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Influence of Soil Applied Paclobutrazol on Tree Growth and Canopy Spread in Acid Lime (*Citrus aurantifolia* Swingle)

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A field experiment was conducted at Horticultural College and Research Institute, Periyakulam during 2006-2007 and 2007-2008 to study the effect of paclobutrazol (Cultar) on tree growth and canopy spread in five year old trees of acid lime. The trees were treated with paclobutrazol at different concentrations *viz*., 1.25, 2.50, 3.75 and 5.00 g a.i per tree following randomized block design. The results were recorded during on and off seasons of the year. Application of paclobutrazol (PP_{333}) had significant effect on tree height in both the seasons. Soil application of paclobutrazol 2.50 g had the highest tree height in the main (3.33 and 3.18 m) and off season (3.86 and 3.48 m) during the year 2007-08 and 2006-07 respectively. The lowest tree height (3.05 and 3.21 m) was registered under paclobutrazol 3.75g during the main and off seasons of the year 2006-07 and 2007-08. Tree spread between east to west was found to be wide (4.40 and 4. 58 m) in soil application of paclobutrazol at 3.75 g during main and off seasons of the year 2006-07 and 2007-08. Similarly, tree spread between north to south, soil application of paclobutrazol at 3.75 g recorded wide tree spread (4.62 and 4.88 m) in the main and off season of the year 2006-07 and 2007-08.

Key words: Acid lime, tree growth, canopy spread, paclobutrazol and season

Acid lime is the third most important fruit crop in citrus sp. It plays an important position in daily life of human beings for reliving thirsty during summer period and contributes an important place in rituals and festivals. Though its production is confined to homestead garden in parts of Tamilnadu in India, it is considered for the vast medicinal properties. Plant growth regulators are found to be widely used in many of the fruit crops for modifying plant growth and development. The plant growth regulator paclobutrazol {(2RS, 3RS) - 1- (4-chlophenyl)-4,4-dimethyl 2-(1,2,4-triazole- lyl) penta-3-ol} (PBZ) has been found to inhibit, specifically, the three oxidative steps of the Gibberellin (GA) precursor ent-kaurene to ent-kaurenoic acid.Thus PBZ blocks the biosynthesis of the active gibberellin GA1 (Zeevaart *et al.*, 1993). In citrus, PBZ may be useful in controlling excessive shoot growth (Aron *et al*., 1985).

Materials and Methods

An investigation on the effect of paclobutrazol at different concentrations was carried out on five year old acid lime trees grown under open conditions during the years 2006-07 and 2007-08. The experiment was conducted at Horticultural College and Research Institute, Periyakulam located at100 N Latitude and 77°E Longitude with 300 m above MSL. The soil was sandy loam in texture. Uniform size of trees were selected for the study during the entire period of experimentation all the trees were given uniform cultural practices including fertilizer application, pest and disease control. The trees were treated with paclobutrazol at 1.25, 2.50, 3.75, 5.00 g a.i./tree with a control. The experiment was conducted in a randomized block design with three replications.

The required quantity of paclobutrazol was applied as soil drench diluting with five liters of water and poured around the root zone by making 4-5 holes using a crow bar before flower bud formation and then the trees were irrigated immediately. The treatments were imposed during main season (on year) of the year 2006-07 and again in 2007-08. The extension of tree growth by height and its canopy area was measured from North-South and East - West expressed as metre.

Results and Discussion

Tree height

Application of paclobutrazol at 3.75g a.i/tree influenced significant reduction in tree height (3.13 m) of acid lime irrespective of seasons and year (Table 1). Increased dosage of application of paclobutrazol retarded tree height during both the seasons. Soil drenching of paclobutrazol suppressed the vegetative growth (Shrestha and Abdulkhader, 1991). The results of tree growth corroborated with the results of Okuda *et al.* (1996)

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Table 1. Effect of paclobutrazol (PP333) on tree height (m) during main and off season

Treatment	Main Season (2006-07)	Main Season (2007-08)	Pooled Mean	Off Season (2006-07)	Off Season (2007-08)	Pooled Mean	Pooled Mean (2006-07 &2007 - 08)
1.25 g/tree (T_1)	3.05	3.22	3.30	3.38	3.70	3.54	3.42
2.50 g/tree (T_2)	3.18	3.33	3.44	3.48	3.86	3.67	3.56
3.75 g/tree (T_3)	2.88	2.95	3.05	3.03	3.39	3.21	3.13
5.00 g/tree (T_4)	2.91	3.08	3.16	3.24	3.56	3.40	3.28
Control (T_5)	3.02	3.18	3.28	3.34	3.70	3.52	3.40
SEd	0.09	0.10	0.10	0.10	0.11	0.01	0.08
CD(0.05)	0.20	0.08	0.20	0.22	0.24	0.03	0.16

who found that paclobutrazol treated trees had severely reduced shoot growth due to internode shortening and reduced number of leaves / shoot (Wani and Lone, 2007)

Canopy spread

The size of canopy area of any fruit crops determines the fruit carrying capacity of a tree. Canopy volume decides the production and

Table 2. Effect of paclobutrazol (PP_{333}) on canopy spread (m) (East-West) during main and off season

Treatment	Main Season (2006-07)	Main Season (2007-08)	Pooled Mean	Off Season (2006-07)	Off Season (2007-08)	Pooled Mean	Pooled Mean (2006-07 &2007 - 08)
1.25 g/tree (T_1)	3.69	3.94	3.82	3.82	3.97	3.90	3.85
2.50 g/tree (T_2)	3.81	4.13	3.97	3.99	4.26	4.13	4.05
3.75 g/tree (T_3)	4.18	4.62	4.40	4.35	4.81	4.58	4.49
5.00 g/tree (T_4)	3.40	3.75	3.58	3.60	3.86	3.73	3.66
Control (T5)	3.50	3.85	3.68	3.69	4.09	3.89	3.78
SEd	0.12	0.13	0.13	0.13	0.14	0.10	0.10
CD(0.05)	0.26	0.29	0.26	0.27	0.30	0.20	0.20

accumulation of food materials supplied to the terminal portion. In the present study paclobutrazol application at 3.75 g a.i./tree increased the canopy spread in both the direction, East-West and North - South (Tables 2 & 3). Paclobutrazol 2.50 g a.i./tree and 1.25 g a.i./tree considerably improved canopy spread of the trees compared to the untreated control. Higher concentration of paclobutrazol reduced the tree height which consequently reduced canopy area.

Table 3. Effect of paclobutrazol (PP_{333}) on canopy spread (m) (North-South) during main and off season

Treatment	Main Season (2006-07)	Main Season (2007-08)	Pooled Mean	Off Season (2006-07)	Off Season (2007-08)	Pooled Mean	Pooled Mean (2006-07 &2007 - 08)
1.25 g/tree (T_1)	3.81	4.24	4.03	3.99	4.41	4.20	4.12
2.50 g/tree (T_2)	3.94	4.32	4.13	4.10	4.59	4.35	4.24
3.75 g/tree (T_3)	4.35	4.89	4.62	4.64	5.12	4.88	4.75
5.00 g/tree (T_4)	3.55	3.90	3.73	3.67	4.08	3.88	3.80
Control (T5)	3.63	4.00	3.82	3.75	4.21	3.98	3.90
SEd	0.12	0.14	0.13	0.13	0.15	0.14	0.10
CD(0.05)	0.27	0.30	0.27	0.29	0.32	0.29	0.21

T_1 - Paclobutrazol 1.25 g a.i./tree **T_2** - Paclobutrazol 2.50 g a.i./tree
T_3 - Paclobutrazol 3.75 g a.i./tree **T_4** - Paclobutrazol 5.00 g a.i./tree **T_5** - Control

It is evident from the study that paclobutrazol arrested the terminal growth of shoots by synthesis of gibberellins, which in turn promoted the canopy spread horizontally to the extent possible from all directions with out response to season and year of application of paclobutrazol, whereas in control treatment the horizontal movement of canopy spread was restricted. These results are in conformity with earlier workers who reported that soil drenching of paclobutrazol showed marked reduction in vegetative growth and canopy area in mango (Blaikie *et al.*, 2004) and apple (Wani and Lone, 2007)

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