.41	0.96	0.27	0.73	0.62	2.34	1.67	0.93	0.20	0.31	0.67	0.65
	C.V.	4.49	4.74	3.42	3.77	4.57	4.41	5.04	4.99	3.29	1.75	0.79	0.36	4.41	3.38	3.81	0.98

**Table 2:- Effect of organic manures and inorganic fertilizers on Head diameter, Head weight, Head yield per plot, Head yield per hectare, TSS, Vitamin C content**

**Yield& Quality parameters:**

Treatments	Head diameter(cm)	Head weight(g)	Head yield per plot(kg)	Head yield per hectare(t/ha)	TSS (°Brix)	Vitamin C content	B:C Ratio
<b>T<sub>0</sub></b>	10.46	151.93	1.77	3.1	<b>12</b>	83.93	1:1.043209
<b>T<sub>1</sub></b>	10.6	163.36	1.83	7.1	12.15	84.68	1:1.049619
<b>T<sub>2</sub></b>	11.06	163.63	2.00	8.8	12.27	89.87	1:1.235871
<b>T<sub>3</sub></b>	13.63	273.83	2.80	9.56	12.90	100.91	1:2.447391
<b>T<sub>4</sub></b>	13.2	252	2.40	9.06	12.86	97.37	1:2.552791
<b>T<sub>5</sub></b>	12.6	229.66	2.13	8.56	12.57	91.80	1:1.552597
<b>T<sub>6</sub></b>	15.5	308.33	3.03	11.36	<b>13</b>	103.97	1:3.047514
<b>T<sub>7</sub></b>	11.26	210	2.10	9	12.50	90.78	1:1.687045
<b>F-Test</b>	S	S	S	S	S	S	
<b>SE.d(±)</b>	0.21	1.97	0.05	0.19	0.10	0.57	
<b>C.D at 5%</b>	0.44	5.77	0.11	0.41	0.20	1.19	
<b>C.V.</b>	3.20	2.33	4.68	4.50	2.52	3.95	

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