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Effect of irrigation levels and plant growth regulators on growth and quality of cucumber (*Cucumis sativus* L.) under poly house

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Abstract

A field experiment was conducted at College of Agriculture, Swami Keshwanand Rajasthan Agricultural University, Bikaner during *Rabi*, 2017-18 with treatment comprised of 4 irrigation levels *viz.*, 0.4, 0.6, 0.8 and 1.0 Etc in main plot and three plant growth regulators *viz.*, water spray, NAA (100 ppm) and GA₃ (50 ppm) in sub plot. The experiment was laid out in split plot design and replicated thrice. The results revealed significant variation in all growth and quality attributes under different drip irrigation and plant growth regulators. The maximum number of branches per vine at 60 DAS (4.72) and harvest (11.39), length of vine at 60 DAS (323.36 cm) and harvest (344.00 cm) and number of leaves per vine at 60 DAS (50.64) were recorded with 1.0 Etc. Results also indicated that quality parameter like chlorophyll content at 60 DAS (1.561 mg g⁻¹) was found maximum with the treatment 1.0 Etc, whereas, drip irrigation levels did not influence TSS and moisture content in fruit. Among various plant growth regulators, highest number of branches per vine at 60 DAS (4.88) and harvest (12.08), length of vine at 60 DAS (330.19 cm) and harvest (348.45 cm), number of leaves per vine at 60 DAS (53.22) and chlorophyll content in leaves at 60 DAS (1.576 mg g⁻¹) were recorded under GA₃ (50 ppm) and moisture content and TSS were observed non significant under plant growth regulators.

Keywords: Cucumber, irrigation levels, GA₃, NAA etc.

Introduction

Cucumber (*Cucumis sativus* L.) is one the most important vegetable crops belonging to family Cucurbitaceae having chromosome number 2n= 14. It is a warm season vegetable grown throughout the world under tropical and sub-tropical conditions. The fruit of cucumber is said to have cooling effect, prevent constipation, checks jaundice and indigestion. The estimated area under this crop is around 82 thousand hectares with total production of about 1260 thousand metric tons in India (Anonymous, 2018) [1]. The available water resources through more efficient methods of water application like drip irrigation under conditions of protected cultivation becomes necessary to enhance yield and water use efficiency (Dunage *et al.*, 2009) [3]. Drip irrigation system improves the WUE because of improving the yield and quality of produce (Singh, 2005) [8]. The use of plant growth regulators mainly in cucumber crop is more beneficial under poly house condition. The effects of plant growth regulators in cucumber exhibits a fascinating range of floral morphology, including staminate, pistillate and hermaphrodite flowers occurring in various arrangements and yielding several types of sexual expression. Plant growth regulators are also used to control the vegetative growth of cucumber plants, thereby increasing the plant population per unit area with regard to yield (Latimer, 1991) [6].

Materials and methods

The experiment was laid out at ventilated poly house, Horticulture farm, College of Agriculture, Swami Keshwanand Rajasthan Agricultural University, Bikaner during *Rabi* 2017-18. The experiment was laid out in split plot design with three replications. There were four level of irrigations *viz.*, 0.4 Etc, 0.6 Etc, 0.8 Etc and 1.0 Etc under drip irrigation and three treatment of plant growth regulators *viz.*, water spray, NAA (100 ppm) and GA₃ (50 ppm). Irrigation was applied in alternate days as per treatment and the basis of ETC levels *i.e.* PE x Kp x Kc considering crop coefficient 0.45 for the initial stage, 0.70 for crop development, 0.90 for mid stage and 0.75 for final stage. Amount of irrigation water applied to all the treatments based on evapotranspiration of crop was considered as total irrigation water

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used in crop production. In addition to this, amount of water used for common irrigation was also computed for calculation of water use.

Results and discussion

The results of experiment revealed that irrigation levels had significant effect on growth attributes and quality of cucumber (Table 1). The maximum number of branches per vine at 60 DAS (4.72) and harvest (11.39), length of vine at 60 DAS (323.36 cm) and harvest (344.00 cm) and number of leaves per vine at 60 DAS (50.64) were recorded with irrigation levels 1.0 ETc, which were statistically at par with treatment 0.8 ETc. However, maximum chlorophyll content in leaves at 60 DAS (1.561 mg g⁻¹). The moisture content (97.66%) was recorded higher with irrigation levels 1.0 ETc followed by 0.8 ETc (97.52%) but found non-significant. Further, the TSS in fruit was also found non significant with maximum (3.89 °Brix) at 0.4 ETc drip irrigation level as scarcity of water may increase solutes in fruits. The increased growth and quality under drip irrigation system might have

resulted due to better water utilization (Manfrinto, 1971), higher uptake of nutrients (Bafna *et al.* 1993)^[2] and excellent soil- water –air relationship with higher oxygen concentration in root zone Gornet *et al.* (1973)^[4].

The results revealed in Table 1 that plant growth regulators had significant effect on growth attributes and quality of cucumber. The significantly higher number of branches at 60 DAS (4.88) and harvest (12.08), length of vine at 60 DAS (330.19 cm) and harvest (348.45 cm), number of leaves at 60 DAS (53.22) and chlorophyll content at 60 DAS (1.576 mg g⁻¹) were recorded with GA₃ (50ppm) while minimum noted in water spray treatment. This finding is in agreement with the results reported by Ullah *et al.* (2011). Increase in growth attributes might be due to its additional availability of GA in seed, which might have increased the level of amylase in the aleurone tissues of seed for better conversion of complex starch into simple sugars for providing energy to growth (Ram Asrey *et al.*, 2001). In case of moisture content and TSS, the effect of plant growth regulators was non-significant.

Table 1: Effect of irrigation levels and plant growth regulators on growth and quality attributes of cucumber cv. Aviva F₁ hybrid

Treatments	Number of branches		Length of vine		Number of leaves per vine	Chlorophyll content (mg g ⁻¹)	Moisture content (%)	TSS (°Brix)
	60 DAS	At harvest	60 DAS	At harvest	60 DAS			
Irrigation levels								
0.4 ETc	3.68	8.23	280.01	300.00	42.00	1.440	95.00	3.89
0.6 ETc	4.23	10.40	305.14	330.00	47.84	1.508	97.26	3.83
0.8 ETc	4.28	10.80	318.72	341.38	49.91	1.552	97.52	3.83
1.0 ETc	4.72	11.39	323.36	344.00	50.64	1.561	97.66	3.83
S.Em±	0.17	0.19	3.26	1.91	0.54	0.003	0.64	0.03
CD at 5%	0.58	0.66	11.27	6.60	1.88	0.012	N.S.	N.S.
Plant growth regulators								
Water spray	3.23	8.16	278.18	307.57	42.10	1.422	96.45	3.83
NAA (100 ppm)	4.58	10.38	312.05	330.52	47.47	1.548	97.04	3.88
GA ₃ (50 ppm)	4.88	12.08	330.19	348.45	53.22	1.576	97.09	3.83
S.Em±	0.19	0.22	2.46	1.30	0.26	0.003	0.30	0.02
CD at 5%	0.57	0.67	7.39	3.89	0.78	0.010	N.S.	N.S.

Conclusion

Based on results of experiment, it may be concluded that irrigation level at 1.0 ETc recorded maximum growth attributes and quality of cucumber which was at par with 0.8 ETc. Among plant growth regulators, the highest growth attributing and quality attributes were recorded with GA₃ (50 ppm).

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