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EFFECT OF PLANT BIO-REGULATORS IN INDUCTION OF LATERAL SHOOTS IN PAPAYA cv. CO.2

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Abstract

The production of lateral shoots for vegetative propagation in papaya is a limiting factor due to apical dominance. To overcome this problem, the effect of plant bio-regulators *viz.*, GA_3 and BA were investigated, on eight months old field grown papaya trees of cv. CO.2 in induction of lateral shoots, to be used as scion for grafting in papaya at Tamil Nadu Agricultural University, Coimbatore (Tamil Nadu), India during 2011. Among the treatments, it was revealed that BA 250 ppm produced a higher number of 42.00 buds per plant at 20 days after spraying. In respect of number of graftable sized scion laterals, plants sprayed with GA_3 125 ppm + BA 125 ppm registered the maximum of 21.50 nos in CO.2 at 20 days and 17.50 nos in 35 days after spraying.

Key words : Papaya, vegetative propagation, plant bioregulators, lateral shoots, CO.2.

Introduction

Papaya is conventionally propagated from seeds and its cultivation is hindered by problems due to inherent heterozygosity and dioecious nature of the crop. In order to retain selected characteristics, vegetative propagation through grafting would be more favourable. Unlike other horticultural crops, vegetative propagation of papaya on commercial scale is having an inherent limitation due to the difficulty in obtaining sufficient number of scions owing to its little bud sprouting character. This is primarily due to the strong apical dominance that occurs as a result of the presence of auxin in the meristem zone by limiting the development of the lateral meristem (Taiz and Zeiger, 2004). To overcome apical dominance and to induce lateral production, use of growth regulators like GA_3 and BA had seen employed in crops like passion fruit (Couto, 1983), papaya (Norton and Norton, 1986) and cherry (Lang, 1996). In recent years, attention has mainly directed to the use of different plant growth regulators that are very effective in controlling and directing a number of plant metabolic processes. Keeping in view the above points, an experiment was laid out to study the effect of these two bio regulators on induction of lateral shoots for promoting scionic shoots of graftable size in papaya.

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Materials and Methods

The present investigation was conducted at the College Orchard, Horticultural College and Research Institute, T.N.A.U., Coimbatore (Tamil Nadu), India during 2011. Eight months old papaya plants of the cv. CO.2 were subjected to the treatments. Two plant bio regulators, separately and their combinations at different levels *viz.*, ($\mathbf{T_2}$) GA_3 250 ppm, ($\mathbf{T_3}$) GA_3 500 ppm, ($\mathbf{T_4}$) BA 250 ppm, ($\mathbf{T_5}$) BA 500 ppm, ($\mathbf{T_6}$) GA_3 125 ppm + BA 125 ppm, ($\mathbf{T_7}$) GA_3 250 ppm + BA 250 ppm along with ($\mathbf{T_1}$) control were tried using RBD design with three replications. The control plants were sprayed with water. Spraying of PGRs was done three times by hand sprayer at weekly intervals and the following operations were carried out in the plants during the experimental study.

1. The leaves of selected trees were defoliated with sharp knife, by leaving 3-4 leaves at the terminal portion.
2. The flowers and fruits in the trees were removed with sharp and clean knife, before the foliar spray of growth regulators.
3. Three days after 1st spray, the apical portion of the plants were removed.
4. Three sprays were given at weekly intervals at 150 ml per tree.

Table 1 : Effect of plant bio regulators in induction of lateral shoots (scions) in papaya *cv.* CO.2.

Treatments	No. of buds per plant	Upto 20 days after spraying			At 20-35 days after spraying			Total no. of graftable laterals per plant (more than 5 cm)
		No. of graftable laterals per plant (more than 5 cm)	Length of laterals (cm)	Girth of laterals (cm)	No. of graftable laterals per plant (more than 5 cm)	Length of laterals (cm)	Girth of laterals (cm)	
T_1 (Control)	29.67	2.00	6.33	5.80	3.67	7.53	4.03	5.67
T_2 (GA 250 ppm)	35.93	16.83	12.27	1.97	12.83	10.60	1.83	29.66
T_3 (GA 500 ppm)	36.03	14.33	9.97	2.13	11.50	10.37	2.13	25.83
T_4 (BA 250 ppm)	42.00	3.17	9.07	4.23	7.00	7.00	3.60	10.17
T_5 (BA 500 ppm)	40.33	1.83	7.90	3.80	4.33	7.80	4.10	6.16
T_6 (GA 125 ppm + BA 125 ppm)	41.00	21.50	11.33	2.17	17.50	10.03	2.53	39.00
T_7 (GA 250 ppm + BA 250 ppm)	39.00	19.50	10.17	2.80	15.33	9.40	3.07	34.83
Mean	37.71	11.31	9.58	3.27	10.31	8.96	3.04	21.62
SEd	3.00	2.13	0.76	0.35	1.69	0.57	0.17	3.58
CD (P=0.05)	6.53	4.64	1.66	0.75	3.67	1.23	0.36	7.80

The laterals from the buds took approximately 3 weeks to attain graftable size scionic shoots. Hence the observation were taken in 3rd week (20 days after spraying) and after removing the scionic shoots for grafting, further observation was carried out for two more weeks. The production of scionic shoots that could be utilized for grafting was again observed during the period from 3rd week to 5th week (35 days after spraying). The data on number of buds per plant, number of graftable sized scionic laterals per plant, length of scionic laterals and girth of scionic laterals were also recorded and subjected for statistical analysis.

Results and Discussion

In the present study, significant differences were observed among the treatments for number of buds per plant, number of graftable sized scionic laterals per plant, length of scionic laterals and girth of scionic laterals. Among the treatments, those sprayed with the combination of GA_3 125 ppm + BA 125 ppm produced maximum number of graftable sized scionic laterals per plant and laterals of optimum length and girth (table 1). The mother plants sprayed with BA 250 ppm produced a higher number of 42.00 buds in cv. CO.2 per plant at 20 days after spraying. In respect of number of graftable sized scionic lateral production, plants sprayed with GA_3 125 ppm + BA 125 ppm registered the maximum number viz., 21.50 laterals at 20 days and another 17.50 laterals at 35 days after spraying. Ono *et al*. (2004) also opined that the treatment of plants with GA_3 (125 mgL^{-1}) + BA (125 mgL^{-1}) and GA_3 (250 mgL^{-1}) + BA (250 mgL^{-1}) promoted the development and the subsequent growth of side shoots.

Among the treatments, the plants sprayed with GA_3 250 ppm exhibited the greater length of laterals *viz*., 12.27 cm at 20 days and 10.60 cm at 35 days after spraying. While comparing the girth of the laterals, the plants sprayed with BA 250 ppm and control recorded the maximum girth at 20 days (5.80 cm) similarly, control and BA 500 ppm at 35 days (4.10 cm) after spraying. However, the suitable girth of scion for grafting was obtained from GA_3 125 ppm + BA 125 ppm both at 20 days (2.17 cm) and 35 days (2.53 cm) after spraying. In respect of total number of graftable sized scionic lateral production, plants sprayed with GA_3 125 ppm + BA 125 ppm registered the maximum number (39.00 laterals) in CO.2.

The present study clearly indicates that papaya plants treated with GA_3 had produced longer and lengthy laterals. The role of GA_3 in promoting lateral shoot by the plants has earlier reported (Modesto and Smith, 1981;

Takahashi *et al*., 1991; Cline, 1997). Moreover, GA_3 in papaya to induce side shoots been previously demonstrated by Allan and MacMillan (1991), Giampan *et al*. (2005). In the treatments of papaya with BA alone, the number of shoots developed was reduced, which may suggest that the concentration of BA (cytokinin) was insufficient to promote the breaking of apical dominance. However, the results suggest that the gibberellins appear to be essential for growth in length through its activity on cell elongation and cytokinin in diameter growth for its activity in promoting cell division. Physiological studies have earlier showed that cytokinin is strongly linked with the onset of lateral bud growth, so its application stimulates cell division and growth of buds in many species (Taiz and Zeiger, 2004). After decapitation, auxin level in lateral buds increases, the level of ABA decreases and transport of nutrients and cytokinins from roots increases lateral bud production. Fabiola *et al*. (2009) also stated that use of cytokinins and gibberellins associated with pruning of apical segment promoted side shoots in papaya.

References

Allan, P. and C. N. MacMillan (1991). Advances in propagation of *Carica papaya* L. cv. Honey Gold cuttings. *Journal of South African Horticulture Science*, **1(2)** : 69-72.

Cline, M. G. (1997). Concepts and terminology of apical dominance. *American J. of Bot.*, **84(9)** : 1064-1069.

Couto, F. D. (1983). Production of papaya and passion fruit. *Report of Agriculture*, **9(120)** : 15-18.

Fabiola, L. B., E. R. Schmildt, J. A. Teixeira and R. I. Coelho (2009). Influence of pruning to different heights in 'Golden' papaya. *Agronomic Science Journal*, **40(4)** : 596-601.

Giampan, J., S. T. Cerqueira, J. A. Peter, J. A. Marques Rezende and F. F. Sasaki (2005). Induction of lateral shoots of papaya (*Carica papaya* L.). *Journal of Horticultural Sciences*, **27(1)** : 185-187.

Lang, G. A. (1996). Early training of cherry trees - bud management. *Good Fruit Grower*, **47(4)** : 49.

Modesto, Z. M. and M. J. Smith (1981). Siqueira. *Botany*. Sao Paulo. EPU: 341.

Norton, M. E. and C. R. Norton (1986). An alternative to *in vitro* axillary shoot propagation enhancement on whole plants. *Journal of Horticultural Sciences*, **61** : 423-427.

Ono, E. O., J. F. Grana Jr. and J. D. Rodrigues (2004). Plant growth regulators on breaking apical dominance in papaya plants (*Carica papaya* L.). *Rev. Bras. Fruitic., Jaboticabal*., **26(2)** : 348-350.

Taiz, L. and E. Zeiger (2004). Cytokinins: Plant growth regulators. *Plant Physiology.* Porto Alegre: Artmed. 21. pp: 517-539.

Takahashi, N., B. O. Phinney and J. MacMillan (1991). *Gibberellins.* Springer-Verlag, New York.