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Effect of Some Growth Retardants and Pinching on Growth, Flowering and Chemical Composition of *Tabernaemontana Coronaria* Plant

Mohamed, S.M., Youssef, A.S.M., Ghatas, Y.A. and Zin El-Abedeen, D.
Hort. Department, Faculty of Agriculture, Benha University, EGYPT
Corresponding Author: ahmed.youssef@fagr.bu.edu.eg

Abstract

This work was carried out during two successive seasons of 2016 and 2017 in the Experimental lathe house of Horticulture Dept., Faculty of Agric., Benha University, Kalubia Governorate, Egypt to study the effect of paclobutrazol, cycocel and pinching treatments on growth, flowering and chemical composition of potted *Tabermaemontana coronaria* plants. After one month from repotting process (March 1st during the two seasons), the plants were arranged into two groups; the first one was lifted without pinching, while the second group was subjected to pinching treatment by removing 1cm from the seedling top, then all plants of the two groups were subjected to three sprays with paclobutrazol at 0.0, 30, 60 and 90 ppm and cycocel at 0.0, 1000, 2000 and 3000 ppm plus tap water as control at one month intervals. The obtained results showed that all pinched plants received growth retardants treatments were shorter than those received growth retardants without pinching in the two seasons. Besides, all pinched plants received growth retardants treatments have more branches/plants, leaves number/plants, leaf area/plant, fresh and dry weights/plants than those received growth retardants without pinching in the two seasons. Anyhow, the highest valued branches/plants, leaves number/plants, leaf area/plant, fresh and dry weights/plants were scored by those subjected to pinching treatment and sprayed with pp333 at 90 ppm in the two seasons. Moreover, all studied treatments of paclobutrazol, cycocel and pinching increased the chemical composition content of *Tabernaemontana coronaria* plants in the two seasons.

Key words: *Tabernaemontana coronaria*, paclobutrazol, cycocel, pinching and pot plant.

Introduction

Tabernaemontana coronaria Stapf (Synonym: *Ervatamia coronaria*) is a glabrous, evergreen, dichotomously branched shrub, belonging to the Family Apocynaceae. It is distributed in upper Gangeticplain, Garhwal, East Bengal, Assam, Karnataka, Kerala and in Burma. *Tabernaemontana coronaria* is a spreading, bushy, many-branched shrub. In general, this spreading, bushy shrub grows to a height of 6 to 10 feet tall and 5 to 8 feet wide. It has oblong leaves with wavy margins that are dark green above and pale green beneath. The flowers are doubled- petaled, fragrant, white, and waxy at 1–5 cm in diameter. In Ayurveda, the root is using for kapha, biliousness and the diseases of the blood. The root has a bitter taste. It is aphrodisiac; tonic, especially to the brain, liver and spleen; and purgative. The milky juice mixed with the oil and when rubbed on to the head cures pain in the eye. It is also known to kill intestinal worms and when its root part is chewed, causes the relief in the toothache (Pushpa *et al*., 2011). Also, it has been used in the folk medicine for anti-infection, anti-inflammation, analgesic, anti-tumor, ant- oxidative effect and the effect in neuronal activity (Ghani, 2003).

Controlling plant size is one of the most important aspects of ornamental 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.

The terms growth retardants is used for all chemicals that retard cell division and cell elongation in shoot tissues and regulate plant height physiologically without formative effects (PGRSA, 2007). One of the most widely used growth retardants is paclobutrazol (pp333) [(2RS,3RS) -1-(4-chlorophenyl-4,4 -dimethyl-2-(1H-1,2,4 triazol-1-yl) pentan-3-ol] is a well-known plant growth retardant (Davis and Andersen, 1989) . Paclobutrazol functions by inhibiting cytochrome P-450, which mediates oxidative dimethylation reactions, including those which are necessary for the synthesis of ergosterol and the conversion of kaurene to kaurenoic acid in the gibberellins biosynthetic pathway (Fletcher *et al*., 2000). From this function, paclobutrazol has long been used to reduce plant height for potted plant production, particularly ornamental plants (Beattie *et al*., 1990; Fletcher *et al*., 2000). Paclobutrazol at concentration of 35 mg a.i./pot reduced plant foliage height and flower stem length, without affecting inflorescence length and delaying the production of potted Thai Tulip (Pinto *et al*., 2006). Cycocel (CCC) (chlormequat; 2-

chloroethyltrimethyl ammonium chloride) is a synthetic plant growth retardant used on ornamental plants for inducing dwarfism in plants and shorter internodes, stronger stems and green leaves . It is also utilized in order to produce compact, sturdy potted and bedding plants, enhance the green colour of the foliage, strengthen flower stem and promote resistance of foliage to environmental stresses. Although growth reduction effect of cycocel is common, growth reduction percentage, flowering, leaf area and chlorophyll content, flower shape and colour responses of plants to this chemical can vary depending on the dose or concentration, method, site of application, species and cultivar and also growing season (Taiz and Zeiger, 2006). The purpose of this study was to investigate the effects of paclobutrazol, cycocel and pinching on growth, flowering, chemical and composition of potted *Tabernaemontana coronaria* plants.

Materials and Methods

This work was carried out during two successive seasons of 2016 and 2017 in the Experimental lathe house of Horticulture Dept., Faculty of Agric., Benha University, Kalubia Governorate, Egypt to study the effect of paclobutrazol, cycocel and pinching treatments on growth, flowering and chemical composition of potted *Tabermaemontana coronaria* plants. Uniform terminal cuttings 7-8cm length with 2-3 leaves and 0.31- 0.35 cm thickness were planted on November 1st 2017 and 2018 in 8 cm plastic pots containing 1:1 mixture of peat moss and sand. Then, were placed under plastic tunnel conditions at the lathe house. On February 1st 2017 and 2018, uniform well rooted cuttings producing 5-6 leaves at 15-17 cm height were repotted in 20cm diameter plastic pots filled with a mixture of 1 sand :1 peat moss (v:v:v). 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	Seasons	
		2012/2013	2013/2014
$CaCO_3$	%	1.09	1.01
Organic matter	%	1.82	1.73
Available nitrogen	%	0.34	0.86
Available phosphorus	%	0.13	0.61
Available potassium	%	0.24	0.79
E.C	ds/m	1.34	1.39
pH	----------	6.73	6.75

After one month from repotting process (March 1st during the two seasons), the plants were arranged into two groups ; the first one was lifted without pinching , while the second group was subjected to pinching treatment by removing 1cm from the seedling top, then all plants of the two groups were subjected to three sprays with paclobutrazol at 0.0, 30, 60 and 90 ppm and cycocel at 0.0, 1000, 2000 and 3000 ppm plus tap water as control at one month intervals. 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. The treatments were arranged at random in three replicates with 10 pots/ each at the lathe house. After two months from replanting, the plants were fertilized every month with chemical NPK fertilizer using ammonium sulfate (20.5% N), calcium superphosphate (15.5% P_2O_5) and potassium sulfate (48% K_2O). A mixture of the three fertilizers, with a ratio of 1: 1: 1 (N: P_2O_5: K_2O), was prepared and applied to the pots at the rate of 2 g/pot. Common agricultural practices (irrigation, manual weed control, etc.) were carried out when needed.

Recorded data:

I- Vegetative growth measurements:

Vegetative characteristics were taken at full flowering stage (September 1st during the two seasons) included plant height (measured from surface of the potting medium to the tallest branch), number of branches/ plant, leaf area (cm^2), number of leaves/ plant, fresh and dry weights of leaves/ plant.

2- Flowering growth measurements:

Flowering characteristics were taken at full flowering stage (October 1st during the two seasons) involved flowering start (days from planting to flowering), number of flowers/ plant, fresh and dry weights of flowers/plant and show value (as plant width / plant height ratio according to **Berghage *et al.*, (1989)**.

3-Root growth measurements:

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

4- Chemical composition determinations:

a- Pigment content (mg/g F.W.) determination:

Chlorophyll a, b and carotenoid were determined in leaf fresh samples (mg/g F. W.) as described by **Saric *et al.*, (1967)**.

Nutrient element % determination:

The chemical analysis was carried out on dried leaves samples obtained from the different treatments. The dry leaves were ground to a fine powder for the determination of N, P and K elements.

N, P and K elements were determined in the acid digested solution, which was prepared according to **Hach *et al.*, (1985)** using a mixture of hydrogen peroxide and sulphuric acid (4:10). Elements estimated were made on 0.2 gm of the dried samples.

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)**.

b- Total carbohydrates % determination:

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 **Bricker** (**1991**). 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

Effect of paclobutrazol, cycocel and pinching treatments on growth, flowering and chemical composition of *Taberaemontana coronaria plants* during 2017 and 2018 seasons.

I.A. Effect on the vegetative growth parameters .

1. Plant height (cm):

According to data presented in Table (1) on plant height as affected by paclobutrazol, cycocel and pinching treatments, it could be concluded that all paclobutrazol, cycocel and pinching treatments as well as their combination affected the plant height of Tabernaemontana plants as compared with control in both seasons. However, plants received the different paclobutrazol and cycocel were shorter than the untreated plants. However, the height concentration of paclobutrazol (90 ppm) was the most effective one for producing the shortest plants (34.2 and 32.65 cm), followed by using the high concentration of cycocel (3000 ppm) which gave 38.25 cm and 36.2 cm in the first and second seasons, respectively .

Table 1. Effect of growth retardants, pinching and their combination on plant height of *Tabernaemontana coronaria* plants during 2016 and 2017 seasons.

Parameter / Treatments		First season		Mean
		Non- Pinched	Pinched	
Control		54.3	51.8	**53.05**
PP333	30 ppm	48.3	45.2	**46.75**
	60	42.4	39.8	**41.1**
	90	36.1	32.3	**34.2**
CCC	1000	51.2	49.3	**50.25**
	2000	46.4	45.6	**46**
	3000	39.6	36.9	**38.25**
Mean		**45.4714**	**42.9857**	
LS.D at 0.5 for		Retardants=3.03	Pinching=1.21	Interaction 4.84
		Second Season		
Control		56.8	51.3	**54.05**
PP333	30 ppm	51.2	48.6	**49.9**
	60	41.6	38.2	**39.9**
	90	34.2	31.1	**32.65**
CCC	1000	52.4	48.2	**50.3**
	2000	43.9	39.9	**41.9**
	3000	38.2	34.2	**36.2**
Mean		**45.4714**	**41.6429**	
LS.D at 0.5 for		Retardants=1.83	Pinching=3.45	Interaction=5.52

Moreover, paclobutrazole and cycocel at the medium concentration decreased the plant height of this plant as compared with untreated plants in the two seasons. On contrary, the tallest plants were recorded by control plants in both seasons. As for the effect of pinching treatments, data in the same table show that pinched plants were superior for decreasing the plant height of Tabernaemontana plants as compared with un-pinched plants in the two seasons. Regarding the interaction effect between the used growth retardants and pinching, data in Table, 1 reveal that all pinched plants received growth retardants treatments were more shorter than those received growth retardants without pinching in the two seasons. Anyhow, the

shortest plants was gained by those subjected to pinching treatment and sprayed with pp333 at 90 ppm as it scored 32.3 and 31.3 cm, followed by those received pp333 at 90 ppm without inching as it recorded 36.1 and 34.2 cm in the first and second seasons, respectively.

2. Branches number/plant:

Data in Table (2) revealed that all tested concentrations of paclobutrazol and cycocel succeeded in increasing the number of branches / plant as compared with control plants in both seasons of this study. However, the highest number of branches/plant was gained by 90 ppm paclobutrazol-sprayed plants as it scored 8.11 and 8.36 branches/plant, followed in descending order by using cycocel at the high concentration (3000 ppm) as it recorded 7.72 and 7.94 branches/plant in the first and second seasons, respectively . Moreover, paclobutrazol at 60 ppm and cycocel at 3000 ppm gave highly significant increases in the number of branches/plant in both seasons of this study .

Referring to the effect of pinching treatments, data in |Table, 2 indicate that the plants were subjected to pinching is showed to be the most effective one for inducing the greatest number of branches/plant as compared with un-pinched plants in the two seasons of this study. Concerning the interaction effect between the used growth retardants and pinching, data in Table, 2 clear that all pinched plants received growth retardants treatments have more branches than those received growth retardants without pinching in the two seasons. Anyhow, the highest number of branches/plant plants was scored by those subjected to pinching treatment and sprayed with pp333 at 90 ppm as it scored 8.41 and 8.74 cm, followed by those received pp333 at 90 ppm without inching as it recorded 7.81 and 7.98 cm in the first and second seasons, respectively.

Table 2. Effect of growth retardants, pinching and their combination on branches number/ plant of *Tabernaemontana coronaria* plants during 2016 and 2017 seasons.

Parameter / Treatments		First season		Mean
		Non- Pinched	Pinched	
Control		4.26	4.92	**4.59**
	30 ppm	5.17	5.61	**5.39**
PP333	**60**	6.94	7.24	**7.09**
	90	7.81	8.41	**8.11**
	1000	5.24	5.36	**5.3**
CCC	**2000**	6.46	6.81	**6.635**
	3000	7.48	7.96	**7.72**
Mean		**6.1943**	**6.6157**	
LS.D at 0.5 for		Retardants=0.14	Pinching0.35	Interaction=0.56
		Second Season		
Control		4.86	5.04	**4.95**
	30 ppm	6.02	6.46	**6.24**
PP333	**60**	7.16	7.63	**7.395**
	90	7.98	8.74	**8.36**
	1000	5.84	6.12	**5.98**
CCC	**2000**	6.90	7.36	**7.13**
	3000	7.46	8.42	**7.94**
Mean		**6.6029**	**7.11**	
LS.D at 0.5 for		Retardants=0.12	Pinching=0.30	Interaction =0.48

3. Leaves number / plant:

Data presented in Table (3) showed that all examined growth retardants treatments increased the leaves number / plant as compared with control in both seasons. Anyway, the increment in leaves number / plant of Tabernaemontana plants is proportionally with the increases of paclobutrazol or cycocel concentration, so the highest number of leaves/plant was recorded by 90 ppm paclobutrazol-sprayed plant as it scored 79.35 and 81.75 leaves/plant, followed in descending order by 3000 ppm cycocel-sprayed plants which recorded 74.95 and 77.50 leaves/plant in the first and second seasons, respectively . In addition, paclobutrazol at 60 ppm and cycocel at 3000 ppm gave highly increments in this parameter in both seasons. As for the effect of pinching treatments, data in |Table, 3 indicate that the greatest number of leaves per plant was gained by those subjected to pinching as compared with those un-pinched in the two seasons of this study. With regard to the interaction effect between the used growth retardants and pinching, data in Table, 3 declare that all pinched plants received growth retardants treatments have more leaves than those received growth retardants without pinching in the two seasons. In this concern, the highest number of leaves/plant plants was recorded by those subjected to pinching treatment and sprayed with pp333 at 90 ppm as it scored 82.3 and 85.3, followed by pinched plants and received cycocel at 3000 ppm as it recorded 77.4 and 82.4 in the first and second seasons, respectively.

Table 3. Effect of growth retardants, pinching and their combination on leaves number/ plant of *Tabernaemontana coronaria* plants during 2016 and 2017 seasons.

Parameter / Treatments		First season		Mean
		Non- Pinched	Pinched	
Control		37.8	44.1	**40.95**
	30 ppm	47.3	52.2	**49.75**
PP333	60	65.6	69.1	**67.35**
	90	76.4	82.3	**79.35**
	1000	47.8	48.8	**48.3**
CCC	2000	60.8	64.6	**62.7**
	3000	72.5	77.4	**74.95**
Mean		**58.3143**	**62.6429**	
LS.D at 0.5 for		Retardants=2.14	Pinching=5.35	Interaction=8.56
		Second Season		
Control		43.3	45.5	**44.4**
	30 ppm	55.8	59.6	**57.7**
PP333	60	67.6	72.3	**69.95**
	90	78.2	85.3	**81.75**
	1000	53.4	56.2	**54.8**
CCC	2000	65.6	69.4	**67.5**
	3000	72.6	82.4	**77.5**
Mean		**62.4**	**67.2**	
LS.D at 0.5 for		Retardants=1.81	Pinching=4.53	Interaction =7.24

4. Leaf area (cm^2):

Data tabulated in Table (4) revealed that all studied concentrations of paclobutrazol and cycocel decreased leaf area of Tabernaemontana plant as compared with un-treated control in both seasons. Anyhow, it was found that there was a negative correlation between the values of leaf area and the concentration of paclobutrazol or cycocel. So, as the concentration of paclobutrazol or cycocel increased the values of leaf area decreased until reach to the maximum decrease at the high level in both seasons. Anyway, 90 ppm paclobutrazol-sprayed plants induced the lowest values in this concern as it scored 28.25 and 26.10 cm^2, followed in ascending order by 3000 ppm cycocel-sprayed plants which registered 30.90 and 28.30 cm^2, in the first and second seasons, respectively. Besides, pp333 and cycocel at the medium concentration recorded highly reduction in leaf area values of this plants in both seasons of this study. On the reverse, the highest values of leaf area were gained by un-treated control in both seasons.

Table 4. Effect of growth retardants, pinching and their combination on leaf area of *Tabernaemontana coronaria* plants during 2016 and 2017 seasons.

Parameter / Treatments		First season		Mean
		Non- Pinched	Pinched	
Control		41.8	40.6	**41.2**
	30 ppm	38.4	37.2	**37.8**
PP333	60	31.9	30.4	**31.15**
	90	28.3	28.2	**28.25**
	1000	38.1	37.6	**37.85**
CCC	2000	34.2	32.4	**33.3**
	3000	31.7	30.1	**30.9**
Mean		**34.9143**	**33.7857**	
LS.D at 0.5 for		Retardants=1.15	Pinching=2.88	Interaction=4.60
		Second Season		
Control		38.4	37.1	**37.75**
	30 ppm	32.4	31.2	**31.8**
PP333	60	28.9	28.1	**28.5**
	90	26.4	25.8	**26.1**
	1000	34.1	33.2	**33.65**
CCC	2000	30.2	30.0	**30.1**
	3000	28.7	27.9	**28.3**
Mean		**31.3**	**30.4714**	
LS.D at 0.5 for		Retardants=1.11	Pinching=2.78	Interaction =4.44

As for the effect of pinching treatments, data in the same table show that pinched plants were superior for decreasing the leaf area of Tabernaemontana plants as compared with un-pinched plants in the two seasons. Regarding the interaction effect between the used growth retardants and pinching, data in Table, 4 reveal that all pinched plants received growth retardants treatments have smallest leaves than those received growth retardants without pinching in the two seasons. Anyhow, the smallest leaf area was gained by those subjected to pinching treatment and sprayed with pp333 at 90 ppm as it scored 28.2 and 25.8 cm2, followed by those received pp333 at 90 ppm without inching as it recorded 28.3 and 26.4 cm in the first and second seasons, respectively.

5. Leaves fresh and dry weights (g):

The data obtained on fresh and dry weights of the leaves per plant (g) as affected by paclobutrazol, cycocel and pinching treatments are shown in Table (5 and 6). These results may be discussed as follows.

All studied treatments of paclobutrazol and cycocel statistically increased the fresh and dry weight of leaves per plant over control in both seasons. However , pp333 at 90 ppm should its superiority in this concern , which included the heaviest fresh and dry weights of leaves/plant in the two seasons . Besides, paclobutrazol at the medium concentration and cycocel at the high concentration recorded high significant increments in this respect in both seasons of this study.

As for the effect of pinching treatments, data in Table, 5 and 6 reveal that the heaviest leaves fresh and dry weights per plant was gained by those subjected to pinching as compared with those un-pinched in the two seasons of this study.

With regard to the interaction effect between the used growth retardants and pinching, data in Table, 5 and 6 show that the heaviest fresh and dry weight of leaves/plant plants was recorded by those un-pinched and sprayed with pp333 at 90 ppm, followed by those sprayed with pp333 at 60 ppm. This trend was true only in the first season, while in the second one the heaviest leaves fresh weight was gained by those pinched and received pp333 at 90 ppm, followed by those received cycocel at 3000vppm.

Table 5. Effect of growth retardants, pinching and their combination on leaves fresh weight / plant of *Tabernaemontana coronaria* plants during 2016 and 2017 seasons.

Parameter / Treatments		First season		Mean
		Non- Pinched	Pinched	
Control		59.2	74.8	**67**
	30 ppm	70.5	78.1	**74.3**
PP333	60	96.6	82.8	**89.7**
	90	98.4	90.2	**94.3**
	1000	70.1	76.8	**73.45**
CCC	2000	78.6	89.6	**84.1**
	3000	86.9	89.8	**88.35**
Mean		**80.0429**	**83.1571**	
LS.D at 0.5 for		Retardants=2.17	Pinching=5.43	Interaction=8.68
		Second Season		
Control		73.1	69.6	**71.35**
	30 ppm	77.8	88.5	**83.15**
PP333	60	87.2	93.2	**90.2**
	90	93.6	98.6	**96.1**
	1000	84.1	79.8	**81.95**
CCC	2000	86.2	89.6	**87.9**
	3000	86.9	94.7	**90.8**
Mean		**84.1286**	**87.7143**	
LS.D at 0.5 for		Retardants=2.07	Pinching=5.18	Interaction =8.28

Table 6. Effect of growth retardants, pinching and their combination on leaves dry weight / plant of *Tabernaemontana coronaria* plants during 2016 and 2017 seasons.

Parameter		First season		
Treatments		Non- Pinched	Pinched	Mean
Control		9.44	11.8	**10.62**
	30 ppm	11.2	12.5	**11.85**
PP333	60	15.4	13.2	**14.3**
	90	15.7	14.4	**15.05**
	1000	11.1	12.2	**11.65**
CCC	2000	12.5	14.2	**13.35**
	3000	13.8	14.3	**14.05**
Mean		**12.7343**	**13.2286**	
LS.D at 0.5 for		Retardants=0.87	Pinching=2.18	Interaction=3.48
		Second Season		
Control		12.4	11.7	**12.05**
	30 ppm	13.1	14.9	**14**
PP333	60	14.8	15.8	**15.3**
	90	15.8	16.7	**16.25**
	1000	14.3	13.5	**13.9**
CCC	2000	14.6	15.2	**14.9**
	3000	14.7	15.9	**15.3**
Mean		**14.2429**	**14.8143**	
LS.D at 0.5 for		Retardants=0.64	Pinching =1.6	Interaction =2.56

I.B. Effect on the flowering growth parameters .

1. Flowering start (days):

Data of time to the first flower showing colour as an indicator of flower development by days determined from the beginning of the planting March, 1st in the two seasons, are shown in Table (7).

Data indicated that all paclobutrazol and cycocel treatments delayed the flowering (increasing the number of days from planting to start flowering) of *Tabernaemontana coronaria* plants as compared with untreated control plants in both seasons.

Table 7. Effect of growth retardants, pinching and their combination on flowering stort of *Tabernaemontana coronaria* plants during 2016 and 2017 seasons.

Parameter		First season		Mean
Treatments		Non- Pinched	Pinched	
Control		92	94	**93**
	30 ppm	108	112	**110**
PP333	60	114	118	**116**
	90	126	129	**127.5**
	1000	102	106	**104**
CCC	2000	112	118	**115**
	3000	118	121	**119.5**
Mean		**110.2857**	**114**	
LS.D at 0.5 for		Retardants 2.16	Pinching=5.4	Interaction =8.64
		Second Season		
Control		98	102	**100**
	30 ppm	114	118	**116**
PP333	60	119	123	**121**
	90	131	135	**133**
	1000	108	112	**110**
CCC	2000	121	124	**122.5**
	3000	126	130	**128**
Mean		**116.7142**	**120.5714**	
LS.D at 0.5 for		Retardants=2.49	Pinching=6.23	Interaction=9.96

However , the greatest delay of *Tabernaemontana coronaria* flowering was gained by 90 ppm paclobutrazol-spryed plants as it recorded 127.5 and 133 days , followed in descending order by using the high concentration of cycocel as it scored 119.5 and 128.0 days, in the first and second seasons,

respectively . Also, pp333 and cycocel at the medium concentrations gave highly delaying in flowering start in both seasons of this plants. On the reverse, the earliest flowering was occurred by untreated plants as it registered 93 and 100 days, followed in ascending order by 2000 ppm cycocel-sprayed plants which gave 104 and 110 days, in the first and second seasons, respectively. As for the effect of pinching treatments, data in the same table show that pinched plants were superior for delaying the flowering of Tabernaemontana plants as compared with un-pinched plants in the two seasons. Regarding the interaction effect between the used growth retardants and pinching, data in Table, 7 reveal that all pinched plants received growth retardants treatments were more delayer than those received growth retardants without pinching in the two seasons. Anyhow, the highest number of days to start flowering was recorded by those pinched and received pp333 at 90 ppm as it scored 129 and 135 days, followed by those received pp333 at 60 ppm without pinching as it recorded 126 and 131 days in the first and second seasons, respectively.

2. Flowers number / plant:

Data in Table (8) indicated that all tested paclobutrazol and cycocel treatments increased the flowers number / plant when compared with un-treated plants in both seasons. On the other hand, the increase in flowers number / plant of *Tabernaemontana coronaria* plants is proportionally with the increment of paclobutrazol or cycocel concentration, hence the highest number of flowers/plant was recorded by 90 ppm paclobutrazol-sprayed plant as it scored 24.32 and 27.1 flowers/plant, followed in descending order by 3000 ppm cycocel-sprayed plants which recorded 22.55 and 25.05 flowers/plant in the first and second seasons, respectively . In addition, pp333 and cycocel at the medium concentrations gave highly increments in this parameter in both seasons.

Regarding the effect of pinching treatments, data in the same table show that pinched plants were superior for increasing the flowers number of Tabernaemontana plants as compared with un-pinched plants in the two seasons. concerning the interaction effect between the used growth retardants and pinching, data in Table, 8 reveal that all pinched plants received growth retardants treatments have more flowers than those received growth retardants without pinching in the two seasons. Anyhow, the highest number of flowers per plant was gained by those subjected to pinching treatment and sprayed with pp333 at 90 ppm as it scored 26.04 and 28.9, followed by those pinched and received cycocel at 3000 ppm as it recorded 23.7 and 27.2 in the first and second seasons, respectively.

Table 8. Effect of growth retardants, pinching and their combination on number of flowers/plant of *Tabernaemontana coronaria* plants during 2016 and 2017 seasons.

Parameter / Treatments		First season		Mean
		Non- Pinched	Pinched	
Control		9.8	12.4	**11.1**
PP333	30 ppm	13.8	16.2	**15**
	60	19.3	21.6	**20.45**
	90	22.6	26.04	**24.32**
CCC	1000	14.04	14.8	**14.42**
	2000	17.9	19.7	**18.8**
	3000	21.4	23.7	**22.55**
Mean		**16.9771**	**19.2057**	
LS.D at 0.5 for		Retardants=1.86	Pinching=4.65	Interaction=7.44
		Second Season		
Control		13.4	14.1	**13.75**
PP333	30 ppm	18.1	19.3	**18.7**
	60	22.01	24.3	**23.155**
	90	25.3	28.9	**27.1**
CCC	1000	16.2	17.9	**17.05**
	2000	21.0	22.8	**21.9**
	3000	22.9	27.2	**25.05**
Mean		**19.8443**	**22.0714**	
LS.D at 0.5 for		Retardants=1.73	Pinching=4.33	Interaction =6.92

3. Flowers fresh and dry weights (g):

The data obtained on fresh and dry weights of the flowers per plant (g) as influenced by paclobutrazol, cycocel and pinching treatments are shown in Tables (9 and 10). These results may be discussed as follows.

All examined treatments of paclobutrazol and cycocel statistically increased the fresh and dry weights of flowers per plant over control in both seasons. However, the heaviest fresh flowers /plant was gained by 90 ppm paclobutrazol - sprayed plants, followed in descending order by using

cycocel at the high concentration (3000 ppm) in the two seasons. Moreover, paclobutrazol at 60 ppm and cycocel at 3000 ppm gave highly significant increasing in flowers fresh and dry weights/plant in both seasons of this study.

Concerning the effect of pinching treatments, data in the same table show that pinched plants were superior for increasing the fresh and dry weights of flowers of Tabernaemontana plants as compared with un-pinched plants in the two seasons. As for the interaction effect between the used growth retardants and pinching, data in Tables, 9 and 10show that all pinched plants received growth retardants treatments have more flowers fresh and dry weights than those received growth retardants without pinching in the two seasons. Anyhow, the heaviest fresh and dry weights of flowers per plant were gained by those subjected to pinching treatment and sprayed with pp333 at 90 ppm, followed by those pinched and received cycocel at 4000 ppm in the two seasons.

Table 9. Effect of growth retardants, pinching and their combination on fresh weight of flowers/plant of *Tabernaemontana coronaria* plants during 2016 and 2017 seasons.

Parameter / Treatments		First season		Mean
		Non- Pinched	Pinched	
Control		15.7	21.9	**18.8**
	30 ppm	20.8	25.9	**23.35**
PP333	60	27.1	32.4	**29.75**
	90	30.6	33.8	**32.2**
	1000	21.2	22.2	**21.7**
CCC	2000	25.1	27.6	**26.35**
	3000	29.1	32.6	**30.85**
Mean		**24.2286**	**28.0571**	
LS.D at 0.5 for		Retardants=1.89	Pinching=4.73	Interaction=7.56
		Second Season		
Control		24.2	26.8	**25.5**
	30 ppm	30.8	34.7	**32.75**
PP333	60	35.2	41.3	**38.25**
	90	37.4	46.2	**41.8**
	1000	27.5	32.2	**29.85**
CCC	2000	33.6	36.4	**35**
	3000	35.8	41.9	**38.85**
Mean		**32.0714**	**37.0714**	
LS.D at 0.5 for		Retardants=1.49	Pinching=3.73	Interaction =5.96

Table 10. Effect of growth retardants, pinching and their combination on dry weight of flowers/plant of *Tabernaemontana coronaria* plants during 2016 and 2017 seasons.

Parameter / Treatments		First season		Mean
		Non- Pinched	Pinched	
Control		2.04	2.86	**2.45**
	30 ppm	2.71	3.37	**2.71**
PP333	60	3.53	4.21	**3.87**
	90	3.80	4.39	**4.095**
	1000	2.77	2.89	**2.83**
CCC	2000	3.28	3.59	**3.435**
	3000	3.71	4.28	**3.995**
Mean		**3.12**	**3.66**	
LS.D at 0.5 for		Retardants=0.22	Pinching=0.55	Interaction=0.88
		Second Season		
Control		3.39	3.78	**3.585**
	30 ppm	4.32	4.88	**4.6**
PP333	60	4.98	5.79	**5.385**
	90	5.21	6.49	**5.85**
	1000	3.86	4.53	**4.195**
CCC	2000	4.72	5.12	**4.92**
	3000	5.04	5.92	**5.48**
Mean		**4.5029**	**5.2157**	
LS.D at 0.5 for		Retardants=0.31	Pinching=0.78	Interaction =1.24

4- Plant width

Data in Table (-) revealed that all tested concentrations of paclobutrazol and cycocel succeeded in increasing the plant width of *Tabernaemontana coronaria* as compared with control plants in both seasons of this study. However, the widest plant was gained by 3000 ppm cycocel-sprayed plants, followed in descending order by using pp333 at the high concentration (90 ppm). This trend was true in the first season, while in the second one pp333 at the high concentration showed its superiority in this concern, followed by cycocel at the high concentration.

Referring to the effect of pinching treatments, data in |Table, 11 indicate that the differences between the values of pinched and not pinched plants do not reached to the level of significant in the two seasons of this study. Concerning the interaction effect between the used growth retardants and pinching, data in Table, 11 clear that the widest plants was scored by those not pinched and sprayed with cycocel at 3000 ppm and those subjected to pinching and sprayed with pp333 at 90 ppm as they gave the same exact value in the first season, while in the second one pp333 at 90 ppm either sprayed on pinched or not pinched plants showed its superiority in this concern .

Table 11. Effect of growth retardants, pinching and their combination on plant width of *Tabernaemontana coronaria* plants during 2016 and 2017 seasons.

Parameter / Treatments		First season		Mean
		Non- Pinched	Pinched	
Control		18.3	19.8	**19.05**
	30 ppm	21.6	23.4	**22.5**
PP333	**60**	27.8	29.2	**28.5**
	90	32.4	29.3	**30.85**
	1000	19.8	21.0	**20.4**
CCC	**2000**	24.3	26.1	**25.2**
	3000	31.2	32.4	**31.8**
Mean		**25.0571**	**25.8857**	
LS.D at 0.5 for		Retardants=0.37	Pinching=0.93	Interaction=1.48
		Second Season		
Control		17.4	18.1	**17.75**
	30 ppm	24.2	25.1	**24.65**
PP333	**60**	26.1	26.4	**26.25**
	90	29.1	28.9	**29**
	1000	23.1	23.2	**23.15**
CCC	**2000**	24.8	24.9	**24.85**
	3000	26.2	26.7	**26.45**
Mean		**24.4143**	**24.7571**	
LS.D at 0.5 for		Retardants=0.22	Pinching=0.55	Interaction =0.88

5. Show value (plant width / height ratio):

Data presented in Table (12) showed that all examined treatments of paclobutrazol and cycocel succeeded in increasing the show value of *Tabernaemontana coronaria* plants when compared with control plants in both seasons of this study. However, the highest record of show value was scored by 90 ppm paclobutrazol-sprayed plants as it registered 0.91 and 0.89, followed by cycocel at 3000 ppm as it registered 0.84 and 0.73 in the first and second seasons, respectively. Moreover, paclobutrazol at 60 ppm and cycocel at 3000 ppm gave highly records in this concern in both seasons. On contrary, the lowest values were scored by un-sprayed plants, followed in ascending order by paclobutrazol and cycocel at the lowest concentration in both seasons.

Referring to the effect of pinching treatments, data inTable, 12 indicate that the plants were subjected to pinching is showed to be the most effective one for inducing the greatest show value as compared with un-pinched plants in the two seasons of this study. Concerning the interaction effect between the used growth retardants and pinching, data in Table, 12 clear that all pinched plants received growth retardants treatments have more show values than those received growth retardants without pinching in most cases in the two seasons. Anyhow, the highest values of show values were scored by those subjected to pinching treatment and sprayed with pp333 at 90 ppm as it scored 0.91 and 0.93, followed by those received pp333 at 90 ppm without inching as it recorded 0.90 and 0.85 cm in the first and second seasons, respectively.

Table 12. Effect of growth retardants, pinching and their combination on show value of *Tabernaemontana coronaria* plants during 2016 and 2017 seasons.

Parameter / Treatments		First season		Mean
		Non- Pinched	Pinched	
Control		0.34	0.38	**0.36**
	30 ppm	0.44	0.52	**0.48**
PP333	60	0.66	0.73	**0.695**
	90	0.90	0.91	**0.905**
	1000	0.39	0.43	**0.41**
CCC	2000	0.52	0.57	**0.545**
	3000	0.79	0.88	**0.835**
Mean		**0.5771**	**0.6314**	
LS.D at 0.5 for		Retardants=0.08	Pinching=0.20	Interaction=0.32
		Second Season		
Control		0.31	0.35	**0.33**
	30 ppm	0.47	0.52	**0.495**
PP333	60	0.63	0.69	**0.66**
	90	0.85	0.93	**0.89**
	1000	0.44	0.48	**0.46**
CCC	2000	0.56	0.62	**0.59**
	3000	0.67	0.78	**0.725**
Mean		**0.5614**	**0.6243**	
LS.D at 0.5 for		Retardants=0.07	Pinching=0.17	Interaction =0.28

I.C. Effect on the root growth parameters .

1. Roots number / plant:

The data obtained on the number of roots per plant at the end of both first and second seasons (December, 1st) as affected by paclobutrazol, cycocel and pinching are presented in Table (13) .

Data showed that the mean number of roots per plant increased progressively with the increasing of paclobutrazol or cycocel concentrations in both seasons. So, the highest concentrations of paclobutrazol showed to be the most effective one for inducing the highest number of roots per plant as it scored 14.5 and 17.05, followed in descending order by the high rate of cycocel as it recorded 13.55 and 15.65 roots/plant in the first and second seasons, respectively.

Table 13. Effect of growth retardants, pinching and their combination on number of roots / plant of *Tabernaemontana coronaria* plants during 2016 and 2017 seasons.

Parameter / Treatments		First season		Mean
		Non- Pinched	Pinched	
Control		8.32	8.84	**8.58**
	30 ppm	10.4	11.1	**10.75**
PP333	60	12.6	13.2	**12.9**
	90	14.1	14.9	**14.5**
	1000	10.7	11.3	**11**
CCC	2000	11.9	12.6	**12.25**
	3000	13.2	13.9	**13.55**
Mean		**11.6029**	**12.2629**	
LS.D at 0.5 for		Retardants=0.43	Pinching=1.08	Interaction=1.72
		Second Season		
Control		9.40	10.3	**9.85**
	30 ppm	11.8	12.9	**12.35**
PP333	60	14.7	15.8	**15.25**
	90	16.3	17.8	**17.05**
	1000	12.1	12.3	**12.2**
CCC	2000	12.9	13.8	**13.35**
	3000	15.1	16.2	**15.65**
Mean		**13.1857**	**14.1571**	
LS.D at 0.5 for		Retardants=0.51	Pinching=1.28	Interaction =2.04

2. Roots fresh and dry weights (g):

The data obtained on fresh and dry weights of the roots per plant (g) as affected by paclobutrazol and cycocel treatments are shown in Tables (14 and 15). These results may be discussed as follows. All studied treatments of paclobutrazol and cycocel statistically increased the fresh and dry weights of roots per plant as compared with control in both seasons. However , all tested concentrations of cycocel should its superiorities in this concern , especially the medium concentration (3000ppm) which induced the heaviest fresh weight of roots/plant, followed in descending order by using the highest concentration of cycocel in the two seasons . As for the effect of pinching treatments, data in the same tables show that pinched plants were superior for increasing the fresh and dry weight of roots of Tabernaemontana plants as compared with un-pinched plants in the two seasons. Referring to the interaction effect between the used growth retardants and pinching, data in Tables, 14 and 15 show that all pinched plants received growth retardants treatments have more roots fresh weight than those received growth retardants without pinching in the two seasons. In this respect, the heaviest fresh weight of roots per plant was gained by those subjected to pinching treatment and sprayed with pp333 at 90 ppm, followed by those not pinched and received pp333 at 90 ppm in the two seasons.

Table 14. Effect of growth retardants, pinching and their combination on fresh weight of roots/plant of *Tabernaemontana coronaria* plants during 2016 and 2017 seasons.

Parameter / Treatments		First season		Mean
		Non- Pinched	Pinched	
Control		12.1	12.6	**12.35**
PP333	30 ppm	13.6	14.5	**14.05**
	60	16.7	17.2	**16.95**
	90	18.4	19.4	**18.9**
CCC	1000	13.9	14.8	**14.35**
	2000	15.6	16.4	**16**
	3000	17.2	18.2	**17.7**
Mean		**15.3571**	**16.1571**	
LS.D at 0.5 for		Retardants=0.35	Pinching=0.88	Interaction=1.40
		Second Season		
Control		13.2	14.5	**13.85**
PP333	30 ppm	16.6	18.1	**17.35**
	60	21.0	22.2	**21.6**
	90	22.9	25.1	**24**
CCC	1000	17.0	17.3	**17.15**
	2000	18.1	19.4	**18.75**
	3000	21.3	22.7	**22**
Mean		**18.5857**	**19.9**	
LS.D at 0.5 for		Retardants=0.77	Pinching=1.93	Interaction =3.08

Table 15. Effect of growth retardants, pinching and their combination on dry weight of roots/plant of *Tabernaemontana coronaria* plants during 2016 and 2017 seasons.

Parameter / Treatments		First season		Mean
		Non- Pinched	Pinched	
Control		1.58	1.64	**1.61**
PP333	30 ppm	1.78	1.89	**1.835**
	60	2.18	2.31	**2.245**
	90	2.41	2.61	**2.51**
CCC	1000	1.81	1.92	**1.865**
	2000	2.11	2.14	**2.125**
	3000	2.24	2.40	**2.32**
Mean		**2.0157**	**2.13**	
LS.D at 0.5 for		Retardants=NS	Pinching=0.21	Interaction=0.34
		Second Season		
Control		1.73	2.05	**1.89**
PP333	30 ppm	2.34	2.54	**2.44**
	60	2.95	3.21	**3.08**
	90	3.21	3.52	**3.365**
CCC	1000	2.39	2.46	**2.425**
	2000	2.54	2.78	**2.66**
	3000	3.00	3.18	**3.09**
Mean		**2.5943**	**2.82**	
LS.D at 0.5 for		Retardants=0.14	Pinching=0.35	Interaction =0.56

I.D. Effect on the chemical composition determinations.

Data in Table (16 to 20) declared that all studied treatments of paclobutrazol and cycocel increased the chemical composition content of *Tabernaemontana coronaria* plants as compared with control in both seasons of this study. However, the highest levees nitrogen content was gained by those subjected to spraying with cycocel at 3000 ppm either pinched or not pinched in the two seasons. The highest leaves phosphorus content was gained by those subjected to spraying with cycocel at 3000 ppm either pinched or not pinched in the two seasons. Moreover, the greatest leaf potassium percentage was gained by those subjected to pinching treatment and sprayed with pp333 at 90 ppm as it scored 1.62 and 1.77 %, followed by those received pp333 at 90 ppm without inching as it recorded 1.52 and 1.76 % in the first and second seasons, respectively. Also, the greatest leaf total carbohydrates percentage was gained by those subjected to pinching treatment and sprayed with pp333 at 90 ppm as it scored 14.8 and 16.7 %, followed by those received pp333 at 90 ppm without pinching as it recorded 14.3 and 16.1 % in the first and second seasons, respectively. Furthermore, the greatest leaf total chlorophylls content was gained by those subjected to pinching treatment and sprayed with pp333 at 90 ppm as it scored 289 and 296 (mg/100g F.W), followed by those received pp333 at 90 ppm without pinching as it recorded 286 and 291 (mg/100g F.W) in the first and second seasons, respectively.

Table 16. Effect of growth retardants, pinching and their combination on leaf nitrogen percentage of *Tabernaemontana coronaria* plants during 2016 and 2017 seasons.

Parameter / Treatments		First season		Mean
		Non- Pinched	Pinched	
Control		1.84	1.81	**1.825**
PP333	30 ppm	1.96	1.98	**1.97**
	60	2.16	2.13	**2.145**
	90	2.24	2.29	**2.265**
CCC	1000	1.89	1.97	**1.93**
	2000	2.21	2.26	**2.235**
	3000	2.34	2.32	**2.33**
Mean		**2.0914**	**2.1086**	
LS.D at 0.5 for		Retardants=NS	Pinching=0.13	Interaction=0.21
		Second Season		
Control		1.76	1.72	**1.74**
PP333	30 ppm	1.94	2.01	**1.975**
	60	2.19	2.16	**2.175**
	90	2.31	2.34	**2.325**
CCC	1000	2.04	2.01	**2.025**
	2000	2.28	2.25	**2.265**
	3000	2.39	2.46	**2.425**
Mean		**2.13**	**2.1357**	
LS.D at 0.5 for		Retardants=NS	Pinching=0.17	Interaction =0.27

Table 17. Effect of growth retardants, pinching and their combination on leaf phosphorus percentage of *Tabernaemontana coronaria* plants during 2016 and 2017 seasons**.**

Parameter / Treatments		First season		Mean
		Non- Pinched	Pinched	
Control		0.21	0.24	**0.225**
PP333	30 ppm	0.29	0.31	**0.3**
	60	0.34	0.32	**0.33**
	90	0.36	0.34	**0.35**
CCC	1000	0.27	0.26	**0.265**
	2000	0.35	0.33	**0.34**
	3000	0.39	0.38	**0.385**
Mean		**0.3157**	**0.3114**	
LS.D at 0.5 for		Retardants=NS	Pinching=0.03	Interaction=0.48
		Second Season		
Control		0.19	0.20	**0.195**
PP333	30 ppm	0.26	0.24	**0.25**
	60	0.31	0.29	**0.3**
	90	0.34	0.34	**0.34**
CCC	1000	0.25	0.26	**0.255**
	2000	0.32	0.33	**0.325**
	3000	0.36	0.37	**0.365**
Mean		**0.29**	**0.29**	
LS.D at 0.5 for		Retardants=NS	Pinching=0.02	Interaction=0.032

Table 18. Effect of growth retardants, pinching and their combination on leaf potassium percentage of *Tabernaemontana coronaria* plants during 2016 and 2017 seasons.

Parameter / Treatments		First season		Mean
		Non- Pinched	Pinched	
Control		1.24	1.21	**1.225**
PP333	30 ppm	1.31	1.36	**1.335**
	60	1.46	1.51	**1.485**
	90	1.52	1.62	**1.57**
CCC	1000	1.29	1.26	**1.275**
	2000	1.38	1.34	**1.36**
	3000	1.49	1.52	**1.505**
Mean		**1.3843**	**1.4029**	
LS.D at 0.5 for		Retardants=NS	Pinching=0.07	Interaction=0.11
		Second Season		
Control		1.29	1.31	**1.3**
PP333	30 ppm	1.42	1.40	**1.41**
	60	1.64	1.62	**1.63**
	90	1.76	1.79	**1.775**
CCC	1000	1.36	1.34	**1.35**
	2000	1.52	1.50	**1.51**
	3000	1.67	1.64	**1.655**
Mean		**1.5229**	**1.5143**	
LS.D at 0.5 for		Retardants=NS	Pinching=0.06	Interaction =0.09

Table 19. Effect of growth retardants, pinching and their combination on leaf total carbohydrates percentage of *Tabernaemontana coronaria* plants during 2016 and 2017 seasons.

Parameter / Treatments		First season		Mean
		Non- Pinched	Pinched	
Control		8.14	8.46	**8.3**
	30 ppm	10.4	10.1	**10.25**
PP333	60	12.6	12.3	**12.45**
	90	14.3	14.8	**14.55**
	1000	9.62	9.84	**9.73**
CCC	2000	11.2	12.3	**11.75**
	3000	12.9	13.0	**12.95**
Mean		**11.3086**	**11.5429**	
LS.D at 0.5 for		Retardants=NS	Pinching=1.82	Interaction=2.91
		Second Season		
Control		9.62	9.47	**9.545**
	30 ppm	11.8	12.1	**11.95**
PP333	60	14.3	14.1	**14.2**
	90	16.1	16.7	**16.4**
	1000	12.2	12.4	**12.3**
CCC	2000	13.7	13.5	**13.6**
	3000	15.2	14.9	**15.05**
Mean		**13.2743**	**13.31**	
LS.D at 0.5 for		Retardants=NS	Pinching=1.72	Interaction =2.75

Table 20. Effect of growth retardants, pinching and their combination on leaf total chlorophylls content of *Tabernaemontana coronaria* plants during 2016 and 2017 seasons.

Parameter / Treatments		First season		Mean
		Non- Pinched	Pinched	
Control		208	216	**212**
	30 ppm	231	228	**229.5**
PP333	60	264	261	**262.5**
	90	286	289	**287.5**
	1000	219	226	**222.5**
CCC	2000	249	241	**245**
	3000	261	254	**257.5**
Mean		**245.4289**	**245**	
LS.D at 0.5 for		Retardants=NS	Pinching=12.3	Interaction=19.7
		Second Season		
Control		219	214	**216.5**
	30 ppm	226	231	**228.5**
PP333	60	261	254	**257.5**
	90	291	296	**293.5**
	1000	229	225	**227**
CCC	2000	246	243	**244.5**
	3000	254	256	**255**
Mean		**246.5714**	**245.5714**	
LS.D at 0.5 for		Retardants=NS	Pinching=11.7	Interaction =18.7

Conclusion

In general, of all obtained results; those of achieving more dwarf plants of *Tabernaemontana coronaria* with many formed flowers could be considered as pioneer results in this respect. Since, treatments of PP_{333} at 90 and 60 ppm or CCC at 3000ppm gave a good display (show value) of pot of *Tabernaemontana coronaria* with optimum growth characteristics from the commercial point of view when compared with other treatments or control.

References

Beattie, D.J., E.J. Holcomb and C.F. Deneke, 1990. Effects of uniconazole and paclobutrazol on plant height and flowering in *Physostegia virginiana* and Cheloneoblique. Plant Growth

Regulator Society of America, 18(4): 187-193.
Berghage, R.D., R.D. Heins, M. Karlsson, J. Erwin and W. Carlson, 1989. Pinching technique influences lateral shoot development in poinsettia. J. Amer. Soc. Hort. Sci., 114(6): 909-914.
Black, C.D., D.O. Evans, L.E. Ensminger, J.L. White, F.E. Clark and R.C. Dinauer, 1982. Methods of soil analysis. Part 2. Chemical and microbiological properties. 2nd Ed. Soil., Soc. of Am. Inc. Publ., Madison, Wisconsin, U.S.A.
Chany, W.R., 2005. Growth retardants: A promising tool for managing urban trees. Env. Toxicol. Chem., 29: 1224-1236.
Davis, T.D. and A.S. Andersen, 1989. Growth retardants as aids in adapting new floricultural crops to pot culture. Acta Horticulturae, 252: 77-85.
Fletcher, R.A., A. Gill, T.D. Davis and N. Sankhla, 2000. Triazoles as plant growth regulators and stress protectants. Horticulture Review, 24: 55-138.
Ghani, A., 2003. Medicinal Plants of Bangladesh. The Asiatic Society of Bangladesh, Dhaka. 2nd Ed., 7: 176-177.
Herbert, D., P.J. Phipps and R.E. Strange, 1971. Determination of total carbohydrates, Methods in Microbiology, 5(8): 290-344.
PGRSA, 2007. Plant growth regulation handbook of the Plant Growth Regulation Society of America. 4th Edition. The Plant Growth Regulation Society of America, Athens.
Pushpa, B., K.P. Latha, V.P. Vaidya, A. Shruthi and C. Shweath, 2011. In vitro Anthelmintic activiy of leaves extracts of *Tabernaemontana coronaria*. 3(4): 1788-1790.
Snedecor, G.W. and W.G. Cochran, 1989. Statistical methods. 7th Ed. Iowa state Univ. Press. Ames Iowa, USA. Taiz, L. and E. Zeiger, 2006. Plant Physiology. 4th edition. Sinauer Associates, Inc., Publishers, Sunderland.

تاثير استخدام بعض معيقات النمو والتطويش على النمو والازهار والتركيب الكيمائى لنبات التبرنا مونتانا

ا.د.صفاء مصطفى محمد – ا.د. احمد سعيد يوسف – ا.م .د.ياسر عبدالفتاح غطاس – دينا ابراهيم زين العابدين
قسم البساتين – كلية الزراعه – جامعه بنها– مصر

هذا العمل نفذ خلال موسمين ناجحين لعامى 2016 و2017 فى الصوبه الخشبيه التجريبيه لقسم البساتين – كلية الزراعه جامعة بنها – محافظة القليوبيه – مصر لدراسة تاثير معاملات الباكلوبترازول والسيكوسيل والتطويش على النمو والتزهير والتركيب الكيماوى لنباتات التبرنامونتانا كورونااريا المزروعه فى الاصص .

بعد شهر من عملية اعادة تدويرها فى الاصص (الاول من مارس لكلا الموسمين) ، فان النباتات تم ترتيبها فى مجموعتين ،الاولى تركت بدون تطويش بينما الثانيه خضعت لعملية التطويش عن طريق ازالة 1سم من القمه الناميه ، بعد ذلك فان نباتات كلا المجموعتين خضعت لثلاث رشات من الباكلوبترازول بتركيز 30و60و90 جزء فى المليون ومن االسيكوسيل بتركيز 1000و2000و3000جزء فى المليون بالاضافه الى ماء الصنبور ككنترول على فترات متباعده خلال الشهر .النتائج المتحصل عليها اظهرت ان جميع النباتات التى طوشت وعوملت بمعيقات النمو كانوا اقصر طولا من تلك التى عوملت بمعيقات نمو دون تطويش فى كلا الموسمين. بالاضافه الى ان جميع النباتات المطوشه التى عوملت بمعيقات نمو امتلكت عدد اكثر من الفروع والاوراق ومساحة ورقه ووزنا طازجا وجافا لكل نبات من تلك النباتات التى عوملت بمعيقات نمو دون تطويش فى كلا الموسمين. على اى حال ، اكثر الافرع جوده واكثر اوراقا ومساحه للورقه واوزانا طازجه وجافه فى النباتات التى خضعت لعملية التطويش ورشت بالباكلوبترازول بتركيز بتركيز 90جزء فى المليون فى كلا الموسمين . اكثر من ذلك ، فان كل المعاملات محل الدراسه من الباكلوبترازول والسيكوسيل والتطويش ازادت المحتوى الكيميائى لنباتات التبرنامونتانا كورونيا فى كلا الموسمين.