

## Effect of growth regulators on water relations and fruit yield of rain-fed sapota (*Achras sapota*)

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### Abstract

Different growth regulator treatments (paclobutrazol, cycocel and chatmatkar) were effective in improving water relations and fruit yield of rainfed sapota. Paclobutrazol at 5 g a.i. was found to be most effective. Relative water content and transpiration were affected by different growth regulator treatments and the most pronounced effect was with paclobutrazol (5 g a.i.). Growth regulator treatments also influenced the second year fruit yield. Maximum fruit yield of 56.3kg/plant was obtained with paclobutrazol (5 g a.i.), whereas, control recorded less fruit yield (30.2kg/plant).

**Key words:** Sapota, *Achras sapota*, growth regulator, plant growth, Paclobutrazol, fruit yield.

### Introduction

Rain-fed horticulture has tremendous potential in the dryland farming system. Hence, there is an urgent need for development of technical know how to increase the production of rainfed horticultural crops. Since, availability of irrigation water is scarce in several areas, the water use efficiency can be improved through use of growth regulators. Majority of the cultivable area, wholly or partially dependent on rainfall. Rebuilding appropriate tree wealth through dryland orcharding for increasing the productivity can largely arrest the declining productivity of dry lands. In recent years, there is a phenomenal increase in area and production of sapota in Karnataka. Although sapota is grown both under rainfed and irrigated conditions, its productivity is considerably high under irrigation. However, sapota has proved to be one of the most economical and viable fruit crops highly suited for dryland horticulture. Different workers have reported use of growth regulators in fruit crops (Hoda and Yadav, 1993, Kulakarni, 1988, Kurian and Iyer 1993a,b,c, Wang and Steffens, 1985). Studies on use of growth regulators in sapota is very limited (Das and Mahapatra, 1975, Ganvit, 1989) hence the present study was undertaken to findout the possible use of growth regulators for rain-fed sapota cultivation.

### Materials and methods

A field trial was conducted with 11 treatments in 16 year old "Kalipatti" sapota orchard at Horticultural Research Station of the University at Bangalore. Different growth regulator treatments were (1) cycocel at 250, 500 and 750 ppm; (2) chatmatkar at 1000, 2000 and 3000ppm (3) paclobutrazol at 1.25, 2.50 and 5.00 g a.i. along with water spray and control. Uniform sapota plants, spaced at 10 x 10m were used for imposition of growth regulator treatments. The soil type was red sandy loam with available nitrogen (375 kg/ha); available phosphorous (4.5 kg/ha) and available potash (75 kg/ha). There were two plants/treatment with three replications in randomized block design. Chatmatkar and cycocel were used as foliar spray with teepol as

surfactant, three times namely second week of June and September in first year and second week of June in second year. Two litres of spray solution was used for each tree. Paclobutrazol applied once during second week of July of first year as soil drench, 45 centimeters away from the trunk. Uniform cultural practices were given to the experimental trees, grown purely under rainfed conditions. The relative water content was calculated based on the formula by Barrs and Weatherley (1962). Stomatal resistance and transpiration was recorded by Li-1600 steady state porometer from 11<sup>th</sup> leaf from top. Fruit yield was recorded during different pickings in both the croppings.

### Results and discussion

**Water relations:** The different growth regulators did not affect the soil moisture (data not presented) although they affected other water relations such as relative water content, transpiration and stomatal resistance (Table 1). All the growth regulator treatments were at par and no definite trend was observed with respect to soil moisture content although paclobutrazol 5 g a.i. / tree was found to be the best compared to other treatments. On contrary in apple plants treated with triazole used less water than the untreated plants (Wang and Steffens, 1985).

The soil moisture status depends upon soil moisture depletion pattern, which is a complex phenomenon influenced by many factors. Response differences may be due to growing conditions and crop species. The increased relative water content by growth regulator treatments was attributed to reduced transpiration. Similar results have been reported by Wieland and Wample (1985) in apple. Different growth regulators influenced the transpiration but not the stomatal resistance. All the growth regulator treatments reduced the transpiration and the maximum effect was with Paclobutrazol treatments. On contrary, Antogonzzi and Romani (1989) reported increased transpiration due to paclobutrazol treatment. The reduced transpiration was because of increased stomatal resistance although it was non-

significant. Swietelek and Miller (1983) reported similar results of stomatal resistance as a result of paclobutrazol application.

**Table 1. Effect of different growth regulators on relative water content, transpiration and stomatal resistance of sapota**

Treatment	Relative water content (%)		Transpiration ( $\mu\text{g. water cm}^{-2} \text{ sec}^{-1}$ )		Stomatal resistance ( $\text{s cm}^2$ )	
	12 month	18 month	Dec. Ist Yr.	Jun. IInd Yr.	Dec. Ist Yr.	Jun. IInd Yr.
	Cycocel 250 ppm	83.5	82.9	4.55	5.05	5.67
Cycocel 500ppm	84.1	83.5	4.51	5.11	6.03	6.16
Cycocel 750ppm	85.6	85.0	4.54	5.08	6.04	6.32
Chamatkar 1000ppm	79.7	79.2	4.50	5.11	6.06	6.38
Chamatkar 2000ppm	80.7	80.2	4.50	5.06	6.07	6.31
Chamatkar3000ppm	82.6	82.1	4.56	5.11	5.69	6.22
Paclobutrazol 1.25g a.i.	84.8	84.3	4.55	5.10	6.01	6.31
Paclobutrazol 2.5g a.i.	85.9	85.4	4.55	5.03	5.68	6.20
Paclobutrazol 5.00g a.i.	86.8	86.4	4.45	4.98	6.84	6.56
Control (water spray)	77.7	77.2	4.63	5.20	5.91	5.95
No spray	76.8	76.2	4.65	5.23	6.45	6.07
Sem+	0.2	0.2	0.03	0.04	0.31	0.16
C.D.at 5%	0.7	0.7	0.10	0.12	NS	NS

Yr. = Year

**Fruit yield:** The fruit yield during the first year cropping and cumulative fruit yields were not affected by different growth regulator treatments (Table 2). The second year fruit yield was affected by different growth regulator treatments. All the growth regulator treatments were at par and significantly increased the fruit yield compared to water spray and control treatments. The fruit yield increase was attributed to increased plant growth through reduced transpiration and increased water relations such as relative water content. Several workers reported similar results of increased flowering and fruit yield in different fruit crops (Kurian and Iyer, 1993c, Hoda and Yadav, 1993, Yadav 1993 and Ravishankar *et al.*, 1990). Non-significant effect in first year fruit yield might be attributed to the time of spray of growth regulators after flowering and fruiting.

**Table 2. Effect of growth regulators on fruit yield of sapota**

Treatment	Fruit yield (kg/plant)		Cumulative yield (kg)
	Ist Year	IInd Year	
Cycocel 250 ppm	45.9	40.0	85.9
Cycocel 500 ppm	51.0	45.7	96.8
Cycocel 750 ppm	58.7	44.9	103.6
Chamatkar 1000 ppm	62.2	44.5	106.7
Chamatkar 2000ppm	52.6	44.2	96.8
Chamatkar 3000 ppm	57.2	46.3	92.5
Paclobutrazol 1.25 g a.i.	52.5	49.8	112.3
Paclobutrazol 2.50 g a.i.	49.2	54.0	103.2
Paclobutrazol 5.00 g a.i.	76.9	56.3	113.2
Control (water spray)	42.1	31.7	73.8
No spray	34.4	30.1	64.5
SEm+	10.8	4.1	13.3
C.D. at 5%	NS	12.1	NS

The results revealed that paclobutrazol @ 5 g a.i. is useful for improving water relations and fruit yield of sapota under rainfed conditions.

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