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EFFECT OF UNICONAZOLE CONCENTRATION AND ITS APPLICATION METHOD ON GROWTH, FLOWERING AND CARBOHYDRATE CONTENT OF *MIRABILIS JALAPA*, L. PLANTS

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ABSTRACT

During two successive experimental seasons, 11- weeks – old plants of *mirabilis jalapa* "L., (four o'clock plants) were treated with uniconazole solution as a foliar spray or a soil drench using the concentrations of 0, 20, 30, 40, 50 and 60 ppm. The experimental design was a split plot with three replicates and the two application methods represented the main plots , where as the concentrations resembled the sub-plots. Number of treatment in each replicate was 12 and 6 plants were used for each treatment per replicate. The significant results can be summarized as follows :-

Regarding the foliar spray and comparing with the control, the concentrations of 20 to 60 ppm in the first season reduced the shoot dry weight, while in the second one decreased the number of flowers and carotenoids content, but in both season decreased the reducing sugars. The concentrations of 30 to 60 ppm increased the number of internods and chlorophyll "a" and "b" in the second season while those of 40 to 60 ppm.0 increased the number of internodes and chlorophyll "b" and delayed the flowering in the first season , but in the second season they decreased the internode length and the leaf area. During the first season concentrations of 50 and 60 ppm

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reduced the inter node length, the branching and the leaf area but increased chlorophyll "a" .

Considering the soil drench and comparing with the control, the concentrations from 20 to 60 ppm, markedly decreased each of the plant height, internode length , branching and reducing sugars, but increased the number of internodes during both seasons, while in the first season they delayed the flowering and in the second one they reduced the number of flowers and carotenoids. The concentrations from 30 to 60 ppm. reduced the leaf area and shoot dry weight during the first season. The concentrations of 40, 50 and 60 ppm reduced the number of flowers and carotenoids in the first season but in the second one they decreased the shoot dry weight, delayed the flowering and increased chlorophyll "a" . During the first season the concentrations of 50 and 60 ppm increased chlorophyll "a". and those of 30 , 50 , and 60 ppm. increased chlorophyll "b" .The rate of 60 ppm reduced the leaf area and increased chlorophyll "b" in the second season .

The general effect of uniconazole showed that the concentrations from 20 to 60 ppm decreased the plant height, internode length , branching , leaf area, shoot dry weight and reducing sugars and delayed the flowering and increased the number of internodes during both seasons. The same concentrations decreased the number of flowers in the first season, while in the second one they increased chlorophyll "b" and decreased carotenoids. The rates from 30 to 60 ppm . increased chlorophyll "a" in both seasons, while in the first season they increased chlorophyll "b" and reduced carotenoids. During the second season , the rates of 30 , 40 and 50 ppm decreased the number of flowers. The comparison between the two methods of application declared that the soil drench was more effective in its retarding effect than the foliar spray.

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INTRODUCTION

Mirabilis Jalapa, (the four-O'clock plant , fam. Nyctaginaceae-) is an affecting perennial herbs, 1 meter or more height, form a thick root; stem forked, many branched, native to tropical America, now widely naturalized and pantropical, planted for medicinal purposes: it is used as a suppurative laxative and cure for scabies and itches. Warmed leaves coated with castor oil are applied to suppurate boils and reduce swellings. A paste of the leaves is applied to cure the irritation of scabies and itches, also there are many landscaping usage for this plant: the plants are grown in cultivation as pot plants and for flower-beds in a sunny weather, also, they can provide a seasonal low hedge, screen, temporary foundation planting or cover of bore sports around the yard. In the Hawaiian Islands, naturalized on midway and its leaves triangular ovate to broadly triangular subcordate, 4-14 cm long, 2-8-5 cm wide, glabrous, rarely puberulent, apex acute to acuminate, petiolate. Flowers are fragrant and produce asubtile and delightful fragrance in terminal, congested or glomerate cymes with many leafy bracts, peduncles 1-5 cm long; involucre with 1 flower, campanulate, deeply 5 lobed, 7-15 mm long; perianth variously coloured, usually dark purplish red, white, yellow or multicolour in naturalized forms, opening in the afternoon, funnelform, 30-50 mm long, tube gradually dilated upward to a broad limb 2- 3.5cm wide, shallowly 5 lobed; stamens 5. Anthocarps dark brown to black, obovoid or subglobose, 8-10 mm long, prominently rugose, glabrous or puberulent (Bailey, 1961).

Several triazol compounds have been observed to be highly effective as growth retardants (Wood, 1988). These compounds have been imported to inhibit gibberellin (GA) biosythesis in plant with high specificity by inhibiting kaurene oxidase, actochrome p-450 oxidase, thus blocking the oxidation of kaurenoic acid (Dalziel and Lawrence 1984). One of these analogs is Uniconazola-p (Sumagic) [E-1-p- Chlorphenyl) -4, 4-dimethyl -2- (1,2,4-triazol-1-y1-1- penten-3-o1)].

Uniconazole is applied to gain control over growth (Barrett, 2001). At the high rate, uniconazole reduced internodes length, elongation

of apical shoots, leaf size, flower size, fruit size and water use. The degree of these effects may be reduced by using moderate rates of uniconazole, treating with gibbrellic acid (GA_3), or by using combination of promalin (GA_{4+7}) at or near anthesis(Williams and Martin, 1967). Also, uniconazola increased shoot numbers (Rounkova, 1989), chlorophyll concentration (Yoon and Lang, 1998), carbohydrates (Han *et al*., 1998), photosynthesis (Thetford *et al.,* 1995b), floral bud initiation (Abdel-Maksoud *et al.,* 1993), flower numbers (Starman, 1991), and resistance to environmental stress (Abd-Maksoud, 1992).

Foliar sprays and drenches are the most common methods of application of plant growth retardants. When plant growth retardants are applied to the foliage, the effect on the vegetation is faster than from soil applications, but is of short duration, and several foliar applications are needed to maintain growth retardation (Sanchez *et al.*, 1988).

This study was carried out for the assessment of the response of *Mirabilis jalapa* "Local variety" to the treatment with uniconazole solution through foliar spray and soil drench in a commercial-like nursery environment in attempt to increase the landscape value of the plant.

MATERIALS AND METHODS

The present study was carried out in two successive seasons of 2007, 2008 in an open field of a private commercial nursery in Damanhour City, El-Beahira Governorate, Egypt.

Seventy seven-days-old uniform plants of a local cultivar of four O'clock plants (*Mirabilis jalapa*) were used in this study. On the 1st of March 2007 and 2008, well developed seeds of *M. Jalapa* obtained from the experimental station of Floriculture and Ornamental Horticulture, Faculty of Agriculture,. Alexandria University were sown in wooden trays filled with a mixture of equal parts of sand and clay. The trays were placed in a shady place in the commercial nursery mentioned before and watered daily. After 4 weeks from sowing, the trays gradually moved from the shade to a sunny place along one week then the seedlings were individually transplanted to 15 cm diameter clay pots, containing a loamy

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soil with pH of 7.3 which contained 0.23% N, 0.06% P_2O_2 and 0.08% K_2O. on April 30, 2007 in the first season and April 28, 2008 in the second one, the plants were repotted in the final clay pots of 30 cm diameter (1 plant/pot) containing the above motioned loamy soil. Walering was carried as required and weed control was undertaken.

Seventy seven-days-old uniform plants of a local cultivar of Four O'clock plants were perparted for uniconazola treatments. Plants were pinched at about 30 cm above soil surface.

All branches and breaks were removed except two ones were kept for each plant with an average length of 15 cm.

Five weights of uniconazole wettable powder; i.e., 20, 30, 40, 50 and 60 mg were transferred to glass flasks. Five acetone drops were added to each weight. Flasks were shaken to dissolve uniconazole in actone, then a little amount of warm tap water was added to each flask and uniconazole was completely dissolved on plate with a magnetic stirrer. Uniconazole solution in each flask was completed to one litter using tap water. Finally, uniconazole concentrations of 20, 30. 40. 50 and 60 ppm were prepared in addition to the control solution, which contained tap water only.

On May 16, 2007 and on May 18, 2008 (in the first and second seasons; respectively), the same days of preparing the uniconazola solution and after two days from pinching, the treatments were conducted. The prepared plants were divided into two equal groups; the first group was specified for the foliar spray and the second one was specified for soil drench treatments. Uniconazole aqueous solutions were applied at the concentrations of 0 (tap water), 20, 30, 40, 50 and 60 ppm, as a single application for both methods. For the foliar spray, pot surface was covered with polyethylene before application to avoid falling of spray drips on the growing medium. Pots were spaced at 30 cm centres. All concentrations were applied using a hand sprayer and non-ionic surfactant tween 80 at 0.05% (v/v) was added to all treatments to reduce the surface tension and increase the contact angle of sprayed droplets.

Each plant was sprayed individually, so that, all foliage was moistened until the point of run-off. The spraying volume was 13 ml. per

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plant. Considering the soil drench, no watering was applied for two days before application. The drench volume was 400 ml. per pot. Two days after chemical application, plants didn't receive any irrigation. Hand removal of weeds was carried out whenever needed. On November 17, 2007 and 2008 during the first and second season, respectively, experiments were terminated.

The pots which contained the treated plants were randomly assigned to three replicates in split pot experiment (Snedecor and Cochran, 1967) in a sunny place under natural day length. The two chemical application methods (spray and drench) represented the main plots, whereas the six uniconazole concentrations resembled the sub-plots.

Number of treatments in each replicate was 12 and six plants were used for each treatment per replicate.

The following data were recorded; plant height, number of internodes per plants, internodes length, number of branches per plant, leaf area according to Zidan (1962), shoots dry weight, flowering date, number of flowers per day, flower diameter, longevity of flowers chlorophyll content according to (Chairman *et al.* 1960) ,carotenoids content and carbohydrate contents according to Shaffer and Hartman (1921), and Loomis and Shull (1937).

RESULTS AND DISCUSSION

1- Vegetative growth

1-1- Plant hight

The statistical analysis for plant of *Mirabilis jalapa* indicated in both seasons that the application methods of uniconazole (spray and drench), uniconazole concentrations and interaction between the two factors had highly significant effects (Table 1). The uniconazole rates were effective in controlling stem height. The control treatments had the maximum mean plant height , while the lowest values were detected when the treatments involved 50 and 60 ppm. It was clear that the drench applications in the two seasons gave significant lower heights than spray

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ones at any rate of uniconazole. The spray application gave the greatest mean value in both seasons. Data also proved that the growth retardant application as soil drench was found more effective in depressing plant stem elongation than as a foliar spray as supported by Huang *et al.* (2004) on *Ixora duffii* and Pinto *et al.* (2005) on *Zinnia* "Persian carpet".

Soil applications were effective since uniconazole is absorbed readily by roots and is xylem translocated to actively growing tissue as found by William (1982) and Early and Martin (1988).

On the other hand, foliar applied uniconazole must travel through the phloem in leaf tissues before reaching xylem tissue in the stem, but it is more readily transponted through the xylem than through the phloem (Cramer and Bridgen, 1998). Therefore, the soil application was more effective in depressing the stem elongation than the foliar spray application.

Differences in plant response to the application methods of uniconazole possibly were due to the amount of compound being applied, absorbed and subsequently translocated to the sites of active elongation as reported by Wang (1991). There was significant difference between the control and each of uniconazole from 20 to 60 ppm. It was noticed that, as the rates of uniconazole increased, the plant elongation decreased. Decreased ranged from 27.7 to 33.9% and from 27.2 to 34.2% of control in the first and second seasons; respectively.

1-2 Number of internodes per plant:-

Regarding the effect of application methods, it was found that the control treatments had the lowest average number of internodes, while the uniconazole treared plants from 20 to 60 ppm using foliar spray or soil drench, significantly produced more internodes compared with the controls in both seasons (Table 1). The largest average number was found in the case of soil drench at the uniconazole concentration of 50 ppm., in the first and second seasons. At uniconazole concentrations of 30, 50 and 60 ppm in the first season and at those of 20, 30, 50 and 60 ppm in the second one, the soil drench was significantly more effective than the foliar spray for increasing the internode numbers. Regardless uniconazole concentrations, there was significant difference between the

two application methods and the plants treated with soil drench produced more internodes than those treated with foliar spray in both seasons. Within the range of tested uniconazole concentrations and regardless the application method, it was noticed in both seasons that the control (0 ppm) had the lowest average number of internodes. While the highest one was noticed at the concentration of 60 ppm. Generally, concentrations from 20 to 60 ppm in both seasons significantly increased the average of number of internodes and as the concentration of uniconazole increased the formation of new internodes increased. These results seemed to agree with those reported by Wang and Gregg (1989) on *Hibiscus rosa – sinensis* and Sorour (2001) *on Jacobinia carnea*

1-3 internode length:-

Mean values of internode length are presented in (Table 1). In both seasons, the control treatments resulted in longest internodes while the treatment of 50 ppm. uniconazole as soil drench gave the shortest ones. There was a marked difference between the control and any other treatments of the soil drench in both seasons. In the case of foliar spray, there was a marked difference between the control and each of 50 and 60 ppm in the first season, while in the second one, there was a marked difference between the control and each of 40, 50 and 60 ppm. The comparison between the foliar spray and soil drench at the same concentration of uniconazole indicated in both seasons that the soil drench treatment was significantly able to reduce the internode length comparing with the foliar treatment (Table 1).

Regardless uniconazole concentrations, there was significantly difference between the two application methods and the plants treated with the soil drench produced short internodes, while those treated with the foliar spray produced long internodes in both seasons. Within the range of the tested uniconazole concentrations regardless the application method, it was noticed that the control (0 ppm) had the longest average of internode length in both seasons, while the shortest one was noticed at the concentration of 60 ppm in the first season and at that of 50 ppm in the second one . Generally, concentrations from 20 to 60 ppm in both seasons significantly reduced the internode length as compared with the control

and as the concentration increased the internode length decreased. The mentioned results are in accordence with those reported by Wang and Gregg (1989) on *Hibiscus rose*-sinensis, and Subhashis and Mitra (2008) on *Kolanchoe*, "volkameriano" Lemon plants and Chrysanthemum.

1-4 Number of branches per plant:-

The data presented in (Table 2) show the mean values of branches per plant. With regard to the application method, it was noticed that the foliar spray method, at any uniconazole rate, had markedly mean values of branches larger than that of the soil drench method through the first season. The same situation was noticed during the second season at uniconazole rates of 20, 50 and 60 ppm. The greatest mean values of branches were obtained by foliar spray at the treatment of 40 ppm and the control in the first and second seasons; respectively. The lowest average values recorded at the treatment of 60 ppm as a soil drench application in two seasons. Neither foliar spray treatment nor soil drench ones were significantly able to overcome the controls during both seasons. With respect to the foliar spray application, it was recorded that all treatments did not significantly differ from the control except the treatment of 60 ppm during the second season which significantly reduced the average number of branches as compared with the foliar spray control. Regarding the soil drench application, it was clear that all treatments significantly reduced the number of branches as compared with the controls through twp seasons (Table 2). The comparison between the foliar spray and soil drench at the same concentration of uniconazole showed that plants treated with uniconazole as a foliar spray significantly had more branches than those of plants treated with the chemical as a soil drench at all concentrations from 20 to 60 ppm in the first season and at 20, 50 and 60 ppm in the second one (Table 2). Regardless of the employed chemical rates, foliar sprayed plants significantly produced more branches than those of soil drench in both seasons. With respect to uniconazole concentrations, regardless of the application method, there were significant differences among the chemical concentrations in the two seasons. Plants at the control significantly produced branches more than those at the concentrations from 20 to 60 ppm in both seasons. In general,

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with the increasing uniconazole concentrations, the branch numbers were reduced. In general these results were similar to those mentioned by Schuh and Biernacka (1995) on *azalea* and Seung Yeol *et al.*, (2002) on *Hanabusaya asiatica.* The present results may be due to the fact that uniconazole altered the hormonal balance of the plant which reflected on reduction of branching (Wilknson and Richards, 1987). Some slight differences were noticed between the results of the two experimental seasons, which could be attributed to the effect of the local environmental conditions as found by Abdel-Maksoud (1992) on *Hibiscus matabilis.*

1-5 Leaf area (cm^2):

Mean values of leaf area are listed in (Table 2). In both seasons, the largest averages were found in the control plants and gradually began to decrease at the other treatments till that of 60 ppm as a soil drench where the smallest leaf area was found in both seasons. In the case of the foliar spray application, uniconazole rates from 20 to 40 ppm in the first season and those of 20 and 30 ppm in the second one did not significantly decreased the leaf area as compared with the control. On the other hand uniconazole rates of 50 and 60 ppm in the first season and those from 40 to 60 ppm in the second one significantly reduced the leaf area as compared with the control (Table 2). In the case of the soil drench application, the effect of uniconazole rate of 20 ppm in the first season and those from 20 to 50 ppm in the second one was not significant comparing with control. On the opposite, the uniconazole rates from 30 to 60 ppm during the first season and that of 60 ppm during the second one significantly reduced the leaf area as compared with the control (Table 2). Results also indicated that the difference between the two application methods was not significant at the same uniconazole rate in both seasons (Table 2). Generally plants treated with uniconazole exhibited significant retardation in leaf area at middle and high treatments compared with untreated plants. This effect may be due to that uniconazole retarded cell division rate. Possibly cell expansion or both in lamina tissue by inhibiting gibberellins in biosynthesis (Sorour, 2001). Results indicated that internode numbers in uniconazole treated plants increased, consequently the leaf number increased thus the reduction in

leaf area was not due to suppression of leaf production but as a result of the suppression of leaf expansion. This explanation is supported by Viagro-Wolff and Warmund (1987). However, Wang and Gregg (1989) and Steinberg *et al.* (1991 a and b) reported that uniconazole suppressed leaf area by suppressing leaf production and expansion.

1-6 Shoots dry weight:-

In (Table 2) results of the first season indicated that the highest average was detected at the control of the foliar spray application followed by the control of the soil drench, while the lowest one was noticed at the treatment of 60 ppm of uniconazole applied as a soil drench. Results of the second season revealed that the highest average was recorded at the control of the soil drench application, while the lowest one was also detected at the treatment of 60 ppm of uniconazole apllied as a soil drench. Uniconazole at the tested concentrations from 20 to 60 ppm applied as a foliar spray resulted in significant decreases in the top dry weight compared with the controls of the first seasons, while the concentrations of 20, 30 and 60 ppm of gave the same results in the second season. The application of uniconazole as a soil drench using the rates from 30 to 60 ppm in the first season and those from 40 to 60 ppm in the second one markedly decreased the top dry weight compared with the controls.

The soil drench application method was more effective in reducing the top dry weight than foliar spry at the concentration of 60 ppm in the first season and at those of 40 and 50 ppm in the second season and the difference between the two methods at the mentioned concentrations was significant. The opposite situation was seen in the second season at the concentrations of 20 and 30 ppm, when the foliar spray method was significantly more effective in reducing the top dry than the soil drench method (Table 2) all uniconazole concentrations from 20 to 60 ppm did not significantly overcome the controls in both seasons.

At the end of this investigation it was noticed that plant height, internode length and leaf area were decreased with increasing the concentrations of uniconazole. This reduction in plant height and leaf area

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and suppression of internode length caused a reduction in shoot dry weight as mentioned by Gilbertz (1992) and Thetford *et al.* (1995 a).

2- Flowering characterizations:-

2- 1 Flowering date (number of days to flowering):-

Table (3) illustrates the average values of days to flowering per plant from the beginning of experiment to the date of the first flower at the different treatments. From the results of the present experiments, it was clear that uniconazole applications resulted in flowering delay. From the foregoing findings the retarding effect of uniconazole on the flowering time was probably due to that uniconazole at the tested concentrations delayed the initiation of flower or related flower bud development or both (Khatab and Hassan, 1980). Also, the possible alteration of the hormonal balance of the plant by uniconazole can not be overlooked (Wilkinson and Richards, 1987).

Results showed that the plants received the uniconazole as a foliar spray were earlier than those treated with the chemical through the soil drench in both seasons, except at the control treatments, which flowered earlier than other treatments. The marked differences were detected between the two methods at each of uniconazole concentrations of 60 ppm in first season and 30, 40, 50 and 60 ppm in the second one.

Regarding the foliar spray method, non-significant differences were detected in the first season among the treatments of 0, 20 and 30 ppm and among the treatments from 20 to 60 ppm. The same observations were recorded in the second season among 0, 20, 30, 40, 50 and 60 ppm and also between 20 and 30 ppm treatments.

Regarding the soil drench method, non significant differences were detected in the first season among the treatments from 20 to 60 ppm and each of them significantly differed with the control. Non-significant differences were recorded in the second season among the treatments of 0, 20 and 30 ppm, between those of 30 and 40 ppm and between those of 40 and 50 ppm. The treatment of 60 ppm was markedly the latest flowering compared with the other treatments in the second season. As

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for the effect of the two application methods, regardless of uniconazole concentrations a significant earlyness in the commencement of the flowering was apparent in the foliar spray treated plants comparing with the soil drench treated ones in both seasons. With respect to uniconazole concentrations, regardless of the application methods, results of the both seasons indicated that non-treated plants significantly flowered earlier than those treated with uniconazole concentrations from 20 to 60 ppm and those received the concentration of 60 ppm were the latest flowering (Table 3). The triazole compounds are known to reduce gibbrellic and biosynthesis in some plants and this effect could delay the flower bud formation and development in uniconazole treated plants (Abdel-Maksoud *et al.,* 1993 and Cramer *et al.,* 1998).

2-2- number of flowers per plant per day:-

Mean values of the number if flowers per day at the different treatments are listed in (Table 3). The largest mean values were noticed at the treatment of 0 ppm in both seasons, while the lowest ones were noticed by the soil drench method at 60 and 50 ppm in the first and second seasons, respectively.

Regarding the foliar spray method, the treatments of 30, 40 and 50 ppm significantly reduced the number of flowers as compared with the control. The same results were recorded in the second season at the treatments from 30 to 60 ppm.

For the soil drench method the treatments from 40 to 60 ppm in the first season and those from 20 to 60 ppm in the second one significantly reduced the flower numbers as compared with the control.

Comparisons between the two applications methods at the same uniconazole concentration indicated that the plants treated with uniconazole as foliar spray significantly produced more flowers than those treated with the uniconazole as soil drench at 20, 30, 40 and 60 ppm in the second season.

The comparison between the two application methods, regardless of the chemical rates, showed that the average flower numbers of the foliar spray application was higher than that of the soil drench application in both seasons, but the difference between them was significant in the

second season. With respect to the effect of uniconazole concentrations regardless of the application methods, it was found, in both seasons, that the control had the highest average value and the concentrations from 20 to 60 ppm significantly decreased the average value of the flower numbers where the lowest average was found at the concentrations of 40 and 50 ppm in the first and second seasons; respectively. The concentrations from 20 to 60 ppm and from 30 to 50 ppm significantly reduced the average number of flowers as compared with the control in the first and second seasons; respectively.

Reduction in flower numbers seen in this work could be attributed to the inhibitory effect of uniconazole at specific rate using specific application on gibberllic acid synthesis as mentioned by Abdel-Maksoud *et al.* (1993), or may due to the reduction in branches numbers.

2-3 Flower diameter:-

The average values for flower diameter at the different treatments are listed in Table (3). It was clear that there were no significant differences between all treatments in the first season, and the same notice was recorded in the second season.

From the foregoing results of the experiment, it was clear that uniconazole application either as a foliar spray or a soil drench application has no effect on increasing or decreasing the flower diameter. These results probably due to the nature of the treatments being with specific rates, did not lead to stimulate or inhibit the flower diameter in the treated plants. With respect to the effect of uniconazole concentrations regardless of the application methods, it was found, in both seasons, that there were not significant differences among the control and the concentrations from 20 to 60 ppm. Also, no significant difference was detected between the application methods.

2-4 Longevity of flower (in hours):-

Average values of the flower longevity on the plant expressed as hours are listed in (Table 4).

There were no significant differences between all treatments in the first season, and the same notice was recorded in the second season. From

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the foregoing results of the experiment, it was clear that uniconazole application as a foliar spray or a soil drench application has no effect on the longevity of flower of *Mirabilis jalapa*. The same results were noticed by the general effects of the chemical concentrations. On the other hand, the present results were similar to those reported by Abdel-Maksoud (1992) who reported that chloromequat (500, 1000 and 1500 ppm) and uniconazole (50 ppm) did not significantly affect flower life on *Hibiscus mutabilis*.

3- Chemical analysis:-

3-1 Leaf chlorophyll "a" content (mg/L):

The highest amounts of chlorophyll "a" were noticed at 50 and 60 ppm applied as a foliar spray in the first and second seasons; respectively. The lowest amounts were recorded at the control of the foliar spray in the first season and at the control of the soil drench in the second one (Table 4).

Regarded the foliar spray treatments, results showed that the treatments of 50 and 60 ppm. significantly increased the leaf chlorophyll "a" as compared with the treatments of 0 (control), 20, 30 and 40 ppm in the first season. Results of the second season revealed that the treatments from 30 to 60 ppm significantly increased the leaf chlorophyll "a" as compared with those from (control) and 20ppm. Insignificant differences were detected in the first season among the treatments of 0, 20, 30 and 40 ppm and among the treatments of 40, 50 and 60 ppm. Also, in the second season, non significant differences were recorded between 0 and 20 ppm, between 30 and 40 ppm, between 40 and 50 ppm and between 50 and 60 ppm.

For the soil drench treatments, there was in the first season, a significant difference between each of 50 and 60 ppm on one side and each of 0, 20 and 30 ppm on the other side. Non significant differences were detected in the first season among the treatments of 0, 20, 30 and 40 ppm and among those of 40, 50 and 60 ppm. In the second season, there was a significant difference between each of 0, 20 and 30 ppm, on one side and each of 50 and 60 ppm on the other side. Also, there was a significant difference between each of 0 and 30 ppm on one side and 40

ppm on the other side during the second season. The treatment of 60 ppm significantly increased the leaf chlorophyll "a" as compared with those from 0 to 40 ppm in the second season only. At the same time of the second season non-significant differences were detected among the treatments of 0, 20 and 30 ppm, between 20 and 40 ppm, between 40 and 50 ppm and between 50 and 60 ppm.

Comparisons between the two methods at the same chemical rate revealed that the plants treated with 30 ppm as a foliar spray significantly had higher amount of leaf chlorophyll "a" than those treated with 30 ppm as a soil drench in the second second season. The general, effect of the application methods exhibited significant difference between the two methods in both seasons. For the general effect of the uniconazole concentrations on chlorophyll "a" content, the concentration of 60 ppm had the highest content, and significantly differed from the other ones, followed by 50, 40, 30, 20 and 0 ppm (control); respectively, during the two seasons. Uniconazole concentrations from 30 to 60 ppm significantly increased the amount of leaf chlorophyll "a" as compared with 0 and 20 ppm concentrations during the two seasons (Table 4).

3-2 Leaf chlorophyll "b" content (mg/L):-

Table (5) presents the average values of chlorophyll "b" at the different treatments. It was clear that leaf chlorophyll "b" content was increased in the treated plants at the different treatments compared with the control. The highest amount of chlorophyll "b" was noticed at 60 ppm applied as a soil drench in the first season and at 60 ppm applied as a foliar spray in the second season. At the same time the foliar spray control had the lowest amount in both seasons. Regarding the foliar spray treatments, the control had the lowest amount of chlorophyll "b", while the treatment of 60 ppm maximized this pigment in both seasons. With increasing the concentrations of uniconazole the chlorophyll "b" was increased. The treatments from 40 to 60 ppm in the first season and those from 30 to 60 ppm in the second one significantly increased the amount of chlorophyll "6" compared with the control. Insignificant differences were recorded among the treatments of 0, 20 and 30 ppm and among those from 20 to 60 ppm in the first season. Results of the second season

showed insignificant differences between 0 and 20 ppm, between 20, 30 and 40 ppm, and between 30, 40, 50 and 60 ppm.

Respecting the soil drench treatments, the control had the lowest amount of chlorophyll "b", while the highest one was recorded at 60 ppm in the both seasons. Generally, the amount of chlorophyll "b" was increased when the uniconazole concentration increased in both seasons. The treatments of 30, 50 and 60 ppm in the first season and that of 60 ppm in the second one significantly increased the amount of chlorophyll "b" compared with the control. Insignificantly differences was noticed among 0, 20 and 40 ppm, and among 20 to 60 ppm in the first season. In the second season, there were not significant differences between the treatments from 0 to 50 ppm and also between those from 20 to 60 ppm. The difference between the two application methods at each uniconazole concentration was not significant in both seasons. The general effect of uniconazole concentrations showed that the concentrations from 30 to 60 ppm in thr first season and those from 20 to 60 ppm in the second one significantly increased chlorophyll (b) compared with the control. The concentration of 60 ppm had the highest amount of chlorophyll "b", while the control had the lowest one in both seasons. The chlorophyll pigments ("a" and "b") increments in the uniconazole treated *Mirabilis jalapa* plants were probably due to the effect of uniconazole causing reduction in the cell size and inhibition its elongation. Consequently resulted in a limited size as stated by Khattab *et al.* (1988), and Abdel-Maksoud *et al.* (1992 and 1993).

3-3- Leaf carotenoids content (mg/100 g):-

In (Table 5), the highest amounts were recorded at the drench soil control and the foliar spray control in the first and second seasons; respectively. The lowest amounts were achieved at the soil drench treatments of 40 and 60 ppm. in the first and second seasons; respectively. In the first season , uniconazole uniconazole concentrations of 50 and 60 ppm. as a foliar spray and those of 40 , 50 and 60 ppm. as a soil drench resulted in significant reduction in the leaf carotenoides content as compared with the control and the same effect was noticed during the second season at the concentrations from 20 to 60 ppm. either by the

foliar spray or by the soil drench.Non-significant difference was detected between the two methods of application at any uniconazole concentration in the first season. The same situation was seen in the second season, except at the uniconazole rate of 20 ppm, where the foliar spray significantly increased the leaf carotenoids content compared with the soil drench (Table 5).

The effect of application methods cleared that the foliar spray significantly increased the leaf carotenoids content compared with that reported by Gad (2003) on *Schefflera actinophylla* treated with paclobutrazol.

The general effect of uniconazole concentrations showed that the 0 concentrations (control) had the highest amount of the leaf carotenoids content and with increasing uniconazola concentration carotenoids were decreased in both seasons . The lowest amount was detected at the concentration of 60 ppm. in both seasons . Significant differences were noticed between the control and the concentrations from 30 to 60 ppm. in the first season and second one. The results were in agreement with those mentioned by Zayed *et al*. (2005) on rice

3-4 leaf carbohydrate content

a- reducing sugar content (g / 100 g) :-

Mean values of the conceded character are listed in table (5). The maximum average was recorded at the control of the soil drench in both seasons. The minimum average was recorded in the first season at treatment of 20 ppm applied as a soil drench and at treatment of 40 ppm applied as a foliar spray in the second season. Non significant differences were noticed among all treatments involving uniconzole from 20 to 60 ppm concentrations in both season, therefore , non significant difference was detected between the two application methods at any uniconazole concentrations in both seasons. In general the present results were in agreement with those reported by *Kishore kumar et al. (2007)*

b- total soluble sugar content (mgig)

In table (5) there were no significant differences between all treatments in the first season, and the same notice was recorded in the

second season. From the foregoing results of the experiment , it was clear that uniconazole application as a foliar spray or soil drench application has no effect on increasing or decreasing the total soluble sugar content of *mirabilis jalapa.*

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الملخص العربي

تأثير تركيز اليونيكونازول وطريقة تطبيقه على نمو وتزهير ومحتوى الكربوهيدرات لنبات شب الليل

تم إجراء هذا البحث لموسمين متتاليين (2007 – 2008) على نبات شب الليل وتم زراعة النباتات في مشتل تجاري – بمحافظة البحيرة – مصر وكان الغرض من إجراء هذا البحث هو دراسة مدى استجابة نبات شب الليل للمعاملة بواسطة مادة اليونيكونازول في حالة تطبيقه رشا على النباتات أو كمحلول مبلل للتربة لزيادة قيمة النبات الاقتصادية .

وقد تم استخدام ست تركيزات من مادة اليونيكونازول (0 ، 20 ، 30 ، 40 ، 50 ملي جرام / لتر) مع نباتات عمرها 77 يوم منزرعة في أصص فخار قطرها 30 سم ، وتم تطبيق المعاملات بطريقة عشوائية ، وكانت التجربة في صورة قطاعات منشقة مكونة من ثلاث مكررات حيث كانت طريقة التطبيق (رش أو تبليل) هو العامل الرئيسي بينما كانت التركيزات هي العامل تحت الرئيسي وكان عدد المعاملات 12 معاملة لكل مكررة وتم استخدام 6 نباتات لكل معاملة داخل المكررة.

وكانت النتائج المتحصل عليها كالتالي :

1. طريقة الرش مقارنة بالكنترول وجد ان استخدام تركيزات اليونيكونازول من 20 إلى 60 جزء في المليون في الموسم الأول ادت إلى تقليل الوزن الجاف للمجموع الخضري بينما في الموسم الثاني قللت من عدد الأزهار ومحتوي الكاروتينات وفي كلا الموسمين ادت إلى نقص السكريات المختزلة . تركيزات اليونيكونازول من 30 إلى 60 جزء في المليون أدت إلى زيادة عدد السلاميات ومحتوى الأوراق من كلورفيل "أ" و "ب" بينما تركيزات اليونيكونازول من 40 إلى 60 جزء في المليون زادت من عدد السلاميات ومحتوى الاوراق من كلوروفيل "ب" و أدت إلى تأخير في ميعاد التزهير في الموسم الأول ولكن في الموسم الثاني ادت إلى تقليل طول السلاميات ومساحة الأوراق خلال الموسم الأول التركيزات من 50 إلى 60 جزء في المليون ادت إلى نقص معنوي في التفريع وطول السلاميات ومساحة الأوراق ولكن زادت من محتوى الأوراق من كلوروفيل " أ "
2. طريقة تبليل التربة مقارنة بالكنترول وجد أن استخدام تركيزات اليونيكونازول من 20 إلى 60 جزء في المليون تقلل من ارتفاع النبات ، طول السلاميات خلال الموسمين بينما في الموسم الأول ادت تلك المعاملات إلى تأخير ميعاد التزهير وفي الموسم الثاني أدت إلى نقص عدد الازهار ومحتوى الكاروتينات ولوحظ حدوث إنخفاض في مساحة الأوراق والوزن الجاف للمجموع الخضري في الموسم الأول نتيجة استخدام تركيزات من 30 إلى 60 جزء في المليون ،

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التركيزات 40 ، 50 ، 60 جزء في المليون أدت إلى إنخفاض عدد الأزهار ومحتوى الكاروتينات في الموسم الأول بينما في الموسم الثاني أدت إلى إنخفاض الوزن الجاف للمجموع الخضري وتأخير ميعاد التزهير وزيادة محتوى الأوراق من كلوروفيل "أ". التركيز 60 جزء في المليون أدى إلى إنخفاض معنوي في مساحة الأوراق وزيادة محتوى الأوراق من كلوروفيل "ب" في الموسم الثاني .

عامة تأثير تركيزات اليونيكونازول من 20 إلى 60 جزء في المليون تؤدي إلى إنخفاض في ارتفاع النبات ، طول السلاميات ، التفريع ، مساحة الأوراق ، الوزن الجاف للمجموع الخضري ، السكريات المختزلة و تأخير ميعاد التزهير وتزيد من عدد السلاميات في كلا الموسمين ونفس التركيزات أدت إلى إنخفاض في عدد الأزهار في الموسم الأول وأدت إلى زيادة محتوى الأوراق من كلوروفيل "ب" وإنخفاض محتوى الكاروتينات بالأوراق في الموسم الثاني . التركيزات من 30 إلى 60 جزء في المليون أدى إلى زيادة محتوى الأوراق من كلوروفيل "أ" في كلا الموسمين بينما في الموسم الأول أدى إلى زيادة محتوى الأوراق من كلوروفيل ب ، وانخفض محتوى الأوراق من الكاروتينيات .

بالمقارنة بين طريقتي الإضافة لليونيكونازول وجد أن طريقة تبليل التربة أكثر تأثيرا من طريقة الرش .