ISSN 0975 – 2595

PRAJÑĀ

Volume 18, 2010

Journal of Pure and Applied Sciences

SARDAR PATEL UNIVERSITY
VALLABH VIDYANAGAR
Gujarat – 388 120, INDIA
www.spuvvn.edu

PRAJÑĀ - Journal of Pure and Applied Sciences, Vol. 18: 13 – 14 (2010)
ISSN 0975 - 2595

SEX MODIFICATION OF CUCUMBER VEGETABLE THROUGH PGRs

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ABSTRACT

An investigation was carried out at the Main Vegetables Research Station, Anand Agricultural University, Anand during 2007. The various plant growth regulators *viz.*, Naphthalene acetic acid (NAA-100 and 200 ppm), Gibberellic acid (GA_3-10 and 20 ppm), Abscisic acid (ABA-10 and 20 ppm), Kinetin (10 and 20 ppm), Ethrel (200 and 300 ppm) were used for conversion of femaleness from male flowers. The PGRs were applied twice at two and four true leaf stages. Among them Ethrel 200 ppm was found most effective in converting femaleness, producing more number of branches and increasing the yield. The sexual differentiation is controlled by endogenous levels of auxins, which developed flowering primordia and during flowering act as anti-gibberellin substance. This anti-gibberellin effect suppressed staminate flowers and promote more number of pistillate flowers. GA_3 enhanced the formation of protoplasm, promote cell division and cell elongation resulted in increasing plant height and vine length.

Key words*: cucumber, plant growth regulators, sex modification.*

INTRODUCTION

Vegetables play an important role in human diet by providing carbohydrates, protein, minerals, vitamins etc. Cucumber used as fresh fruit, slice, pickles and as cooked vegetable. It has medicinal properties like prevent constipation, in digestion, curing diabetes and jaundice. The valuable cucumber exhibits wide spectrum of sex expression, It produced much more staminate flowers than pistillate flowers. Some time it creates serious problem for increasing fruit set and yield.

Higher temperature and longer light period induced maleness. An application of plant growth regulators like NAA, GA_3, Ethrel, Cytokinin and ABA played an important role in sex expression, sex ratio and yield. Sulochanamma [1] reported that the foliar application of Ethrel 250 ppm increased the number of female flowers in muskmelon. Therefore the investigation has been framed for finding out appropriate PGRs with proper concentration for modification of sex and for obtaining higher yield of cucumber.

MATERIALS AND METHODS

The investigation was carried out at Main Vegetable Research Station, Anand Agricultural University, Anand during summer season of the year 2007. Gujarat cucumber-1 commercially grown cultivar of cucumber was selected for the present study. An experiment was laid out in Randomized Block Design with three replications. There were twelve treatments used. Among them four different plant growth regulators were sprayed in two concentrations viz. NAA (100 & 200 ppm), GA_3 (10 and 20 ppm), ABA (10 and 20 ppm) and Ethrel (200 & 300 ppm). One chemical Kinetin (10 and 20 ppm) and two controls with and without water spray were used. The stalk solution of PGRs and the Kinetin chemical were prepared in mg per one liter of water. The first spray treatment was given at two true leaf stage and the second one at four true leaf stage. Ample nutrition, irrigation and plant protection measures were adopted. Number of branches emerged per plant, length of vine, female flowers and yield were measured. The collected data were statistically analysed by using analysis of variance technique described by Panse and Sukhatme [2].

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RESULTS AND DISCUSSION

Vegetative parameters

The data pertaining to number of branches per vine at 20 days as affected by PGRs and chemical were found to be non significant but at last harvest stage they were significantly influenced.

The response of different treatments on the number of branches per plant at 20 days and last harvest time differed significantly. The average maximum number of branches per plant (9.87) at last harvest time was recorded in Ethrel 200 ppm treatment. It may be due to antimitotic action and Ethrel act as a gibberellin antagonist Scott and Leopold [7] and thus providing an inhibitory effect on the suppression of the apical growth of main axis and thereby increased number of branches. The findings of the present studies are in consonance with those of Pandya [3] in bottle gourd, and Rafeekher *et al.* [4] in cucumber.

Sex expression parameters

The response of different treatments on days required for appearance of first female flower differed significantly among all the treatments, Ethrel 300 ppm was found to be most effective in reducing number of days (30.93) required for appearance of first female flower, which was followed by Ethrel 200 ppm (31.87). Early flowering of treated plants may be due to induction of tendency of femaleness in the plant and increased levels of auxins might have resulted in the early induction of female flowers. Similar findings were obtained by Singh and Choudhary and Asghar *et al.* [5-6] in cucumber.

The response of different treatments on number of female flowers per plant differed significantly. As regards the number of female flowers, the treatments Ethrel 200 ppm and 300 ppm produced maximum number of female flowers per plant (33.47 and 33.27, respectively). It may be possibly due to promotive effect on flower bud initiations.

Table: Effect of PGRs on vegetative growth, sex expression and yield of cucumber.

Sr. No.	Treatments	No. of branches per vine at last harvest	Days required for appearance of first female flower	Number of female flowers per vine	Sex ratio (M : F)	Number of fruits per plant	Fruit weight at 5th picking (g)	Yield (t/ha)
1	NAA 100 ppm	6.62	35.27	28.47	3.78 : 1	18.90	191.23	16.67
2	NAA 200 ppm	6.42	35.10	27.07	4.08 : 1	19.50	193.17	17.72
3	GA_3 10 ppm	5.92	41.13	20.00	11.53 : 1	15.07	191.20	13.58
4	GA_3 20 ppm	5.95	41.30	20.80	11.60 : 1	14.70	187.77	12.83
5	ABA 10 ppm	6.75	37.47	24.13	5.63 : 1	17.33	190.67	15.82
6	ABA 20 ppm	6.45	37.13	24.00	5.98 : 1	17.60	184.10	15.96
7	Kinetin 10 ppm	6.87	36.23	23.73	6.05 : 1	17.50	187.43	15.60
8	Kinetin 20 ppm	6.12	36.43	25.00	5.78 : 1	17.73	194.33	15.73
9	Ethrel 200 ppm	9.87	31.87	33.47	1.80 : 1	23.20	188.53	21.15
10	Ethrel 300 ppm	9.78	30.93	33.27	1.81 : 1	23.60	186.60	20.05
11	Control (Water spray)	5.82	40.10	19.53	8.26 : 1	13.87	184.07	12.79
12	Control (Without spray)	5.87	40.40	20.93	7.90 : 1	13.90	185.07	11.47
S.Em. ±		0.34	1.21	0.81	0.33	0.83	5.72	1.21
C.D. at 5%		1.01	3.56	2.38	0.97	2.43	NS	3.54
C.V. %		8.70	5.69	5.62	9.27	8.10	5.25	13.24

Essentially, it is the unsaturated hydrocarbon "ethylene" that is released in plant system, consequent on the application of Ethrel, which evokes various physiological responses. Generally, on flowering process, it is considered to have effects opposite to gibberellins Scott and Leopold [7]. On the basis of this anti-gibberellin hypothesis assumed that Ethrel may cause reduction in GA level in plant to bring favourable changes to femaleness in cucumber plant Kshirsagar *et al*. [8]. Same results were recorded by Hilly *et al.* [9] in ridge gourd.

The present studies indicated that the response of different treatments to male: female sex ratio differed significantly. All the treatments significantly lowered the male: female sex ratio over control. Among all the treatments, Ethrel 200 ppm and 300 ppm were found to be most effective in lowering the male: female flower ratio (1.80: 1 and 1.81: 1, respectively) whereas, in the GA_3 it was highest ratio (11.60: 1). Probably, it could be attributed to the suppression of staminate flowers and promoted more number of pistillate flowers. Similar results were obtained by Kshirsagar *et al*. [8] in cucumber and Ghosh *et al*. [10] in *Momordica.*

Yield parameters

With regards to yield, present investigation revealed that the growth regulators at all concentrations significantly increased the number of fruits per plant. Among them Ethrel 300 ppm and 200 ppm recorded maximum number of fruits (23.60 and 23.20) than all other treatments and control. This may be probably due suppressed male flower production and promoted female flower production, so ultimately higher numbers of fruits per plant were harvested. The role of plant regulators in increasing fruit set explained by Kshirsagar *et al*. [8] in cucumber.

In the present study it was observed that the average weight of fruit at 5th picking was not significantly influenced by different treatments. However, in 5th picking average weight of marketable fruit was highest (194.33g) with 20 ppm Kinetin and the lowest (184.07g) with control. Similar results were obtained by Kshirsagar *et al*. [8] in cucumber.

The results of the present investigation revealed that the treatment Ethrel 200 ppm and 300 ppm produced the maximum yield 21.15 and 20.05 tonne per ha; while control (T_{11} & T_{12}) produced the lowest yield 11.47 and 12.79 tonne per ha. An increase in fruit yield in treated plants may due to physiologically more activation for the development of flowers and fruits, ultimately leading to higher yield. Increased fruit yield may also be due to the increase in pistillate flowers production which resulted in more number of fruits per plant. These findings are in consonance with those of Kshirsagar *et al*. [8] and Iwahori *et al.* [11] in cucumber.

REFERENCES

[1] Sulochanamma, B.N. (2001). Effect of Ethrel on sex expression in muskmelon. *J. Res. RAU*. **29**(2-3):91-96.

[2] Panse, V.G. and Sukhatme, P.V. (1995). Statistical methods for agricultural workers. I.C.A.R. Pub., New Delhi.

[3] Pandya, M.B. (1995). Effect of plant growth regulators and chemicals on the growth, sex behaviour and yield of bottlegourd (*Lagenaria siceraria* Mol.) Standl.] cv. Pusa Summer Prolific Long. M.Sc. (Agri.) thesis submitted to Gujarat Agril. University, S.K.Nagar.

[4] Rafeekher, M., Gondane, S.U., Gormnagar, H.B., Murkute, A.A., Chaudhari, D.U. and Patil, R.R. (2001). Hormonal regulation of growth, sex expression and yield of cucumber in *kharif* crops. *J. Soils and Crops*, **11**(1) : 95-98.

[5] Singh, R.K. and Choudhary, B. (1988). Differential response of chemicals on sex modification of three genera of cucurbits. *Indian J. Hort.*, **45**(1-2) : 88-89.

[6] Asghar, H., Wazir, F. K. and Suleman Ali (1990). Influence of growth promoting hormones on growth, sex expression and production of *Cucumis sativus. Sarhad J. of Agric.*, **6**(6) : 563-569.

[7] Scott, P.C. and Leopold, A.C. (1967). Opposing effects of gibberellins and ethylene. *Plant Physiol.*, **42**: 1021-1022.

[8] Kshirsagar, D.B., Desai, U.T., Patil, B.T. and Pawar, B.G. (1995). Effect of plant growth regulators on sex expression and fruiting in cucumber cv. Himangi. *J. Maharashtra Agric. Uni.* **20**(3) : 473- 474.

[9] Hilli, J.S., Vyakarnahal, B.S., Biradar, D.P. and Hunje. R. (2010). Effect of growth regulators and stages of spray on growth, fruit set and seed yield of ridge gourd (*Luffe acutayula* L.) *Karnataka J .Agri. Sci.* **23**(2):239-242.

[10] Ghosh, S. and Basu, P.S. (1982). Effect of growth regulators on sex expression of *Momordica chonantia* L. *Scientia Horticultural* **17** (2): 107 -112.

[11] Iwahori, S., James. M, Lyonl and Smith, D.E. (1970). Sex expression in cucumber plants as effected by 2. Chloroethyl phosphonic acid, Ethylene and growth regulators. *Plant Physiol.* **46**: 412-415.

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[2] Sadqui, M., Fushman, D. and Munoz, V. (2006) Atom – by – atom analysis of global downhill protein folding. *Nature*, **442:** 317 – 321.

Books

[16] Stebbins, G. L. (1974) *Flowering plants: Evolution above the species level*, Arnold Press, London, pp. 1 – 399.

Chapters from a book

[19] Schafer, H. and Muyzer, G. (2001) Denaturing gradient gel electrophoresis in marine microbial ecology. In *Methods in Microbiology* (Ed. Paul, J. H.), Academic Press, London, Vol. 30, pp. 425 – 468.

Thesis or other diplomas

[21] Nayaka, S. (2004) *The visionary studies on the lichen genus Lecanora sensu lato in India.* Ph. D. Thesis, Dr. R. M. L. Avadh University, Faizabad, India.

Conference proceedings

[4] Mohapatra, G. C. (1981) Environment and culture of early man in the valley of rivers Chenab and Ravi, western sub-Himalayas. In *Proceedings X Congress of IUPPS*, Mexico, pp. 90 – 123.

Online documentation

[9] Koning, R. E. (1994). Home Page for Ross Koning. Retrieved 26-6-2009 from *Plant Physiology Information Website*: http://plantphys.info/index.html.

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