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YIELD, QUALITY AND SHELF LIFE OF BITTERGOURD (*MOMORDICA CHARANTIA* LINN.) FRUITS AS INFLUENCED BY PLANT GROWTH REGULATORS

D. Veenakumari, V.K. Raju and V.S. **Dcvadas**
College of Horticulture, Vellanikkara 680 654, Trichur, India

Abstract: Effect of pre-harvest application of GA (200 and 300 ppm), CCC (250 and 500 ppm) and MH (500 and 1000 ppm) as compared to a no-spray control, on growth, quality components and storage life of bittergourd fruits of MC 84 was studied during 1992. The chemicals were applied twice; 10 days after the first fruit set and 15 days after the first application. GA at 300 ppm produced the highest yield, length and girth of fruits which was followed by GA 200 ppm. Moisture content was maximum in fruits obtained from plants treated with CCC at 250 ppm, whereas the highest ascorbic acid content was in fruits of GA (200 ppm) treated plants. Maximum shelf-life of fruits was observed with MH (500 ppm) spray.

Key words: Bittergourd, growth regulators, shelf life.

INTRODUCTION

Bittergourd (*Momordica charantia* Linn.) is valued for its nutritive and medicinal properties and is a good source of minerals. Because of these unique properties there is always a consumer preference for bittergourd among the cucurbits. However, highly perishable nature of the fresh fruits resulting in produce loss has been a handicap in bittergourd **production.** Use of growth regulators for promoting germination of seeds, growth, flowering, fruit set and yield of various crops has been reported. But such studies were mainly concentrated in fruit crops and vegetables like potato and onion. Maleic hydrazide (MH) was reported to enhance shelf life of potato, onion and mango. Use of such chemicals in highly perishable vegetables like bittergourd is rather limited.

MATERIALS AND METHODS

This investigation was conducted at the College of Horticulture, Kerala Agricultural University, Vellanikkara during May to September 1992. Promising pre-release culture of bittergourd named MC 84 was used for the study. The experiment was laid out in a replicated block design with seven treatments in four replications. The treatments were foliar spraying of GA at 200 ppm and 300 ppm, CCC at 250 and 500 ppm, MH at 500 and 1000 ppm and a control (no spray). There were four pits per plot per replication. Plants were raised as per the package of practices recommendations of the Kerala Agricultural University. The treatments were applied twice; 10 days after the first fruit set and 15 days after the first application. Fruits of 14 to 15 days maturity were harvested and observations were recorded on yield parameters, quality aspects and storage life of fruits. For recording colour change of fruits during storage the following score chart was used.

Characteristic offruit	*Score*
Green colour, fresh and firm without any symptoms of shrinkage	0
Green colour with shrivelled appearance	1
Slight yellowing starting from the tip	2
50 per cent yellowing	3
While fruits turning yellow, rind remained firm	4
Whole, but yellow, soft and decayed	5

RESULTS AND DISCUSSION

Maximum yield was from plants treated with GA 300 ppm, which was on par with GA 200 ppm (Table 1). Similarly, fruit length and girth were significantly higher in GA treated

Table 1. Effect of pre-harvest application of growth regulators on yield components and quality attributes of bittergourd

Treatments, ppm	No. of harvest	Fruits per plot	Yield kg/plot	Fruit length cm	Fruit girth cm	Total ash %	Vit.C mg/100g	Chlorophyll mg/g		Total phenol g/100g	Iron mg/100g
								a	b		
GA, 200	9.0	62.0b	15.3c	18.7b	16.4bc	8.14	88.80d	0.035	0.036	9.90	1.43
GA, 300	8.3	62.8b	16.8c	19.4b	17.2c	8.54	74.67 c	0.025	0.010	9.63	1.27
CCC, 250	7.5	62.0b	12.1b	15.2a	14.4a	9.29	70.28 c	0.029	0.022	9.37	1.42
CCC, 500	8.0	55.3a	10.4a	15.5a	14.0a	6.87	44.8 lab	0.20	0.009	7.29	1.46
MH, 500	7.8	56.2a	10.7ab	15.8a	14.4a	8.44	52.61 b	0.013	0.006	6.77	1.12
MH, 1000	7.8	54.8a	10.6ab	14.2a	14.4a	8.60	77.11c	0.025	0.018	9.38	1.47
Control	8.3	63.8b	12.0ab	15.9a	15.4b	7.68	39.22a	0.026	0.009	11.46	1.33
CD(0.05)	NS	2.17*	1.53*	2.15*	0.9*	NS	7.87	NS	NS	NS	NS

Note: Figures having similar letters (a,b,c) are statistically on par with each other

Table 2. Effect of pre-harvest application of growth regulators on storage characteristics of bittergourd fruits

Treatments, ppm	Shelf life, days	Weight loss during storage (%)			Rotting of fruits (%)			Score of colour change		
		0-2 days	2-4 days	Cumulative	2 days	4 days	6 days	4 days	4 days	5 days
GA, 200	4.0b	8.4	6.0	13.70	11.6a	53.8a	95.5	1.8	2.3	4.8
GA, 300	3.5b	6.2	4.8	12.25	44.8bc	71.0ab	100.0	2.0	3.0	4.8
CCC, 250	3.8b	8.0	5.7	13.31	24.6ab	73.2abc	98.4	1.3	2.0	5.0
CCC, 500	4.0b	7.8	9.1	15.93	30.1abc	78.2bc	95.3	1.3	2.3	5.0
MH, 500	4.1b	6.3	5.9	11.36	19.1a	69.3ab	99.4	1.5	2.0	4.5
MH, 1000	3.3ab	7.3	4.0	11.22	26.4abc	77.4bc	100.0	1.8	1.8	4.8
Control	2.3a	10.1	5.9	14.12	46.1	95.7	100.0	1.3	2.4	5.0
CD(0.05)	1.1*	NS	NS	NS	21.2*	23.5*	NS	-	-	-

Note: Figures having similar letters (a,b,c) are statistically on par with each other
χ^2 for colour change (Friedman two way analysis) - 32.63 (significant at 5% level)

fruits both at 200 and 300 ppm. The lowest yield was observed in plants treated with CCC 500 ppm. Lowest fruit length was recorded in MH 1000 ppm and girth in CCC 500 ppm. The increased fruit size obtained by GA application may be due to the well established effect on cell division and cell elongation. Growth retarding effect of other chemicals might have helped in better expression of the activity of GA (Irulappan, 1972). However, the treatments had no effect on the number of harvest. The post-flowering application of growth regulators has not changed the flowering pattern of the crop. Maximum number of fruits was obtained from control, which was on par with GA 200 ppm, 300 ppm and CCC 250 ppm. Minimum number of fruits was obtained from MH 1000 ppm. The reduction in fruit number in MH spray may be due to the retardation of plant growth and the resultant reduction of flowering period.

Maximum moisture content was seen in fruits obtained from plants treated with CCC 250 ppm. This can be attributed to the antitranspirant activity of the chemical (Usha and Peter, 1988). Ash content of the fruits was not influenced by the treatments. The highest ascorbic acid content was recorded in fruits obtained from plants treated with GA 200 ppm. Similar observations on increased ascorbic acid content with GA treatment in tomato was reported by Oza and Rangnekar (1969) and Irulappan (1972). MH 1000 ppm

also had a significant positive effect in increasing the ascorbic acid content of fruits. But there was no significant variation between treatments on the chlorophyll, phenol and iron content of fruits.

Spoilage of fruits during storage as measured by rotting percentage and weight loss are furnished in Table 2. Maximum shelf life of 4.06 days was recorded in fruits obtained from plants treated with MH 500 ppm followed by GA 200 ppm and CCC 500 ppm. Results also showed that lowest weight loss and lowest rotting percentage occurred in fruits obtained from MH treated plants. The enhanced shelf life in GA treatment might be due to its retarding influence on senescence process. GA treatment might have suppressed the ethylene accumulation in fruit tissues (Diley, 1969; Khader, 1989) which in turn slowed down the ripening process. Rotting of the fruits was lower when GA 200 ppm and MH 500 ppm were applied. MH might have inhibited the growth and multiplication of pathogens responsible for rotting (Nawaz *et al.*, 1988).

Slowest change in colour was seen in fruits obtained from MH 500 ppm treated plants followed by MH 1000 ppm . Colour change was faster in control and GA 200 ppm. This better retention of green colour by MH treatment is in agreement with the reports of Date and Mathur (1959) and Garg *et al.* (1976) in mango, who opined that development of yellow colour was retarded by MH treatment.

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