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EFFECT OF ETHEPHON ON EARLINESS, VEGETATIVE CHARACTERS, FRUIT CHARACTERS AND FRUIT YIELD IN *CUCUMIS* GENOTYPES*

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Plant growth substances like auxins, gibberellins. cytokinins and ethylene are used to tailor plant growth in the desired direction. Application of ethephon has been reported to reduce the length of main vine (Iwahari *et al.*, 1969), increase the number of primary branches per plant (Bhandari *et al.*, 1974), reduce duration (Lower and Miller, 1969), increase in the female: male flower ratio (George, 1971) and increase in fruit yield per plant (Verma and Chowdhury, 1980) in *Cucumis* genotypes. The present study was undertaken to study the response of *Cucumis* genotypes to different levels of ethephon.

Materials and Methods

The experiments were conducted during October-January 1981-82 and March-May, 1982. The materials comprised of 20 *Cucumis* genotypes grown in a split plot design taking four concentrations of ethephon (0 ppm, 100 ppm, 200 ppm and 300 ppm) in main plots and the *Cucumis* genotypes in sub-plots with 3 replications. There was one pit/genotype/subplot. Two plants/pit were maintained. The spacing was 1 5 m x 2.5 m. Observations were recorded on length of main vine, number of primary branches for plant, number of nodes to first male flower, to first female flower and first fruit and per cent of female flowers for first 10 nodes, first 20 nodes and first 30 nodes. Fruit length, weight and volume, flesh thickness, number of seeds per fruit, fruits per plant and fruit yield per plant were also recorded. The relationship, if any, between various plant characters and levels of elhephon sprayed was estimated through regression equations (Ostle, 1954). The differential response of genotypes to ethephon application was estimated through the corresponding values of regression. Co-efficient of determination (R^2) was found separately for each variety for each character.

Results and Disqussion

The levels of ethephon caused significant differences in the length of main vine, number of primary branches per plant, number of nodes to first male flower, number of nodes to first female flower, per cent of female flowers for first 10 nodes, first 20 nodes and first 30 nodes, number of nodes to first fruit, flesh thickness, number of seeds per fruit and fruit yield per plant (Table 1). The twenty *Cucumis* genotypes were significantly different for the 15 quantitative characters studied. The genotypes x levels of ethephon interaction was significant for per cent of female flowers for first 10 nodes, first 20 nodes and first 30 nodes and number of fruits per plant.

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Table 1

General analysis of variance

Source of variation		df	MS							
			X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8
Replications	E_1	2	1063.88	3.28	0.58	0.49	21.27	44.00	3.0.46	0.43
	E_2	2	10740.89	31.40	8.32	10.85	12.44	14.04	6.00	19.63
Levels of ethepon	E_1	3	12246.05**	57.01**	22.09**	19.34**	337.60**	138.12**	56.57*	15.62**
	E_2	3	46417.25**	79.44**	11.80**	6·74**	203.00**	87.05**	33.92**	5.21*
Error (a)	E_1	6	212.58	1.22	0.59	0.18	17.05	9.38	5.82	0.80
	E_2	6	3888.35	1.41	0.77	0.62	3.90	1.64	1.46	0.74
Genotypes	E_1	19	8960.71**	16.65**	2.58**	3.61**	229.59**	179.45**	135.91**	4.91**
	E_2	19	30745.57**	4.59**	6.74**	11.30**	434.92**	254.02**	168.40**	16.70**
Genotypes x levels of ethephon	E_1	57	218.02	0.80	0.45	0.52	27.36	10.50**	7.83**	1.09
	E_2	57	2007.19	1.78	0.68	0.53	28.41**	11.98**	7.21**	0.66
Error (b)	E_1	152	362.20	1.26	0.57	0.58	3.97	2.47	1.83	1.09
	E_2	152	1921.93	2.09	0.92	0.87	2.27	1.70	1.40	1.24

Table 1 (Contd.)

		df	MS						
			X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}	X_{15}
Replications	E_1	2	3.19	0.52	566953	0.003	20937	3.39	9.26
	E_2	2	16.79	0.47	294218	0.14	4998	20.50	37.46
Levels of	E_1	3	25.79	0.65	584326	0.17*	44556*	0.32	5.60*
ethephon	E_2	3	47.94	2.23	1707024	0.60	30110**	1.21	24.45
Error (a)	E_1	6	7.41	0.15	160310	0.03	7192	2.17	0.63
	E,	6	32.39	1.11	1056400	0.15	1813	7.38	19.17
Genotypes	E_1	19	289.10**	1.92**	1796174**	5.70**	519535**	14.00*	14.05**
	E_2	19	498.25**	5.87**	5398228**	4.77**	326259**	44.44**	52.58**
Genotypes x	E_1	57	10.64	0.10	106094	0.07	8768	3.95**	4.53**
levels of ethephon	E_2	57	10.69	0.19	157014	0.15	11344	4.83	5.56
Error (b)	E_1	152	14.58	0.14	133817	0.13	12788	1.89	3.22
	E_2	152	19.67	0.19	182157	0.20	18236	3.44	6.45

E_1 = October-January, 1981-82, E_2 = March-May, 1982, X_1 = Length of main vine, X_2 = Number of primary branches per plant, X_3 = Number of nodes to first male flower, X_4 = Number of nodes to first female flower, X_5 = Percentage of female flowers for first 10 nodes, X_9 = Percentage of female flowers for first 20 nodes, X_7 = Percentage of female flowers for first 30 nodes, X_8 = number of nodes to first fruit, X_9 = Fruit length, X_{10} = Fruit weight, X_{11} = Fruit volume, X_{12} = Flesh thickness, X_{13} = Number of seeds per fruit, X_{14} = Number of fruits per plant, X_{15} = Fruit yield per plant.

* Significant at P = 0.05

** Significant at P = 0.01

Table 2

Effect of ethephon on fruit yield per plant (kg)

Genotypes		0 ppm	100 ppm		200 ppm		300 ppm		Mean ± SEm
CS 1	E_1	2.80	4.50	(+60.71)	2.33	(-16.78)	3.66	(+30.71)	3.32 ± 0.23
	E_2	8.10	10.00	(+23.45)	7.45	(- 8.02)	7.14	(-11.85)	8.20 ± 0.33
CS 3	E_1	5.31	3.27	(-43.71)	5.97	(+2.75)	6.70	(+15.31)	5.44 ± 0.23
	E_2	6.79	7.74	(113.99)	11.28	(+66.12)	7.48	(+10.16)	8.32 ± 0.33
CS 4	E_1	3.28	2.21	(- 32.62)	3.71	(+13 10)	3.13	(+ 4.57)	3.09 ± 0.23
	E_2	7.71	3.46	(-55.12)	8.17	(+ 5.96)	5.45	(—29.31)	6.20 ± 0.33
CS 10	E_1	5.74	548	(- 4.52)	4.63	(—19.33)	5.12	(-10.80)	5.24 ± 0.23
	E_2	7.68	8.87	(+15.49)	12.48	(+62.50)	9.93	(+29.29)	9.74 ± 0.33
Mudicode local	E_1	6,70	3.85	(—42.53)	5.32	(-20.59)	4.44	(-33.73)	5.08 ± 0.23
	E_2	9.80	7.02	(—28·36)	12.54	(+27.95)	13 62	(+38.97)	10.75 ± 0.33
Poona Kheera	E_1	1.37	3.38	(+146.71)	5.79	(+322.62)	3.51	(+156.0)	3.51 ± 0.23
	E_2	4.42	4.18	(- 5.42)	6.64	(+50.22)	7.99	(+80.76)	5.81 ± 0.33
CS 21	E_1	4.28	4.09	(- 4.43)	3.94	(- 7.94)	2.38	(—44.39)	3 67 ± 0.23
	E_2	4.79	5.00	(+ 4.38)	6.05	(+26.38)	6.05	(+26.30)	5.93 ± 0.33
CS 31	E_1	5.17	520	(+ 0.58)	4.00	(—22.63)	1 87	(-63.82)	4.06 ± 0.23
	E_2	6.61	7.10	(+ 7.41)	5.94	(-10.13)	4.21	(—36.30)	5.96 ± 0.33
CS 35	E_1	7.08	4.44	(-37.28)	4.33	(—38.84)	5.00	(—29.37)	5.21 ± 0.23
	E_2	6.61	7.10	(+ 7.41)	5.94	(-10.13)	4.21	(—36.30)	5.96 ± 0.33
CS 36	E_1	525	5.73	(+ 9.14)	6.48	(+23.42)	5.47	(+ 4.90)	5.73 ± 0.23
	E_2	6.63	6.91	(+ 4.22)	8.88	(+33.93)	10.41	(+57.01)	8.18 ± 0.33
CS 37	E_1	5.10	6.31	(+23.72)	6.81	(+33.52)	6.33	(+24.11)	6.14 ± 0.23
	E_2	4.52	8.01	(+77.21)	7.38	(+63.27)	7.09	(+56.85)	6.75 ± 0.33
CS 38	E_1	5.56	4.23	(-23.92)	2.18	(-60.79)	3.74	(—32.73)	3.77 ± 0.23
	E_2	5.64	8.69	(+54.07)	3.78	(+55.67)	7.01	(+24.29)	7.53 ± 0.33

Table 2 (contd)

Genotypes		0 ppm	100 ppm	200 ppm	300 ppm	Mean ± SEm
CS 43	E_1	7.21	4.21 (-41.60)	8.10 (+12.34)	2.85 (-60.47)	5.60±0.23
	E_2	8.89	8.43 (-6.12)	9.82 (+0.35)	8.81 (—1.89)	9.01±0.33
CS 44	E_1	4.67	6.58 (+40.89)	3.53 (-24.41)	5.24 (+12.20)	5.01±0.23
	E_2	8.53	8.85 (+3.75)	7.59 (-11.01)	8.60 (+0.82)	8.39±0.33
CS 46	E_1	5.06	3.11 (-38.53)	2.94 (—41.89)	3.56 (-29.64)	3.67±0.23
	E_2	6.64	6.81 (+2.50)	6.40 (-3.61)	6.93 (+4.36)	6.69±0.33
Pusa San Yog	E_1	1.97	2.92 (+48.22)	3.08 (+56.34)	3.65 (+85.27)	2.91±0.23
	E_2	4.09	3.40 (+16.87)	5.43 (+32.76)	3.62 (-11.49)	4.14±0.33
Japanese Long Green	E_1	2.97	5.53 (+86.19)	3.70 (+24.57)	2.84 (—4.37)	3.70±0.23
	E_2	1.65	3.06 (+85.45)	5.46 (+230.90)	4.70 (+184.84)	3.72±0.33
Panniyur	E_1	7.41	4.83 (—34.81)	3.65 (—50.74)	3.71 (—49.93)	4.90±0.33
	E_2	7.85	7.58 (-3.43)	7.72 (-1.65)	6.52 (—16.94)	7.42±0.33
Sweet Slice	E_1	2.92	2.95 (+1.02)	3.13 (+7.19)	2.27 (-22.26)	2.82±0.23
	E_2	4.16	4.47 (+7.45)	3.66 (-12.01)	2.70 (-35.09)	3.74±0.33
Green Gem	E_1	2.20	3.92 (+78.18)	3.55 (+61.36)	1.84 (+16.36)	2.88±0.23
	E_2	2.62	3.41 (+30.15)	4.85 (+85.11)	3.56 (+35.87)	3.85±0.33
Mean± S E m	E_1	4.63±0.23	4.34±0.23	4.36±0.23	3.87±0.23	
	E_2	6.33±1.26	6.54±0.26	7.87±1.26	7.04±1.26	

CD (P=0.05) Main plot treatment E_1 = 1.59 Subplot treatments within main plot treatments E_1 = 2.88
Sub plot treatments E_2 = 1.44 Main plot treatments within sub-plot treatments E_1 = 2.84

E_1 = October — January, 1981—82 E_2 = March — May, 1982
Data in parenthesis indicate percentage increase or decrease

Table 3

Classification of *Cucumis* genotypes based on response to ethephon application for different characters

Characters		Positive response			No response			Negative response		
		100ppm	200ppm	300ppm	100ppm	200ppm	300ppm	100ppm	200ppm	300ppm
Length of main vine	E_1	0	0	0	17	14	12	3	6	8
	E_2	0	0	0	16	15	12	4	5	8
Primary branches/plant	E_1	0	8	16	20	12	4	0	0	0
	E_2	18	9	20	2	1	0	0	0	0
Nodes to first male	E_1	8	12	10	12	8	10	0	0	0
flower	E_2	4	3	3	16	17	17	0	0	0
Nodes to first female	E_1	6	9	7	14	11	13	0	0	0
flower	E_2	0	0	4	20	20	16	0	0	0
Per cent of female	E_1	4	8	14	15	12	6	0	0	0
flower for first nodes	E_2	6	10	10	14	10	10	0	0	0
Per cent of female	E_1	4	10	15	10	10	10	0	0	0
flower for first 20 nodes	E_2	5	8	9	15	12	11	0	0	0
Per cent of female	E_1	2	9	7	16	10	13	2	1	0
flower for first 30 nodes	E_2	5	5	7	14	15	11	1	0	0
Nodes to first fruit	E_1	2	4	4	18	15	16	0	1	0
	E_2	0	0	1	20	20	19	0	0	0
Flesh thickness	E_1	0	0	0	20	20	19	1	0	0
Seeds/fruit	E_1	1	1	0	19	17	18	0	2	2
	E_2	0	0	0	18	18	19	2	2	1
Fruit/plant	E_1	2	1	1	16	19	18	0	1	1
Fruit/yield/plant	E_1	0	1	0	18	17	17	2	2	3

The figure indicate the total number of genotypes.
E_1 = October-January, 1981-82.
E_2 = March-May, 1982.

The length of main vine decreased with the application of ethephon. Number of primary branches per plant increased with increase in levels of ethephon during both the seasons. Role of ethephon at different concentrations to regulate apical dominance was manifested in this particular observation. Number of nodes to first male flower increased with increased levels of ethephon application. Female flowers appeared at lower nodes. Role of ethephon in modifying the sex expression was further confirmed through the observation of increased female: male flower ratio. Further, this was manifested through the appearance of first fruit in the lower nodes. No significant effect of different levels of ethephon on fruit length, fruit weight and fruit volume was observed. The flesh thickness of fruit decreased with the application of ethephon during the first season. The response to ethephon application was significant (P = 0.05) and the response curve was linear. Ethephon application had significant effect on number of seeds per fruit resulting in reduced number of seeds per fruit in treated genotypes.

The effect of different levels of ethephon on fruit yield per plant was significant in the first season (October-January, 1981-82) but not during the second season (March-May, 1982) (Table 2). Significant increase in yield was observed only in the genotype Poona Kheera (Table 3).

The present study thus revealed the following. Vegetative characters like length of main vine and number of primary branchas per plant could be altered through ethephon application. Definite change in sex expression favouring femaleness was also possible. Constancy in fruit length, fruit weight and fruit volume despite reduction in seed number, in ethephon sprayed plants is a matter of considerable interest. Response of *Cucumis* to ethephon application for fruit yield per plant depends on the genotype and the season of cultivation.

Summary

In twenty *Cucumis* genotypes, whole plant sprays with 3 levels of ethephon produced significant reduction in length of main vine, number of nodes to first female flower and first fruit, seed number and flesh thickness. Number of nodes to first male flower and number of primary branches per plant increased significantly. The effect of ethephon was significant for flesh thickness and fruit yield per plant. Ethephon had no significant effect on fruit length, weight and volume.

സംഗ്രഹം

ഇരുപത് വെള്ളരി ഇനങ്ങളിൽ എത്തിഫോൺ എന്ന രാസപദാർത്ഥത്തിന്റെ ഉപയോഗം പഠനവിഷയമാക്കി. പ്രധാന ശിഖരത്തിന്റെ നീളം, ആദ്യത്തെ പെൺ പുഷ്പത്തിലേക്കുള്ള മുകുളങ്ങളുടെ എണ്ണം, ആദ്യത്തെ കായ്കളിലേക്കുള്ള fl^cft^gSSBg^CTS എണ്ണം, ttjl ത്തിന്റെ എണ്ണം, ശിഖരങ്ങളുടെ എണ്ണം, എന്നിവയെ എത്തിഫോൺ പ്രയോഗം ബാധിച്ചതായി കണ്ടു. കായ്കളുടെ കനം, വിളവ് മുതലായവയ്ക്കും എത്തിഫോൺമൂലം വ്യതിയാനങ്ങൾ വന്നതായി കണ്ടു. എത്തിഫോൺ കായ്കളുടെ നീളം, തൂക്കം, വ്യാപ്തം എന്നിവയെ ബാധിക്കുന്നില്ല എന്നു മനസ്സിലായി.