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EFFECT OF ABA AND GA_3 ON SEX EXPRESSION OF *CUCUMIS SATIVUS* AND *LUFFA CYLINDRICA*

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Abstract

Effect of ABA and GA_3 on sex expression of *Cucumis sativus* and *Luffa cylindrica* were investigated under field conditions. GA_3 promoted male tendency in both the plants; ABA promoted male tendency in *L. cylindrica*, with no effect on sex expression in *C. sativus*. ABA application increased number of flower buds and their abortion in *L. cylindrica* whereas it decreased flower bud formation in *C. sativus*.

Introduction

Cucurbitaceous plants except few, have unisexual flowers and are monoecious (Loy *et al*, 1967). Environmental factors modify sex expression in cucumber cultivars, since high nitrogen, low light intensity, short day and low night temperature are known to favour femaleness (Heslop-Harrison, 1957).

Sex expression in cucumber plants may be regulated through a balance between endogenous auxin and gibberellins (Atsmon *et al*, 1968). Exogenous auxin application leads to femaleness (Iro & Saita, 1956; Galum, 1959) through ethylene production (Shannon & Guardia, 1969) and that gibberellins induce maleness by lowering the level of endogenous ethylene (Scott & Leopold, 1967; Saito & Iro, 1963). Abscissic acid (ABA) application was found to have no effect on sex expression of monoecious cucumber plant (Iwahori *et al*, 1969). However Friedlander *et al* (1977) found that exogenous application of ABA substantially enhanced the male tendency in monoecious cucumber plants and the female tendency in dioecious plants irrespective of photoperiod. This paper describes the effect of ABA and Gibberellic acid on the sex expression of *Cucumis* and *Luffa* under natural field conditions.

Material and Methods

Seeds of *Cucumis sativus* cv. Beitalfa and *Luff cylindrica* cv. local were sown in 15 cm diam. earthen pots. Seedlings at first leaf stage were transplanted into 38 cm diam earthen pots filled with sandy loam and cow dung manure in 3:1 ratio. Plants were kept in the field and irrigated with tap water daily. Temperature averaged between 20 – 38°C during the experiment. At two leaf stage and at six leaf stage the plants were

separately sprayed with ABA of and GA_3 @ 15 μg per plant and @ 25 μg per plant. Control plants were sprayed with distilled water. Four replicates for each treatment was kept. Observations were restricted to the main stem and data on sex expression in plants were collected over a period extending upto eight weeks after second treatment.

Results

ABA did not alter the differentiating node number in *C. sativus* whereas a substantial increase was observed in *L. cylindrica* (Table 1). Application of ABA increased the flowering node number from 7th to 10th node in *Cucumis* and 17th to 21st node in *Luffa* while at high concentration a decrease in flowering node number was recorded (Fig. 1). Whereas ABA was found to promote the number of flowering buds of *Luffa*, the number of flower buds showed a decline in *Cucumis* (Table 1).

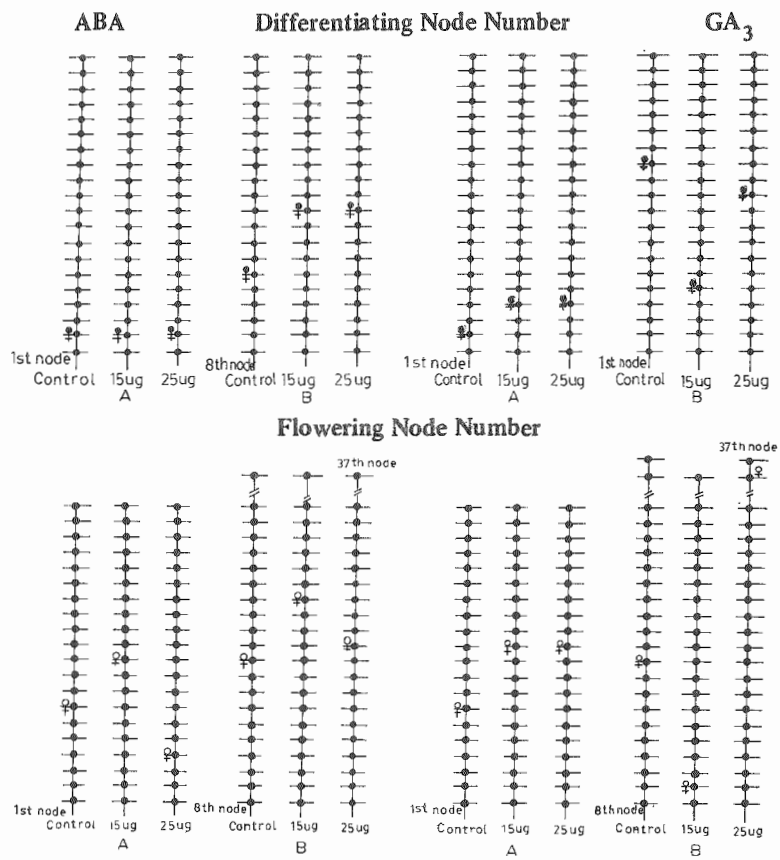

Fig. 1. Effect of ABA and GA_3 on differentiating and flowering node number.
(A) *Cucumis sativus* (B) *Luffa cylindrica*.
—●— Node ♀ First female bud ♀ First female flower

Table 1. Effect of ABA and GA_3 on differatiating and flowering node number, number of flower buds and their abortion in *Cucumis sativus* and *Luffa cylindrica*

	Treatment					
	Cont.	ABA 15 μg	ABA 25 μg	Cont.	GA_3 15 μg	GA_3 25 μg
Cucumis sativus						
Differentiating node number	2 ± 0	2 ± 0.25 (0 %)	2 ± 0.25 (0 %)	2 ± 0	4 ± 0.41 (50%)	4 ± 0 (50%)
Flowering node number	7 ± .29	10 ± 0.25 (42%)	4 ± 0.5 (– 42%)	7 ± 0.29	11 ± .48 (57%)	11 ± 0.5 (57%)
Number of flower buds	39 ± 1	26 ± 1 (– 33%)	21 ± 2 (– 46%)	39 ± 1	50 ± 3 (28%)	41 ± 2 (5%)
Number of flower buds aborted	18 ± 1	5 ± 2 (– 30%)	3 ± 2 (– 34%)	18 ± 1	25 ± 4 (16%)	20 ± 2 (6%)
Lufffa cylindrica						
Differentiating node number	13 ± 0.5	17 ± 0.4 (30%)	17 ± 0.28 (30%)	13 ± 0.5	5 ± 0.4 (– 64%)	11 ± 0.5 (– 15%)
Flowering node number	17 ± 0.25	21 ± 0.5 (24%)	18 ± 0.48 (6%)	17 ± 1	9 ± 0.25 (– 47%)	37 ± 1.5 (118%)
Number flower buds	45 ± 2	155 ± 2 (224%)	100 ± 3 (122%)	45 ± 2	49 ± 2 (8%)	66 ± 4 (46%)
Number of flower buds aborted	28 ± 4	87 ± 1.5 (210%)	86 ± 1.5 (142%)	28 ± 4	23 ± 1.5 (– 18%)	22 ± 1.5 (– 21%)

GA_3 stimulated the male tendency in *Cucumis* by increasing the differentiating and flowering node number while in *Luffa* @ GA_3 15 μg lowered the differentiating node number (Table 1, Fig. 1). However application of GA_3 @ 25 μg increased the flowering node number from 17th to 37th node (Fig. 1). GA_3 application resulted in an increase in number of flowering buds of *Cucumis* and *Luffa* (Table 1). The number of aborted buds due to GA_3 treatment was more in *Cucumis* than in *Luffa*.

Discussion

Application of ABA had a pronounced effect on sex expression in *L. cylindrica* than in *C. sativus* as it promoted both differentiating and flowering node number. In *Cucumis* ABA raised flowering node number by shifting the position of first female flower to higher node on the main stem. It did not induce any change in differentiating node number. Similarly application of GA_3 promoted flower node number in *Luffa* while in *Cucumis* it enhanced both differentiating and flowering node number. Such similar results on sexual differentiation in cucumber was observed with exogenous application of ABA (Friedlander *et al*, 1977).

The present study has revealed that sex expression in *Luffa* and *Cucumis* responds differently to applied growth substances. The reasons for these differences are not known. There are reports that sex expression is a function of endogenous hormonal balance (Fuch, 1977) and the extent to which growth substances influence sex expression varies considerably from plant to plant (Cleland, 1969) as also observed in the present study. The promotion of male tendency in plants by the addition of ABA and GA_3 may be correlated with the endogenous level of growth substances (Friedlander *et al*, 1977a).

Since ABA and GA_3 reacted differently in the number of flower bud formation and their abortion (Table 1) it would suggest that in *Luffa* and *Cucumis* the differentiation and development of flower buds require different concentarations of growth substances. ABA in *Luffa* was found to promote formation of flower bud accompanied with an increase in bud abortion as also observed by Addicot (1969) and Iwahori (1970).

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