Journal of Applied Horticulture, 7(2): 139-141, July-December, 2005

Effect of growth retardants on vegetative growth, yield and fruit quality of high density peach trees

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Abstract

Foliar sprays of cycocel (CCC) and cultar (paclobutrazol) were applied one month after full bloom to high density planting of peach in two successive years. Cultar at 1500 ppm was most effective in reducing the plant height, extension growth and shoot internode length. Both cycocel (1500 ppm) and cultar (1000 ppm) increased the fruit number and yield but had no significant effect on fruit weight. Fruit firmness was increased under 1000 and 1500 ppm of cultar treatment in the second year. However, TSS and acidity were not affected by both the growth retardants. The best results were obtained with cultar 1000 ppm in controlling the vegetative growth as well as fruiting in young peach trees.

Key words: Peach, foliar spray, cycocel, cultar, yield, fruit quality

Introduction

High density planting (HDP) in fruit plants is one of the important methods to achieve high productivity per unit area. HDP in fruit plants requires growth and canopy management through pruning and use of growth retardants. Hence, application of growth retardants play significant role for regulation of vegetative growth in HDP. Gibberllin biosynthesis inhibitors were found to be effective in controlling shoot growth of pome and stone fruit trees (Williams *et al.*,1986). Paclobutrazol and cycocel have been reported to restrict shoot extension and increase yield in stone and pome fruit trees (Stan *et al.*, 1989; George *et al.*, 1995; Theron *et al.*, 1998). Therefore, an experiment was conducted to evaluate the efficacy of cycocel (CCC) and cultar (paclobutrazol) on growth, yield and fruit quality of densely planted peach trees.

Materials and methods

Two year old uniform trees of peach cv. Paradelux growing in the high density orchards (2 x 2m) at Horticultural Experiments and Training Centre, Chaubattia, were selected for the study. Treatments included foliar application of three different concentrations of cycocel (500, 1000 and 1500 ppm) and cultar (500, 1000 and 1500 ppm) at 1 month after flowering along with control (untreated). A randomized block design with three replications was used. The chemicals were applied consecutively for two years during 1999 and 2000. The data were recorded in the first and second year of application for growth of trees, yield and quality characters of fruit. The extension growth of shoots was recorded on tagged branches at the cessation of growth. The physico-chemical characters of fruit were assessed after harvesting the ripe fruits. Fruit firmness was determined with a Magness-Taylor type pressure tester. Total soluble solids (TSS) in flesh was measured with a hand refractometer. Titratable acidity was determined by titration method (A.O.A.C., 1980).

Results and discussion

As evident from Fig. 1, both the growth retardants suppressed the increase in tree height . Cultar at 1500 ppm resulted in maximum reduction of height and 65.94 and 53.01 % less values were recorded than the control in the first and second year, respectively. These results corroborate the findings of Xu and Cao (1987) and Wang *et al.* (1993). Although cycocel at 1500 ppm also significantly reduced the tree height in the first year but not in the second year.

Maximum reduction in extension growth (cm) was obtained with cultar 1500 ppm in both the years (Fig. 1). However, cultar at 1000 ppm also significantly reduced the extension growth in the first year. George *et al.* (1995) also observed the reduction in shoot extension of young peach trees following paclobutrazol treatment. Similarly, shoot inter node length was shortened by foliar sprays of cultar 1500 ppm in both the years which is in conformity with the findings of Li *et al.* (1988) and Wang *et al.* (1993).

Data pertaining to yield contributing characters (Fig. 2) revealed that number of fruits/tree over two years was maximum with cultar 1000 ppm. Similar increase in the number of fruits following cultar application was also observed by Mavrodiev *et al.* (1987). Cycocel at 1500 ppm also significantly increased the number of fruits in the second year of application. However, there was no significant difference in fruit weight in the treated trees in both the years. In contrast to this, Kara and Kaska (1991) reported increased fruit weight in paclobutrazol treated peach trees.

Fruit yield varied during both the years. Data shown in Fig. 2 indicated that highest fruit yield/tree was observed with cultar 1000 ppm in both the years. The increase in fruit yield may be attributed to the effectiveness of paclobutrazol in increasing the number of fruits (Mavrodiev *et al.*, 1987). Furthermore, reduced competition from vegetative growth possibly also resulted in enhanced fruit yield. Yield enhancement in high density plantings of peach with paclobutrazol applications has been reported by

Table 1. Effect of growth retardants on fruit quality parameters of peach cv. Paradelux

Retardent concentration (ppm)	Fruit firmness I year	Fruit firmness II year	T.S.S. (%) I year	T.S.S. (%) II year	Acidity (%) I year	Acidity (%) II year
Cycocel(500)	19.33	17.25	7.16	7.90	0.69	0.61
Cycocel(l000)	16.25	17.56	7.75	8.25	0.67	0.66
Cycocel(1500)	17.33	18.50	7.16	8.50	0.70	0.65
Cultar(500)	22.16	18.25	7.00	8.20	0.64	0.60
Cultar(l 000)	18.33	20.10	7.00	8.33	0.71	0.68
Cultar(1500)	21.66	20.95	7.00	8.10	0.68	0.65
Control	20.25	17.66	6.66	8.25	0.72	0.68
C.D. (5%)	N.S.	0.86	N.S.	N.S.	N.S.	N.S.

Stan *et al.* (1989). Cycocel at 1500 ppm also showed significant increase in yield in the second year.

Except fruit firmness, the quality parameters of fruit such as total soluble solids (TSS) and acidity were not influenced by the growth retardants (Table 1). Fruit firmness was not affected in the first year of application but it was significantly increased in the second year by cultar 1500 ppm followed by cultar 1000 ppm. Enhanced flesh firmness with paclobutrazol application has also been reported by Kara and Kaska (1991). Percent total soluble solids (TSS) and acidity of fruits were not affected significantly by both the growth retardants in the present investigation. Chun and Lee (1989) and Bilgener *et al.* (1998) also observed that paclobutrazol

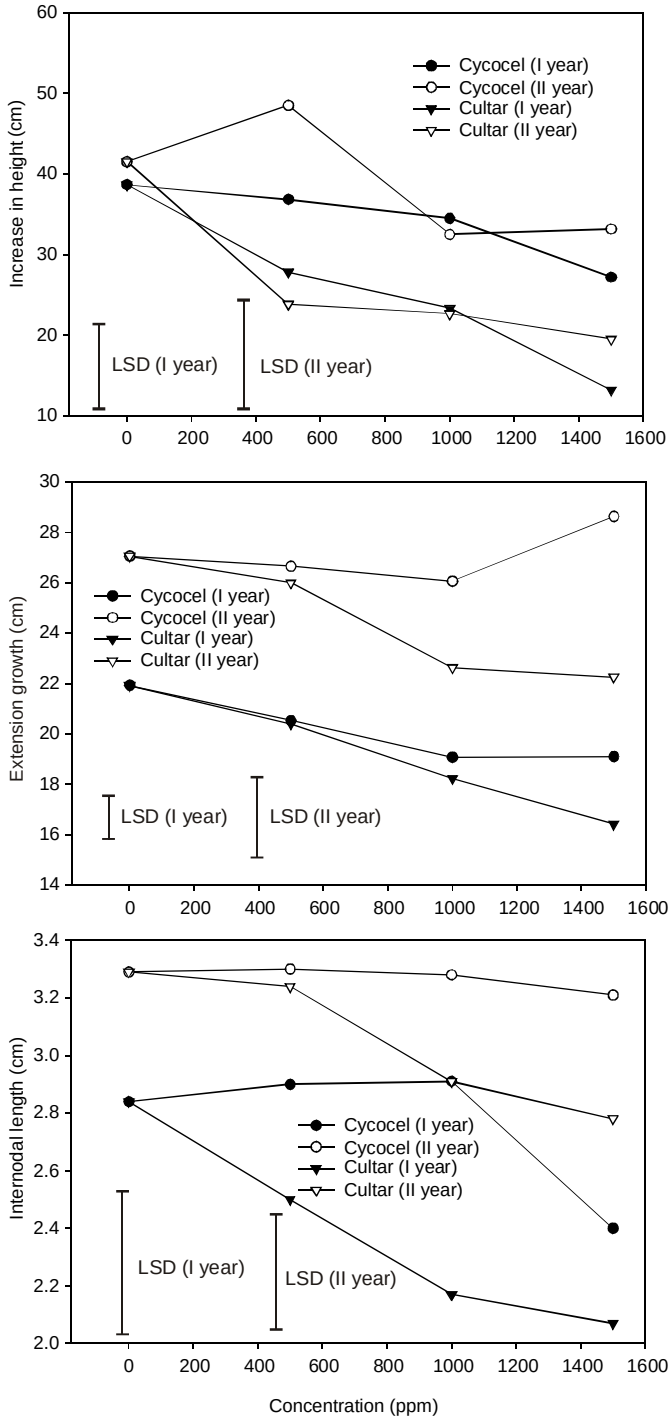

Fig. 1. Effect of growth retardants on growth characters in peach

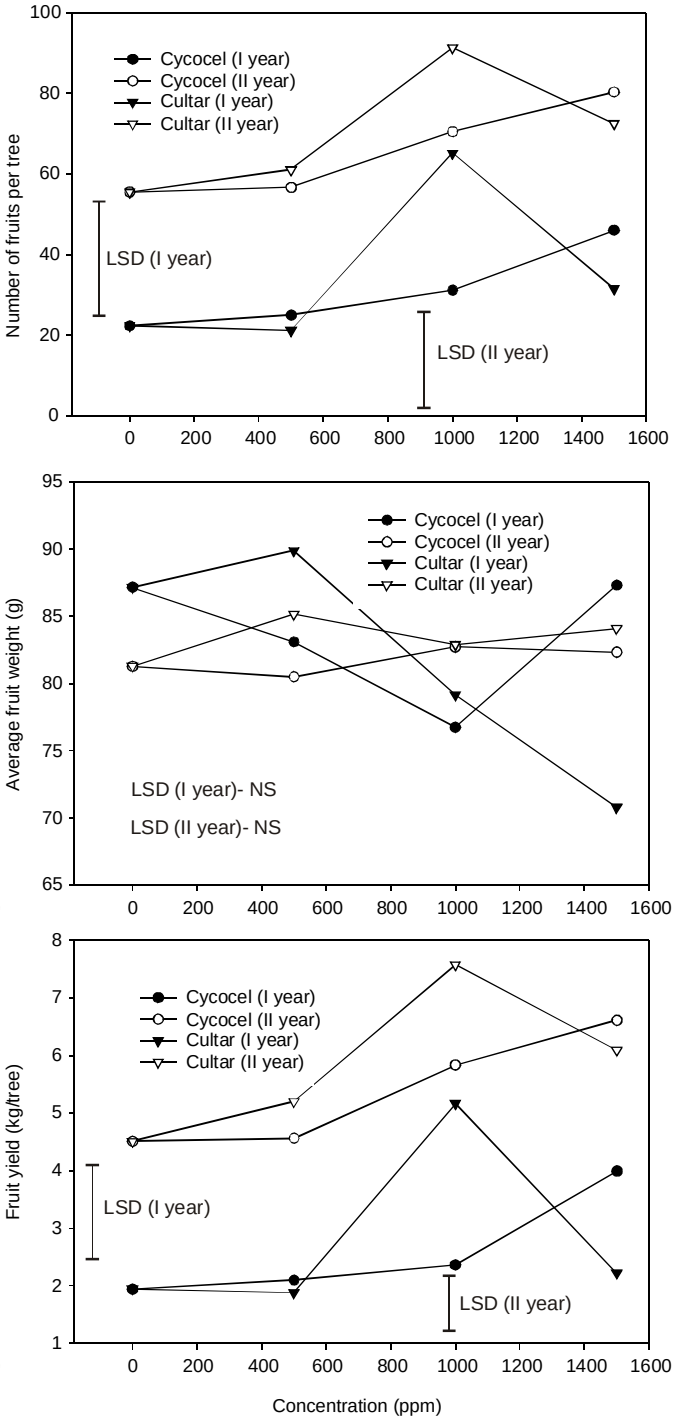

Fig. 2. Effect of growth retardants on yield and yield-contributing characters in peach

applications had no significant effects on fruit quality of peach.

Results of the present investigation revealed that significant results can be obtained with cultar 1000 ppm in controlling the vegetative growth as well as fruiting in young peach trees.

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