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Effect of growth retardants on quality of papaya (*Carica papaya* Linn) cv. CO 2

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ABSTRACT

A field experiment was conducted to investigate the influence of four growth retardants *viz.*, alar, ccc, ethrel and paclobutrazol as foliar sprays on different morphological characters such as flowering, fruit set, yield and fruit quality on papaya cv. CO 2 at Tamil Nadu Agricultural University, Coimbatore – 3 in split plot design with three replications. Among the four growth retardants, alar had profound influence on quality of fruits. The effects varied depending upon the concentrations of growth retardants. Alar improved fruit weight and volume, while paclobutrazol reduced it. Pedicel length is an important trait, was increased by paclobutrazol. The edible quality of fruit was increased by paclobutrazol except TSS and TSS - Acid ratio.

Key words : Papaya, Growth retardants, Alar, ccc (Cycocel), Ethrel, Paclobutrazol, Foliar spray.

Papaya is suitable to grow in homesteads, kitchen gardens, parks, the land available near factories. It is suitable to grow as intercrop in plantation crops during early stages of plant growth. Amongst fruit crops, mango crop is one which papaya is the best suited as an intercrop. Papaya fruits rank second after mango in the content of vitamin A. Besides it contains vitamin B_1, B_2, C and D. The yellow pigment in papaya is due to caricaxanthin. Fruits contain valuable proteolytic enzyme, papain, which helps in digestion of protein rich foods. The growth of papaya plant is so unique that after flowering both the processes of leaf and floral initiation and differentiation occur simultaneously, thus producing fruits continuously all round the year. The growth retardants are organic chemicals, which slow down cell division and expansion in tissues and regulate plant height physiologically without formative effects. Recently new chemicals have been discovered among which paclobutrazol (PP_{333}) is becoming more popular in tree fruit crops.

Present study was therefore, organized to assess the effect of paclobutrazol in comparison with alar, ccc and ethrel, on quality of fruits and latex output in papaya cv. CO 2.

MATERIALS AND METHODS

Investigations were carried out to have a specific as well as comprehensive information on the possible effects of plant growth retardants in papaya cv. CO 2, hence the study was conducted to induce early flowering, improve yield and quality of the fruit and latex and increase the economic life span of the tree.

The main plot treatments spraying at 60th (D1), 75th (D2) and 60th and 75th (D3) days of spraying. Growth retardants used at different concentrations as sub plot treatments. Alar 500, 750, 1000 ppm, Ethrel 150, 250, 350 ppm, CCC 750, 1500, 3000 ppm, Paclobutrazol 250, 500 and 1000 ppm, respectively. The total number of plants taken for experiment was 702, with six plants per treatment in three replication. The spacing between plants are 1.8 x 1.8m.

Five seedlings were transplanted per pit in the main field, when they were 40 – 50 days old measuring 45 cm in height. The seedlings were watered twice a day till they established. Later these were irrigated once in a week or 10 days. Soon after planting the seedlings were drenched with copper oxy chloride (COC) at 250 ml of 0.1% per pit. Fungicidal applications were repeated thrice at 15 days interval.

The data collected were scrutinized as per Panse and Sukhatme (1967) for understanding the level of significance.

RESULTS AND DISCUSSION

Total Soluble Solids (TSS) and Titrable Acidity:

Spraying at different days in the main plot was found not significant. Significant differences were observed among the treatments in respect of total soluble solids and titrable acidity. The percentage of TSS was higher in alar at 1000 ppm (15.05) and it was 9.02 per cent in control. The highest level of titrable acidity (0.716%) was recorded in paclobutrazol at 1000 ppm, followed by ccc at 750 ppm, while it was 0.083 per cent in control. Under the interaction effect higher titrable acidity (0.65%) was recorded in paclobutrazol (500 ppm) when sprayed on 60th day of planting (D1) which was at par with 750 ppm of ccc (Table 1).

Table 1 : Effect of growth retardants on fruit quality

Treatments	TSS (%)	Titrable acidity (%)	Total sugars (%)	Reducing sugars (%)	Non reducing sugars (%)	TSS acid ratio	Ascorbic acid mg/100g
T_1 – control	9.02	0.083	7.12	5.78	0.92	34.97	65.93
T_2 – Alar 500 ppm	13.30	0.339	8.61	7.20	1.41	39.57	71.44
T_3 – Alar 750 ppm	14.31	0.371	8.88	7.60	1.31	38.81	72.62
T_4 – Alar 1000 ppm	15.05	0.419	7.65	6.38	1.28	36.14	73.67
T_5 – Ethrel 150 ppm	12.12	0.146	10.04	9.16	0.88	84.94	47.54
T_6 – Ethrel 250 ppm	11.07	0.148	9.03	8.18	0.85	75.43	51.49
T_7 – Ethrel 350 ppm	12.25	0.158	8.45	7.68	0.77	77.70	63.21
T_8 – CCC 750 ppm	11.12	0.622	10.24	9.72	0.52	17.88	42.43
T_9 – CCC 1500 ppm	11.70	0.537	11.15	13.03	0.45	21.72	38.24
T_{10} –CCC 3000 ppm	12.48	0.448	11.09	10.50	0.40	28.35	39.27
T_{11} – Paclobutrazol 250 ppm	12.16	0.530	10.80	9.83	0.95	23.65	72.36
T_{12} – Paclobutrazol 500 ppm	13.26	0.632	12.25	11.33	1.00	20.85	73.42
T_{13} – Paclobutrazol 1000 ppm	11.82	0.716	11.29	10.35	1.20	16.54	74.79
S.E. ±	0.142	0.011	0.019	1.365	0.0034	1.800	0.142
C.D. (P=0.05)	0.284	0.021	0.039	2.721	0.0069	3.585	0.283

Total, Reducing and Non - Reducing sugars:

Spraying of different days was found significant in respect of total sugars. The higher level of total sugars (12.25%) was noticed in paclobutrazol at 500ppm followed by ccc at 1500 ppm (11.15%), the lowest was recorded in control. The highest percentage of reducing sugar (13.03) was recorded in ccc at 1500 ppm followed by paclobutrazol at 500 ppm (11.33) (Table 1).

In contrast, paclobutrazol increased the percentage of non-reducing sugars (1.20) at 1000 ppm concentration in comparison with ccc and ethrel. Similar association was also observed in papaya by Shanmugavelu *et al.* (1973).

TSS – Acid ratio and Ascorbic acid:

Ethrel had reduced the TSS – acid ratio. Ethrel at 150 ppm had recorded the highest ratio of 84.94. The lowest ratio (16.54) was recorded in paclobutrazol at 1000 ppm.

Ascorbic acid content increased with higher concentrations of alar and paclobutrazol. The highest ascorbic acid content (74.79%) was in paclobutrazol at 1000 ppm compared to control (65.93%). In the present study though paclobutrazol was found to increase total sugars, acidity and ascorbic acid content in papaya, the results in other fruit crops indicate that paclobutrazol did not affect the above quality characters (Annadurai and Shanmugavelu, 1978 and El-otamani *et al.*, 1992) in banana and mango. On the contrary paclobutrazol has been reported to have improved fruit colour and shelf life in apples (Greene and Murray, 1983). Selectivity of plants in response to growth retardant often presents a puzzling pattern.

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