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PLANT GROWTH REGULATORS AND SEX EXPRESSION IN FLOWER BUDS OF *MOMORDICA CHARANTIA IN VITRO*

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ABSTRACT

A study on the effect of plant growth regulators on the sex expression of *Momordica charantia in vitro* revealed that α naphthalene acetic acid, kinetin and ethrel induced femaleness by increasing the size of pistillage buds while gibberellic acid and abscisic acid induced maleness by increasing the size of staminate buds. α naphthalene acetic acid and gibberellic acid were more effective than other plant growth regulators in causing femaleness and maleness, respectively. Morphactin caused maximum male sterility.

INTRODUCTION

THE *in vitro* culture of plant tissues has been studied by Gautheret[5,6] and his coworkers from 1940. The effect of plant growth regulators on sex expression in flower buds *in vitro* is very interesting and recently Galun *et al.*[3,4] studying the effect of growth regulators like IAA and GA_3 in flower buds of *Cucumis sativus* reported that IAA promote the development of ovary and this effect is antagonised by GA_3. Their interesting findings give impetus to undertake this problem. One of the advantages of using this type of study is that nutrients and plant growth regulators of known concentration may be substituted for those normally available in the intact plants. Under these conditions, it is then possible to single out any one factor and determine its influence on sex expression under controlled conditions. The present experimental study includes not only α naphthalene acetic acid and gibberellic acid but also other plant growth regulators like kinetin, abscisic acid, ethrel and morphactin.

MATERIALS AND METHODS

The buds (2·5 cm in length) of *Momordica charantia* grown under normal conditions were dipped in distilled water just after picking followed by 1·5% sodium hypochlorite solution and finally washed with distilled water three or four times. After autoclaving the 2% agar medium appropriate amounts of α naphthalene acetic acid (α NAA), gibberellic acid (GA_3), kinetin (KN), abscisic acid (ABA), ethrel (Eth) and morphactin (CFI) were weighed and mixed in culture medium. The culture medium was the same as used by Henderson *et al.*[7], with slight modification, *i.e.*, KN and IAA were not used as the constituents of culture medium. Each plant growth regulator was prepared at 5 ppm concentration. Plant regulator free basic medium was taken as control. The agar nutrient medium either with or without plant growth regulators was poured in deep sterile petridishes to a 5·00 mm height and 3·00 mm of lower ends of flower buds were embedded in the culture medium. The flower buds were incubated at 22 ± 2° C. Eight replicate cultures were used for each treatment. The reduction in opening of staminate flowers from staminate buds was taken as a criterion for pollen sterility. This was further confirmed by using the safranin stain, given to the pollen.

TABLE I

Effect of plant growth regulators on the size of flower buds and % of open staminate flowers of Momordica charantia in vitro

Sl. No.	Treatments	Size of flower in cm				% of open staminate flowers
		Staminate flower		Pistillate Flower		
		Length	Diameter	Length	Diameter	
1.	Contro	3·8±·12	1·8±·10	3·6±·16	1·9±·14	80
2.	α NAA	3·0±·14	1·6±·10	5·2±·18	2·7±·16	64
3.	GA_3	8·1±·21	2·0±·12	3·8±·18	2·0±·14	96
4.	KN	4·0±·18	1·9±·12	4·3±·20	2·6±·16	80
5.	ABA	4·6±·16	2·4±·14	2·7±·14	1·4±·10	88
6.	Eth	4·2±·16	2·2±·14	5·3±·20	2·6±·16	64
7.	CFl	2·8±·12	1·2±·10	2·6±·10	1·3±·12	16

Observations were made on flower size in terms of length and diameter measured at 3 points-base, middle and apex. The cultures were maintained for 15 days. The data giyen in the table are expressed as average size ± standard error of flower buds treated with various plant regulators. The '*t*' test was used as a measure of statistical significance.

RESULTS AND DISCUSSION

The results have been shown in Table I. *In vitro* experiments reveal that all the plant regulators influenced the size of both kinds of flower buds. α naphthalene acetic acid increased the size (length and diameter) of pistillate flower buds and decreased the length of staminate type. Percentage of open staminate flowers was reduced from 80 to 64% and show pollen sterility. Decrease in length of staminate flower bud and increase in size (length and diameter) of pistillate type show the female tendency by α NAA. This tendency has also been reported by Choudhury and Phatak[2] in intact plants of *Cucumis sativus* and Satyanarayana and Rangaswami[12] in ribbed gourd.

Gibberellic acid, a well-known plant growth regulator for cell elongation also caused elongation in flower buds but this elongation was confirmed to only staminate buds. It had no significant effect on the size of pistillate flower which showed that GA_3 without influencing pistillate flower, induced maleness. This tendency increased with an increase in percentage of open flowers which showed a decrease in pollen sterility. Maleness caused by GA_3 has also been shown by Atsmon *et al.*[1] in cucumber and by Randhawa and Singh[10] in muskmelon. Kinetin caused an increase in the size of only pistillate flowers which showed the tendency of KN towards femaleness. Feminization due to KN treatment has also been observed by Negi and Olmo[9] and Moore[8] in *Vitis vinifera*.

Abscisic acid reduced the size of pistillate flower but increased the size of staminate flowers. Abscisic acid (by decreasing the size of pistillate flower and increasing the size of staminate flower) enhanced maleness by depressing the femaleness. Like GA_3, ABA also reduced the pollen sterility by increasing the percentage of open staminate flowers. Ethrel had no effect upon staminate flowers but increased the length and diameter of pistillate flower buds. Besides feminization ethrel showed male sterility also by decreasing the percentage of open staminate flowers.

Morphactin, a growth retardant decreased the size of flower buds of both staminate and pistillate types. Morphactin greatly enhanced pollen sterility by decreasing the percentage of open staminate flowers. Sankhla and Sankhla[11] and Uma *et al.*[13], reported abortion of stamens in *Nicotiana penicilata* and *Cannabis sativa*, respectively.

Among all the treatments, maximum reduction in size of the staminate and pistillate flower buds was noted in CFl treatment. Maximum length was noted in GA_3 treated staminate and Eth treated pistillate flower buds. Maximum diameter for staminate and pistillate flower buds was noted in treatments with ABA and α NAA, respectively. Gibberellic acid caused maximum increase and

CFI caused maximum decrease in percentage of open staminate flowers.

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SIXTY YEARS OF COCONUT RESEARCH AND DEVELOPMENT IN INDIA

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THE Indian Society for Plantation Crops and the Indian Council of Agricultural Research celebrated the Diamond Jubilee Year of Coconut Research in India from December 27, 1976 to January 8, 1977. Coconut research was first begun in India (and also in the world) in 1916 at Kasaragod, Nileshwar, and Pilicode under the old Madras Presidency. Today, Kasaragod is the headquarters of the Central Plantation Crops Research Institute, Indian Council of Agricultural Research. It is the main Institute in India researching on coconut. The Coconut Research Station at Nileshwar is under the Kerala Agricultural University and the Pilicode Station functions under the Kerala Agriculture Department.

The most notable achievements of six decades of coconut research has been the production of hybrids between Tall and Dwarf forms of coconuts and discovery that they are high yielding, early bearing and semi-tall as compared to local forms. Further, they bear better even when infected by the dreaded root (wilt) disease. A commemorative stamp brought out by the Posts and Telegraphs Department depicted a semi-tall, early bearing hybrid palm of coconut.

The coconut palm is best known as an oil yielding plant. Coconut oil ranks sixth in the world today in terms of production and fourth in terms of international trade among edible oils. India ranks third in the world after the Philippines and Indonesia in coconut production. In India, coconut ranks about the fourth in production among the vegetable oils.

Till about four decades ago, coconut oil was the leading edible vegetable oil of international trade. It was also among the cheapest oils. Today, it has become one of the most expensive vegetable oils. It is in this background that the present Symposium was organized. Incidentally, this was the first time that an international symposium was organized on this important and most useful plant.

The Symposium was attended by 320 scientits and delegates from all over India and most of the coconut growing countries of the world. It was inaugurated by Dr. M. S. Swaminathan, FNA, FRS (Director General, Indian Council of Agricultural Research and Secretary to the Government of India, Department of Agricultural Research and Education), with a key-note address 'Coconut research—the next phase'. He identified the major R & D problems in coconut as breaking the yield barrier which has remained at best stagnant with 30-40 nuts annually. He also called for finding out a solution to the root (wilt) disease of Kerala State which is responsible for an annual loss of Rs. 300 million.

The Symposium was organized in 9 sessions in which 80 papers were presented 46 from India and 34 from abroad. These sessions consisted of Genetics and Plant Breeding (10 papers), Agronomy and Soil Chemistry (10 papers), Biochemistry and Physiology (9 papers), Technology (7 papers), Basic Studies (7 papers), Diseases (5 papers), Diseases of Uncertain Aetiology (10 papers), Pests (7 papers), and Development Programmes in India and Other Parts of the Country (16 papers).

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