

## STUDYING THE EFFECT OF PACLOBUTRAZOL (PBZ) ON FLOWERING, FRUIT SET AND FRUIT QUALITY IN " OFF YEAR" OF LANGRA MANGO CV. (*Mangifera indica* L.)

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**Abstract:** This investigation was carried out at the Orchard of Horticultural Research Station, El-Kassasin, Ismailia Governorate during "off" year of the two successive seasons( 2003/4 and 2004/5) on 24-year-old of Langra trees to evaluate the effect of soil drench and foliar applications of Paclobutrazol (PBZ) at 2,4 and 6 g/tree for each application method on flowering, fruit set, yield and fruit quality. The obtained results showed that all PBZ treatments advanced flowering date, improved number of perfect flowers per panicle and increased fruit set per tree as well

as yield either as average number of fruit or as fruit weight (kg.) per tree. Moreover, paclobutrazol (PBZ) treatments increased fruit weight, fruit length, seed weight and pulp weight as compared with untreated (control) trees. On the other hand, fruit width, total soluble solids percentage (T.S.S.) and total acidity percentage in fruit juice showed untrue variations between treated and untreated (control) fruits. Soil drench applications were more effective on flowering, fruit set, yield and fruit quality than foliar applications. The most effective treatment was using PBZ as soil drench at 4 g/tree.

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**Key words:** Mango, Fruit set Percentage, Fruit quality, Off year, Paclobutrazol, Flowering, Soil drench, Foliar spraying .

### Introduction

Treated Alphonso mango cv. trees with paclobutrazol as a soil drench or foliar sprays, increased yield per tree with no effect on fruit size and quality. Foliar sprays were less effective . In addition, application of PP333 increased production of Zihun cv. mango tree and percentage of

flowering shoots to 67.0-100% (Miao *et al.*, 1994). Soil application of PBZ or foliar sprays on sex-year-mango cv. Tommy Atkins trees advanced flowering date, increased flowering shoots, increased yield per tree and kept fruit size with no effect by any treatment (Medina and Campbell, 1994).

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On 5-year-old mango cv. Haden trees, pacloburazol was applied to the soil at 0.0, 5.0, 10.0 or 15.0g/tree. Total fruit weight was significantly increased by the higher PBZ application rates; although average individual fruit weight was lower than in controls (Ferrarie and Sergent, 1998). In order to induce "off" season flowering, single and multiple foliar applications of paclobutrazol were supplied to Nam Dok Mai cv. mango trees, the number of flowering shoots in PBZ treated trees was twice than that of the controls. Two application of either 1000 or 2000 p.p.m. paclobutrazol resulted in the highest number of flowering panicles and most uniform flowering (Tongumpi *et al.*, 1997).

Drench application of paclobutrazol at 1-10 ml around the trunk of 12-year-old Tommy Atkins cv. mango trees and Sensation cv. trees prior to the initiation of postharvest flushing, increased fruit weight and tree revenue in Sensation cv. However, number of retained fruits, average fruit weight, yield and tree revenue decreased in Tommy Atkins cv. with increasing rates of paclobutrazol applied (Oosthuysen and Jacob, 1997). On the mango cv. Deshehari, the number of fruits and yield were increased with PBZ application to soil at 4g/tree which produced high quality ripened fruits (Yadava and Singh,

1998). Spraying Taimour mango trees at pos-bloom with PP333 (paclobutrazol) at 300 ppm produced the highest values of fruit weight and pulp weight (Abou-Rawash *et al.*, 1998). Paclobutrazol at 4g/tree applied as soil drench to 25-year-old mango cv. Alphonso, increased flowering, and fruit set and yield (Bhatt *et al.*, 1998). Spraying paclobutrazol on panicles of 6 mango cvs. at full bloom, improved yield and fruit quality (Ahmed *et al.*, 1998). Paclobutrazol beside significantly reduced vegetative growth in mango, it induced early and profuse flowering, increased number and weight of fruits/tree (Patil and Talathi 2001). Paclobutrazol as foliar application on Alphonso mango cv. at rate of 10 ml/tree increased all parameter of ripe fruit except for acidity (Vijayala and Sirinivasan, 2001). Paclobutrazol stimulated flowering 3 months after application on Haden mango cv. and restricted vegetative bud-break for short time (Rojas, 2001).

The aim of this investigation is to study the effect of soil drench and foliar spraying of paclobutrazol (PBZ) on fruit set and fruit quality in Off year seasons in mango cv. Langra.

### **Materials and Methods**

The study was carried out for two successive seasons on "off year" during (2003/4 and 2004/5)

at the Orchard of Horticultural Research Station, El-Kassasin, Ismailia Governorate on 24-year-old Langra mango cv. trees to evaluate their response to different concentrations and application method of Paclobutrazol. The trees grafted on polyembryonic seedlings rootstock, grown in sandy soil, irrigated with drip system irrigation and subjected to the normal agricultural practices. Twenty one uniform vigour trees were chosen in complete randomized design divided to seven treatments (each has 3 replicates). Cultar containing 25% paclobutrazol (PBZ) was used as single application at rates of 2,4 and 6 g./tree in each season. Concerning soil drench application each rate was dissolved in 20 liter of water then was applied around the trunk of tree at "off" year (late September) in both studied seasons. The same rates of PBZ were diluted in 20 liter of water as foliar application treatments and were sprayed on shoot tips at early December in each studied seasons. Three trees in "on" year were sprayed with water and used as untreated (control) treatment. The following parameters were assessed:

- 1- Flowering date (was defined when at least 25 in florescence per tree were at anthesis).
- 2- Average number of panicles per tree.

- 3- Percentage of perfect flowers per panicles (total number of perfect flowers/total number of flowers).

- 4- Fruit set percentage (was calculated at pea stage which was quantified on 10 panicles per tree as shown by (Salazar and Vazquez, 1997).

- 5- Yield as number of fruits or as weight (kg) per tree.

- 6- Total soluble solids percentage (TSS) was determined by using a portable light refractometer.

- 7- Total acidity percentage in fruit juice (expressed as grams of citric acid per 100 ml juice) as pointed in A.O.A.C (1980).

- 8- Fruit weight, length (L), diameter (D) and L/D ratio were also calculated.

The experiment was arranged in a complete randomized block design with three replicate. The New Least Significant Difference (New L.S.D) was used for comparison between the means (Snedecor and Cochran, 1980).

## **Results and Discussion**

### **1-Flowering:**

The effect of paclobutrazol (PBZ) treatments on date of flowering, average number of panicles per tree and average number of flowers per panicle were presented in Table (1). Data showed that, all PBZ treatments advanced flowering date in

**Table (1):** Effect of paclobutrazol treatments on flowerig date, average number of panicles per tree and number of flowers per panicle of Langra mango cv. during 2003/2004 and 2004/2005, seasons.

Treatments	First season			Second Season		
	Date of flowering	No of panicle/tree	No of flowers per panicle	Date of flowering	No of panicle/tree	No of flowers per panicle
Control (untreated)	12 <sup>th</sup> March	43.3	324	17 <sup>th</sup> March	53.0	296
Drench at 2g/tree	11 <sup>th</sup> Feb	108.1	347	10 <sup>th</sup> Feb	112.4	349
Drench at 4g/tree	8 <sup>th</sup> Feb	147.0	398	8 <sup>th</sup> Feb	138.3	385
Drench at 6g/tree	10 <sup>th</sup> Feb	112.2	357	8 <sup>th</sup> Feb	122.0	350
Foliar sp. at 2g/tree	4 <sup>th</sup> March	93.0	331	8 <sup>th</sup> March	96.3	330
Foliar sp at 4g/tree	2 <sup>nd</sup> March	111.3	345	5 <sup>th</sup> March	108.1	336
Foliar sp at 6g/tree	3 <sup>rd</sup> March	96.1	330	9 <sup>th</sup> March	101.6	331
New LSD at 5%	-	6.74	7.05	-	10.14	7.61

langra mango trees. Moreover, soil drench applications advanced flowering date from 30 to 33 days, while foliar applications advanced flowering date from 8 to 10 days in the first season and from 37 to 39 days with drench application and from 9 to 12 days for spraying application as compared with control trees in the second season, respectively. Number of panicles significantly increased in trees treated with soil drench applications of PBZ as compared with foliar applications. Moreover, all PBZ treatments either as drench or as foliar applications increased number of panicles per tree in comparison with untreated (control) trees. PBZ treatments increased number of flowers per panicle and drench application treatments were superior in this parameter as compared with foliar spraying treatment and control trees. The most effective treatment in advancing flowering date, increasing average number of panicles per tree and increased number of flowers per panicle was using PBZ at 4 g./tree as soil drench application. This was clear in both studied seasons. These results are in agreement with the findings of Medina and Campbell (1974); Tongumpai *et al.* (1997); Bhatt *et al.* (1998); Rojas, (2001) and Patil and Talathi (2001).

## **2- Fruit set and yield:**

Regarding to percentage of perfect flowers, fruit set and yield per tree, data in Table (2) clearly revealed that, percentage of perfect flowers per panicle significantly increased by PBZ treatments either as soil drench or as foliar application except PBZ foliar at 2g./tree as compared with control (untreated) trees. Whereas, percentage of fruit set was significantly increased with PBZ application either as soil drench or as foliar spray compared to untreated control ones, in both studied seasons, respectively. Yield per tree either as number of fruits or as weight (kg) significantly increased with either drench or foliar applications as compared with control treatments. In addition, drench application treatments were more effective in such fruits than using PBZ as foliar sprays. Moreover, using PBZ as soil drench at 4 g./tree was most effective in the yield parameters. Anyhow, average of fruits number per tree with drench applications were (129.1, 177.1 and 140.0) as compared with (99.0, 121.0 and 109.2) for foliar spraying applications in the second season and (128.4, 179.1 and 139.2) with soil drench applications against (105.9, 120.8 and 108.9) for foliar spraying application in the first season. However, the lowest values (59.2 and 55.1) were obtained from

**Table (2):** Effect of paclobutrazol treatments on perfect flowers, fruit set% and yield per tree of Langra mango cv. during 2003/2004 and 2004/2005 seasons.

Treatments	First season				Second Season			
	Perfect flower %	Fruit set %	Yield component		Perfect flower %	Fruit set %	Yield component	
			No fruit/tree	Fruit weight kg/tree			No fruit/tree	Fruit weight kg/tree
Control (untreated)	25.3	0.17	55.1	14.551	21.6	0.20	59.2	15.492
Drench at 2g/tree	31.1	0.37	128.4	46.134	28.9	0.37	129.1	46.243
Drench at 4g/tree	34.4	0.45	179.1	67.484	36.1	0.46	177.1	66.819
Drench at 6g/tree	31.9	0.39	139.2	49.137	29.1	0.40	140.0	49.21
Foliar sp. at 2g/tree	27.2	0.32	105.9	37.297	24.2	0.30	99.0	34.65
Foliar sp at 4g/tree	30.1	0.35	120.8	44.442	27.1	0.36	121.0	44.612
Foliar sp at 6g/tree	31.5	0.33	108.9	37.189	26.2	0.33	109.2	46.851
New LSD at 5%	3.06	0.09	11.4	6.03	3.14	0.07	10.87	7.22

control trees in both seasons, respectively.

Yield as weight (kg) per tree significantly increased in all PBZ treatments in comparison with untreated control trees. Soil drench application treatments were superior in comparison with foliar application treatments, whereas, treatment of 4 g./tree a soil drench application gave the highest values (66.819 and 67.484 kg/tree) while untreated (control) were inferior (15.492 and 14.551 kg/tree), the other treatments arranged between the above mentioned values in the first and the second seasons, respectively.

These results are coinciding with these mentioned by Medina and Campbell (1994), Miao *et al.* (1994); Oosthuysen and Jacob (1997); Bhatt *et al.* (1998); Yadava and Singh (1998); Ahmed *et al.* (1998) and Patil *et al.* (2001).

### **3- Physical and chemical characters:**

As shown in Table (3), fruit weight (g), fruit length (cm), seed weight (g) and pulp weight (g) significantly increased in treated trees with different concentrations of PBZ as compared with untreated (control) trees. Moreover, soil drench application treatments were more effective than foliar application treatments. The most effective treatment was soil drench

application at rate of 4 g./tree which resulted in the highest values concerning fruit weight (377.5 and 376.8 g), fruit length (13.8 and 12.9 cm), seed weight (83.01 and 82.87 g) and pulp weight (287.0 and 282.6 g) in comparison with other tested treatments and control treatment in both studied seasons, respectively. In addition, fruit width, total soluble solids and juice acidity values showed untrue variations between different tested treated and untreated control trees.

The obtained results are in agreement with the findings of Medina and Campbell (1994); Ferrarie and Sargent (1998); Abou-Rawash *et al.* (1998); Ahmed *et al.* (1998) and Patil and Talathi, (2001).

It can be concluded that, paclobutrazol treatments at 2, 4 and 6 g./tree either as drench or as foliar application treatments at "off" year season, improved flowering, yield and fruit characteristics of langra mango cv. Moreover, drench applications were the most effective than foliar application treatments and the best results were obtained from using PBZ at 4 g./tree as drench application.

**Table (3):** Effect of paclobutrazol treatments on some physical and chemical characteristics of Langra mango cv. during 2003/2004 and 2004/2005, seasons.

Treatments	First season							Second Season						
	Fruit W (g)	Fruit L (cm)	Fruit width (cm)	Seed w (g)	Pulp w (g)	TSS %	Acid %	Fruit W (g)	Fruit L (cm)	Fruit width (cm)	Seed w (g)	Pulp w (g)	TSS %	Acid %
Control (untreated)	261.7	10.7	8.0	57.53	196.3	15.3	0.29	264.1	11.1	8.0	58.10	198.1	15.1	0.30
Drench at 2g/tree	358.2	11.6	8.1	78.80	268.7	15.7	0.28	359.3	11.5	8.1	79.05	269.5	15.2	0.28
Drench at 4g/tree	377.3	13.8	8.7	83.01	287.0	16.3	0.26	376.8	12.9	8.7	82.87	282.6	16.0	0.27
Drench at 6g/tree	351.5	11.7	8.5	77.33	263.6	15.4	0.28	353.0	11.4	8.4	77.61	269.8	15.2	0.28
Foliar sp. at 2g/tree	350.0	11.1	8.1	77.04	262.5	15.6	0.28	352.2	11.3	8.1	77.41	264.2	15.4	0.28
Foliar sp at 4g/tree	368.7	12.6	8.5	81.11	276.5	15.7	0.26	367.9	11.8	8.2	80.93	275.9	15.3	0.27
Foliar sp at 6g/tree	347.1	11.4	8.3	76.36	260.4	15.4	0.28	341.5	11.5	8.2	75.13	256.1	15.3	0.28
New LSD at 5%	8.64	1.01	NS	4.77	8.71	1.01	NS	8.01	1.02	NS	4.24	10.12	NS	NS



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## دراسة تأثير استخدام الباكلوبيوترازول في سنة الحمل الخفيف على التزهير وعقد الثمار والمحصول وجودة الثمار في صنف المانجو لانجرا

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قسم بحوث الفاكهة الاستوائية ، معهد بحوث البساتين ، مركز البحوث الزراعية ، الجيزة ، مصر .  
أجريت هذه الدراسة على أشجار المانجو صنف لانجرا بعمر 24 سنة والنامية بمحطة بحوث البساتين ، القصاصين ، محافظة الإسماعيلية خلال موسمين (2003 / 2004 ، 2004 / 2005 ) حيث كانت الأشجار في سنة الحمل الخفيف off-year بهدف تقييم تأثير المعاملة بمعدلات مختلفة من الباكلوبيوترازول ( 2 ، 4 ، 6 جم/شجرة ) (كولتار) سواء كإضافة أرضية أو رشاً على الأشجار لمعرفة تأثيره على التزهير وعقد الثمار والمحصول وجودة الثمار . وقد أوضحت النتائج المتحصل عليها أن جميع المعاملات المستخدمة أدت إلى تكبير التزهير وحسنت من متوسط عدد الأزهار الخنثى في الشمارخ الزهري وزادت من نسبة عقد الثمار وبالتالي زاد المحصول للشجرة سواء كان عدد ثمار أو وزن ثمار ، علاوة على ذلك أدت المعاملات إلى زيادة متوسط وزن الثمرة وطول الثمرة وكذلك وزن البذرة ووزن اللب مقارنة بثمار الأشجار غير المعاملة ( الكنترول).

من ناحية أخرى فإن سمك الثمرة والنسبة المئوية لكل المواد الصلبة الذائبة الكلية والحموضة الكلية لم تتأثر معنوياً بالمعاملات المختلفة مقارنة بالكنترول . كما أوضحت الدراسة أن الأضافة الأرضية كانت أكثر فعالية من الرش بالنسبة للتزهير وعقد الثمار والمحصول وجودة الثمار وكانت أفضل المعاملات علي الإطلاق هي المعاملة باستخدام الباكلوبيوترازول بمعدل 4 جم للشجرة كإضافة أرضية.