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# Effect of integrated nutrient management on growth, flowering and yield attributes of cucumber (*Cucumis sativus* L.)

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## Abstract
The present experiment was conducted on cucumber with using various INM treatments during the summer season of year 2018 to find out the effect of integrated nutrient management on growth, flowering and yield attributes of cucumber. Total ten treatments were tried in Randomized Block Design (RBD) with three replications. Out of these an application of 75% RDF + 12.5% FYM + 12.5% VC $ha^{-1}$ had a beneficial effect on growth parameters like maximum vine length (137.70 cm), number of leaves $plant^{-1}$ (97.80), maximum number of primary branches $plant^{-1}$ (8.50), maximum length and width of leaf i.e. 16.20 cm and 17.70 cm. flowering parameters viz. minimum days to first flower formation (37.80), minimum number of days to first male and female flower formation i.e. 39.70 and 44.57, lowest number of male flowers $plant^{-1}$ (52.20), maximum number of female flowers plant-1 (27.70), lowest sex ratio (1.90) and yield and yield attributing characters like minimum days taken to first fruit formation (53.40), maximum number of fruits $plant^{-1}$ (8.35), length of fruit (20.20 cm), width of fruit (4.38 cm), weight of fruit (161.50 g), maximum fruit yield $plant^{-1}$ (1.34 kg), fruit yield plot-1 (8.04 kg), highest fruit yield (148.88 q ha-1), maximum TSS of edible fruit (4.11 $^{0}$Brix) and peel thickness( 1.33 cm) as compared to control. Similarly, maximum net return (Rs. 66747 ha-1) and cost benefit ratio (2.27) were also found in the treatment 75% RDF + 12.5% FYM + 12.5% VC $ha^{-1}$.

**Keywords:** Cucumber, NPK, FYM, vermicompost, growth, flowering, yield and quality

## Introduction
Cucumber (*Cucumis sativus* L.) is extensively grown vegetable crop of cucurbitaceae family. The chromosome numbers of cucumber are 2=14 (De, Candole, 1999) [5]. Cucumber is second most widely cultivated cucurbitaceous crop in world after watermelon. It is one of the most important and popular vegetable crop extensively grown during all the growing seasons i.e. spring summer, summer rainy and early autumn in all parts of country. It is a cross pollinated crop and is pollinated by bees. It is a warm season crop and susceptible to frost. Optimum temperature range for the growth and development of cucumber is 18 $^{0}$C-24 $^{0}$C. Cucumber is a very good source of vitamins A, C, K, and $B_6$, potassium, pantothenic acid, magnesium, phosphorus, copper and manganese (Vimala *et al.* 1999) [32]. The ascorbic acid and caffeic acid contained in cucumber helps to reduce skin irritation (Okonmah, 2011) [20]. Edible portion of cucumber contains 0.4% protein, 2.5% carbohydrates and 0.1% fat and 7.0 mg vitamin C, 25 mg phosphorus, 10 mg calcium and 1.5 mg iron per 100 g edible fruit. It is used for fresh consumption (slicing cucumber) and for preservation. Immature fruits are universally used as salad, pickling and also used with curd for the preparation of "Rayata". The green leaves are used as potherbs and seeds and seed oils are also edible (Hazra *et al.* 2011) [11]. Integrated Nutrient Management (INM) system refers to the balanced use of chemical fertilizers in combination with organic manures, crop residues, biofertilizers and other biological sources (Thriveni *et al.* 2015) [30]. Integrated sources of nutrients enhance growth, yield, quality and post-harvest quality of soil in vegetables (Kumar *et al.* 2018) [13]. INM maintains soil as storehouses of plant nutrients that are essential for vegetative growth. The goal of INM is to integrate the use of all natural and man-made sources of plant nutrients, so that crop productivity increases in an efficient and environmentally benign manner, without sacrificing soil productivity of future generations (Maruthi *et al.* 2014) [17]. Recently, quality cucumber fruits are obtained by using integrated application of organic manures and inorganic fertilizers.

Organic manures supply the abundant quantity of organic matter to improve the physical and chemical properties of soil with less quantity of nitrogen, phosphorus and potassium. Similarly, inorganic means of fertilization has been supplied nitrogen, phosphorous and potassium instantly to recover the various metabolic activities in plant body but they gave residual effect in soil and found hazards to soil strata. Most of the vegetables are being produced by using various key plant nutrients like nitrogen, phosphorous and potassium. These plant nutrients are essentially important for growth, flowering and yield of edible part of vegetable like fruit. Nitrogen plays a central role in the synthesis of chlorophyll and essential constituent of compounds like amino acid, proteins, nucleic acids, porphyrin, flavin, pyridines, nucleotides, enzymes, coenzymes and alkaloids which contributes to the growth of plant. Phosphorous play an important role in the production of vegetable crops, it imparts hardiness to shoot, increased size of fruit and quality, regulates the photosynthesis, governs physic-bio-chemical processes and helps root enlargement. Potassium is necessary for many functions of plants like carbohydrate metabolism, enzyme activation, osmotic regulation and efficient use of water, nitrogen uptake and protein synthesis and translocation of assimilates. It also has a role in decreasing certain plant diseases and improves fruit quality of vegetables (Singh, 1991) [25]. Organic manure can serve as an alternative practice to mineral fertilizers for improving soil structure and microbial biomass (Suresh *et al*. 2004) [28]. There are so many organic manures are used in vegetable production for supplying all three major nutrients like nitrogen, phosphorous and potassium even some micro-nutrients. Traditionally well rotten FYM is being used as manure since long back as organic manure. Recently, vermi-composting has been considered as a way of achieving stabilized substrates for improving soil fertility (Tognetti *et al*. 2007) [31]. Earthworms have been used in the vermi-conversion of urban, industrial and agro-industrial wastes to produce biofertilizers (Elvira *et al*. 1998 [7], Suthar, 2006 [29], Gupta and Garg, 2008 [10]).

## Materials and Methods

A field experiment was conducted at Horticultural Research Centre, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut (U.P.) 250110 during the summer season of year 2018. The experiment was laid out in Randomized Block Design (RBD) and replicated thrice. Total ten treatments were tried namely $T_1$ - RDF (100:60:60 NPK $ha^{-1}$), $T_2$ - RDF + 15 tones FYM, $T_3$ - RDF + 10 tones VC, $T_4$ - 75% RDF + 25% FYM, $T_5$ - 75% RDF + 25% VC, $T_6$ - 50% RDF + 50% FYM, $T_7$ - 50% RDF + 50% VC, $T_8$ - 75% RDF + 12.5% FYM + 12.5% VC, $T_9$ - 50% RDF + 25% FYM + 25% VC and $T_{10}$ - Control. The soil of the experimental field was sandy loam in texture having pH of 7.70 with available nitrogen (149.80 kg $ha^{-1}$), available phosphorus (24.18 kg $ha^{-1}$) and available potassium (113 kg $ha^{-1}$). The cucumber variety Pant Khira-1 was taken for study purpose. It was earlier evolved through inbreeds of indigenous germplasm at Pantnagar and released by the G. B. Pant University of Agriculture & Technology, Pantnagar (Uttarakhand) in 2001 and recommended for western Uttar Pradesh and Uttarakhand for commercial cultivation. The seeds were sown in field at a spacing of 1.50 m x 0.60 m. The organic manure like FYM was incorporated in experimental field as per the treatments suggested prior to two week of seed sowing. However, the vermicompost was also applied in experimental plots at the time of sowing. The nitrogen, phosphorus and potassium were applied in the form of urea, single super phosphate (SSP) and muriate of potash (MOP). The half dose of nitrogen, full dose of phosphorus and potassium were applied in experimental plots at the time of seed sowing. The remaining half dose of nitrogen was applied in two equal doses at vining stage and flower initiation stage. All the cultural practices were done at regular intervals as per the requirement of crop during the course of investigation. Similarly, plant protection measures were also done with spraying fungicides and insecticides like Mancozeb and Monocrotophos to save crop from pest and diseases. During the experimentation, various observations on growth, flowering, yield and yield promoting parameters with their quality were recorded during whole of the cropping period. The obtained data were statically analyzed with using standard statistical method as suggested by Gomez and Gomez (1996) [9].

## Result and Discussion

### Effect of Integrated Nutrient Management on growth parameters

The various growth parameters like vine length, number of leaves, primary branches, length of leaf and width of leaf of cucumber were significantly influenced by different combined doses of organic and inorganic nutrient sources in terms of Integrated Nutrient Management as compared to control during the course of investigation. The data presented in Table-1 showed that the significant improvement was noticed when applied different combinations of organic and inorganic source of nutrients on vine length as compared to control. The maximum vine length (137.70 cm), maximum number of leaves $plant^{-1}$ (97.80), more number of primary branches $plant^{-1}$ (8.50) were observed under the treatment $T_8$ (75% RDF + 12.5% FYM + 12.5% VC $ha^{-1}$) followed by $T_3$- RDF + 10 tones VC $ha^{-1}$, while the minimum vine length, minimum number of leaves $plant^{-1}$, less number of primary branches $plant^{-1}$ were observed in control ($T_{10}$). It might be due to the combined application of FYM, vermicompost and inorganic fertilizers increased the absorption of nutrients especially nitrogen which enhanced the cell division, cell elongation and increased the plant growth. These findings are in line with Vishwakarma *et al.* (2007) [33], Mahmoud *et al*. (2009) [16] and Das *et al.* (2015) [4]. In context of length and width of leaves, the maximum length of leaves (16.20 cm) and maximum width of leaf (16.70 cm) was recorded with the treatment $T_8$ (75% RDF + 12.5% FYM + 12.5% VC $ha^{-1}$) followed by $T_3$- RDF + 10 tones VC $ha^{-1}$, while the minimum length and width of leaf were recorded under control treatment. The significant increase in length and width of leaf might be due to better nutrient supply by specific combination of INM treatments which leads to increase the internal metabolic activities in plants. The similar results were also reported by Kumar and Karuppaiah (2008) [15], Prasad *et al.* (2009) [22], Anjanappa *et al*. (2012) [1].

**Table 1:** Effect of integrated nutrient management on growth characters of cucumber

| Treatments | Vine length (cm) | No. of leaves plant$^{-1}$ | No. of Branches plant$^{-1}$ | Leaf length (cm) | Leaf width (cm) |
|---|---|---|---|---|---|
| $T_1$ | 129.50 | 87.70 | 6.60 | 14.00 | 14.40 |
| $T_2$ | 131.70 | 91.20 | 7.50 | 14.50 | 15.40 |
| $T_3$ | 134.10 | 94.00 | 7.90 | 15.30 | 16.10 |
| $T_4$ | 126.00 | 83.90 | 6.00 | 13.00 | 13.10 |
| $T_5$ | 127.60 | 86.10 | 6.40 | 13.50 | 13.70 |
| $T_6$ | 122.40 | 81.00 | 4.30 | 11.60 | 12.00 |
| $T_7$ | 124.40 | 82.70 | 5.20 | 12.40 | 12.30 |
| $T_8$ | 137.70 | 97.80 | 8.50 | 16.20 | 16.70 |
| $T_9$ | 133.40 | 93.20 | 7.70 | 14.80 | 15.90 |
| $T_{10}$ | 119.80 | 77.80 | 3.90 | 9.50 | 11.00 |
| S.Em | 0.31 | 0.40 | 0.26 | 0.34 | 0.25 |
| C. D. | 0.89 | 1.16 | 0.75 | 1.00 | 0.72 |

**Effect of Integrated Nutrient Management on flowering behavior**

The parameters like days to first flower formation, days to first male flower formation, days to first female flower formation, number of male flowers plant$^{-1}$, number of male flowers plant$^{-1}$ and their Sex ratio had influenced by different doses of organic and inorganic combinations in significant manner during the course of investigation. These parameters were found statistically differed among the different applied treatments during the cropping season. Among the treatments, $T_8$- 75% RDF + 12.5% FYM + 12.5% VC ha$^{-1}$ had gave minimum number of days (37.80) to first flower initiation which was sated earlier then control and other treatments. Similar results were also found in terms of days taken to first male and female flower appearance plant fertilized with 75% RDF + 12.5% FYM + 12.5% VC ha$^{-1}$ as compared control. The earliest male flowering (39.70 days) was seen in treatment T8-75% RDF + 12.5% FYM + 12.5% VC ha$^{-1}$ and lowest days (44.57) taken to first female flower initiation followed by RDF + 10 tones VC ha$^{-1}$, while the maximum days taken to first male and female flower initiation were observed in control ($T_{10}$). The earliness of flowering might be due to the better translocation of nutrients to the aerial parts of the plant and enhancement in reproductive phase due to the treatment of relevant combinations of organic and inorganic source of nutrients. Likewise phosphorus plays an important role for reproductive organs and initiation of flowering. The similar findings were earlier reported by Vishwakarma *et al.* (2007) [33], Anjanappa *et al*. (2012) [1] and Singh *et al*. (2017) [26]. The male, female flowers plant$^{-1}$ and sex ratio as affected by INM application in significant manner as compared control (Table 2). An application of 75% RDF + 12.5% FYM + 12.5% VC ha$^{-1}$ had produced minimum number of male flower plant$^{-1}$ (52.20) followed by RDF + 10 tones VC ha$^{-1}$ (53.80), whereas maximum number of male flowers plant$^{-1}$ (74.10) were noted under control. The increased number of male flowers might be due to higher uptake of nitrogen favoring growth activity in plant organs resulting more male flowers are born on vine. The various workers were reported that vermicompost releases auxin like gibberellins responsible for growth of vine, resulting more male flowering buds. The similar results were also reported by Anjanappa *et al*. (2012) [1] and Singh *et al*. (2017) [26]. In other hand, the maximum number of female flowers plant$^{-1}$ (27.70) were observed with a combined dose of 75% RDF + 12.5% FYM + 12.5% VC ha$^{-1}$ followed by RDF + 10 tones VC ha$^{-1}$ (23.30), while lowest number of female flowers plant$^{-1}$ (14.50) were produced in control ($T_{10}$). The reason behind the more number of female flowers may be due to the supply of nitrogen, phosphorous and potassium through the organic and inorganic sources of nutrients at optimum level. The earliness might be also due to the enhanced production of growth promoting substances like gibberellic acid, IAA by application of vermicompost which induce the earliness of female flower production, Sreenivas *et al.* (2000) [27] and Kameswari *et al.* (2010) [12]. These results are in conformity with the finding of Anjanappa *et al*. (2012) [1] and Singh *et al*. (2017) [26]. However, the minimum sex ratio plant$^{-1}$ (1.90) was observed in plant fertilized with 75% RDF + 12.5% FYM + 12.5% VC ha$^{-1}$. Moreover, maximum sex ratio (5.11) was observed in control. The lowest sex ratio may be due to the production of almost same number of pistillate flowers as that of staminate flowers. The results are in conformity with the finding of Gill *et al*. (2012) [8] and Singh *et al*. (2017) [26].

**Table 2:** Effect of integrated nutrient management on flowering characters of cucumber

| Treatments | Days to 1$^{st}$ flower formation (Days) | Days to 1$^{st}$ male flower formation (Days) | Days to 1$^{st}$ female flower formation (Days) | No. of male flowers plant$^{-1}$ | No. of female flowers plant$^{-1}$ | Sex ratio |
|---|---|---|---|---|---|---|
| $T_1$ | 43.77 | 45.20 | 49.60 | 62.00 | 21.90 | 2.83 |
| $T_2$ | 42.43 | 44.10 | 48.33 | 59.90 | 23.30 | 2.57 |
| $T_3$ | 38.60 | 41.10 | 46.30 | 53.80 | 25.00 | 2.15 |
| $T_4$ | 45.63 | 47.20 | 53.60 | 65.60 | 18.90 | 3.47 |
| $T_5$ | 44.87 | 46.90 | 52.27 | 66.00 | 20.50 | 3.21 |
| $T_6$ | 47.23 | 51.10 | 56.53 | 70.50 | 15.50 | 4.54 |
| $T_7$ | 46.53 | 48.80 | 55.57 | 68.10 | 16.90 | 4.02 |
| $T_8$ | 37.80 | 39.70 | 44.57 | 52.20 | 27.70 | 1.90 |
| $T_9$ | 40.13 | 41.90 | 46.80 | 56.80 | 24.90 | 2.28 |
| $T_{10}$ | 49.37 | 53.40 | 58.30 | 74.10 | 14.50 | 5.11 |
| S. Em | 0.51 | 0.26 | 0.62 | 0.32 | 0.30 | 0.08 |
| C. D. | 1.48 | 0.76 | 1.79 | 0.92 | 0.87 | 0.23 |

**Effect of Integrated Nutrient Management on yield parameters**

Yield and yield attributing characters like days taken to first fruit formation, number of fruits plant$^{-1}$, length of fruit (cm), width of fruits (cm), weight of fruit at edible maturity (g), fruit yield plant$^{-1}$ (kg), fruit yield plot$^{-1}$ (kg) and total fruit yield (q ha$^{-1}$) were found statistically differed in all applied treatment in integrated manner i.e. organic and inorganic with or without combination during the course of investigation. The minimum days to first fruit initiation (53.40 days) were recorded in $T_8$- 75% RDF + 12.5% FYM + 12.5% VC ha$^{-1}$ followed by $T_3$- RDF + 10 tones VC ha$^{-1}$, while maximum days to first fruit initiation (72.23) were noted under $T_{10}$ (control). The integrated approach of nutrient application has improved earliness fruiting as compared to unfertilized plot. These findings are in line with Arshad *et al*. (2014) [2] and Moharana *et al*. (2017) [18]. The maximum number of fruits plant$^{-1}$ (8.40), maximum length of fruit (20.20 cm), highest fruit width (4.38 cm) at edible maturity and maximum weight of edible fruit (161.50 g) were observed in plants supplied with a dose 75% RDF + 12.5% FYM + 12.5% VC ha$^{-1}$ followed by $T_3$- RDF + 10 tones VC ha$^{-1}$. Moreover, the control plants had lowest number of fruits plant$^{-1}$ (6.10), minimum length (11.10 cm), width of fruit (2.57 cm) and minimum fruit weight (137.80 g) were observed in unfertilized plot ($T_{10}$). Integrated use of organic manures and chemical fertilizers increased the fruit length due to the fact that increasing major elements like nitrogen, phosphorous and potassium application through organic manures might have accelerated the synthesis of chlorophyll and amino acids resulted more translocation of photosynthesis from leaves to fruits caused increased number of fruits per vine, size and weight of fruits. Similar findings were also recorded by Eifediyi and Remison (2010) [6] and Mohrana *et al*. (2017) [18]. Among the treatments, maximum fruit yield plant$^{-1}$ (1.34 kg), highest fruit yield plot$^{-1}$ (8.04 kg) and maximum fruit yield (148.88 q ha$^{-1}$) was practically examined under the treatment $T_8$- 75% RDF + 12.5% FYM + 12.5% VC ha$^{-1}$ followed by $T_3$- RDF + 10 tones VC ha$^{-1}$. However, fruit yield plant$^{-1}$ (0.84 kg), fruit yield plot$^{-1}$ (5.04 kg) and fruit yield (93.33 q ha$^{-1}$) were found minimum under control. It might be due to balanced nutrition, better uptake of nutrients by the plants which helped for better fruit set and fruit yield. More number of fruits plant$^{-1}$ and fruit weight plant$^{-1}$ ultimately resulted in highest fruit yield ha$^{-1}$. Maximum yield of cucumber in present study could be due to the influence of organic manures (FYM and vermi-compost) in combination with NPK enhanced the synthesis of photosynthesis by increasing the growth hormones and amino acids. These findings are in close conformity with earlier results obtained by Thriveni *et al*. (2015) [30], Baghel *et al*. (2017) [3] and Pradhan *et al*. (2018) [21].

**Effect of Integrated Nutrient Management on quality parameters**

Among the treatments the quality as affected by different INM treatments in significant behavior as compared to control. The maximum TSS of edible fruit was observed in $T_8$- 75% RDF + 12.5% FYM + 12.5% VC ha$^{-1}$ (4.11 $^0$B) followed by $T_3$- RDF + 10 tones VC ha$^{-1}$ (3.94 $^0$Brix). However, the minimum TSS value (1.74 $^0$Brix) was recorded in control. It might be due to the combined application of FYM, vermicompost and inorganic fertilizers might have led to balance C: N ratio which resulted in satisfactory nutrient availability and increased plant metabolism, which ultimately lead to increased carbohydrate accumulation in fruit resulting total soluble solids (TSS), were found maximum. Similar findings were reported by Thriveni *et al.* (2015) [30], Singh *et al.* (2017) [26] and Shree *et al.* (2018) [24]. However, the maximum peel thickness (1.33 cm) was recorded in 75% RDF + 12.5% FYM + 12.5% VC ha$^{-1}$ followed by RDF + 10 tones VC ha$^{-1}$ (1.11 cm), while the minimum peel thickness (0.47 cm) was observed in control. The peel thickness is directly associated with higher accumulation of carbohydrates, protein and captured energy by the abundant supply of nitrogen, phosphorous and potassium through mineral nutrient sources and organic sources of nutrients. This is in confirmation with findings of Kameswari *et al.* (2010) [12], Aanjanappa *et al.* (2012) [1] and Sharma *et al.* (2012) [23].

**Table 3:** Effect of integrated nutrient management on yield and quality characters of cucumber

| Treatments | Days taken to 1st fruit formation (Days) | No. of fruits plant$^{-1}$ | Fruit length (cm) | Fruit Width (cm) | Weight of fruit (g) | Fruit yield (kg plant$^{-1}$) | Fruit yield (kg plot$^{-1}$) | Fruit yield (q ha$^{-1}$) | TSS ($^0$Brix) | Peel thickness (cm) |
|---|---|---|---|---|---|---|---|---|---|---|
| $T_1$ | 56.30 | 7.40 | 17.50 | 3.59 | 152.90 | 1.13 | 6.78 | 125.55 | 3.52 | 0.91 |
| $T_2$ | 60.57 | 7.60 | 17.50 | 3.83 | 154.60 | 1.14 | 6.84 | 126.66 | 3.70 | 0.96 |
| $T_3$ | 55.96 | 8.30 | 19.30 | 4.31 | 159.90 | 1.27 | 7.62 | 141.11 | 3.94 | 1.11 |
| $T_4$ | 65.17 | 7.20 | 15.40 | 3.08 | 149.80 | 1.06 | 6.36 | 117.77 | 3.02 | 0.76 |
| $T_5$ | 62.03 | 7.30 | 16.60 | 3.39 | 151.50 | 1.11 | 6.66 | 123.33 | 3.38 | 0.87 |
| $T_6$ | 69.07 | 6.90 | 13.60 | 2.67 | 145.30 | 1.01 | 6.06 | 112.22 | 2.42 | 0.68 |
| $T_7$ | 67.17 | 7.00 | 14.30 | 2.91 | 147.40 | 1.05 | 6.30 | 116.66 | 2.79 | 0.71 |
| $T_8$ | 53.40 | 8.35 | 20.20 | 4.38 | 161.50 | 1.34 | 8.04 | 148.88 | 4.11 | 1.33 |
| $T_9$ | 57.97 | 7.90 | 18.60 | 4.03 | 156.40 | 1.24 | 7.44 | 137.70 | 3.81 | 1.01 |
| $T_{10}$ | 72.23 | 6.10 | 11.10 | 2.57 | 137.80 | 0.84 | 5.04 | 93.33 | 1.74 | 0.47 |
| S. Em | 0.46 | 0.19 | 0.38 | 0.15 | 0.49 | 0.03 | 0.21 | 2.70 | 0.06 | 0.05 |
| C. D. | 1.33 | 0.54 | 1.08 | 0.42 | 1.43 | 0.08 | 0.61 | 7.81 | 0.18 | 0.13 |

**Effect of Integrated Nutrient Management on economics of treatments**

The highest cost of cultivation (Rs. 73765 ha$^{-1}$) was recorded in RDF + 10 tones VC ha$^{-1}$. However, the lowest cost of cultivation was found (Rs. 43785 ha$^{-1}$) in control. Maximum involvement of cost was noticeable might be due to application of 100 per cent recommended dose of inorganic fertilizers along with vermicompost. The maximum gross return (Rs. 119104 ha$^{-1}$), net return (Rs. 66747 ha$^{-1}$) and cost: benefit ratio (2.27) was observed in 75% RDF + 12.5% FYM + 12.5% VC ha$^{-1}$, while the minimum gross return (Rs. 74664 ha$^{-1}$), net return (Rs. 30879 ha$^{-1}$) was observed in control treatment. However the minimum cost: benefit ratio (1.53) was recorded in RDF + 10 tones VC ha$^{-1}$ during the course of investigation. The higher gross return under 75% RDF + 12.5% FYM + 12.5% VC ha$^{-1}$ was mainly due to higher yield, while enhanced net return and benefit: cost ratios was because the cost of cultivation involved in the production was minimum under this treatment combination. These results are also in conformity with findings of Kameswari *et al.* (2010) [12], Kumar *et al.* (2013) [14], Nagar *et al.* (2017) [19] and Shree *et al.* (2018) [24].

**Table 4:** Effect of integrated nutrient management economics of different treatments in Cucumber

| Treatments | Yield (q $ha^{-1}$) | Gross Return (Rs $ha^{-1}$) @ 800/q | Cost of Treatment (Rs $ha^{-1}$) | Total cost of cultivation (Rs $ha^{-1}$) | Net Return (Rs $ha^{-1}$) | B: C Ratio |
|---|---|---|---|---|---|---|
| $T_1$ | 125.55 | 100440 | 4979 | 48764 | 51676 | 2.05 |
| $T_2$ | 126.66 | 101328 | 12480 | 56265 | 45063 | 1.80 |
| $T_3$ | 141.11 | 112888 | 29980 | 73765 | 39123 | 1.53 |
| $T_4$ | 117.77 | 94216 | 5822 | 49607 | 44609 | 1.89 |
| $T_5$ | 123.33 | 98664 | 11322 | 55107 | 43557 | 1.79 |
| $T_6$ | 112.22 | 89776 | 6415 | 50200 | 39576 | 1.78 |
| $T_7$ | 116.66 | 93328 | 15165 | 58950 | 34378 | 1.58 |
| $T_8$ | 148.88 | 119104 | 8572 | 52357 | 66747 | 2.27 |
| $T_9$ | 137.70 | 110160 | 12165 | 55950 | 54210 | 1.96 |
| $T_{10}$ | 93.33 | 74664 | 00.00 | 43785 | 30879 | 1.70 |

## Conclusion

On the basis of results obtained from the study and concluded that the treatment $T_8$- 75% RDF + 12.5% FYM + 12.5% VC $ha^{-1}$ was found superior in terms of growth, flowering and yield attributes of cucumber and also increases the TSS and peel thickness as well as treatment. It was also stated that the highest cost benefit ratio was also found with above treatments.

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