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Production potential of Onion crop (*Allium cepa* L.) cv. N-53 as influenced by integrated nutrient management

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Abstract
A field experiment was carried out during the rabi season of 2018-19 at experimental farm Department of Horticulture College of Agriculture Parbhani (Maharashtra). Eleven treatments were applied with three replications and laid out under randomized block design (RBD). The result revealed that the application of 50 N Enriched through compost + Biofertlizers + 50 % N through chemical fertilizers + Sulphur + Micronutrients was recorded as best treatment for majority of characters. Therefore basis of present study it is concluded that application of Biofertilizers *Azospirillum* and *PSB* in combination with 50% compost, 50% N through chemical fertilizer, sulphur and micronutrient can be suggested cost effective combination for enhanced growth, yield and quality onion production.

Keywords: nutrient management on growth, yield and quality of onion

Introduction
Most of the Indian population is vegetarian and vegetable plays vital role in Indian diet. India is the second largest producer of vegetables in the world next to china. Vegetables are vital sources of proteins, vitamins, phosphorus, calcium, minerals, dietary fibers, micronutrients, antioxidants and phyto-chemicals in our daily diet. Onion (*Allium cepa* L.) is one of the most important vegetable crop grown in India having both the food and medicinal values. Onion is member of *Amryllidaceae* family. It contain 2n=16 chromosome. Onion is "Queen of the kitchen" is one of the most important and commercially valuable vegetable as well as spice crop grown in India. Onion is known to check the deposition of cholesterol in blood vessels, thus protect against cure heart diseases resulting from blockage of arteries. Apart from nutrition, they also contain a wide array of potential phyto-chemicals like anti-carcinogenic principles and anti-oxidants. Onion has its own distain the world, area under onion is 4.30 million hectare with 74.26 million metric tons production in respect to 19.4 MT/ha productivity. In India, onion is grown on 1270 million hectare accounting for 21564 million tons of bulb production with 19.10 MT/ha productivity. Contribution of India in onion production in the world is around 20.2 per cent and Maharashtra is leading state in onion production in India, accounting 1064 hectare area and 218 lakh tonnes tons of total onion production and productivity of 17.9 MT/ha. (Anonymous, 2017). The Maharastra state has exported 13, 09,863.26 thousand Tonnes of fresh onion for the worth of Rs. 1,722.85 crores during year 2017 (Anonymous, APEDA Report, 2017).Therefore to increase export it is necessary to increase the productivity and quality standards of onion. The contribution of Maharashtra in onion production in India is 30.48 per cent, and specific pocket area of onion production are Nasik (Lasalgaon), Nagar (Karjat), Pune, Solapur, Satara, Dhule and Jalgaon districts on commercial scale. Nasik is the leading district for production of onion in the country.

The concept of sustainable agriculture envisages primary emphasis on manipulation and management of biological systems not only to maximize yield but also to stabilize the agro-systems and to minimize industrial input demands which may endure the adverse effect of climate change. Therefore, the experiment was conducted for sustainable production of onion with combine use of biofertilizers and chemical fertilizers. (Singh *et al*. 2017) [9].

Therefore, considering the need of time and as onion is the most important vegetable of our daily diet, it is highly essential to generate the information about the effect of different organic inorganic and biofertilizres on growth, yield and quality of onion. However, such type of work is scanty in onion on grown under Marathwada conditions. Hence, by keeping these points in view, the systematic investigation has been planned to evaluate the integrated nutrient management in onion. (*Allium cepa* L.)

Material and methods

The field experiment entitled "Integrated nutrient management in Onion (*Allium cepa* L)" was carried out at Instructional-cum-Research farm of Department of Horticulture, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra during *Rabi*-2018-19. The experiment consisted of eleven treatment which were laid out in randomized block design with three replication. The nursery Raised beds were prepared having size 3 x 1 x 0.15 m and upper layer of each raised bed was mixed with a mixture of well rotten and sieved FYM and sand. Raised beds were drenched with copper oxychloride. Then fungicide treated onion seeds of variety N-53 were sown on raised beds in rows at row spacing of 10 cm by mixing with fine sand. The raised beds were maintained systematically till the seedlings were ready for transplanting. Healthy, uniform 50 days old onion seedlings were transplanted at a spacing of 15 cm x 10 cm. Light irrigation was given immediately after transplanting. Compost 5 t/ha was applied before transplanting of crop to plots of all treatments. NPK were applied through urea, single super phosphate and muriate of potash by calculating as per plot size respectively. The biofertilizer were applied to onion seedlings by preparing slurry of soil with an addition of 500g of *Azospirillium* and phosphate solubilizing bacteria of each. The root of clipped onion seedling were dipped in bioinoculant for 10 minutes and the immediately transplanted in experimental field. After sulphur and boron applied foliar spraying. Matured crop was harvested. Five plants were selected randomly from each replication to record the observations on growth and yield attributes.

The growth parameters was measured at interval starting from 30, 60, 90 days after transplanting. Diameter of the onion bulb is the maximum distance between the opposite side of right angles to the polar diameter. It was measured by Vernier calliper in centimeter. The average length of bulb was calculated from randomly selected five fruit of each treatment with vernier calliper and value were recorded in centimetre. The polar diameter was measured from the junction of root plate to the top of the bulb from the same, which was used for recording neck thickness and mean polar diameter was worked out with the help of vernier calliper. The bulb form randomly selected five observational plants of each plot were weighed individually on an electronic balance and the average fresh weight was computed and expressed in grams. The weight of harvested and well cured bulbs from each replication and each treatment were recorded separately and average yield per plot was calculated in kilograms. The yield per hectare was calculated by multiplying the total yield per plot with hectare factor and expressed in quintals. Total acidity is determined by titrating the sample extracted in water against 0.1% sodium hydroxide. The total soluble solids content of onion bulbs was recorded with the help of hand refractometer. The average content was worked out from five observational the bulbs and it was expressed in percentage. Reducing sugars (%) and non-reducing sugars (%) of onion bulbs were determined on fresh basis as juice was taken for analysis by benedict method.

The B:C ratio was calculated by using following formula.

$$\text{B: C ratio} = \frac{\text{Gross monetary returns (Rs/ha)}}{\text{Total cost of cultivation (Rs/ha.)}}$$

The treatment details

No. of Treatment	Treatments combination
T_1	RDF (100:50:50 kg^{-1}) (control)
T_2	RDF + Biofertilizers (*Azospirillum* + *PSB* @ 500 g ha^{-1})
T_3	RDF + Sulphur (25 kg ha^{-1})
T_4	RDF + Micronutrients (Zinc 20 kg and Boron 5 kg ha^{-1})
T_5	RDF + Biofertilizer + Sulphur
T_6	RDF + Sulphur + Micronutrients (Zinc & Boron)
T_7	RDF + Bioferilizers + Sulphur + Micronutrients
T_8	Organic(100 % N- Enriched through compost 5 t ha^{-1} + Biodfertilizers)
T_9	50 % N Enriched through compost + Biofertilizers + 50 % N through chemical fertilizers
T_{10}	50 % N Enriched through compost + Biofertilizers + 50 % N through chemical fertilizers + Sulphur
T_{11}	50 % N Enriched through compost + Biofertilizers + 50 % N through chemical fertilizers + Sulphur + Micronutrients

Result and discussion

1. Growth parameter

1.1 Plant height

The data regarding plant height are presented in Table 1 indicated that maximum plant height (65.20 cm) were recorded with the treatment T11 i.e. 50 % N Enriched through compost + Biofertilizers +50 % N through chemical fertilizers + Sulphur + Micronutrients), which were statistically at par with the treatment T10 (59.88 cm). It was statistically followed by the treatments T9 (59.40 cm), T7 (58.60 cm), T8 (58.06 cm), T4 (57.13 cm), T2 (56.46 cm), T3 (55.83 cm), T3 (55.86 cm), T6 (53.40 cm) and T5 (53.33 cm), which were statistically at par with each other. The minimum plant height (45.60 cm) was found in the treatment T1 (RDF 100:50:50) control. The results were also in confirmity with the findings of V.K. Singh *et al*. (2017) [9] in onion and D.N. Damse (2014) [2] in garlic.

1.2 Number of leaves

The data regarding number of leaves are presented in Table 1 indicated that maximum number of leaves (18.8) respectively was recorded in the treatment of T_{11} i.e. 50 % N Enriched through compost + Biofertilizers + 50 % N through chemical fertilizers + Sulphur + Micronutrients, and it was statistically superior over rest of the treatments. Which was followed by the treatment T_{10} (16.66), T_9 (14.00), T_8 (13.20), T_3 (13.00), T_7 (12.86), T_5 (12.66), and T_4 (12.46), were, the minimum number of leaves (10.8) was found in the treatment T_1 (RDF 100:50:50 kg ha^{-1}) control treatment, which were statistically at par with treatments T_2 (12.33), and T_6 (12.00). The results were also in conformity with the findings of V.K. Singh *et al.* (2017) [9] in onion and D.N. Damse (2014) [2] in garlic.

Table 1: Growth parameters as influenced by integrated nutrient management in onion crop

Tr. No	Treatments details	Plant height (cm)	No of leaves	Neck Thickness(cm)	Bulb diameter(cm)	Leaf length(cm)
T_1	RDF(100:50:50 kg ha^{-1}) (control)	45.60	10.80	1.20	3.33	48.30
T_2	RDF + Biofertilizers (*Azospirrillum* + *PSB* @ 500 g ha^{-1})	56.46	12.33	1.28	3.86	49.00
T_3	RDF + Sulphur (25 kg ha^{-1})	55.86	13.20	1.32	3.50	51.70
T_4	RDF + Micronutrients (Zinc 20 kg and Boron 5 kg ha^{-1})	57.13	12.46	1.36	3.63	51.40
T_5	RDF + Biofertilizer + Sulphur	53.33	12.66	1.43	3.80	51.00
T_6	RDF + Sulphur + Micronutrients (Zinc & Boron)	53.40	12.20	1.55	4.30	48.50
T_7	RDF + Bioferilizers + Sulphur + Micronutrients	58.60	12.86	1.67	4.90	53.10
T_8	Organic (100 % N- Enriched through compost 5 t ha^{-1}+ Biodfertilizers)	58.06	13.20	1.39	4.40	52.50
T_9	50 % N Enriched through compost + Biofertilizers + 50 % N through chemical fertilizers	59.40	14.00	1.70	5.20	53.40
T_{10}	50 % N Enriched through compost + Biofertilizers + 50 % N through chemical fertilizers + Sulphur	59.86	16.66	1.75	5.53	55.00
T_{11}	50 % N Enriched through compost + Biofertilizers + 50 % N through chemical fertilizers + Sulphur + Micronutrients	65.20	18.80	1.80	5.90	58.10
	SE±	1.83	0.55	0.04	0.29	1.54
	CD at 5%	5.42	1.63	0.12	0.87	4.57

1.3 Neck thickness (cm)

The data regarding neck thickness are presented in Table 1 indicated that, maximum neck thickness (1.80 cm) respectively were recorded in the treatment T11 i.e. 50 % N Enriched through compost + Biofertilizers + 50 % N through chemical fertilizers + Sulphur + Micronutrients, which were statistically at par with the treatments T10 (1.75cm) and T9 (1.70cm). It was followed by the treatments T7 (1.67cm), T6 (1.55cm), T5 (1.43cm), T8 (1.39cm) and T4 (1.36cm). The minimum neck thickness (1.20 cm) was found in soil application of T1 (RDF 100:50:50 kg ha-1) control. Which was statistically T2 (1.28 cm) and T3 (1.32 cm) the results were also in conformity with the findings Umesh Acharya *et al*. (2015) [8] in onion and D.N. Damse (2014) [2] in garlic.

1.4 Bulb diameter (cm)

The data regarding bulb diameter are presented in Table 1, indicated that, maximum bulb diameter (5.9 cm) was recorded with the treatment T_{11} i.e. 50 % N Enriched through compost + Biofertilizers + 50 % N through chemical fertilizers + Sulphur + Micronutrients, which were statistically at par with the treatments T_{10} (5.53cm) and T_9 (5.20cm). It was statistically followed by the treatments T_7 (4.90cm), T_8 (4.40cm), T_6 (4.30cm), T_2 (3.86cm), T_5 (3.80cm), T_4 (3.63cm) T_3 (3.50cm). The minimum bulb diameter (3.33cm) was found in the treatment of T_1 (RDF 100:50:50 kg ha^{-1}) control. Similar results were reported by Umesh acharya *et al*. (2015) [8] and Ram Vachan *et al.* (2018) in onion and D.N. Damse (2014) [2] in garlic.

1.5 Leaf length (cm)

The data regarding leaf length are presented in Table 1, indicated that, maximum leaf length (58.10 cm) respectively were recorded with the treatment of T_{11} i.e. 50 % N Enriched through compost + Biofertilizers + 50 % N through chemical fertilizers + Sulphur + Micronutrient and which were statistically at par within the treatment T_{10} (55.00cm).Which was statistically followed by with treatments T_9 (53.40cm), T_7 (53.10cm), T_8 (52.50cm), T_3 (51.70cm), T_4 (51.40cm), T_5 (51.00cm), T_2 (49.00cm) While, the minimum leaf length of bulb (48.30cm) was found in the treatment T_1 (RDF100:50:50 kg ha^{-1}) control. The results were also in conformity with the findings Ram Vachan *et al.* (2018) in onion.

2. Yield attributes

2.1 Length of bulb

The data regarding length of bulb are presented in Table 2 showed that, the significantly maximum length of bulb (6.5 cm) was observed with the treatment of T_{11} i.e. 50 % N Enriched through compost + Biofertilizers + 50 % N through chemical fertilizers + Sulphur + Micronutrient. It was 43.75 per cent increase as compared to control, which were statistically at par with the treatment T_7 (6.40cm), T_{10} (6.20cm) and T_9 (6.10cm). Which was statistically followed by the treatments T_4 (5.40cm), T_3 (5.10cm), T_2 (5.00cm). The minimum length of bulb (3.6 cm) was observed in the treatment T_1 (RDF100:50:50 kg ha^{-1}) control, which was statistically at par with the treatments T_8 (4.10 cm), T_5 (4.10 cm) and T_6 (4.30 cm). The results were also in conformity with the findings Swati Brinjh *et al*. (2014) [7] in onion.

2.2 Diameter of bulb (cm)

The data regarding diameter of bulb are presented in Table 2, showed that, the significantly maximum diameter of bulb (6.60cm) was observed the treatment T_{11} i.e. 50 % N Enriched through compost + Biofertilizers + 50 % N through chemical fertilizers + Sulphur + Micronutrient. It was 42.43 per cent increase as compared to control, which were statistically at par with the treatments T_{10} (6.50cm), T_9 (6.00cm), T_7 (5.60cm), T_8 (5.60cm) and T_6 (5.00cm). It was followed by the treatments T_5 (4.60cm), T_3 (4.60cm), T_4 (4.40cm), T_2 (3.80cm) while, the minimum diameter of bulb (3.90cm) was observed in the treatment T_1 i.e. RDF 100:50:50 kg ha^{-1} control. The results were also in conformity with the findings of D.N. Damse (2014) [2] in garlic.

2.3 Weight of bulb (g)

The data regarding weight of bulb are presented in Table 2, indicated that, maximum weight of bulb (233 g) was observed in the treatment T_{11} (50 % N Enriched through compost + Biofertilizers + 50 % N through chemical fertilizers + Sulphur + Micronutrient). It was 63.01 per cent increase as compared to control. Which were statistically at par with the treatments T_{10} (213 g) and T_9 (211 g). It was statistically followed by with the treatments T_7 (158 g), T_6 (152 g), T_8 (151 g), T_5 (143 g), T_3 (114 g), T_4 (121 g), T_2 (110 g) while, the minimum (86g) weight of bulb was observed in the treatment T_1 (RDF 100:50:50 kg ha^{-1}) control. The results were also in conformity with the findings D.N. Damse (2014) [2] in garlic.

2.4 Yield per plot (kg)

The data regarding yield per plot are presented in Table 2, indicated that, the significantly highest yield per plot (41.66 kg) was recorded in the treatment T_{11} i.e. 50 % N Enriched through compost + Biofertilizers + 50 % N through chemical fertilizers + Sulphur + Micronutrient. It was 68.61 per cent increase as compared to control. Which were statistically at par with the treatment T_{10} (39.66 kg). It was 67.02 per cent increase as compared to control. Which was statistically followed by the treatments T_9 (35.00 kg), T_7 (27.33 kg), T_8 (26.00 kg), T_6 (25.00 kg), T_5 (24.33 kg), T_4 (20.22 kg), T_3 (18.42 kg), T_2 (17.24 kg) While, the lowest yield (13.08 kg) per plot was observed in the treatment T_1 (RDF 100:50:50 kg ha^{-1}) control. Which was statistically at par with the treatment T_2 (17.24 kg). Similar results were reported by by Prusty (2019) [4] in onion.

Table 2: Yield attributes as influenced by integrated nutrient management in onion crop

Tr. No	Treatments details	Bulb Length (cm)	Bulb Diameter (cm)	Weight of bulb (g)	Yield Kg/plot	Yield (q ha^{-1})	B:C ratio
T_1	RDF(100:50:50 kg ha^{-1}) (control)	3.60	3.80	86	13.08	136	1.06
T_2	RDF + Biofertilizers (*Azospirillum* + *PSB* @ 500 g ha^{-1})	5.00	3.90	110	17.24	156	1.09
T_3	RDF + Sulphur (25 kg ha^{-1})	5.10	4.60	114	18.42	166	1.18
T_4	RDF + Micronutrients (Zinc 20 kg and Boron 5 kg ha^{-1})	5.40	4.40	121	20.22	183	1.40
T_5	RDF + Biofertilizer + Sulphur	4.10	4.60	143	24.33	220	1.97
T_6	RDF + Sulphur + Micronutrients (Zinc & Boron)	4.30	5.00	152	25.00	226	2.06
T_7	RDF + Bioferilizers + Sulphur + Micronutrients	6.40	5.60	158	27.33	247	2.32
T_8	Organic (100 % N- Enriched through compost 5 t ha^{-1}+ Biodfertilizers)	4.00	5.60	151	26.00	235	2.88
T_9	50 % N Enriched through compost + Biofertilizers + 50 % N through chemical fertilizers	6.10	6.00	211	35.00	350	3.45
T_{10}	50 % N Enriched through compost + Biofertilizers + 50 % N through chemical fertilizers + Sulphur	6.20	6.50	213	39.66	378	3.66
T_{11}	50 % N Enriched through compost + Biofertilizers + 50 % N through chemical fertilizers + Sulphur + MicronutrientsSE ±	6.50	6.60	233	41.66	384	3.75
	SE ±	0.35	0.61	8.04	1.60	3.58	0.069
	CD at 5%	1.04	1.81	23.77	4.75	10.59	0.206

2.5 Yield per hectare (q)

The data regarding yield per hectare are presented in Table 2 revealed that, the significantly highest yield per hectare (384 q) was recorded in the treatment T_{11} i.e. 50 % N Enriched through compost + Biofertilizers + 50 % N through chemical fertilizers + Sulphur + Micronutrient. It was 64.59 per cent increase as compared to control. Which were statistically at par with the treatment T_{10} (378q).Itwas64.03 per cent increase as compared to control. It was statistically followed by the treatments T_9 (350q), T_7 (247q), T_8 (235q), T_6 (226q), T_5 (220q), T_4 (183q), T_3 (166q), T_2 (156q) whereas, the lowest (136 q) yield per hectare was observed in the treatment T_1 (RDF100:50:50 kg ha^{-1}) control. 50 kg ha^{-1}) control.

Yield parameters highly responded to boron as well as zinc, so judicial application of zinc and boron may provide highest yield. The application of organic, inorganic and biofertilizers in various combinations. This might be due to the fact that organic manure supplied to balanced nutrition to the crop, improved soil condition and thereby resulting in better growth and development leading to higher yield. Similar results were reported by Prusty (2019) [4] in onion

3. Quality parameter

3.1 Total soluble solids (%)

The data regarding total soluble solids are presented in Table 3, indicated that the significantly highest TSS (12%) was recorded in the bulbs obtained in the treatment T_{11} i.e. 50 % N Enriched through compost + Biofertilizers + 50 % N through chemical fertilizers + Sulphur + Micronutrient, which were statistically at par treatments T_{10} (11.30%), T_9 (11.30%) and T_8 (11.00%). Which was statistically followed by with treatments T_7 (10%), T_6 (9.60%), while the minimum TSS (8%) was observed in the treatment T_1 (RDF100:50:50 kg ha^{-1}) control treatment. which were statistically at par with the treatment T_3 (8.10 %), T_5 (8.30 %), T_2 (8.40 %), T_4 (8, 60 %), and T_6 (9.60 %). Combination of biofertilizers, organic and inorganic sources of nutrient found beneficial in increasing total soluble solids. This may be due to the known fact that, organic and inorganic nutrient sources are capable for supplying adequate macro and micro nutrients which plays major role in quality improvement through desirable enzymatic changes took place during entire plant growth. The results are in consequences with the findings of, S. Ghanti *et al.* (2009) [6].

3.2 Acidity (%)

The data regarding acidity are presented in Table 13, indicated that, the significantly highest acidity (2.63%) was recorded in the bulbs obtained in the treatment T_{11} i.e. 50 % N Enriched through compost + Biofertilizers + 50 % N through chemical fertilizers + Sulphur + Micronutrient, which were statistically at par with the treatments T_5 (2.50%), T_9 (2.43%), T_4 (2.40%) and T_{10} (2.36%). The minimum acidity (1.6%) was observed in the treatment T_1 (RDF100:50:50 kg ha^{-1}) control. which were statistically at par with the treatments T_2 (1.76 %), T_8 (1.70 %), T_7 (1.90 %) and T_6 (2.00 %). Addition of biofertilizers, sulphur and micronutrients along with general recommended dose of fertilizers. Has significant effect on onion acidity. The results are in consequences with the findings Heerendra Prasad *et al.* (2017) [3] in onion.

3.3 Total sugars (%)

The data regarding total sugar percentage are presented in Table 14, indicated that, maximum total sugars (9.07%) was recorded in the onion bulbs produced in the treatment T_{11} i.e. 50 % N Enriched through compost + Biofertilizers + 50 % N through chemical fertilizers + Sulphur + Micronutrient), which were statistically at par with the treatment T_{10} (9.05%), T_8 (8.98%) T_7 (8.91%), T_3 (8.75%), T_6 (8.69%), T_4 (8.69%), T_9 (8.52%) and T_5 (7.81%). The minimum total sugars (7.11%) were observed in the treatment T_1 (RDF100:50:50 kg ha^{-1}) control, which were statistically at par with the treatment T_2 (7.76 %).

3.4 Reducing sugars (%)

The data regarding reducing sugar per centage are presented in Table 14, indicated that, maximum reducing sugars (3.93%) was recorded in the onion bulbs produced in the treatment T_{11} i.e. 50 % N Enriched through compost + Biofertilizers + 50 % N through chemical fertilizers + Sulphur + Micronutrient, which was statistically at par with T_{10} (3.91%), T_9 (3.88%), T_8(3.86%), T_7(3.81%), T_5 (3.76%), T_3 (3.75 %),T_4 (3.76%) and T_6(3.76%). The minimum (3.28%) reducing sugars was observed in the treatment T_1 (RDF 100:50:50 kg ha^{-1}) control treatment. which were statistically at par with the treatment T_2 (3.32 %).

3.5 Non reducing sugar (%)

The data regardingnon reducing sugar percentage are presented in Table 14 indicated that the significantly maximum non reducing sugars (5.15%) was recorded in the onion bulbs produced in the treatment T_{11} i.e. 50 % N Enriched through compost + Biofertilizers + 50 % N through chemical fertilizers + Sulphur + Micronutrient, which were statistically at par with the treatments T_{10}(5.13%), T_7(5.11 %), T_8(5.10 %),T_3 (5.03 %), T_6(5.00 %), T_4 (5.00 %) and T_9 (4.80 %) While, the minimum non reducing sugars (3.91%) were observed in the treatment T_1 (RDF 100:50:50 kg ha^{-1}) control. The application of biofertilizers, inorganic and organic manure improved the quality parameters in respect of TSS, total sugar, reducing sugar and non-reducing sugar content. The results are in consequences with the findings S. Ghanti *et al.* (2009) [6], and Anil kumar *et al.* (2017) [1] in onion.

Table 3: Quality parameters as influenced by integrated nutrient management in onion crop

Tr. No	Treatments details	TSS (%)	Acidity (%)	Reducing sugar (%)	Nonreducing sugar (%)	Total sugar (%)
T_1	RDF (100:50:50 kg ha^{-1}) (control)	8.0	1.60	3.28	3.91	7.11
T_2	RDF + Biofertilizers (*Azospirillum* + *PSB* @ 500 gha^{-1})	8.4	1.76	3.32	4.04	7.36
T_3	RDF + Sulphur (25 kg ha^{-1})	8.1	2.03	3.75	5.04	8.75
T_4	RDF + Micronutrients (Zinc 20 kg and Boron 5 kg ha^{-1})	8.6	2.40	3.69	5.00	8.69
T_5	RDF + Biofertilizer + Sulphur	8.3	2.50	3.76	4.06	7.81
T_6	RDF + Sulphur + Micronutrients (Zinc & Boron)	9.6	2.00	3.69	5.00	8.69
T_7	RDF + Bioferilizers + Sulphur + Micronutrients	10.0	1.90	3.81	5.11	8.91
T_8	Organic (100 % N- Enriched through compost 5 t ha^{-1}+ Biodfertilizers)	11.0	1.70	3.86	5.10	8.98
T_9	50 % N Enriched through compost + Biofertilizers + 50 % N through chemical fertilizers	11.3	2.43	3.88	4.80	8.52
T_{10}	50 % N Enriched through compost + Biofertilizers + 50 % N through chemical fertilizers + Sulphur	11.3	2.36	3.91	5.13	9.05
T_{11}	50 % N Enriched through compost + Biofertilizers + 50 % N through chemical fertilizers + Sulphur + Micronutrients	12	2.63	3.93	5.15	9.07
	SE ±	0.59	0.14	0.13	0.24	0.44
	CD at 5%	1.77	0.41	0.39	0.72	1.32

Conclusion

The overall assessment of the results of present investigation entitled "Integrated nutrient management in onion (*Allium cepa* L.) Cv. N-53" concluded that the treatment T_{11} (50 % N Enriched through compost + Biofertilizers + 50 % N through chemical fertilizers + Sulphur + Micronutrients) significantly influenced the growth, yield and quality attributes and benefit cost ratio of onion. The growth parameter *viz*. plant height, number of leaves, neck thickness, bulb diameter, leaf length, bulb parameter like length of bulb, diameter of bulb, weight of bulb, yield parameter *viz.* yield per plot and yield per hectare, quality parameter *viz.* total soluble solids, acidity, total sugar, reducing sugar and non reducing sugar.

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