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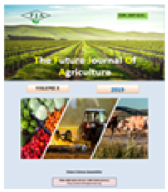

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Mangifera indica TREE AS A NEW POT PLANT

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ABSTRACT: This work was carried out during two successive seasons of 2019 and 2020 in the Experimental lathe house of Horticulture Dept., Faculty of Agric., Benha university, Kalubia Governorate, Egypt to study the effect of paclobutrazol (0.0, 50, 100 and 150 ppm), and chemical fertilization (0.0, 4, 6 and 8g/pot) treatments on growth, fruiting and chemical composition of potted mango cv. Keitt. Uniform seedlings of mango were planted on February 1st 2019 and 2020 in 40 cm plastic pots containing 1:1 mixture of peat moss and compost. Obtained results showed that, the shortest plants were recorded by un-fertilized plants and sprayed with PP333 at 150 ppm in the two seasons. The highest value of plant width and show value were recorded by 150 ppm PP333-sprayed plants enriched with NPK fertilization at 8 g/ plant in the two seasons. 150 ppm PP333-sprayed plants supplemented with NPK fertilization at 8 g/ plant treatment scored the highest number of fruits / plant and the heaviest mean fruit fresh weigh. The heaviest roots fresh and dry weights was scored by 150 ppm PP333 combined with NPK fertilization at 8 g/ plant treatment in the two seasons. The richest leaf N, P, K and total carbohydrates % was scored by 150 ppm PP333 combined with NPK fertilization at 8 g/ plant in the two seasons.

Key words: *Mangifera indica* cv. Keitt, PP_{333}, chemical fertilization and pot plant.

INTRODUCTION

Controlling plant size is one of the most important aspects of horticultural plants production. Growers can control plant height genetically, environmentally, culturally, or chemically. These techniques can be effective height-suppressing strategies for some plants, but when growers are faced with ornamental plants containing large varieties of genera, species, or cultivars, these techniques may not work equally well for each crop under a common environment. An alternative, effective strategy for controlling plant height is to use chemical plant growth retardants (**Chany, 2005**). Application of growth retardants is a common practice for commercial growers to achieve attractive compact pot-grown plants.

Mango [*Mangifera indica* L.] belongs to Family Anacardiaceae is one of the most important fruits in the tropical and subtropical regions. In Egypt, the area of mango orchards increased annually. Many cultivars are grown in Egypt such as Keitt, Ewaise and Sedik facing many problems i.e., poor fruit set, high fruit drop, irregular bearing, low productivity and malformation disease (**El-Badawy and Abd El-Aal, 2013**).

The terms growth retardants are used for all chemicals that retard cell division and cell elongation in shoot tissues and regulate plant height physiologically without formative effects (**PGRSA, 2007**).

Paclobutrazol (PP_{333}) "Guitar" or Bonzi or Cultar [(2RS,3RS) -1-(4-chlorophenyl-4,4 -dimethyl-2-(1H-1,2,4 triazol-1- yl) pentan-3-ol] is a very potent growth retardant that inhibits cell elongation and seems to interfere with gibberellins synthesis by inhibiting the oxidation of kaurene to kaurenoic acids, cytochrome P450 catalyzed reaction taking place on microsome. This in turn, reduces the rate of cell division without causing any cytotoxicity (**Ball, 1987).** This direct morphological consequence is a reduction in the vegetative growth.

Fertilizing plants causes them to grow more rapidly and efficiently, just like ensuring a manufacturing plant has all the raw materials it needs for a production line. Fertilizers are essential to produce out the best features of ornamental potted plants. For natural plants to grow and thrive they need a number of chemical elements, but the most important are nitrogen, phosphorus and potassium. Most packaged fertilizers contain these three macronutrients. Nitrogen is especially important, and every amino acid in plants contains nitrogen as an essential component for plants to manufacture new cells (**Marschner, 1997**). Phosphorus which has been called the key to life is essential for cell division and for development of meristematic tissues and it is very important for carbohydrate transformation due to multitude of phosphorylation reaction and to energy rich phosphate bond (**Lambers *et al*., 2000**). Potassium is important for growth and elongation probably due to its function as an osmoticum and may react synergistically with IAA. Moreover, it promotes CO_2 assimilation and translocation of carbohydrates from the leaves to storage tissues (**Mengel and Kirkby, 1987**).

Therefore, the objective of this work was to study the effect of the foliar growth retardants paclobutrazol and chemical fertilization on the growth, yield and chemical composition of mango cv. Keitt plants to produce them as pot plants.

MATERIALS AND METHODS

This work was carried out during two successive seasons of 2019 and 2020 in the Experimental lathe house of Horticulture Dept., Faculty of Agric., Benha University, Kalubia Governorate, Egypt to study the effect of paclobutrazol, and chemical fertilization treatments on growth, fruiting and chemical composition of potted mango plants. Uniform seedlings of mango were planted on February 1st 2019 and 2020 in 40 cm plastic pots containing 1:1 mixture of peat moss and compost. The chemical characteristics of the planting medium were shown in Table (a). Chemical analysis was determined according to **Black *et al.* (1982).**

Table a. Chemical analysis of the planting medium

Parameters	Unit	Reading
		2019
$CaCO_3$	%	1.01
Organic matter	%	2.45
Available nitrogen	%	0.98
Available phosphorus	%	0.58
Available potassium	%	0.89
E.C	ds/m	1.12
pH	---	6.62

Growth retardants treatments

Mango plants were subjected to foliar spray with pp333 at the rates of 0, 50, 100 and 150 ppm three times, each at one-month interval, the first one was after two months from planting time in both seasons. A surfactant (Tween 20) at a concentration of 0.01% was added to all tested solutions including the control. The plants were sprayed with a hand pump mister to the point of runoff. A surfactant (Tween 20) at a concentration of 0.01% was added to all tested solutions including the control.

Chemical fertilization treatments

Mango plants received chemical fertilizer (using ammonium nitrate (33% N), calcium superphosphate (15.5% P2O5) and potassium sulfate (48% K2O). A mixture of the three fertilizers, with a ratio of 1:1:2 (N: P2O5: K2O), was prepared and applied to the plants at the rate of 4, 6 and 8g/pot as side dressing seven times at monthly interval, starting 45 days from planting in both seasons.

Layout of the Experiment

The design of this experiment was factorial experiments in a complete randomize block design with 16 treatments represented the combinations between paclbutrazol at the rates of 0, 50, 100 and 150 ppm and chemical fertilization at the rates of 0, 2, 4 and 8 g/ plants (4 chemical fertilization levels x 4 paclobutrazol concentrations). The treatments were arranged at random in three replicates with 10 pots/ each at the lathe house. Common agricultural practices (irrigation, manual weed control, pest control, …. etc.) were carried out when needed.

Recorded data:

1- Vegetative growth measurements

Vegetative characteristics were taken at full flowering stage included plant height (measured from surface of the potting medium to the tallest branch), plant width, show value (as plant width / plant height ratio according to **Berghage *et al.* (1989).**

2- Fruiting growth measurements

Fruiting characteristics were taken at full ripening stage involved fruit number / plant and fruit weight (g).

3- Root growth measurements

Whereas, roots measurements were taken at the end of experiment (December 1st during the two seasons) included fresh and dry weights of roots/plant.

4- Chemical composition determinations

Nitrogen content was determined by modified micro Kjeldahle method as described by **A.O.A.C. (1970)**. Phosphorus was colorimetrically determined using method described by **Murphy and Riley (1962)** using spectrophotometer at 882 µv. As for potassium, it was estimated using flame photometry according to **Cottenie *et al*., (1982)**. Total carbohydrates percentage in dried leaves was determined colorimetrically according to **Herbert *et al.* (1971).**

Experimental layout and statistical analysis

This factorial experiment was arranged in a complete randomized block design system, each treatment contained three replicates of 10 pots for each replicate. The obtained results were statistically analyzed by using MSTATC program. Analysis of variance was performed to determine significant differences. Means were compared using LSD test at 0.05 level according to **Snedecor and Cochran (1989**).

RESULTS AND DISCUSSION

1- Effect on the vegetative growth parameters

Plant height (cm)

Data in Table (1) shows that all tested concentrations of pp333 succeeded in decreasing plant height of mango plants as compared with un-sprayed plants in both seasons. In this respect, the high concentration (150 ppm) gave the highest values in this concern, followed by the medium concentration (100 ppm) in both seasons. On the other hand, there was a positive correlation between the plant height values and fertilization levels, so the values of plant height increased as the level of fertilization increased until reach to the maximum increasing at the high level (8 g/ plant). This trend was true in both seasons.

Moreover, data in Table (1) indicate that all the interactions between PP333 concentrations and fertilization levels statistically affected plant height of mango plants as compared with untreated plants in both seasons. In this concern, the tallest plants were recorded by 0.0 ppm PP333 combined with NPK fertilization at 8 g/ plant treatment in the two seasons. On contarary, the shortest plants were recorded by those sprayed with PP333 at 150 ppm and received no chemical fertilization in the two seasons.

Table 1. Effect of paclobutrazol and chemical fertilization as well as their combination on plant height (cm) of *Mangifera indica* plants during 2018 and 2019 seasons

Parameters / PP_{333}	Plant height (cm)				
	Chemical fertilization				
	0.0	**4g/plant**	**6g/plant**	**8g/plant**	**Mean**
			1st season		
0.0	141.3	143.2	146.8	148.2	144.9
50 ppm	126.8	129.3	131.6	134.2	130.5
100 ppm	121.7	123.7	125.9	126.8	124.5
150 ppm	112.8	114.8	119.2	121.2	117.0
Mean	125.7	127.8	130.9	132.6	
L.S.D at 0.05 for	Fertilization=3.24		PP_{333} = 3.24	Interaction=6.48	
			2nd season		
0.0	158.7	167.2	171.2	176.3	168.4
50 ppm	131.0	136.2	141.0	143.4	137.9
100 ppm	126.3	131.2	134.6	138.2	132.6
150 ppm	119.4	123.4	127.3	129.6	124.9
Mean	133.9	139.5	143.5	146.9	
L.S.D at 0.05 for	Fertilization=8.14		PP_{333} =8.14	Interaction=16.28	

Plant width (cm)

Data in Table (2) indicted that all studied concentrations of pp333 succeeded in increasing plant width of mango plants as compared with un-sprayed plants in both seasons. In this respect, the high concentration (150 ppm) gave the highest values in this concern, followed by the medium concentration (100 ppm) in both seasons. On the other hand, there was a positive relationship between the plant width values and fertilization levels, so the values of plant width increased as the level of fertilization increased until reach to the maximum increasing at the high level (8 g/ plant in both seasons.

Moreover, data in Table (2) indicate that all the interactions between PP333 concentrations and chemical fertilization levels statistically increased plant width of mango plants as compared with untreated plants in both seasons. In this regard, the highest value of plant width was recorded by 150 ppm PP333 combined with NPK fertilization at 8 g/ plant treatment in the two seasons.

Table 2. Effect of paclobutrazol and chemical fertilization as well as their combination on plant width (cm) of *Mangifera indica* plants during 2018 and 2019 seasons

Parameters / PP_{333}	Plant width (cm)				
	Chemical fertilization				
	0.0	**4g/plant**	**6g/plant**	**8g/plant**	**Mean**
	1st season				
0.0	58.3	64.8	79.2	86.2	72.1
50 ppm	64.2	73.6	86.1	92.1	79.0
100 ppm	69.7	78.1	89.4	94.3	82.9
150 ppm	74.3	84.2	96.2	99.6	88.6
Mean	66.6	75.2	87.7	93.1	
L.S.D at 0.05 for	Fertilization= 7.24		PP_{333} = 7.24	Interaction=14.48	
	2nd season				
0.0	64.1	73.8	81.7	89.8	77.4
50 ppm	69.4	83.9	94.2	98.7	86.6
100 ppm	78.1	89.3	97.8	104.6	92.5
150 ppm	84.7	96.4	106.2	112.1	99.9
Mean	74.1	85.9	95.0	101.3	
L.S.D at 0.05 for	Fertilization=8.17		PP_{333} =8.17	Interaction=16.34	

Show value

Data in Table (3) revealed that all examined concentrations of pp333 increased the show value of mango plants as compared with un-sprayed plants in both seasons. Anyhow, the high concentration (150 ppm) gave the highest values in this concern, followed by the medium concentration (100 ppm) in both seasons. On the other hand, there was a positive relationship between the show values and fertilization levels, so the records of show value increased as the level of fertilization increased till reach to the highest increasing at the high level (8 g/ plant). This trend was true in both seasons.

Furthermore, data in Table (3) show that all the interactions between PP333 concentrations and chemical fertilization levels statistically increased the show value of mango plants as compared with untreated plants in both seasons. In this concern, the highest record of show value was observed by 150 ppm PP333-sprayed plants combined with NPK fertilization at 8 g/ plant treatment in the two seasons.

Such results showed similar trend to those obtained by various investigators working on PP_{333} and CCC on different plants. In this concern**, Eissa (2014)** on *Murraya exotica* and *Duranta repens* plants, **Ghatas (2016)** on *Chrysanthemum frutescens* plant**, Abd El-Aal and Mohamed (2017)** on *Pelargonium zonale* L., **Sharaf-Eldien *et al.* (2017)** on *Zinnia elegans*, **El Gendy *et al.* (2018)** on *Tagetes patula* plants and **Noor El-Deen (2020)** on *Ruellia simplex*.

The aforementioned results of chemical fertilization are coincided with those attained by **Habib (2012)** on *Caryota mitis* Lour, **Wanderley *et al.* (2012)** on areca bamboo palm (*Dypsis lutescens*) and **Youssef and Abd El-Aal (2014)** on *Hippeastrum vittatum*, **Youssef (2014)** on *Beaucarnea recurvata*, **Mazhar and Eid (2016)** on *Gladiolus grandiflorus*, **Sakr (2017)** on *Calendula*, **Mohamed (2018)** on *Dypsis cabadae*.

Table 3. Effect of paclobutrazol and chemical fertilization as well as their combination on show value of *Mangifera indica* plants during 2018 and 2019 seasons

Parameters / PP_{333}	Show value				
	Chemical fertilization				
	0.0	4g/plant	6g/plant	8g/plant	Mean
			1st season		
0.0	0.41	0.45	0.54	0.58	0.50
50 ppm	0.51	0.57	0.65	0.69	0.60
100 ppm	0.57	0.63	0.71	0.74	0.66
150 ppm	0.66	0.73	0.81	0.82	0.76
Mean	0.54	0.60	0.68	0.71	
L.S.D at 0.05 for	Fertilization=0.07		PP_{333} = 0.07	Interaction=0.14	
			2nd season		
0.0	0.40	0.44	0.48	0.51	0.46
50 ppm	0.53	0.62	0.67	0.69	0.63
100 ppm	0.62	0.68	0.73	0.76	0.70
150 ppm	0.71	0.78	0.83	0.86	0.80
Mean	0.57	0.63	0.68	0.70	
L.S.D at 0.05 for	Fertilization=0.06		PP_{333} =0.06	Interaction=0.12	

2- Effect on the fruiting growth parameters

Fruits number / plant and fruit weight

Data in Tables (4 and 5) indicated that all tested paclobutrazol treatments increased the fruits number / plant and mean fruit fresh weight when compared with un-treated plants in both seasons. On the other hand, the increase in fruits number / plant and mean fruit fresh weight of mango plants is proportionally increased with the increment of paclobutrazol concentration, hence the highest number of fruits/plant and mean fruit weight were recorded by 150 ppm paclobutrazol-sprayed plant, followed in descending order by 100 ppm PP333-sprayed plants.

Additionally, there was a positive relationship between fruits number / plant and mean fruit weight and fertilization levels, so the values of fruits number / plant and mean fruit weight increased as the level of fertilization increased until reach to the highest increasing at the high level (8 g/ plant) in both seasons. Moreover, data in Tables (4 and 5) reveal that all the interactions between PP333 concentrations and chemical fertilization levels increased the fruits number and mean fruit weight of mango plants as compared with untreated plants in both seasons. In this concern, the highest number of fruits / plant and the heaviest fruit fresh weight were scored by 150 ppm PP333 combined with NPK fertilization at 8 g/ plant treatment in the two seasons.

Table 4. Effect of paclobutrazol and chemical fertilization as well as their combination on number of fruits / plant of *Mangifera indica* plants during 2020 season

Parameters / PP_{333}	Number of fruits / plant				
	Chemical fertilization				
	0.0	4g/plant	6g/plant	8g/plant	Mean
0.0	1.38	1.49	1.68	1.92	1.62
50 ppm	1.64	1.86	1.98	2.18	1.92
100 ppm	2.04	2.56	2.83	3.06	2.62
150 ppm	2.64	2.92	3.28	3.54	3.10
Mean	1.93	2.21	2.44	2.68	
L.S.D at 0.05 for	Fertilization=0.23		PP_{333} =0.23	Interaction=0.46	

Table 5. Effect of paclobutrazol and chemical fertilization as well as their combination on mean fruit fresh weight of *Mangifera indica* plants during 2020 season

Parameters / PP_{333}	Mean fruit fresh weight (g)				
	Chemical fertilization				
	0.0	**4g/plant**	**6g/plant**	**8g/plant**	**Mean**
0.0	214.3	221.5	231.8	239.2	226.7
50 ppm	226.2	231.8	242.0	249.6	237.4
100 ppm	249.3	254.8	268.2	271.3	260.9
150 ppm	258.7	264.2	276.0	281.4	270.1
Mean	237.1	243.1	254.5	260.4	
L.S.D at 0.05 for	Fertilization=7.35		PP_{333} =7.35	Interaction=14.7	

3- Effect on the root growth parameters

Roots fresh and dry weights (g)

The data obtained on fresh weight of the roots per plant (g) as affected by paclobutrazol and cycocel treatments are shown in Tables (6 and 7). These results may be discussed as follows.

All studied treatments of paclobutrazol statistically increased the fresh and dry weight of roots per plant as compared with control in both seasons. In this concern, the highest concentrations of paclobutrazol showed to be the most effective one for inducing the highest fresh and dry weight of roots per plant, followed in descending order by PP333 at 100 ppm in the two seasons of this study.

In general, there was a positive correlation between roots fresh and dry weights and fertilization levels, so the values of roots fresh and dry weights increased as the level of fertilization increased until reach to the highest increasing at the high level (8 g/ plant) in both seasons. Moreover, data in Tables (6 and 7) show that all the interactions between PP333 concentrations and chemical fertilization levels increased the roots fresh and dry weights of mango plants as compared with untreated plants in both seasons. In this concern, the heaviest roots fresh and dry weights were scored by 150 ppm PP333 combined with NPK fertilization at 8 g/ plant treatment in the two seasons.

Table 6. Effect of paclobutrazol and chemical fertilization as well as their combination on roots fresh weight / plant (g) of *Mangifera indica* plants during 2018 and 2019 seasons

Parameters / PP_{333}	Roots fresh weight / plant (g)				
	Chemical fertilization				
	0.0	**4g/plant**	**6g/plant**	**8g/plant**	**Mean**
			1st season		
0.0	86.3	94.6	102.3	106.9	97.5
50 ppm	90.2	96.2	106.4	112.3	101.3
100 ppm	96.4	106.8	118.3	124.6	111.5
150 ppm	98.2	111.2	118.9	132.4	115.2
Mean	92.8	102.2	111.5	119.1	
L.S.D at 0.05 for	Fertilization= 8.17		PP_{333} =8.17	Interaction=16.34	
			2nd season		
0.0	132.6	141.2	146.8	156.2	144.2
50 ppm	141.9	151.6	159.8	163.2	154.1
100 ppm	152.8	161.3	170.2	179.2	165.9
150 ppm	159.4	168.2	176.4	184.3	172.1
Mean	146.7	155.6	163.3	170.7	
L.S.D at 0.05 for	Fertilization=7.38		PP_{333} =7.38	Interaction=14.76	

Table 7. Effect of paclobutrazol and chemical fertilization as well as their combination on roots dry weight / plant (g) of *Mangifera indica* plants during 2018 and 2019seasons

Parameters / PP_{333}	Roots dry weight / plant (g)				
	Chemical fertilization				
	0.0	4g/plant	6g/plant	8g/plant	Mean
	1st season				
0.0	15.5	16.9	18.4	19.1	17.5
50 ppm	16.2	17.3	19.0	20.2	18.2
100 ppm	17.3	19.1	21.3	22.3	20.0
150 ppm	17.6	20.0	21.4	23.8	20.7
Mean	16.7	18.3	20.0	21.4	
L.S.D at 0.05 for	Fertilization=1.34		PP_{333} =1.34	Interaction=2.68	
	2nd season				
0.0	25.1	26.8	27.7	29.6	27.3
50 ppm	26.8	28.7	30.2	31.0	29.2
100 ppm	28.9	30.6	32.3	34.0	31.5
150 ppm	30.2	31.9	33.4	35.0	32.6
Mean	27.8	29.5	30.9	32.4	
L.S.D at 0.05 for	Fertilization=1.52		PP_{333} =1.52	Interaction=3.04	

The previous mentioned findings of root traits could be interpreted on the basis of the physiological role of the nature of growth retardants action. Since, PP333 and CCC treatments alter the endogenous levels of different determined phytohormones i.e. auxin, gibberellins, ABA and cytokinins level that tended to increase the size of root system of mango plants. It is well established that cytokinins stimulate lateral roots initiation and thus increasing the size (number, thickness, fresh and dry weights) (**Devlin and Witham, 1983**). The results of paclobutrazol are in agreement with those obtained by **Eissa (2014)** on *Murraya exotica* and *Duranta repens* plants, **Ghatas (2016)** on *Chrysanthemum frutescens* plant**, Abd El-Aal and Mohamed (2017)** on *Pelargonium zonale* L., **Sharaf-Eldien *et al.* (2017)** on *Zinnia elegans*, **El Gendy and Atteya (2018)** on *Tagetes patula* plants and **Noor El-Deen (2020)** on *Ruellia simplex*.

The aforementioned results of chemical fertilization are coincided with those attained by **Hussein (2009)** on *Cryptostegia grandiflora*, and **Youssef and Abd El-Aal (2014)** on *Hippeastrum vittatum*, **Youssef (2014)** on *Beaucarnea recurvata*, **Mazhar and Eid (2016)** on *Gladiolus grandiflorus*, **Sakr (2017)** on *Calendula officinalis* plant.

4- Effect on the chemical composition determinations

Data in Tables (8-11) declared that all studied treatments of paclobutrazol increased leaf N, P, K and total carbohydrates % of mango plants as compared with control in both seasons of this study. In this respect, the richest leaf N, P, K and total carbohydrates % were recorded by 150 ppm pp333-sprayed plants followed in descending order by 100 ppm pp333-sprayed plants in this regard in both seasons. In general, there was a positive correlation between leaf N, P, K and total carbohydrates % and fertilization levels, so the values of leaf N, P, K and total carbohydrates % increased as the level of fertilization increased until reach to the highest increasing at the high level (8 g/ plant) in both seasons. Moreover, data in the same Tables show that all the interactions between PP333 concentrations and chemical fertilization levels increased the leaf N, P, K and total carbohydrates % of mango plants as compared with untreated plants in both seasons. In this concern, the highest values of leaf N, P, K and total carbohydrates % were scored by 150 ppm PP333 combined with NPK fertilization at 8 g/ plant treatment in the two seasons.

Table 8. Effect of paclobutrazol and chemical fertilization as well as their combination on leaves N% of *Mangifera indica* plants during 2018 and 2019 seasons

Parameters / PP_{333}	Leaves N %				
	Chemical fertilization				
	0.0	**4g/plant**	**6g/plant**	**8g/plant**	**Mean**
			1st season		
0.0	2.04	2.16	2.14	2.21	2.14
50 ppm	2.12	2.11	2.19	2.28	2.18
100 ppm	2.19	2.36	2.34	2.43	2.33
150 ppm	2.24	2.35	2.41	2.49	2.37
Mean	2.15	2.25	2.27	2.35	
L.S.D at 0.05 for	Fertilization=0.04		PP_{333} =0.04	Interaction=0.08	
			2nd season		
0.0	2.17	2.26	2.39	2.37	2.30
50 ppm	2.26	2.38	2.37	2.45	2.37
100 ppm	2.37	2.41	2.52	2.68	2.50
150 ppm	2.42	2.40	2.61	2.76	2.55
Mean	2.31	2.36	2.47	2.57	
L.S.D at 0.05 for	Fertilization=0.07		PP_{333} =0.07	Interaction=0.14	

Table 9. Effect of paclobutrazol and chemical fertilization as well as their combination on leaves P% of *Mangifera indica* plants during 2018 and 2019 seasons

Parameters / PP_{333}	Leaves P %				
	Chemical fertilization				
	0.0	**4g/plant**	**6g/plant**	**8g/plant**	**Mean**
			1st season		
0.0	0.227	0.236	0.235	0.241	0.235
50 ppm	0.231	0.239	0.238	0.246	0.239
100 ppm	0.239	0.238	0.248	0.256	0.245
150 ppm	0.241	0.249	0.254	0.262	0.252
Mean	0.235	0.241	0.244	0.251	
L.S.D at 0.05 for	Fertilization=0.02		PP_{333} =0.02	Interaction=0.04	
			2nd season		
0.0	0.227	0.236	0.235	0.241	0.235
50 ppm	0.231	0.239	0.238	0.246	0.239
100 ppm	0.239	0.238	0.248	0.256	0.245
150 ppm	0.241	0.249	0.254	0.262	0.252
Mean	0.235	0.241	0.244	0.251	
L.S.D at 0.05 for	Fertilization=0.03		PP_{333} = 0.03	Interaction=0.06	

Table 10. Effect of paclobutrazol and chemical fertilization as well as their combination on leaves K% of *Mangifera indica plants* during 2018 and 2019 seasons

Parameters / PP_{333}	Leaves K %				
	Chemical fertilization				
	0.0	**4g/plant**	**6g/plant**	**8g/plant**	**Mean**
			1st season		
0.0	1.26	1.38	1.36	1.43	1.36
50 ppm	1.31	1.29	1.41	1.46	1.37
100 ppm	1.42	1.49	1.48	1.56	1.49
150 ppm	1.49	1.52	1.54	1.64	1.55
Mean	1.37	1.42	1.45	1.52	
L.S.D at 0.05 for	Fertilization=0.12		PP_{333} =0.12	Interaction=0.24	
			2nd season		
0.0	1.37	1.42	1.54	1.52	1.46
50 ppm	1.48	1.51	1.61	1.64	1.56
100 ppm	1.52	1.51	1.66	1.72	1.60
150 ppm	1.57	1.62	1.69	1.78	1.67
Mean	1.49	1.52	1.63	1.67	
L.S.D at 0.05 for	Fertilization=0.14		PP_{333} =0.14	Interaction=0.28	

Table 11. Effect of paclobutrazol and chemical fertilization as well as their combination on leaves total carbohydrates% of *Mangifera indica* plants during 2018 and 2019 seasons

Parameters / PP_{333}	Leaves total carbohydrates %				
	Chemical fertilization				
	0.0	**4g/plant**	**6g/plant**	**8g/plant**	**Mean**
			1st season		
0.0	17.6	18.2	19.8	19.7	18.8
50 ppm	18.4	19.9	21.8	21.6	20.4
100 ppm	19.6	20.4	23.2	24.9	22.0
150 ppm	20.7	20.6	24.1	25.8	22.8
Mean	19.1	19.8	22.2	23.0	
L.S.D at 0.05 for	Fertilization=0.21		PP_{333} =0.21	Interaction=0.42	
			2nd season		
0.0	18.3	19.7	21.0	21.8	20.2
50 ppm	19.6	20.6	21.9	22.4	21.1
100 ppm	20.7	20.5	22.6	25.6	22.4
150 ppm	21.5	21.8	23.7	26.5	23.4
Mean	80.1	82.6	89.2	96.3	
L.S.D at 0.05 for	Fertilization=0.81		PP333 =0.81	Interaction=1.62	

As for the explanation of the incremental effect of paclobutrazol and cycocel on chemical constituents in leaf of Tabernaemontana, it could be illustrated here on the basis that PP333 and CCC treatments stimulated the endogenous cytokinins synthesis as will be mentioned afterwards and there is an intimate relationship between cytokinins and chlorophylls metabolism in both excided or detached leaf disks and intact plants i.e., cytokinins retard chlorophylls degradation, preserve it and increase its synthesis (**Devlin and Witham, 1983**). Besides, cytokinins activate a number of enzymes participating in a wide range of metabolic reactions in the leaves. These reactions included the maturation of proplastid into chloroplasts. These enzymes could be divided into two groups according to their response to cytokinins. The first group of enzymes could be said to relate to chloroplast differentiation, while the second group could be related to cytokinin stimulated group (**Kulaeva, 1979**). Also, the increase in chlorophyll content due to growth retardants treatments might be attributed to the character of some growth retardants on depressing leaf area which lead to intensification of pigments in leaf. These results go on line with that obtained by **Abd El-Kader (2009)** on *Cestrum elegans* and *Tecoma stans*, **Jungklang and Saengnil (2012)** on patumma cv. Chiang Mai Pink, **Ghatas (2016)** on *Chrysanthemum frutescens* plant**, Abd El-Aal and Mohamed (2017)** on *Pelargonium zonale* L., **Sharaf-Eldien *et al.* (2017)** on *Zinnia elegans*, **El Gendy *et al.* (2018)** on *Tagetes patula* plants and **Noor El-Deen (2020)** on *Ruellia simplex.*

The aforementioned results of chemical fertilization are coincided with those attained by **Rodrigo *et al.* (2011)** on *Pinus nigra* and *Betula papyrifera*, **Habib (2012)** on *Caryota mitis* Lour, **Wanderley *et al.* (2012)** on areca bamboo palm (*Dypsis lutescens*) and **Youssef and Abd El-Aal (2014)** on *Hippeastrum vittatum*, **Youssef (2014)** on *Beaucarnea recurvata*, **Mohamed (2018)** on *Dypsis cabadae.*

CONCLUSION

Generally, of all obtained results; those of achieving more dwarf plants of mango with many formed fruits could be considered as pioneer results in this respect. Therefore, treatments of PP_{333} at 150 supplemented with chemical fertilization at 8 g / pot gave a good display (show value) of pot of mango with optimum growth characteristics from the commercial point of view when compared with other treatments or control.

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