INFLUENCE OF NUTRIENT MANAGEMENT PRACTICES ON GROWTH, FLOWERING AND YIELD ATTRIBUTES OF CUCUMBER (*Cucumis sativus*)

ABSTRACT

Field experiments were conducted at AICRP on Vegetable Crops, operating under Odisha University of Agriculture and Technology, Bhubaneswar, Odisha, India during summer season of 2017 and 2018 to find out the impact of various nutrient management practices on growth, yield attributes and yield of cucumber (*Cucumis sativus* L.). Twelve nutrient management practices such as, T_1 (Absolute Control), T_2 (RDF through Fertilizer (100:60:60 NPK ha^{-1}), T_3 (½ RDF + Biofertilizer consortia (BF) *i.e.*, *Azospirillum*, *Azotobacter* and *PSB* @ 4 kg ha^{-1} in 1:1:1), T_4 (Vermicompost @ 4 tha^{-1}), T_5 (VC @ 2 tha^{-1}+ BFs), T_6 (½ RDF + VC @ 2 tha^{-1}+ BFs), T_7 (RDF+ VC @ 2 tha^{-1}+ Biofertilizer consortia), T_8 (FYM @ 20 tha^{-1}), T_9 (FYM @ 10 tha^{-1}+ BFs), T_{10} (½ RDF + FYM @ 10 tha^{-1}+ BFs), T_{11} (RDF+ FYM @ 10 tha^{-1}+ BFs) and T_{12} (½ RDF + FYM @ 10 tha^{-1} + VC @ 2 tha^{-1}+ BFs), were evaluated by adopting RBD replicated thrice. The pooled results over two years revealed significant variations among the nutrient management practices for all the characters under study. Invariably, INM practices recorded significantly better vegetative growth, earliness in flowering, fruit yield and yield attributing parameters over inorganic, organic sources, BFs and absolute control. The results revealed integrated application of ½ RDF+FYM @ 10tha^{-1}+VC @ 2tha^{-1}+BFs recorded significantly higher maximum vegetative growth parameters (*i.e.*, vine length of 296.4 m with 4.1 primary branches vine^{-1}), induced earliness in flowering (*i.e.*, days to appearance of male flowers : 30.2, days to appearance of female flowers : 31.7, sex ratio of : 12.8, fruit yield attributing parameters (*i.e.*, fruit girth : 15.0 cm, fruits vine^{-1} : 8.6, days to 1st fruit harvest : 48.9), days to final harvest : 80.1, yield *i.e.*, marketable yield (12.6 kg plot^{-1}, 156.0 q ha^{-1}, 15.6 tha^{-1}) and total fruit yield (13.9 kg plot^{-1}, 172.2 q ha^{-1}, 17.2 tha^{-1}). Thus it may be concluded that integrated application of nutrients from inorganic, organic with soil inoculation of biofertilizer consortia not only increased significantly increased growth, flowering and fruit yield in cucumber.

Keywords : Cucumber, RDF, FYM, Vermicompost, Biofertilizer consortia, growth, flowering, fruit yield

1.INTRODUCTION

Cucumber (*Cucumis sativus* L.) belong to the family Cucurbitaceae which composed of 117 genera and 825 species spread over the tropical parts of the world (Gopalkrishnan, 2007). Among the cultivated cucurbits, cucumber is second most widely cultivated crop in the world after watermelon (Singh *et al*., 2018), grown successfully in three major climates of the world as tropical, subtropical and temperate climates under both open and protected conditions. Cucumber being an important salad crop treated as rich source of vitamins (A, C, K, B_6) and minerals (potassium, phosphorus, copper, magnesium, manganese) (Vimala *et al*.,1999). Cucumber is also used to treat against skin irritation due to presence of both ascorbic acid and caffeic acid (Okonmah, 2011). Similarly, Hazra *et al*. (2011) recommended versatile utility of cucumber such as pot herbs, edible seed oils etc.

Odisha produces 54.63 Million tonnes of cucumber annually with a share of 3.40% against India's production of 1260 Million tonnes from an area of and productivity of 82000 ha (NHB, 2018). In India cucumber occupies an important position due to its different types of uses, nutritive value and increasing export potential.

The lower productivity of cucumber (15.36 tha^{-1}) in India is primarily due to cultivation of low yielding varieties under unfertile soils coupled with heavy infestation of pests and diseases. It has been demonstrated that the genetic potential of a high yielding variety contributes about hardly 24% alone towards yield and other critical inputs, especially nutrients in association with water and other factors accounts for the rest (Sankaram, 1996).

Moreover, indiscriminate and over application of inorganic fertilizers without application of any organic manure and bioactive ingredients in soil, the physical and biochemical properties of the soil has been deteriorated gradually (Kumar *et al*., 2018). Further, it also reduces activity of microbes in soil, decreasing humus content of soil intern increased the pollution of soil, water and air (Singh and Kallo, 2000). Under such circumstances, it is essential to develop strategies for utilizing all available nutrient resources measures and to develop crop management system for sustainable production, productivity per unit area with maintenance of soil health, which resulted in a system known as Integrated Nutrient Management System, which refers to the supply of nutrients to the plants from various nutrient resources in the soil (native) inorganic sources (primarily inorganic chemical fertilizers), organic sources (manures, crop residues and other organics) as well as bioactive microbes (Biofertilizer). Roy and Angel(1991) suggested that "INM system" is a concept which aims at to maintenance or adjustment of soil fertility and plant nutrient supply to an optimum level for sustaining desirable crop productivity , high optimization of benefits from all possible sources of plant nutrients in an integrated manner. Although the basic concept of INM is to efficiently utilize all sources of nutrients, but under field situations, all these components may not be available at one place. Therefore, there is need to go for " *Catch and Match*" system, *i.e* application of nutrients from inorganic, organic and other bioactive microbes at a particular time at a particular place is to be produced and applied for crop production and sustainability of soil fertility as well.

Cultivation of cucumber requires fertile soils as infertile soils result in production of bitter, malformed fruits which are not accepted by the consumers (Olalekan, 2017). Therefore, in order to produce cucumber on a sustainable basis and to meet the production with quality fruits, other sources of nutrient inputs have to continuously explore in order to meet the desirable target. Therefore, the present investigation was conducted to investigate the efficacy of various nutrient management practices involving inorganic chemical fertilizer, organic and bioactive microbes either alone or in combination for better growth and yield in Cucumber.

2. MATERIALS AND METHODS

The field experiment was conducted at AICRP on Vegetable Crops operating under OUAT, Bhubaneswar, Odisha, India during summer season of 2017 and 2018. Twelve nutrient management practices including absolute control were evaluated by adopting RBD replicated thrice (Table 1). The cucumber variety, Seven Star was sown during 21.3.2017 of Summer 2017 and 2018, respectively in a plot size of 3m X 2.7m with a spacing of 1.5 m X 1 m. All the recommended package of practices were adopted uniformly except nutrient management practices, which were applied as per treatment schedule. Soil samples from the experimental plot was taken and analysed by adopting the standard procedure. Both FYM and vermicompost used in the experimental plots after proper analysis. In the experiment biofertilizer consortia, consisting of *Azotobacter*, *Azospirillum* and *PSB* (1:1:1) were purchased from Dept. of Soil Science and Agriculture Chemistry , College of Agriculture, OUAT and used as soil inoculation. Inorganic fertilizers were applied as per treatment schedule in the form of Urea, SSP and MOP. Observations were recorded on vegetative growth, flowering parameters along with fruit yield and yield attributing parameters. Fruit yield including both marketable and total was calculated on the basis of per plot yield harvested at different phrases of cucumber as per treatment schedules. The observed data were subjected to statistical analysis (Gomez and Gomez, 1996).

3. RESULT AND DISCUSSION

3.1 EFFECT OF NUTRIENT MANAGEMENT MODULE ON VEGETATIVE GROWTH PARAMETERS

It has been established in earlier that among the vegetative parameters primarily vine length, number of primary branches vine^{-1} and intermodal length contribute towards enhanced growth and productivity in cucumber. In the present study conducted over two years revealed significant influence of various nutrient management practices towards vine length, number of branches vine^{-1} and internodal length.

Significantly, highest vegetative growth parameter, *i.e.,* vine length (296.4 cm),number of primary branches vine^{-1} (4.2) with moderate intermodal length (7.1 cm) was produced by cucumber variety Seven Star in the plots supplied with integrated application of ½ RDF+FYM @10tha^{-1}+VC @2tha^{-1}+BFs as compared to their sole application from inorganic, organic and absolute control plots. However, nutrient management practices comprising of integrated approach such as RDF+F_{10}+BFs, recorded higher vegetative growth parameters and were *statistical at par* with best module, indicating the significance of integrated nutrient management approach. This might be due to integrated application of nutrients from various sources such as inorganic fertilizers, organic manures, (FYM and/or VC) coupled with soil inoculation of biofertilizer consortia created favorable environment for growth and development of the plant with continuous supply of nutrients from various sources, especially nitrogen which in turn enhance the cell division and increased in vine growth [Mohammed , 2017 ; Ghayal *et al.,* 2018 ; Singh *et al*., 2018 and Singh *et al*., 2020]. Further due to application of organic sources of nutrients from both FYM and/or VC, provide macro, secondary and micronutrients continuously to cucumber plots, there by increased vegetative growth. The better efficacy of organic sources on vegetative growth of cucumber have also been reported by Sallaku *et al.*, 2007 and Sanni *et al.,* 2015 in cucumber. The increased efficacy of integrated application of nutrients with soil inoculation of biofertilizer consortia (*Azotobactor*, *Azospirillum* and *PSB*) in the present study might be addition of nitrogen high *Azotobactor*, *Azospirillum* as well as solubilisation of unavailable phosphorus to available form by *PSB*, resulting better growth of cucumber plants. Besides this, soil inoculation with biofertilizer consortia also releases some growth promoting substances.Similar reports on efficacy of biofertlizer in vegetative growth parameter have been reported by Padmavathiamma *et al.* (2008) and Mohammed (2017) in cucumber.

The study also revealed that among various organic and biofertilizer nutrient management practices evaluated over two years in cucumber, significantly highest vegetative growth parameter like vine length at final harvest (234.4 cm) and number of primary branches vine^{-1} (3.7) with minimum internodal length (8.8 cm) with application of FYM @ 20 tha^{-1} over the other organic sources and absolute control. The increased vegetative growth might be due to addition of higher doses of nutrients through FYM. However, other organic sources, results showed non-significant effect on vegetative growth parameters with application of reduced doses integrated with BFs.

3.2 EFFECT OF NUTRIENT MANAGEMENT MODULE ON FLOWERING BEHAVIOUR

A perusal to table no. 2 revealed significant variations among the nutrient management practices for flowering parameters in cucumber during both the years of study. Most of the commercially grown cucumbers including variety Seven Star are monoecious in nature, where both male and female flowers are produced in the same plant in different positions and productivity of the crop depend on % of sex ratio (male and female flower) along with earliness in male and female flower production. The sex expression of cucumber although genetically controlled but significantly influenced by nutrient management, water management, prevailing climate conditions and hormonal balance *etc*. The pooled results showed significantly better performance of cucumber variety Seven Star with respect to earliness in terms of days to appearance of 1st male flower (30.2), days to appearance of 1st female flower (33.6), node number for appearance of 1st male flower (12.6), node number for appearance of 1st female flower(16.2) and above all sex ratio (male : female) (12.8) was recorded in the plots raised by integrated application of ½ RDF + FYM @ 10tha^{-1}+ VC @ 2tha^{-1}+ BFs than the corresponding application of inorganic, organic biofertilizer along with absolute control. However, *statistical parity* were observed for RDF + VC(2tha^{-1}) + BFs (14.2) and 1/2RDF + F_{10} + BFs(14.3). .

The earliness in flowering behaviour in cucumber was observed in the aerial parts of the plant and environment in reproductive phase due to integration of nutrients from all possible sources. Besides, it has been demonstrated the significant role of phosphorus towards reproductive organ including flowering where might be involvement of *PSB* in BFs (Vishwakarma, 2007 and Anjanappa *et al*, 2012). Similar observations on better efficacy of

INM treatments towards earliness in flowering behaviour have been reported in cucumber [Umamaheswarappa *et al.*, 2005; Anjanappa *et al.*, 2012 and Singh *et al.*, 2017], Prasad *et al*. (2009) in bitter gourd and Youssef and Eissa (2014) and Baghel *et al.* (2017) in bottle gourd.

On the other hand, significantly delayed in flowering behaviour was recorded in absolute control, without any nutrients, this might be due to reduced status of nutrients restricted the vegetative growth phases, in turn delayed in flowering behaviour. Further, the production of highest sex ratio (Male;Female) in the present study might be due to production of more staminate flower with lower number of female flower production. The results are in agreement with the findings of Gill *et al*. (2012), Singh *et al*. (2017) and Singh *et al*. (2018).

The experiment also revealed better performance with respect to earliness in flowering behaviour of the cucumber plants among organic and biofertilizer nutrient management. However, significantly better flowering behaviour was recorded in plots applied with FYM 20 tha^{-1} while lowest in absolute control. Similar observations in flowering behaviour was also suggested by Nirmala *et al.* (1999) and Sanni *et al.* (2015) in cucumber, while Mulani *et al.*, (2007) in bitter gourd.

3.3 EFFECT OF NUTRIENT MANAGEMENT IN FRUIT YIELD AND YIELD ATTRIBUTING PARAMETERS

The pooled results of two years revealed significant influence of various nutrient management practices on fruit yield and yield attributing parameters (Table no. 3, 4 and 5). Invariably, integrated application of ½ RDF + FYM @ $10tha^{-1}$+ VC @ $2tha^{-1}$+ Biofertilizer consortia recorded significantly better results in terms of days taken to 1^{st} harvest (45.3), days taken to last harvest (80.1), fruit girth (15.1), number of fruits $vine^{-1}$ (8.6) as compared to sole application of nutrients with inorganic fertilizer or organic and bioactive sources including absolute control.

However, the 2^{nd} best INM practices, identified for fruit yielding attributing traits in the present study was integrated application of RDF+FYM @10 tha^{-1}+BF. Similarly, application of FYM @ $20tha^{-1}$recorded significantly heaviest fruits of 172.6 g which was *statistically at par* with T_7, T_{11} and T_{12} indicating the significance of integrated application of inorganic chemical fertilizers along with organic manures (FYM and/or VC) and biofertilizer consortia. This increased fruit yield attributing traits in cucumber might be due to creation of favourable environment for early vegetative growth and flowering which in turn produced better results in fruit yield attributing traits. Integration of plant nutrients from organic, inorganic and bioactive microbes might created balanced nutrition which accelerated the synthesis of chlorophyll and amino acids, there by translocation of photosynthates from leaves to fruits increased in fruits fruit size, number of fruits $vine^{-1}$ and fruit weight (Eifediyi and Remison, 2010; Moharana *et al*, 2017). Further integration of vermicompost in INM practices in tomato Nagavallemma *et al.* (2004), Azarmi *et al.* (2009), Prabhu *et al.* (2006) and Bhattarai and Sapkota (2016) in cucumber. Soil inoculation of BFs comprising of *Azatobacter* and *Azospirillum* and PSB also solubilizing the unavailable phosphates to available form, in turn better growth and development of the crop. Besides, soil inoculation of BFs and PSB releases growth promoting substances which in turn increased growth, earliness in flowering, in turn enhance fruit yield attributing traits. Results of present study well corroborates with the findings of earlier scientists in cucumber (Moharana *et al*, 2017; Singh *et al*, 2018 and Dash *et al*, 2018).

On commercial scale, production of higher marketable fruit yield play vital role towards higher profit than total fruit yield. Cucumber, being primarily monoecious in sex form, hence effective pollination, fertilization, fruit set and subsequent fruit development will count towards higher marketable yield. On the other hand, production of small size, deformed fruits, bent neck fruits count towards unmarketable fruit yield, hence reduced the total yield and profit as well. Pooled results of two year revealed significant influence of nutrient management practices towards fruit yield which varied significantly from 5.7 and 4.6 (T_1) to 17.2 and 15.6 tha^{-1}(T_{12}) for total and marketable fruit yield, respectively. Invariably, adoption of INM practices consisting of ½ RDF + FYM @ 10tha^{-1}+ VC @ 2tha^{-1}+ Biofertilizer consortia (T_{12}) and RDF + FYM @ 10tha^{-1}+ VC @ 2tha^{-1}+ BFs produced significantly higher total fruit yield (17.2 and 15.6 tha^{-1}) and marketable fruit yield (15.6-13.8 tha^{-1}), respectively as compared to other sources of nutrients including absolute control. The results also showed increased % of marketable fruit yield with adoption of INM treatment 92-94 % (T_{10}, T_{11} and T_{12}) which further established the superiority of INM treatments over their sole application.

The results of the present study also revealed that integration of plant nutrients from various sources enhanced the vegetative growth, earliness in flowering and increased fruit yield attributing traits in cucumber (Table no. 1, 2 and 3) which ultimately increased the fruit yield.

Significantly, highest production of marketable and total fruit yield in cucumber by T_{12} was primarily due to balanced integration of nutrients resulting higher yield. Further presence of vermicompost @ 2tha^{-1} might be attributed increase the quality of nutrients for longer period and continuous supply of nutrients. This might have attributed more availability and subsequent nutrient uptake by the crop, thus increasing fruit yield. Similarly slow and steady release of macro, secondary and micronutrients from organic sources (FYM and/or VC) might have increased the food reserves for the developing sink and better performing towards the developing fruits (Patil *et al*, 2004; Chowhan *et al*, 2017). In addition to inorganic, organic sources of nutrients, soil inoculation of biofertilizer consortia further added nitrogen from atmosphere by fixation and solubilisation of insoluble phosphates to soluble form along with release of plant growth promoting substances enhanced the growth and fruit yield. Similar results of increased fruit yield by adoption of integrated application of nutrients with inorganic, organic and biological sources have been reported by Triveni *et al.*, 2015 in bitter gourd, while Eifediyi and Remison (2010) and Mohrana et al. (2017) in cucumber.

4. CONCLUSION

It may be concluded from the present study that integrated application of nutrients with inorganic chemical fertilizers , organic measures (FYM and/or VC) coupled with soil inoculation with biofertilizer consortia comprising of *Azotobactor, Azospirillum* and PSB 1:1:1 not only increased the vegetative growth but also induced earliness in flowering and fruit yield in cucumber.

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Table 1: Effect of nutrient sources on vegetative parameters of cucumber variety "Seven Star"

SL. No.	Treatments	Vine length			Primary branches $vine^{-1}$			Internodal length of Cucumber		
		1st year	2nd year	Pooled	1st year	2nd year	Pooled	1st year	2nd year	Pooled
1	Absolute Control	105.0	137.3	121.1	2.2	2.7	2.5	9.1	8.8	9.0
2	RDF	189.0	298.3	243.8	2.6	3.9	3.2	7.7	8.0	7.9
3	1/2 RDF+ BFs	153.0	237.4	195.0	2.8	3.3	3.0	7.4	7.8	7.6
4	VC_4	162.0	197.0	179.5	2.3	3.2	2.7	6.3	6.7	6.5
5	VC_2+BFs	148.0	244.4	196.3	2.7	3.1	2.9	6.7	6.9	6.8
6	1/2 RDF+VC_2+BFs	164.0	273.0	218.0	3.0	3.0	3.0	6.8	7.5	7.1
7	RDF+VC_2+BFs	233.0	316.6	274.9	3.1	4.5	3.8	7.7	7.4	7.5
8	F_{20}	222.0	246.8	234.4	3.2	4.4	3.7	8.7	8.8	8.8
9	F_{10}+ BFs	185.0	220.0	202.0	2.9	3.3	3.1	8.0	8.1	8.0
10	1/2 RDF+F_{10}+BFs	203.3	302.5	252.9	3.0	4.2	3.6	8.6	8.6	8.6
11	RDF+F_{10}+BFs	261.0	323.2	292.0	3.2	4.7	4.0	6.6	7.2	6.9
12	1/2 RDF+F_{10}+VC_2+ BFs	264.6	328.2	296.4	3.4	4.9	4.1	7.3	6.9	7.1
	Mean	**190.82**	**260.45**	**225.64**	**2.90**	**3.81**	**3.36**	**7.62**	**7.77**	**7.70**
	SE(m)±	**7.17**	**12.65**	**15.76**	**0.16**	**0.19**	**0.26**	**0.44**	**0.37**	**0.27**
	CD (5%)	**21.02**	**37.11**	**49.04**	**0.46**	**0.56**	**0.81**	**1.30**	**1.07**	**0.76**
	CV(%)	**7.0**	**8.0**	**8.0**	**9.0**	**9.0**	**9.0**	**10.0**	**8.0**	**9.0**

Table 2: Effect of nutrient sources on flowering parameters of cucumber variety "Seven Star"

SL. No.	Treatments	Number of days for 1st male flower appearance			Number of days for 1st female flower appearance			Node bearing 1st male flower			Node bearing 1st female flower			Sex Ratio (Male : Female)		
		1st year	2nd year	Pooled	1st year	2nd year	Pooled	1st year	2nd year	Pooled	1st year	2nd year	Pooled	1st year	2nd year	Pooled
1	Absolute Control	36.2	40.0	38.1	39.1	42.3	40.7	18.9	19.0	19.0	20.8	21.2	21.0	16.3	16.1	16.2
2	NPK	32.3	30.4	31.3	34.6	32.2	33.4	14.7	14.6	14.7	18.3	18.0	18.1	15.2	13.5	14.3
3	½ NPK+ BFs	33.4	32.8	33.1	34.4	33.4	33.9	16.2	16.2	16.2	18.8	18.8	18.8	15.4	14.3	14.9
4	VC_4	34.5	35.2	34.9	35.9	36.6	36.3	14.8	14.5	14.7	18.8	18.5	18.6	15.7	13.4	14.6
5	VC_2+BFs	31.5	32.0	31.7	33.5	32.8	33.2	18.6	17.9	18.2	19.2	18.8	19.0	15.5	14.4	14.9
6	½ RDF+VC_2+BFs	32.3	30.9	31.6	33.4	32.6	33.0	13.8	16.0	14.9	18.8	18.7	18.8	15.1	14.1	14.6
7	RDF+VC_2+BFs	30.5	29.6	30.1	31.8	31.8	31.8	13.6	13.6	13.6	17.7	16.7	17.2	15.1	13.3	14.2
8	F_{20}	31.3	32.3	31.8	33.8	35.2	34.5	14.7	15.1	14.9	19.2	18.3	18.7	15.4	14.1	14.8
9	F_{10}+ BFs	32.7	33.8	33.3	34.1	35.2	34.6	15.6	15.3	15.4	18.5	18.2	18.3	15.4	14.0	14.7
10	½ RDF+F_{10}+BFs	31.9	30.0	30.9	33.2	32.1	32.6	14.4	14.0	14.2	18.1	17.6	17.8	15.1	13.5	14.3
11	RDF+F_{10}+BFs	30.4	30.0	30.2	32.4	32.0	32.2	13.1	13.2	13.2	17.1	16.5	16.8	14.9	13.4	14.1
12	½ RDF+F_{10}+VC_2+ BFs	30.7	29.7	30.2	31.8	31.6	31.7	12.8	12.4	12.6	16.6	15.8	16.2	13.1	12.5	12.8
	Mean	**32.36**	**32.26**	**32.31**	**34.04**	**34.03**	**34.04**	**15.15**	**15.20**	**15.17**	18.5	18.1	18.3	15.22	13.92	14.56
	SE(m)±	**0.81**	**0.74**	**0.60**	**0.92**	**0.85**	**0.65**	**0.45**	**0.39**	**0.32**	**0.49**	**0.40**	**0.30**	**0.38**	**0.24**	**0.27**
	CD (5%)	**2.36**	**2.17**	**1.73**	**2.70**	**2.50**	**1.85**	**1.33**	**1.16**	**0.90**	**1.43**	**1.13**	**0.83**	**1.12**	**0.70**	**0.83**
	CV(%)	**4.0**	**4.0**	**4.0**	**5.0**	**4.0**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**	**4.0**	**4.0**	**4.36**	**2.97**	**3.73**

Table 3: Effect of nutrient sources on fruit yield attributing parameters of cucumber variety "Seven Star"

	Treatments	Days to 1st harvest			Fruit length (cm)			Fruit girth (cm)			Average fruit weight (g)			Number of fruits vine^{-1}			Days to last harvest		
		1st year	2nd year	Pooled	1st year	2nd year	Pooled	1st year	2nd year	Pooled	1st year	2nd year	Pooled	1st year	2nd year	Pooled	1st year	2nd year	Pooled
1	Absolute Control	53.6	55.3	54.4	8.8	8.1	8.5	8.4	7.7	8.1	55.6	92.0	73.8	4.4	4.5	4.4	65.0	64.6	64.8
2	RDF	51.0	51.2	51.1	11.4	14.0	15.1	13.0	13.3	13.1	139.1	149.4	144.2	5.8	7.1	6.5	68.3	76.1	72.2
3	1/2 RDF+ BFs	52.2	49.2	50.7	12.9	14.4	13.6	11.2	12.2	11.7	98.8	116.1	107.5	5.3	5.7	5.5	69.3	77.3	73.3
4	VC_4	52.8	50.7	51.7	13.2	14.2	13.7	10.2	11.8	11.0	101.3	128.6	115.0	5.4	6.6	6.0	68.8	76.6	72.7
5	VC_2+BFs	52.1	49.6	50.9	11.4	12.5	11.9	9.8	12.6	11.2	95.7	108.4	102.0	5.0	5.8	5.4	70.0	76.7	73.4
6	1/2 NPK+VC_2+BFs	52.6	50.7	51.6	14.7	16.6	15.7	12.5	13.3	12.9	102.9	135.3	119.1	5.8	6.9	6.3	70.9	78.3	74.6
7	NPK+VC_2+BFs	50.0	49.8	49.9	17.1	20.1	18.6	14.1	15.2	14.7	158.0	158.4	158.2	6.2	9.8	8.0	75.0	82.2	78.6
8	F_{20}	51.6	49.4	50.5	14.5	17.3	15.9	13.7	15.1	14.4	169.1	176.1	172.6	6.0	8.1	7.0	73.3	78.0	75.6
9	F_{10}+ BFs	50.8	51.7	51.3	14.8	15.3	15.1	13.3	13.4	13.4	120.6	140.8	130.7	5.8	7.1	6.4	73.0	77.7	75.3
10	1/2 NPK+F_{10}+BFs	50.6	48.3	49.5	15.3	17.0	16.1	13.4	13.8	13.6	152.7	153.2	153.0	6.1	7.9	7.0	68.0	77.3	72.6
11	NPK+F_{10}+BFs	49.3	49.2	49.3	16.0	19.1	17.6	14.1	15.2	14.6	160.7	169.6	165.1	6.3	10.0	8.1	75.7	82.6	79.2
12	1/2 NPK+F_{10}+VC_2+ BFs	48.8	48.5	48.7	16.3	19.7	18.0	14.9	15.1	15.0	153.6	155.5	154.5	6.5	10.6	8.6	76.3	83.8	80.1
	Mean	**51.33**	**50.35**	**50.84**	**14.13**	**15.83**	**14.98**	**12.51**	**13.38**	**12.95**	**125.72**	**140.31**	**133.01**	**5.75**	**7.55**	**6.65**	**71.19**	**77.63**	**74.41**
	SE(m)±	**0.84**	**0.61**	**0.76**	**0.63**	**0.64**	**0.49**	**0.46**	**0.53**	**0.46**	**5.27**	**5.02**	**6.15**	**0.37**	**0.38**	**0.67**	**0.93**	**0.61**	**0.75**
	CD (5%)	**2.46**	**1.79**	**2.37**	**1.85**	**1.88**	**1.40**	**1.35**	**1.57**	**1.42**	**15.46**	**14.73**	**19.13**	**1.08**	**1.10**	**2.07**	**2.73**	**1.78**	**2.15**
	CV(%)	**3.0**	**2.0**	**3.0**	**8.0**	**7.0**	**7.0**	**6.0**	**7.0**	**7.0**	**7.0**	**6.0**	**7.0**	**11.0**	**9.0**	**10.0**	**2.0**	**1..0**	**2.0**

Table 4: Effect of nutrient sources on fruit yield attributing parameters of cucumber variety "Seven Star"

	Treatments	Marketable (kg/Plot)			Unmarketable (kg/Plot)			Total Fruit Yield (kg/Plot)			Marketable (q/ha)			Unmarketable (q/ha)			Total Fruit Yield (q/ha)		
		1st year	2nd year	Pooled	1st year	2nd year	Pooled	1st year	2nd year	Pooled	1st year	2nd year	Pooled	1st year	2nd year	Pooled	1st year	2nd year	Pooled
1	Absolute Control	4.0	3.3	3.7	0.9	0.7	0.8	4.8	4.0	4.4	50.1	41.1	45.6	11.4	9.3	10.4	60.1	50.5	55.3
2	RDF	7.3	10.0	8.6	0.7	1.0	0.9	8.2	11.1	9.7	90.6	123.9	107.3	9.5	13.3	11.4	102.1	137.3	119.7
3	1/2 RDF+ BFs	6.8	8.5	7.6	0.8	1.0	0.9	7.6	9.5	8.6	84.6	105.1	94.9	10.2	13.1	11.7	93.9	118.3	106.1
4	VC_4	7.0	8.8	7.9	0.6	0.8	0.7	7.7	9.6	8.7	87.0	109.0	98.0	8.3	10.2	9.3	95.6	119.3	107.4
5	VC_2+BFs	5.7	7.1	6.4	0.9	1.2	1.1	6.2	8.4	7.3	70.3	88.6	79.5	11.6	15.6	13.6	77.4	104.3	90.8
6	1/2 NPK+VC_2+BFs	7.0	8.7	7.9	0.8	1.0	0.9	7.9	9.8	8.9	87.3	108.5	97.9	10.8	13.4	12.1	97.7	122.0	109.8
7	NPK+VC_2+BFs	7.9	11.4	9.7	0.9	1.3	1.1	9.1	12.8	10.9	98.6	141.8	120.2	11.3	16.1	13.7	112.2	158.0	135.1
8	F_{20}	7.5	11.0	9.2	0.9	1.2	1.1	8.3	12.3	10.3	92.6	136.8	114.7	11.5	15.5	13.5	103.3	152.3	127.8
9	F_{10}+ BFs	7.0	9.6	8.3	0.8	1.1	0.9	7.6	10.7	9.2	87.3	118.5	102.9	10.0	13.7	11.9	94.7	132.3	113.5
10	1/2 NPK+F_{10}+BFs	7.3	10.7	9.0	0.7	1.1	0.9	7.9	11.8	9.8	90.6	132.3	111.4	9.2	13.6	11.4	98.2	146.0	122.1
11	NPK+F_{10}+BFs	8.9	13.5	11.2	0.8	1.2	1.0	10.1	14.8	12.5	110.0	167.4	138.7	11.0	15.5	13.2	125.5	183.0	154.2
12	1/2 NPK+F_{10}+VC_2 + BFs	9.3	15.9	12.6	0.8	1.4	1.1	10.5	17.3	13.9	115.6	196.3	156.0	10.5	17.6	14.1	130.4	214.0	172.2
	Mean	**7.19**	**9.92**	**8.56**	**0.85**	**1.13**	**0.99**	**8.04**	**11.05**	**9.55**	**88.76**	**122.49**	**105.63**	**10.48**	**13.97**	**12.22**	**88.76**	**136.46**	**112.61**
	SE(m)±	**0.36**	**0.43**	**0.47**	**0.04**	**0.06**	**0.05**	**0.35**	**0.48**	**0.92**	**4.40**	**5.29**	**5.89**	**0.53**	**0.68**	**0.618**	**4.40**	**5.92**	**6.39**
	CD (5%)	**1.05**	**1.26**	**1.36**	**0.13**	**0.16**	**0.14**	**1.03**	**1.41**	**2.87**	**12.91**	**15.51**	**16.80**	**1.55**	**2.00**	**1.76**	**12.91**	**17.37**	**18.20**
	CV(%)	**6.0**	**7.0**	**8.0**	**9.0**	**8.0**	**9.0**	**8.0**	**8.0**	**8.0**	**9.0**	**7.0**	**8.0**	**9.0**	**8.0**	**9.0**	**9.0**	**8.0**	**8.0**

Table 5: Effect of nutrient sources on fruit yield of cucumber variety "Seven Star"

	Treatments	**Marketable (tha^{-1})**			**Total (tha^{-1})**		
		1^{st} year	2^{nd} year	Pooled	1^{st} year	2^{nd} year	Pooled
1	Absolute Control	4.9	4.1	4.5	6.0	5.4	5.7
2	RDF	8.5	11.9	10.2	10.2	13.7	12.0
3	1/2 RDF+ BFs	8.4	10.5	9.4	9.4	11.8	10.6
4	VC_4	8.7	10.9	9.8	9.6	11.9	10.8
5	VC_2+BFs	9.3	11.8	10.5	7.7	10.4	9.1
6	1/2 NPK+VC_2+BFs	8.7	10.9	9.8	9.8	12.2	11.0
7	NPK+VC_2+BFs	10.1	14.2	12.1	11.2	15.8	13.5
8	F_{20}	9.2	13.7	11.4	10.3	15.2	12.8
9	F_{10}+ BFs	6.6	9.0	7.8	9.5	13.2	11.3
10	1/2 NPK+F_{10}+BFs	8.9	13.2	11.1	9.8	14.6	12.2
11	NPK+F_{10}+BFs	11.5	16.1	13.8	12.6	18.3	15.4
12	1/2 NPK+F_{10}+VC_2+ BFs	12.2	19.7	15.6	13.0	21.4	17.2
	Mean	**8.90**	**12.17**	**10.53**	**9.93**	**13.66**	**11.79**
	SE(m)±	**0.40**	**0.55**	**0.54**	**0.43**	**0.75**	**0.63**
	CD (5%)	**1.16**	**1.62**	**1.54**	**1.27**	**2.21**	**1.79**
	CV(%)	**7.70**	**7.88**	**7.91**	**7.55**	**9.53**	**9.0**