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Research Article

INFLUENCE OF INTEGRATED NUTRIENT MANAGEMENT PRACTICES IN CUCUMBER (*CUCUMIS SATIVUS* L.) CV. PUNJAB NAVEEN

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ABSTRACT

A field experiment was conducted in the Department of Horticulture, Khalsa College, Amritsar during 2017-2018 to study the Influence of integrated nutrient management practices in cucumber (*Cucumis sativus* L.) cv. Punjab Naveen. The seeds were sown in mid February. The experiment was laid out in RBD with ten treatment combinations replicated thrice. Results of the study showed that the combined application of organic and inorganic fertilizers had significant effect on the physical and biochemical characteristics of cucumber. The results of the experiment revealed that among the different treatments the application of NPK 75% RDF + FYM 25% showed maximum growth attributes. Maximum vine length (2.34 m), number of branches (16.90), number of leaves per vine (128.07), fruit length (22.20 cm), fruit breadth (5.37 cm), fruit weight (285.71 g) and TSS (3.07 °B) were recorded with the application of NPK 75% RDF+ FYM 25% as compared to other treatments of nutrient management. The yield (17.10 tha^{-1}) was also found to be maximum under NPK 75% (RDF) + FYM 25% respectively.

INTRODUCTION

Cucumber (*Cucumis sativus* L.) is essentially a warm season crop mainly grown in tropical and subtropical regions where it is cultivated in the field (Prabhu *et al* (2006). It is one of the important monoecious annual crop in the cucurbitaceae family that has been cultivated by man for over 3,000 years (Saeed and Waheed 2017). It is one of the high yielding vegetable with respect to economic importance. It ranks fourth after tomatoes, cabbage and onion in Asia (Eifedyi and Remison 2011). It is truly a versatile vegetable because of wide range of uses from salads to pickles and digestive aids to beauty products. Cucumber aids in weight loss. The calorific and nutritional value of cucumber is very low but it is a primary source of vitamins, minerals and fiber for human body. Its peel is a good source of dietary fiber that helps to cure constipation and offer some protection against colon cancers by eliminating toxic compounds from the gut. It contains unique anti-oxidants in moderate ratios such as α-carotene and β-carotene, vitamin-c, vitamin-a, zea-xanthin and lutein. Cucumbers are usually served as raw in salads and sandwiches in tropical region (Enujeke 2013). Its juice is often recommended as a source of silicon to improve the health and complexion of the skin. It is a good source of vitamin A, C, K, B_6, potassium, pantothenic acid, magnesium, phosphorus, copper and manganese.

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The ascorbic acid and caffeic acid in cucumber help to reduce skin irritation (Okonmah 2011). Cucumber cultivar Punjab Naveen was used to study. The variety is excellent in taste, appearance, colour, size and texture. It is better in quality having high dry matter and vitamin C content. Cucumber responds well to manuring and fertilization. The application of high input technologies such as chemical fertilizer, pesticides and herbicides improved the production but there is a growing concern over the adverse effects of the use of chemicals on soil productivity and environmental quality (Prabhu *et al* 2006). Integrated nutrient supply system has become an accepted strategy to bring about improvement in soil fertility .The use of inorganic fertilizers alone may cause problems for human health and the environment. So organic fertilizer is considered a major source of plant nutrients (Naeem *et al* 2006). Organic manure can serve as an alternative practice to mineral fertilizers for improving soil structure and microbial biomass (Suresh *et al* 2004). Biofertilizers are efficient, eco-friendly, environmentally safe, cost effective, economically viable and ecologically sound. They are playing a significant role in improving the nutrient availability to crop plants (Tilak and singh 1994). Currently, with improved standard of living and increasing population, there is high demand for exotic food materials of which cucumber is one of them. However, the quantity been produced cannot meet the consumers demand hence there is need to evaluate the possibility of production of cucumber. Integrated nutrient management practices for better productivity integrating both nutrients sources can help boost the production of cucumber and meet up with the quantity

demanded by the people. Hence an investigation had therefore been planned to do comparative studies of inorganic and organic fertilizers.

MATERIALS AND METHODS

The present investigation on Influence of integrated nutrient management practices in cucumber (*Cucumis sativus* L.) **cv.** Punjab Naveen was conducted at an experimental plot in the nursery of Department of Horticulture, Khalsa College, Amritsar. Cucumber cultivar Punjab Naveen was used in research study. The seeds were obtained from Punjab Agricultural University, Ludhiana. The whole experimental plot was brought to fine tilth by repeated ploughings followed by harrowing and planking. Finally it was levelled and divided into plots. The seeds were soaked over night and were sown next day on well prepared plots in 10 treatments(T_1:NPK 100% RDF, T_2: NPK 75% RDF + FYM 25% , T_3:NPK 50% RDF + FYM 50%, T_4 : NPK 25% RDF + FYM 75%, T_5: 0 + FYM 100%, T_6: FYM 75% + BF (Azotobacter, Phosphate solubilising bacteria and *Frateuria aurantia*), T_7 :FYM 50% + BF + Jeev Amrit (one spray), T_8 :FYM 25% + BF + Jeev Amrit (two sprays), T_9: BF + Jeev Amrit (three sprays)and T_{10}:Control. The trial was laid out following RBD (Randomized block design) in the middle of February. Fertilizers viz. nitrogen, phosphorus and potash were applied according to the treatments. The half dose of nitrogen along with full amount of phosphorus and potash were applied as the basal dose at the time of sowing and the remaining half dose of nitrogen was applied 30 days after sowing. The recommended doses for the N, P and K (100, 50, 50 kg ha^{-1}) were applied in the form of urea, DAP (Di ammonium Phosphate) and MOP (Muriate of Potash) respectively. Observations were recorded of various growth, yield and quality characters. Statistical analysis and interpretation of data was done by following the Fisher analysis of variance technique and results were tested at 5% level of significance.

RESULTS AND DISCUSSION

Maximum vine length (2.34 m) was recorded in the treatment T_2 (NPK 75% + FYM 25%). The vine length under control was recorded to be the minimum (2.23 m). The increase in the vine length might be due to the favourable nutritional environment in the root zone thus created by the addition of organic manures and fertilizers resulted in increased absorption of these nutrients which was responsible increased vegetative growth promoting vine length of cucumber (Narayanamma *et al* 2010). Similar findings have been reported by Mondal and Roy (2001) in potato, Reddy and Rao (2004), Vishwakarma *et al* (2007), Prasad *et al* (2009) and Nayak and Pradhan (2016) in cucumber.

The perusal of the data regarding number of branches per vine indicated that the maximum number of branches per vine (16.90) were observed in plants treated with T_2: NPK 75% + FYM 25%. The minimum number of branches (10.17) were found in the plants where no fertilizer was applied. Increase in the number of branches per vine which might be due to an increase in the organic matter by addition of organic and inorganic manures and bio fertilizers resulting in good vegetative growth. Similar results were obtained by Reddy and Rao (2004), Umekwe *et al* (2014) and Naorem and Kumar (2015) in cucumber varieties.

Table 1 Vegetative characters of cucumber cv. Punjab Naveen as influenced by the integrated nutrient management**.**

Treatments	Vine length (m)	Number of branches per vine	Number of leaves per vine	Number of fruits per vine
T_1: NPK 100%	2.29	13.80	106.73	11.97
T_2: NPK 75% + FYM 25%	2.34	16.90	128.07	13.83
T_3 : NPK 50% + FYM 50%	2.30	15.07	109.53	13.17
T_4 : NPK 25% + FYM 75%	2.30	14.13	108.80	12.77
T_5 : FYM 100%	2.27	12.47	104.87	11.53
T_6 : FYM 75% + BF	2.28	13.83	108.20	12.13
T_7 : FYM 50% + BF + JA (One spray)	2.32	16.10	118.40	13.27
T_8 : FYM 25% + BF + JA (Two spray)	2.28	11.00	107.47	11.43
T_9 : BF + JA (Three spray)	2.26	10.63	104.67	10.40
T_{10} : Control	2.23	10.17	97.40	9.77
Mean	2.29	13.41	109.41	12.03
CD at 5% level	2.23	1.08	NS	0.92

The data regarding the number of leaves per vine as influenced by organic and inorganic fertilizers depicted that the maximum number of leaves per vine (128.07) were obtained in treatment T_2 (NPK 75% + FYM 25%). The minimum number of leaves per vine (97.40) was found in the plants where no fertilizer was applied.

Maximum number of fruits per vine (13.83) were observed in the plants which were provided with the NPK 75% + FYM 25%. Minimum number of fruits per vine (9.77) were recorded in the unfertilized treatment. The highest number of fruits per vine might be due to the increase in the number of flowers per vine which could be attributed to the better photosynthesis activity and an accumulation of carbohydrates which helped in better growth and flowering of the plant. It was also related to the maximum uptake of NPK nutrients and due to the influence of biofertilizers which provided favourable conditions around the roots resulting in better absorption of nutrients. Jilani *et al* (2009) and Anjanappa *et al* (2012) also observed the similar results in cucumber and Ibrahim and EI-Kader (2015) in bottle gourd respectively.

Maximum fruit length (21.60 cm) was found in T_2 (NPK 75% + FYM 25%) at 60 DAS, 22.13 cm at 70 DAS and 22.20 cm at 80 DAS. The minimum fruit length (17.83 cm) was found in the fruits of untreated plants at 80 DAS. Throughout the whole research fruit length acted as a tone character for the economic yield which was dependent upon the prevailing environmental conditions during the research period reflecting that more was the fertilizer dose better was the fruit length (cm) as compared to the control. Eifediyi and Remison (2010), Enujeke (2013) and Okoli and Nweke (2015) noticed in various cucumber varieties.

It was noted that the plants under treatment T_2 (NPK 75% + FYM 25%) registered the maximum fruit breadth (5.03 cm while minimum fruit breadth (4.10 cm) was found in the treatment T_{10} (Control). The increase in fruit breadth might be due to the increased photosynthetic area and translocation of photosynthates in plants which subsequently accelerated the formation of wider fruits. The present findings are in line with the research work of Jilani *et al* (2009), Eifediyi and Remison (2010) and Enujeke (2013) in cucumber plants.

Table 2 Fruit size (cm^2) of cucumber cv. Punjab Naveen as influenced by the integrated nutrient management

Treatments	Fruit length (cm)			Fruit breadth (cm)		
	60 DAS	70 DAS	80 DAS	60 DAS	70 DAS	80 DAS
T_1: NPK 100%	18.53	18.30	19.53	4.76	4.81	4.75
T_2: NPK 75% + FYM 25%	21.60	22.13	22.20	5.03	5.02	5.37
T_3 : NPK 50% + FYM 50%	20.23	20.13	21.30	4.87	4.87	5.05
T_4 : NPK 25% + FYM 75%	19.63	20.63	21.07	4.92	4.81	5.09
T_5 : FYM 100%	18.87	18.80	21.40	4.93	4.75	4.58
T_6 : FYM 75% + BF	19.57	19.30	19.27	5.03	4.76	4.85
T_7 : FYM 50% + BF + JA (One spray)	21.00	21.57	21.73	5.02	4.93	5.33
T_8 : FYM 25% + BF + JA (Two spray)	17.90	18.33	17.97	4.53	4.58	4.77
T_9 : BF + JA (Three spray)	16.63	17.77	18.70	4.58	4.58	4.53
T_{10} : Control	16.47	17.43	17.83	3.85	3.85	4.10
Mean	19.04	19.44	20.10	4.71	4.70	4.84
CD at 5% level	0.69	0.66	1.26	0.36	0.20	0.46

From the data on fruit weight it is clear that the maximum fruit weight (283.67 g) was found in T_2 (NPK 75% + FYM 25%) at 60 DAS and minimum fruit weight (222.00g) was found in the untreated plants (T_{10}) .The increase in the weight of fruits with the application of nutrients might be due to high and continuous nutrients availability from combined sources of plants leading to good growth with an increase in the photosynthetic area and translocation of photosynthates in plants which subsequently accelerated the formation of more number of large sized fruits resulting in the increased fruit weight). The research findings of Jilani *et al* (2009, Anjanappa *et al* (2012) and Ghosh *et al* (2016) in cucumber are in close confirmation with the present results.

The data with regard to total soluble solids of cucumber as influenced by organic and inorganic fertilizers. Maximum TSS (3.07 ° Brix) was recorded in the treatment T_2(NPK 75% + FYM 25%). The TSS of plants under control was recorded to be minimum (2.07 °Brix). Application of NPK and FYM might have exhibited regulatory role on absorption and translocation of various metabolites in which most important carbohydrates affected the quality of the fruits. The increase in TSS content might be attributed to the quick metabolic transformation of starch and pectin into soluble compounds and rapid translocation of sugars from leaves to developing fruits. The increase in TSS have een reported by Meenakshi *et al* (2007) in bittergourd, Kameswari *et al* (2012) in ridgegourd, Afran- ul-Haq *et al* (2015) and Das *et al* (2015) in bottlegourd.

Maximum ascorbic acid (16.37 mg/100g) was recorded in the treatment T_2 (NPK 75% + FYM 25%). The ascorbic acid of plants under control was recorded to be minimum (11.73 mg/100g).Organic fertilizers are hydrophilic in nature and absorb moisture and nutrients which persist longer thus improving the soil structure and indirectly enhanced the fruit quality in terms of ascorbic acid content. The increase in organic matter by increase of nitrogen had also been found to increase ascorbic acid content in cucumber. The increase in ascorbic acid content might also be due to the quick metabolic transformation of starch and pectin into soluble compounds and rapid translocation of sugars from leaves to developing fruits. The increase in ascorbic acid have been reported by Meenakshi *et al* (2007) in bittergourd, Kameswari *et al* (2012) in ridgegourd, Afran- ul-Haq *et al* (2015) and Das *et al* (2015 in bottlegourd.

It was noted that the plants treated with T_2 (NPK 75% + FYM 25%) registered the maximum fruit yield per vine (2.19 kg) and (17.10 tha^{-1}). Minimum fruit yield (1.91) kg per vine and 12.86 t ha^{-1} found in untreated treatment.

The maximum fruit yield per vine might be due to the more number of fruits and maximum fruit length resulting from balanced fertilization. The favourable nutritional environment in the root zone thus created by addition of organic manures and biofertilizers resulted in increased absorption of these nutrients which was responsible for increased fruit yield attributing characters of cucumber (Narayanamma *et al* 2010). Azarmi *et al* (2010) observed in his study that the application of nutrients caused a significant effect on the yield as compared to the unfertilized ones. The findings of Anjanappae *et al* (2010) in cucumber are also in line with the present results.

Table 3 Fruit weight (g) and yield attributes of cucumber cv. Punjab Naveen as influenced by the integrated nutrient management

Treatments	Fruit weight (g)			Fruit yield (kg/vine)	Fruit yield (tha^{-1})
	60 DAS	70 DAS	80 DAS		
T_1: NPK 100%	250.49	272.85	269.26	2.04	15.23
T_2: NPK 75% + FYM 25%	283.67	288.34	285.71	2.19	17.10
T_3 : NPK 50% + FYM 50%	271.67	282.85	280.41	2.10	15.66
T_4 : NPK 25% + FYM 75%	270.33	266.34	263.98	2.08	15.43
T_5 : FYM 100%	240.44	250.22	242.17	1.90	14.20
T_6 : FYM 75% + BF	263.67	270.80	263.45	2.06	15.13
T_7 : FYM 50% + BF + JA (One spray)	276.59	281.65	275.72	2.11	16.76
T_8 : FYM 25% + BF + JA (Two spray)	249.18	263.07	260.99	1.99	14.26
T_9 : BF + JA (Three spray)	223.69	220.08	221.74	1.90	13.50
T_{10} : Control	222.00	220.08	221.74	1.91	12.86
Mean	255.17	263.34	260.06	2.03	15.01
CD at 5% level	18.12	8.09	8.70	0.08	0.78

Table 4 Biochemical characters of cucumber cv. Punjab Naveen as influenced by the integrated nutrient management

Treatments	TSS (°Brix)	Ascorbic acid (mg/ 100 g)
T_1: NPK 100%	2.37	13.33
T_2: NPK 75% + FYM 25%	3.07	16.37
T_3 : NPK 50% + FYM 50%	2.67	13.73
T_4 : NPK 25% + FYM 75%	2.57	13.63
T_5 : FYM 100%	2.57	11.57
T_6 : FYM 75% + BF	2.33	13.13
T_7 : FYM 50% + BF + JA (One spray)	3.03	15.87
T_8 : FYM 25% + BF + JA (Two spray)	2.27	12.67
T_9 : BF + JA (Three spray)	2.13	12.97
T_{10} : Control	2.07	11.73
Mean	2.51	13.50
CD at 5% level	0.42	1.63

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