EFFECT OF ETHEPHON ON SEX EXPRESSION IN CUCUMBER (*CUCUMIS SATIVUS*)

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ABSTRACT

Application of ethephon to field grown plants of cucumber (*Cucumis sativus*) caused suppression and delay in the production of male flowers and an advancement and increase in the number of female flowers per plant which resulted in high crop yields.

KEY WORDS: *Cucumis sativus*, Ethephon, Ethylene, Sex expression

INTRODUCTION

Cucumber (*Cucumis sativus*) is a popular vegetable grown on a commercial scale and in homegardens in most parts of Sri Lanka. The plant is monoecious which bears male and female flowers separately in the same plant. The plant bears a high proportion of male flowers compared to female flowers resulting in low yields. A substantial crop yield increase could be obtained if female flowers per plant can be increased by some method such as the use of plant growth regulators.

Ethylene (C_2H_4) is implicated in the promotion of more female sex expression in cucurbits (Hume and Lovell, 1983). Arora *et al.* (1983) observed that ethephon (2-chloroethyl phosphonic acid), an ethylene releasing chemical, at 250 ppm is effective in inducing female flowers at the second node and in improving higher, early and total yield in summer squash (*Cucurbita pepo*). Dubey (1983) stated that ethephon at 250 ppm increased the number of female flowers and yield in *Luffa cylindrica*. Kurata (1985) demonstrated that seedling treatment with 60 — 100 ppm ethephon increased the number of female flowers in cucumber. Singh *et al.* (1985) observed that ethephon at 100 ppm resulted in early appearance of the first female flower in cucumber. Thus spraying plants with ethephon appears to be an effective method of increasing female sex expression. This study was therefore undertaken to determine the effect of ethephon spray on female flower formation in cucumber.

MATERIALS AND METHODS

The effect of spraying different concentrations of ethephon on the formation of female flowers in cucumber (variety LY 58) was studied at the Regional Agricultural Research Centre (RARC), Bombuwela (maha 85/86) and Agricultural Research Station (ARS), Labuduwa (yala 87 and maha 87/88). The concentrations tested were 0, 100, 150, 200, 250 and 300 ppm in maha 85/86 and 0, 50, 100 and 200 ppm in yala 87 and maha 87/88.

In yala 87 the trial was modified based on the results obtained in maha 85/86. A completely randomized block design was adopted with 3 replicates in maha 85/86 and 6 replicates in yala 87 and maha 87/88. The plot size was 2m × 2m with a spacing of 100cm × 100cm. Four seeds were dibbled per hill and thinned out to 2 seedlings per hill 14 days after sowing. Plants were trained onto trellises to facilitate data recording. All plots received a basal application of 625 kg/ha of the NPK fertilizer mixture 16-20-12. The same fertilizer mixture at 125 kg/ha was also applied at 1, 1½ and 2 months after planting.

Ethephon solutions (using ethrel 50% EC) were sprayed early in the morning on the foliage with the appearance of the first 2-3 true leaves and a second spray 6 days later. The entire plant was sprayed till the solution started trickling down the leaves in the form of small droplets. A sticker was added to the spray solution.

Number of male and female flowers, and cucumber yields were recorded in maha 85/86, yala 87, maha 87/88.

RESULTS AND DISCUSSION

Flowering and cucumber yield data obtained for the three seasons are given in Tables 1, 2 and 3. Application of 50-100 ppm ethephon spray caused a delay in the production of male flowers and advanced the production of female flowers by a few days. When the concentration was increased beyond 100 ppm male flower production was further delayed whereas female flower production was not markedly influenced.

Application of ethephon influenced the population of both male and female flowers per plant. In treated plots an increase in number of female flowers and a decrease in number of male flowers were observed. Ethephon at 100 ppm induced a significantly higher number of female flowers in all three seasons (Tables 1,2 and 3).

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A noteworthy observation in this study was that with the application of ethephon at 100 ppm the mean number of female flowers per plant increased by 105, 76 and 21% over the control during maha 85/86, yala 87 and maha 87/88 respectively. Lower percentage of female flowers per plant over the control during maha 87/88 was possibly due to the moisture stress during the flowering period. This can be seen from the rainfall figures during the flowering phase for the three seasons-67 mm in maha 87/88 compared to 345 mm in maha 85/86 and 1124 mm in yala 87. The ratio of female to male flowers was high in all plants which received ethephon application.

Ethephon at 100 ppm gave a significant yield increase over the control in both maha 85/86 and yala 87 (Tables 1 and 2). In maha 85/86, this treatment also gave a significantly higher yield than all other treatments (Table 1). But in maha 87/88, no significant differences in yield among the different treatments were noted probably due to soil moisture stress during the flowering phase.

CONCLUSION

In cucumber, application of ethephon increased the number of female flowers and reduced the number of male flowers per plant leading to yield increase. Ethephon at 100 ppm was found to be the most effective concentration.

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Table 1. Effect of ethephon on flowering and yield of cucumber — maha 1985/86 (RARC, Bombuwela)

Ethephon concentration (ppm)	*No. of days to first male flower*	*No. of days to first female flower*	*No. of male flowers / plant*	*No. of female flowers / plant*	*Percentage of female flowers/ plant*	*Female: Male ratio*	*Yield (t/ha)*
100	32.7	32.7	389**	11.9*	105	1:33	62.8**
150	40.3	34.7	400**	10.3	78	1:39	50.4
200	40.3	33.7	324**	11.7*	102	1:28	54.0
250	40.3	33.7	330**	11.6	100	1:28	49.0
300	42.7	34.7	438*	9.7	67	1:45	48.0
0	28.5	34.0	604	5.8	0	1:104	53.1
LSD (0.05)	—	—	143	5.8	—	—	4.5
(0.01)	—	—	203	8.2	—	—	6.1
CV (%)	—	—	19.0	31.0	—	—	14.0

*Significant at 5% level: **Significant at 1% level

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Table 2. Effect of ethephon on flowering and yield of cucumber — yala 1987 (ARS, Labuduwa)

Ethephon Concentration (ppm)	*No. of days to first male flower*	*No. of days to first female flower*	*No. of male flowers/ plant*	*No. of female flowers/ plant*	*Percentage of female flowers/ plant*	*Female: Male Ratio*	*Yield (t/ha)*
50	34.3	39.3	624*	9.5**	64	1:66	49.3+
100	34.0	39.0	621*	10.2**	76	1:61	50.8**
200	39.3	40.2	653*	8.8**	52	1:74	44.0
0	33.7	42.3	869	5.8	0	1:150	30.9
LSD (0.05)	—	—	192	1.8	—	—	13.4
(0.01)	—	—	266	2.5	—	—	18.6
CV (%)	—	—	22.6	17.0	—	—	24.0

*Significant at 5% level: **Significant at 1% level

Table 3. Effect of ethephon on flowering and yield of cucumber — maha 1987/88 (ARS, Labuduwa)

Ethephon concentration (ppm)	*No. of days to first male flower*	*No. of days to first female flower*	*No. of male flowers/ plant*	*No. of female flowers/ plant*	*Percentage of female flowers/ plant*	*Female: male ratio*	*Yield (t/ha)*
50	33.0	31.2	390**	10.0	05	1:39	49.4
100	33.2	31.5	395**	11.5*	21	1:34	49.6
200	32.5	31.2	443**	9.7	2	1:46	49.1
0	31.0	32.7	677	9.5	0	1:71	43.2
LSD (0.05)	—	—	52	1.5	—	—	8.0
(0.01)	—	—	72	2.1	—	—	11.0
CV (%)	—	—	8.9	12.2	—	—	13.6

*Significant at 5% level; **Significant at 1% level