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# Effect of Some Growth Retardants on Control of Vegetative Growth and Flowering of Some Ornamental Plants.

By

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**SUMMARY AND CONCLUSION**

This study was conducted in the Mansoura Research Station, Horticulture Research Institute, Agriculture Research Center, during two successive seasons (2014/2015 and 2015/2016). The objective of this investigation aimed to study the effects of "Cycocel" and "Bonzi." (growth retardants) on the vegetative growth, flowering, and the flowers quality to make *Kalanchoe blossfeldiana* and *Salvia splendens* (scarlet sage) more compact, shorter, with a profuse branches and inflorescences, flowering earlier, and to be more suitable as a pot plants.

Uniform terminal cuttings 7-9 cm length were planted in 8cm plastic pots filled with a mixture of clay and sand (3:1 V:V) on October 1<sup>st</sup> for kalanchoe and February 1<sup>st</sup> for scarlet sage in the both seasons. Then plants were transplanted to 18cm plastic pots filled with the same media after 45 days from planting. The plants were treated on November 15<sup>th</sup> for kalanchoe and March 15<sup>th</sup> for scarlet sage with the growth retardants, while the plants which treated for the second time sprayed in the first of December for kalanchoe and the first of April for scarlet sage. The regenerated plants were fertilized with [(Nutri Leaf) NPK 20:20:20 + micro elements] (recommended) as drench to the soil.

All growth retardants (CCC and PBZ) have been prepared before spraying as follows:

1- Cycocel (CCC): The stock of this compound was a solution contains 20% active substance [(2-chloroethyl) trimethyl ammonium chloride]. The stock was diluted by distilled water to the wanted concentrations (1000, 2000 and 3000 ppm).

2- Paclobutrazol (PBZ): The stock of this compound was a solution contains 25% active substance [(±)-(R,R)-beta-(4-chlorophenyl)methyl)-alpha-(1,1-dimethylethyl)-1H-1,2,4-triazole-1-ethanol]. The stock was diluted by distilled water to the wanted concentrations (50, 100 and 150 ppm).

The kalanchoe and scarlet sage plants were sprayed by the growth retardants as follows:

### **\*Treatments:**

Plants were sprayed after 45 days of planting (spraying once) and after 45 days and 60 days (spraying twice) with chlormequat (CCC) at 1000, 2000 or 3000 ppm, paclobutrazol (PBZ) at 50, 100 or 150 ppm and distilled water, respectively.

The experiments were factorial in a completely randomized block design. Each treatment had six replicates, each of which contains three plants. The first factor was the plant growth retardants type (CCC and PBZ), plus the control treatment (sprayed with distilled water). The second factor was the application times of both growth retardants (once or twice). The data were subjected to statistical analysis of variance of the factorial experiment design according to **Snedecor and Cochran (1989)**. The means were compared using least significant difference test (LSD) at  $P \leq 0.05$ .

*The most important obtained results can be summarized as follows:*

### **1- Vegetative characteristics:**

#### **1.1. Plant height (cm):**

It was quite clear that the shortest plants were obtained when plants treated with PBZ at 150 ppm twice which recorded 10.06 and 10.61 cm compared with control treatment 14.82 and 15.14 cm in the first and second season, respectively for kalanchoe plants. While it was 28.28 and 28.37 compared with control treatment 58.39 and 55.00 cm in the first and second season, respectively for scarlet sage plants.

#### **1.2. Number of branches per plant:**

Results recorded showed that all treatments significantly increased number of branches per plant as compared with control plants. Treated kalanchoe with PBZ at 150 ppm for twice in the second season induced the highest number of branches per plant in (5.81) compared with control treatment (2.44). While it was different in the first season because CCC at 3000 ppm for twice gave the maximum number of branches per plant, as it was (5.72) compared with control treatment (2.89). A remarkable increase was observed when treated scarlet sage with PBZ at 150 ppm for twice, as it was 13.56 and 12.67 branches per plant, while control was 4.67 and 4.44 branches/plant in the first and second season, respectively.

### **1.3. Plant diameter (cm):**

It was obvious that treated kalanchoe with CCC at 3000 ppm for once in the first season gave the width plants as it was 19.72 cm, while the best result in the second season was 20.50 cm when treated with PBZ at 150 ppm for once. Treated scarlet sage with PBZ at 150 ppm for once gave the best results (52.84 and 50.50 cm) when compared with control (28.00 and 23.38 cm in the first and second season, respectively).

## **2- Flowering characteristics:**

### **2.1- Number of inflorescences per plant:**

A significant increment was observed when kalanchoe plants treated with CCC and PBZ treatments. It was clear that treated kalanchoe with PBZ at 150 ppm for twice in the second season gave the maximum number of inflorescences per plant (5.00) when compared with control (1.33). While the best result in the first season emanated from treating plants with CCC at 3000 ppm for once (4.95). It was clear that treated scarlet sage with PBZ at 150 ppm for twice gave the maximum number of inflorescences/ plant (18.96 and 18.23) when compared with control (4.67 and 4.44 in the first and second season, respectively).

### **2.2- Number of florets per inflorescence:**

Untreated kalanchoe gave the maximum of florets/ inflorescence (160 and 167), while the closest result was emanated from treating plants with CCC at 2000 ppm for once (159 and 166.6 in the first and second season respectively). The minimum number of florets per inflorescence was resulted from treating kalanchoe with PBZ for twice at 100 ppm in the first season (72.3) and 150 ppm in the second season (64.3). It was clear that untreated scarlet sage gave the maximum and the same number in this respect in both seasons, as it was 21.00 florets/ inflorescence. Treated scarlet sage with CCC at 1000 ppm for once gave the closest result to control, as it was 20.56 and 20.89 florets/ inflorescence in the first and second season, respectively. The minimum number of florets/ inflorescence was 19.44 (PBZ at 150 ppm for once in the first season) and 20.11 (PBZ 100 and 150 ppm for twice in the second season).

### **2.3- Inflorescence Diameter in Kalanchoe and length in Scarlet sage (cm):**

From the previous results as decreased the number of florets directly caused littleness in the inflorescence diameter. PBZ at 150 ppm for twice gave the minimum value of inflorescence diameter in kalanchoe and inflorescence length in scarlet sage.

### **2.4- Time to flower (day):**

It was worth noting that treated plants with PBZ at 150 ppm for twice, prompted it to flower 23 days (Kalanchoe) and 20 days (Scarlet sage) earlier than control treatment.

### **2.5- The inflorescence blooming period (day):**

Results showed that all treatments were decreased blooming period for about 7 days in both plants (Kalanchoe and Scarlet sage).

## **3-The chemical analysis:**

### **3.1- The total chlorophyll (mg/ g FW):**

All treatments tested increased chlorophyll content. Highly significant values were observed in total chlorophyll when plants treated with the both growth retardants (CCC or PBZ). The maximum chlorophyll content in kalanchoe plants was 0.572 and 0.679 mg/ g FW in the first and second season respectively, when PBZ was used for twice at 150 and 100 ppm respectively. While the equivalent result in scarlet sage was (5.153 and 5.073 mg/ g FW in the first and second season respectively)

### **3.2- The total carbohydrates (mg/ g DW):**

All treatments tested increased carbohydrates content. Highly significant values were observed in total carbohydrates when plants were treated with the both growth retardants (CCC or PBZ). The maximum result in kalanchoe was (171.07 and 207.07 mg/ g DW in the first and second season respectively) obtained when plants treated with PBZ at 150 ppm for twice. While the equivalent result in scarlet sage was 80.06 and 102.08 mg/ g DW in the first and second season respectively, when PBZ was used for twice at 150 and 100 ppm, respectively.



### **4- IV. Anatomical study:**

In the paclobutrazol application (150 ppm twice) the microscopic image of stem cross sections showed that the thickness of xylem was reduced when compared to the control application. The micrograph images of sections from the stems of the control and paclobutrazol-treated kalanchoe and scarlet sage plants showed that treated stem is characterized by increased cortex thickness, well-developed vascular bundles, and reduced internode length.

### **CONCLUSION:**

**It could be concluded from all the data collected in this work that spraying *Kalanchoe blossfeldiana* and *Salvia splendens* with paclobutrazol at 150 ppm for twice, between the first time of spraying and the second 15 days gave the best results over all of other treatments. It may be noted that Paclobutrazol is more economical and safety than chlormequat. Dwarfing and compactness effect, branching and flowering increase color darkness of leaves were achieved in this work. A matter of importance giving the plant to have better quality especially for indoor decoration.**