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Studies on Influence of different Regimes of Irrigations and Fertigation Levels on Growth and Quality Parameters of Cucumber Grown under Protected condition

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ABSTRACT: One of the major cucurbitaceous vegetable crops grown in subtropical areas of the world is the cucumber (*Cucumis sativus* L.). At the Hi-tech Horticulture unit, Agriculture Research Station, University of Agricultural Sciences, Dharwad, researchers looked at the effects of irrigation and fertigation on the growth, yield, and quality parameters of parthenocarpic cucumber grown under naturally ventilated polyhouse for two seasons in 2019–20 and 2020–21. According to the studies, irrigation and fertigation have a substantial impact on the growth and yield of parthenocarpic cucumbers grown in polyhouses. TSS was high at I_1F_4 in terms of quality metrics (3.60, 3.50 and 3.55 o brix in first and second season followed by pooled data). In the first and second seasons, which were followed by pooled data, ascorbic acid content was quite high at I_2F_3 (3.73, 3.75, and 3.74 mg $100g^{-1}$). I_2F_4 (80 percent ETc and 120 percent RDF) had the largest plant height at 90 days after planting, the highest average fruit weight (158.13 g), the highest number of fruits per vine (24.76), the highest yield (18.40 kg m^{-2}) (92.01 q $500m^{-2}$), and the highest number of fruits per plant (184.02 t ha^{-1}). In comparison to other treatment combinations, the significant yield was caused by better usage of the water at 80 per cent and the recommended amount of fertilizers by lowering percolation losses of water and reduction in leaching nutrients. We can infer from this study that 20 per cent of the water and energy needed to supply that water can be saved. Hence, drip irrigation under greenhouse cultivation is concentrated to supply irrigation water and fertilizers to rhizosphere through various phases of nutrient demand of a crop. Therefore, keeping in view all the perspectives of protected cultivation and fertigation, the present investigation was framed to study the performance of greenhouse cucumber in varying levels of fertilizer doses.

Keywords: Cucumber, parthenocarpic, polyhouse, fertigation, ascorbic acid.

INTRODUCTION

The most popular and economically grown vegetable crop under protected conditions is cucumber (*Cucumis sativus* L.). More people like hybrid parthenocarpic cucumbers. Without pollination, parthenocarpic plants can produce fruit. Parthenocarpic is a beneficial trait for cucumbers cultivated in protected culture systems because pollinators are not necessary in this situation. Cucumbers are collected when they are still developing and before the seeds have fully matured. Cucumbers without seeds are preferred by consumers. Another reason parthenocarpic cucumber plants are recommended for growing in sheltered conditions is because the fruit they produce is seedless. Because of its demand, it is grown throughout the year. It is consumed as salad, sandwich and pizza preparations etc. It is a rich source of vitamin B, carbohydrates, calcium and phosphorous. It also contains iodine and contains a total 4-6% of dry sugars, 0.1% of fat (Rana 2008). The flavor of cucumber is due to two compounds 2, 6-nonadienal and 2, 6 - nonadenol. The pleasant aroma of cucumber is derived from the 2, 6-nandienal with assistance from 2-hexenal.

Estimating the crop's water consumption based on evapotranspiration is necessary to create an efficient irrigation strategy (ET). The idea of crop coefficient (Kc) is required because greenhouse crops must be managed differently than outside crops due to changes in plant spacing, crop height (which requires the use of vertical supports), and aerodynamic qualities (Fernandez *et al.*, 2005; Orgaz *et al.*, 2005). According to some researchers, greenhouse crops require less water than crops grown outdoors since the sun radiation is 18 to 20 per cent lower and the wind speed is constrained (Harmanto *et al.*, 2005). This results in lower crop evapotranspiration (Patel and Rajput 2011) potentially; fertigation can lessen the movement of nutrients away from the root zone. This contributes to decreasing the input costs by enhancing the efficiency of the usage of water and fertiliser (Bar -Yosef, 1999; Solaimalai *et al.*, 2005).

MATERIALS AND METHODS

The goal of the current research is to better understand how irrigation and fertigation levels affect parthenocarpic cucumber performance in naturally ventilated polyhouses. The experiment was conducted in 2019–20 and 2020–21 at the Hi-Tech Horticulture Unit of the University of Agricultural Sciences, Dharwad. It is located at 15°26'N latitude and 75°70' E longitude, at an elevation of 678 m above mean sea level, in the northern transitional tract of Karnataka State. A Factorial randomized block design with three replications was used to set up the experiment. The first factor consists of three irrigation (I) regimes, I_1 (60%ETc), I_2 (80% ETc) and I_3 (100 % ETc) and second factor is having four fertilizer (F) levels, F_1 (60% RDF), F_2 (80% RDF), F_3(100 % RDF) and F_4 (120% RDF),where RDF is 150:75:75 NPK kg ha^{-1}. Planting was done with a spacing of 45 × 45cm with plot size of 8X1 m.

RESULTS AND DISCUSSION

Tables 1, 2 and 3 present the findings from two years' worth of pooled data. Fruits varied significantly in terms of quality metrics like TSS and ascorbic acid concentration. At lower levels of irrigation regimes, TSS and ascorbic acid contents were high.TSS was high at I_1 - 60 per cent of ETc (3.51, 3.42 and 3.46^o brix in first and second season followed by pooled data). Fertigation with F_4 -120 per cent of RDF showed higher TSS (3.58, 3.48 and 3.53 ^{o} brix in first and second season followed by pooled data). In case of interaction effect, highest TSS was observed in I_1F_4 -60 per cent ETc and 120 per cent RDF (3.60, 3.50 and 3.55^{o}brix in first and second season followed by pooled data). Ascorbic acid content was very high at I_3 (3.60, 3.64 and 3.62 mg 100g^{-1} in first and second season followed by pooled data), fertigation at F_4-120 per cent of RD F(3.57, 3.61 and 3.59 mg 100g^{-1} in first and second season followed by pooled data) and in interaction studies, I_2F_3 - 80 per cent of ETc and 100 per cent of RDF(3.73, 3.75 and 3.74 mg 100g^{-1}in first and second season followed by pooled data.) recorded higher ascorbic acid. It was due to lesser content in the fruit; hence there may be higher concentration of sugar and total soluble solids. Whereas in case of treatment combinations of fertigation and irrigation I_1F_4, I_1F_3, I_2F_4 and I_3F_4 had higher values for TSS and ascorbic acid compared to the treatment combinations having higher moisture and less nutrient combinations. It was interesting to note that, TSS content was reduced in the larger fruits that are obtained by higher irrigation levels (Sanders *et al.*, 1989; Aladenola and Madramootoo 2014; Lee and Kader 2000)

The highest vine length at 90 DAP (224.86 cm) recorded at I_2 (80% ETc), which was comparable with I_3 (100% ETc) (224.98 cm). Irrigation at I_1 (60% ETc) recorded the lowest vine length (214.69 cm). Where F_4 (120% RDF) recorded the highest vine length (242.38 cm), which was statistically superior over F_3 (100% RDF) (230.16 cm). Fertigation at F_4 (120% RDF) and F_3 (100% RDF) realized significantly highest vine length. Interaction effect between irrigation regimes and fertigation levels have no significant effect on vine length.

The average fruit weight for irrigation regime I_2 (80% ETc) was 150.21 g, which was on par with I_3's average fruit weight of 149.95 g. The fertigation F_4 (120 percent RDF) had the highest average fruit weight (156.45 g), which was followed by F_3 (100 % RDF) at 150.12 g in. I_2F_4 treatment combinations produced 158.13 g. Average fruit weights of I_3F_4 157.04 g and I_1F_4 154.16 g were significantly greater. I_3 (100 % ETc) had the considerably highest number of fruits per vine (23.31), followed by I_2 (80 % ETc) (23.14), and Fertigation at F_4 (120 % RDF), which had the significantly highest number of fruits per vine (23.92). In the I_2F_4 treatment combination; a significantly larger quantity of fruits per vine (24.76) was observed. The maximum fruit output per vine, 3.90 kg, was produced by I_3 (100 % ETc). 4.07 kg was the highest fruit output per vine. The results of the present experiment are in agreement with the findings of Gupta *et al.* (2014) in capsicum. The treatment combinations of I_2F_4 (4.14 kg) registered considerably increased fruit production.I_3 recorded the noticeably highest yield per square meter (17.31 kg) (100 % ETc).

Significantly greater fruit output per square meter was obtained during fertilization at F_4 (120 percent RDF) (18.09 kg). Best yield per square meter by a significant margin (18.40 kg) I_3 produced the highest yield per 500 m^2 (86.56 q/500 m^2) (100 % ETc). The maximum yield was obtained when using F_4 (120 per cent RDF; 90.44 q/500 m^2). The maximum yield of I_2F_4 treatment combinations was recorded (92.0 q /500 m^2). I_3 produced the highest output (173.12 t ha^{-1}) on record

(100 % ETc). The maximum yield was reported by F_4 (120 % RDF) (180.87 t ha^{-1}). The I_2F_4 treatment combination had a yield of 184.02 t ha^{-1}, which was comparable to that of I_1F_4, I_2F_3, I_3F_2, I_3F_3, and I_3F_4, but much higher than that of other fertigation treatments. I_1F_1 recorded the lowest yield (125.02 t ha^{-1}), nevertheless. The current results are in agreement with Janapriya *et al.* (2010) and Patil and Gadge (2016), who discovered a considerably higher cucumber fruit production with increased fertigation levels.

Table 1: Influence of irrigation regimes and fertigation levels on growth and quality parameters of parthenocarpic cucumber under naturally ventilated polyhouse.

Treatments	TSS (^{o} Brix)			Ascorbic acid (mg $100g^{-1}$)			Vine length (cm) 90DAP		
(I)	2019-20	2020-21	Pooled	2019-20	2020-21	Pooled	2019-20	2020-21	Pooled
I_1	3.51	3.42	3.46	3.32	3.38	3.35	209.83	219.55	214.69
I_2	3.49	3.39	3.44	3.47	3.49	3.48	224.86	235.33	230.09
I_3	3.39	3.33	3.36	3.60	3.64	3.62	219.85	230.10	224.98
S.Em±	0.03	0.02	0.02	0.04	0.04	0.04	3.17	3.31	3.24
C.D.(P=0.05)	0.08	0.07	0.07	0.11	0.12	0.10	9.28	9.70	9.49
Fertigation (F)									
F_1	3.32	3.25	3.29	3.34	3.38	3.36	201.13	210.50	205.82
F_2	3.41	3.36	3.39	3.40	3.47	3.44	209.77	219.54	214.65
F_3	3.54	3.41	3.48	3.53	3.56	3.55	224.93	235.40	230.16
F_4	3.58	3.48	3.53	3.57	3.61	3.59	236.88	247.88	242.38
S.Em±	0.03	0.03	0.03	0.04	0.05	0.04	3.66	3.82	3.74
C.D.(P=0.05)	0.10	0.08	0.08	0.13	0.14	0.12	10.72	11.20	10.96
Interactions									
$I_1 \times F_1$	3.46	3.38	3.42	3.19	3.20	3.19	190.40	199.31	194.86
$I_1 \times F_2$	3.40	3.37	3.39	3.34	3.47	3.40	201.60	210.93	206.27
$I_1 \times F_3$	3.59	3.41	3.50	3.28	3.30	3.29	219.45	229.57	224.51
$I_1 \times F_4$	3.60	3.50	3.55	3.49	3.54	3.52	227.85	238.39	233.12
$I_2 \times F_1$	3.42	3.31	3.37	3.24	3.28	3.26	204.75	214.24	209.50
$I_2 \times F_2$	3.41	3.36	3.38	3.32	3.35	3.34	216.30	226.37	221.34
$I_2 \times F_3$	3.54	3.41	3.47	3.73	3.75	3.74	231.68	242.55	237.12
$I_2 \times F_4$	3.58	3.46	3.52	3.57	3.59	3.58	246.70	258.16	252.43
$I_3 \times F_1$	3.09	3.06	3.08	3.61	3.65	3.63	208.25	217.95	213.10
$I_3 \times F_2$	3.43	3.35	3.39	3.55	3.60	3.57	211.40	221.31	216.35
$I_3 \times F_3$	3.49	3.41	3.45	3.59	3.63	3.61	223.65	234.07	228.86
$I_3 \times F_4$	3.56	3.48	3.52	3.65	3.69	3.67	236.10	247.09	241.60
S.Em±	0.06	0.05	0.05	0.08	0.08	0.07	6.33	6.61	6.47
C.D.(P=0.0)	0.17	0.14	0.14	0.22	0.24	0.20	NS	NS	NS

Recommended Dose of Fertilizer (RDF):150:75:75 NPK kg. ha^{-1}

Irrigation regimes (I) I_1: Drip irrigation at 60 % of ETc I_2: Drip irrigation at 80 % of ETc I_3: Drip irrigation at 100 % of ETc
0Fertigation levels (F) F_1: Fertigation with 60% of RDF F_2: Fertigation with 80% of RDF F_3: Fertigation with 100% of RDF F_4: Fertigation with 120% of RDF

Table 2: Influence of irrigation regimes and fertigation levels on growth and yield of parthenocarpic cucumber under naturally ventilated polyhouse.

Treatments	Average fruit weight (g)			Number of fruits per vine			Fruit yield per vine (kg)		
Irrigation	**2019-20**	**2020-21**	**Pooled**	**2019-20**	**2020-21**	**Pooled**	**2019-20**	**2020-21**	**Pooled**
I_1	141.89	147.54	144.71	20.83	21.65	21.24	3.42	3.56	3.49
I_2	147.27	153.14	150.21	22.69	23.60	23.14	3.73	3.87	3.80
I_3	147.03	152.88	149.95	22.85	23.76	23.31	3.82	3.97	3.90
S.Em±	1.44	1.51	1.48	0.21	0.22	0.21	0.057	0.060	0.058
C.D.(P=0.05)	4.23	4.43	4.33	0.61	0.64	0.63	0.17	0.18	0.17
Fertigation									
F_1	139.37	144.88	142.12	20.30	21.10	20.70	3.23	3.36	3.29
F_2	141.67	147.28	144.47	21.75	22.61	22.18	3.58	3.72	3.65
F_3	147.19	153.06	150.12	22.99	23.91	23.45	3.82	3.98	3.90
F_4	153.37	159.52	156.45	23.46	24.39	23.92	3.99	4.15	4.07
S.Em±	1.66	1.75	1.70	0.21	0.25	0.25	0.07	0.07	0.07
C.D(P=0.05)	4.88	5.12	5.00	0.61	0.74	0.72	0.19	0.20	0.20
Interactions									
$I_1 \times F_1$	128.60	133.70	131.15	18.04	18.75	18.40	2.76	2.87	2.81
$I_1 \times F_2$	141.73	147.33	144.53	19.69	20.46	20.08	3.25	3.38	3.31
$I_1 \times F_3$	146.11	151.91	149.01	22.71	23.62	23.16	3.72	3.86	3.79
$I_1 \times F_4$	151.13	157.19	154.16	22.87	23.78	23.32	3.95	4.11	4.03
$I_2 \times F_1$	140.97	146.54	143.75	20.73	21.56	21.15	3.35	3.48	3.41
$I_2 \times F_2$	145.25	151.02	148.14	22.28	23.16	22.72	3.73	3.88	3.80
$I_2 \times F_3$	147.83	153.77	150.80	23.47	24.41	23.94	3.76	3.91	3.84
$I_2 \times F_4$	155.05	161.22	158.13	24.27	25.24	24.76	4.06	4.22	4.14
$I_3 \times F_1$	148.53	154.39	151.46	22.11	22.99	22.55	3.58	3.72	3.65
$I_3 \times F_2$	138.03	143.48	140.75	23.28	24.20	23.74	3.76	3.91	3.84
$I_3 \times F_3$	147.63	153.49	150.56	22.79	23.69	23.24	3.99	4.15	4.07
$I_3 \times F_4$	153.95	160.14	157.04	23.23	24.15	23.69	3.96	4.12	4.04
S.Em±	2.88	3.02	2.95	0.42	0.44	0.43	0.11	0.12	0.12
C.D.(P=0.05)	8.45	8.86	8.66	1.22	1.29	1.25	0.34	0.35	0.34

Recommended Dose of Fertilizer (RDF):150:75:75 NPK kg. ha^{-1}

Irrigation regimes (I) I_1: Drip irrigation at 60 % of ETc I_2: Drip irrigation at 80 % of ETc I_3: Drip irrigation at 100 % of ETc
Fertigation levels (F) F_1: Fertigation with 60% of RDF F_2: Fertigation with 80% of RDF F_3: Fertigation with 100% of RDF F_4: Fertigation with 120%

Table 3: Influence of irrigation regimes and fertigation levels on yield of parthenocarpic cucumber under naturally ventilated polyhouse.

Treatments	Fruit yield (kg $m^{2)}$			Yield per 500 m^2 (q)			Fruit yield per Ha. ($t\ ha^{-1}$)		
Irrigation	2019-20	2020-21	Pooled	2019-20	2020-21	Pooled	2019-20	2020-21	Pooled
I_1	15.19	15.79	15.49	75.95	78.96	77.46	151.89	157.93	154.91
I_2	16.55	17.21	16.88	82.74	86.04	84.39	165.48	172.08	168.78
I_3	16.98	17.65	17.31	84.88	88.24	86.56	169.75	176.48	173.12
S.Em±	0.25	0.27	0.26	1.27	1.32	1.30	2.54	2.65	2.59
C.D.(P=0.5)	0.75	0.78	0.76	3.73	3.88	3.80	7.45	7.77	7.61
Fertigation									
F_1	14.33	14.91	14.62	71.67	74.53	73.10	143.35	149.05	146.20
F_2	15.90	16.53	16.22	79.52	82.66	81.09	159.05	165.32	162.19
F_3	16.98	17.65	17.32	84.88	88.27	86.58	169.76	176.55	173.15
F_4	17.74	18.44	18.09	88.68	92.20	90.44	177.35	184.39	180.87
S.Em±	0.29	0.31	0.30	1.47	1.53	1.50	2.93	3.06	2.99
C.D.(P=0.05)	0.86	0.90	0.88	4.30	4.48	4.39	8.60	8.97	8.78
Interactions									

$I_1 \times F_1$	12.26	12.74	12.50	61.30	63.71	62.51	122.61	127.43	125.02
$I_1 \times F_2$	14.44	15.01	14.72	72.20	75.03	73.62	144.39	150.07	147.23
$I_1 \times F_3$	16.51	17.16	16.84	82.53	85.82	84.18	165.06	171.65	168.35
$I_1 \times F_4$	17.55	18.26	17.90	87.76	91.29	89.52	175.52	182.57	179.04
$I_2 \times F_1$	14.86	15.47	15.16	74.32	77.33	75.82	148.63	154.66	151.65
$I_2 \times F_2$	16.57	17.23	16.90	82.84	86.13	84.49	165.67	172.27	168.97
$I_2 \times F_3$	16.72	17.38	17.05	83.59	86.90	85.25	167.17	173.81	170.49
$I_2 \times F_4$	18.05	18.76	18.40	90.23	93.79	92.01	180.46	187.58	184.02
$I_3 \times F_1$	15.88	16.51	16.19	79.40	82.54	80.97	158.80	165.07	161.94
$I_3 \times F_2$	16.71	17.36	17.04	83.54	86.82	85.18	167.08	173.63	170.35
$I_3 \times F_3$	17.70	18.42	18.06	88.52	92.09	90.31	177.05	184.18	180.61
$I_3 \times F_4$	17.61	18.30	17.96	88.04	91.51	89.78	176.09	183.03	179.56
S.Em±	0.51	0.53	0.52	2.54	2.65	2.60	5.08	5.30	5.19
C.D.(P=0.05)	1.49	1.55	1.52	7.45	7.77	7.60	14.89	15.53	15.21

Recommended Dose of Fertilizer (RDF):150:75:75 NPK kg. ha^{-1}

Irrigation regimes (I)	Fertigation levels (F)
I_1: Drip irrigation at 60 % of ETc	F_1: Fertigation with 60% of RDF
I_2: Drip irrigation at 80 % of ETc	F_2: Fertigation with 80% of RDF
I_3: Drip irrigation at 100 % of ETc	F_3: Fertigation with 100% of RDF
	F_4: Fertigation with 120%

CONCLUSION

From this study, it is evident that adopting I_2F_4 (80% ETc with 120% RDF) is most profitable compared to other treatments and 20 per cent of irrigation and energy required to supply the irrigation can be saved , which can reduce the cost of cultivation of cucumber. It was important to notice that by using considerably less amount of irrigation water (20%), the higher productivity was achieved. This was a significant step towards good agricultural practices to get more production by using minimum possible resources in view of suitability which otherwise cause soil health problems like salinity reduced microbial activity, degradation of soil productivity due to addition of high inputs that had been a characteristic feature of greenhouse cultivation. Further, there is a need of mulching studies along with best treatment combination from the present investigation.

REFERENCES

Aladenola, O. and Madramootoo, C. (2014). Response of greenhouse -grown bell pepper (*Capsicum annuum* L.) to variable irrigation. *Can. J. Plant Sci.*, *94*: 303-310.

Bar-Yosef, B. (1999). Advances in fertigation, *Advances in Agron.*, *65*: 1-77.

Fernandez, M. D., Gallardo, M., Orgaz, F. and Fereres, E. (2005). Water use and production of a greenhouse pepper crop under optimum and limited water supply. *J. Hort. Sci. Biotech.*, *80*(1): 87-96.

Gupta, A. J., Ahmed, M. F. and Bhat, F. N. (2010). Studies on yield, quality, water and fertilizer use efficiency of capsicum under drip irrigation and fertigation, *Indian J. Hort*., *67*: 213-218.

Harmanto, Salokhe, V. M., Babel, M. S. and Tantau, H. J. (2005). Water requirement of drip irrigated tomatoes grown in greenhouse in tropical environment. Agric. *Water Manage.*, *71*(3): 225-242.

Janapriya, S., Palanisamy and D. and Ranghaswami, M. V. (2010). Soilless media and fertigation for naturally ventilated polyhouse production of cucumber (*Cucumis sativus* L.) cv. green long. *International Journal of Agricultural and Environment Biotechnology*, *3*(2): 199-203.

Lee, S. K. and Kader, A. A. (2000). Pre harvest and postharvest factors influencing vitamin C content of horticultural crops. *Postharvest Bio. Technol*., *20*: 207-220.

Orgaz, F., Fernandez, M. D., Bonachela, S., Gallardo, M. and Fereres, E. (2005). Evapotranspiration of horticultural crops in an unheated plastic greenhouse. *Agric. Water Manage.*, *72*: 81-96.

Patel, N. and Rajput, T. B. S. (2011). *Environment monitoring and estimation of water requirement inside a polyhouse through internet*. In: 21st Int. Congr. Irrig. Drain. ICID, 16-22 October, Tehran, Iran. p. 323 -331.

Patil, M. and Gadge, S. B. (2016). Yield response of cucumber (*Cucumis sativus* L.) to different fertigation levels. *Internat. J. Agric. Engg*., *9*: 145-149.

Rana , M. K. (2008). Scientific cultivation of vegetables, Kalyani Publishers, New Delhi, p.139

Sanders, D. C., Howell, T. A., Hile, M. M. S., Hodges, L., Meek, D. and Phene, C. J. (1989). Yield and quality of processing tomatoes in response to irrigation rate and schedule. *J. American Soc. Hort. Sci.*, *114*: 904-908.

Solaimalai, A., Baskar, M., Sadasakthi, A. and Subburamu, K. (2005). Fertigation in high value crops. *Agric. Rev*., *26*: 1-13.

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