2012 4th International Conference on Agriculture and Animal Science
IPCBEE vol.47 (2012) © (2012) IACSIT Press, Singapore
DOI: 10.7763/IPCBEE. 2012. V47. 8

Effect of Uniconazole and Gibberellic Acid on Height Control of Pansy

Sergul Ergin[1] and Mehmet Ozgur[1 +]

[1] Uludag University, Faculty of Agriculture, Horticulture Department, 16059 Gorukle/Bursa

Abstract. In this study, the effects of plant growth regulators on height control of Pansy (*Viola x wittrockiana*) 'Jack Pot F1' were investigated. In order to control plant height, 5, 10, 20 and 40 ppm concentrations of uniconazole were used. All concentrations of uniconazole applications decreased the plant height, number of node and length of internodes. 5 and 10 ppm uniconazole concentrations were found to be suitable for commercial Pancy production. 10 and 25 ppm GA_3 applications, which is used to reverse over dose effect of uniconazole (40 ppm) concentration were increased plant height, but increase in plant height was found be extreme.

Keywords: Height control, Pansy, Uniconazole, Gibberellic acid.

1. Introduction

Bedding plants (i.e. impatiens, petunia, marigold, pansy) are grown from seed to flowering stage in greenhouses. But depending on the climatic factors during the growing season, environmental factors in greenhouses cannot be controlled adequately which do not have proper equipment (high temperature, high humidity and lack of light intensity), and enough ventilation. Moreover, excessive - unbalanced fertilization may cause adverse effect on plant height. This situation results in loosing plant shape and/or quality degradation in later stages. It is possible to prevent elongation of seedlings with control of environmental conditions or by using growth retardant substances. Generally, due to the lack of well-equipped greenhouses, the growth retardant substances remain an important choice for growers. However, the manufacturers do not have sufficient knowledge or experience in the use of growth regulators and improper use of growth retardants causes some problems in plant growths.

Plant growth retardants are generally used for potted ornamental plants growing in controlled environment. Their basic action mechanism is the inhibition of gibberellin biosynthesis in plants. The primary reason using growth retardants (known as anti-gibberellins) are to reduce plant height (Buck et al.1999).

Doses of growth regulators depend on plant species, environmental conditions, and vegetation period of plant. These substances can be applied as dripping, dipping, spraying, irrigation, pasting, gaseous, and powder to the plants (Tayama et al. 1992, Baktir 1996).

Uniconazole has a significant dwarfing effect even at low doses on the flowering plants (Douglas and Whipker 1998). It can be absorbed by the leaves, but not transported other plant parts. For this reason, it is recommended that Uniconazole must contact with the stem in spray applications.

Uniconazole applications limited plant height and GA_{4+7} applications were completely reversed this effect in lilies (Jiao et al. 1991, Wang et al. 1995). Zhou and Ye (1996) reported that uniconazole

+ Corresponding author. Tel.: +90 224 294 1480 ; Fax: +90 224 442 9098
E- mail: mozgur@uludag.edu.tr

applications reduced plant height and extended shoot in *Brassica napus*. Uniconazole descreased plant height about 25% and grain yield was not effected in maize (Schluttenhofer et al. 2011).

Application dose and vegetation period must be known to control the effect of growth retardant substances on plant height. On the other hand, the growth and development of plants can be completely prevented if over doses of these substances are applied. This situation is absolutely unacceptable in growing bedding plants. In such cases, negative effects of growth retardant substances can be eliminated by external gibberellic acid (GA_3) applications. To stimulate plant growth and development again, it is necessary to determine the appropriate dose of gibberellic acid.

In this study, we investigated different doses of uniconazole and gibberellic acid in order to control plant height and/or to solve some problems created by overdose application of growth retardants in pansy. For this purpose, uniconazole was used to reduce plant height and gibberellic acid was applied to reverse the negative effect of overdose uniconazole application in pansy. We determined the appropriate doses of both growth regulators.

2. Materials and Methods

The seasonal winter variety of Pansy (*Viola x wittrockiana*) 'Jack Pot F1' cultivar was used as plant material. Uniconazole (Sumagic, Valent USA Corp., Walnut Creek, USA) was used to reduce plant height and Gibberellic acid (GA_3) (Gold-gibb, Safa Tarim A. S., TURKIYE) was used to reverse the dwarfing effect of excessive uniconazole application on plants with. Seedlings were transplanted into 300 ml black bags containing 50% pine needle and 50% peat mix. Plants at 3-4 leaf-stage were sprayed with 0 (Control), 5, 10, 20 and 40 ppm concentrations of uniconzole. In order to eliminate the over-dose effects of 40 ppm uniconazole, 0, 10 and 25 ppm consantrations of GA_3 were sprayed 3 weeks after 40 ppm uniconazole application. Measurements were done during the blooming period in order to determine the effects of applications.

The experiment was arranged in a randomized plot design with three replications. Data were tested by 0.05 significance level of Duncan test using MSTAT-C program.

3. Results and Discussion

Effects of different uniconazole doses on plant height and internodium lenght was showed in Figure 1. All applications reduced plant height and length of internodes. Average plant height in control plants was 6.7 cm while 4.2, 3.3, 2.1 cm in 5, 10 and 20 ppm uniconazole doses, respectively.

Uniconazole doses were effective on number of nodium (Figure 2.). Number of nodium was decreased with increasing doses of uniconazole (7.3 in control, 5.6 in 5 ppm, 4.9 in 10 ppm and 4.1 in 20 ppm).

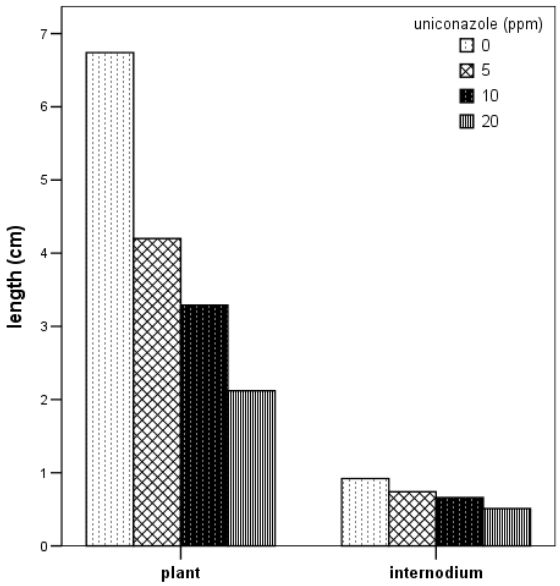

Fig. 1: Effects of different doses of uniconazole on plant height and internodium lenght.

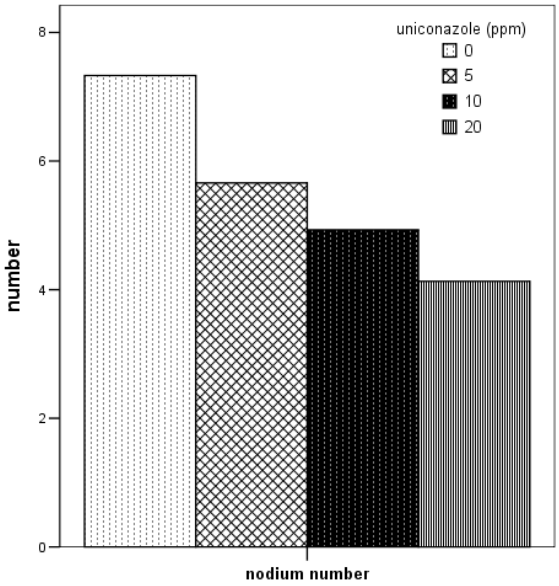

Fig. 2: Effects of different doses of uniconazole on number of nodium.

Effects of uniconazole applications on leaf and flower area are given in Figure 3. Regarding the effect of uniconazole applications on flower area, there was no significant difference between control and 5 ppm application. While flower area was 22.8 cm^2 in control plants, it was 20,8 cm^2 in 10 ppm and 15.8 cm^2 in 20 ppm applications. Increasing doses of uniconazole also decreased the leaf area. It was measured 13.5 cm^2 in control plants and 11.2, 9.1, and 6.4 cm^2 in 5, 10, 20 ppm, respectively.

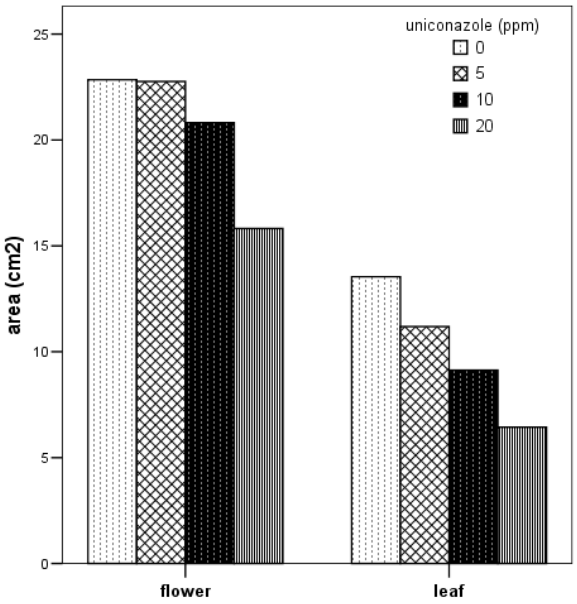

Fig. 3: Effects of different uniconazole doses on flower and leaf area.

The results of experiment indicated that differences in plant height, nodium number, internodium length, leaf and flower area was at significance level of 0.05. The differences among the doses of uniconazole applications were insignificant in terms of stem diameter, shoot number, leaf number and pedicel length. For growing good quality pansy plants, our results recommended 5 or 10 ppm of uniconazole applications at 3-4 leaf stage.

Similarly uniconazole application reduced the plant height in maize, tulips, hyacinths and caladium (Schluttenhofer et al. 2011, Krug et al. 2005(a), Krug et al. 2005(b), Krug et al. 2007) . Uniconazole also reduced plant height of *Ligustrum* by inducing shorter internodes with smaller diameters and by reducing secondary branching relative to the controls (Steinberg et al. 1991). Wang and Gregg (1989) reported a reduction in stem diameter in hibiscus treated with uniconazole.

In order to eliminate or reduce the impact of over dose effects of uniconazole (40 ppm), 10 and 25 ppm doses of GA_3 were used. GA_3 applications were let to elongation of plant height by breaking of dwarfing effects of uniconazole. Effects of GA_3 treatments on plant height, nodium number, internodium length, leaf number, pedicel length, leaf and flower area were found to be significant. Significant difference was not observed in the stem diameter and the number of shoot.

Plant height was 2 cm in over dose application of uniconazole (40 ppm), while it was 18.5 cm in 10 ppm and 15.0 in 25 ppm (Figure 4.). GA_3 treatments were increased the length of internodes and pedicel, but there is no significant difference between 10 and 25 ppm applications of GA_3.

GA_3 applications were increased the number of leaf. The average leaf number was 10.0 in control plants and 13.4 and 13.2 in 10 and 25 ppm, respectively. Numbers of nodes were found to be lowest (3.8) in control plants, but it was found about 10 nodes for both doses of GA_3 treatments. Number of shoots were not affected significantly by GA_3 applications (Figure 5).

The effects of different GA_3 doses on flower and leaf area are shown in Figure 6. Applications were increased flower area and leaf area. As a result, both GA_3 applications significantly increased plant height compared to the control plants. Ten and 25 ppm GA_3 increased the plant height too much; therefore, the selection of lower doses of GA_3 would be useful for pansy.

According to the results of various studies; GA_{4+7} applications counteracted the inhibiting effect of uniconazole on shoot growth and the rate of flower bud development in lilies (Jiao et al. 1991, Wang et al. 1995). Wang and Dunlap (1994) reported that applications of GA_{4+7} to uniconazole-treated plants resulted in long pedicels, having long cells in *Hibiscus*.

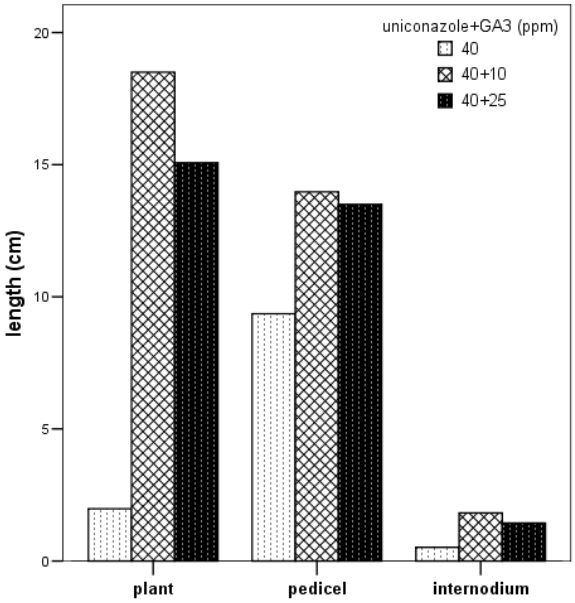

Fig. 4: Effects of different uniconazole+GA_3 doses on plant height, pedicel and internodium length.

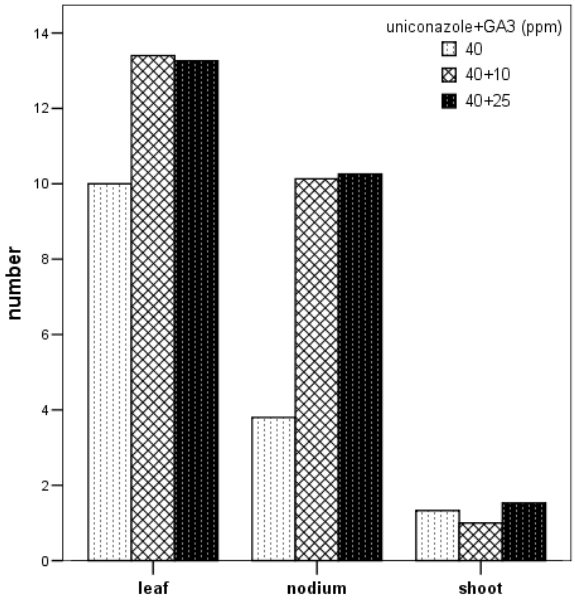

Fig. 5: Effects of different uniconazole+GA_3 doses on leaf, node and shoot numbers.

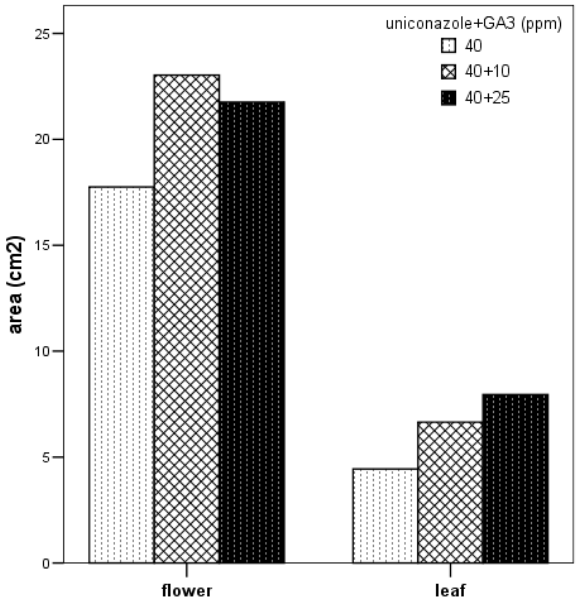

Fig. 6: Effects of different uniconazole+GA3 doses on flower and leaf area.

4. References

[1] I.Baktir. Bitki Büyüme Düzenleyicilerin Süs Bitkileri Yetiştiriciliğinde Kullanılması. *TİGEM,* Antalya, 1996.

[2] C. A. Buck, S. A. Carver, M. L Gastom, P. S. Konjoian, L. A. Kunkle, M. F. Wilt. *Tips on Growing Bedding Plants.* Fourth Edition. Ohio, U.S.A., 1999.

[3] A. B. Douglas, and B. E. Whipker. Best Management Horticulture Information Leaftles. NC State University, Dept. of Horticultural Science. 1998, **529**:10-98.

[4] J. Jiao, X. Wang, M. J. Tsujita. Antagonistic Effeccts of Uniconazole and GA_{4+7} on Shoot Elongation and Flower Development in 'Nellie White' Easter Lily. *Scienta Horticultuare.* 1991, **46** (3-4): 323-331.

[5] B. A. Krug, B. E. Whipker, I. McCall, J. M. Dole (a). Comparison of Flurprimidol to Ancymidol, Paclobutrazol and Uniconazole for Tulip Height Control. *HortTechnology* 2005, **15**(2):370-373.

[6] B. A. Krug, B. E. Whipker, I. McCall, J. M. Dole (b). Comparison of Flurprimidol to Etephon, Paclobutrazol and Uniconazole for Hyacinth Height Control. *HortTechnology* 2005, **15**(4):872-874.

[7] B. A. Krug, B. E. Whipker, I. McCall. Caladium Height Control with Flurprimidol, Paclobutrazol and Uniconazole. *HortTechnology* 2007, **17**(3):368-370.

[8] C. M. Schluttenhofer, G. D. Massa, C. A. Mitchell. Use of Uniconazole to Control Plant Height for an Industrial/Pharmaceutical Maize Platform. *Industrial Crops and Products*, 2011, **33** (3): 720–726.

[9] S. L. Steinberg, J. M. Zajicek, M. J. McFarland. Short-Term Effect of Uniconazole on the Water Relations and Growth of *Ligustrum. J. Amer. Soc. Hort. Sci,.* 1991, **116** (3):460-464.

[10] H. K. Tayama, A. R. Larson, A.P. Hammer, J. T. Roll. Tips on The Use Of Chemical Growth Regulators On Floriculture Crops. *Ohio Florists Association*, U.S.A., 1992.

[11] Y.T. Wang, and J. R. Dunlap. Effect Of GA_{4+7} on Growth and Cellular Change in Uniconazole-Treated Hibiscus. *Journal of Plant Growth Regulation*, 1994. **13** (1): 33-38.

[12] Y.Wang, and L. L. Gregg. Uniconazole Affects Vegetative Growth, Flowering, and Stem Anatomy of *Hibiscus. J. Amer. Soc. Hort. Sci.* 1989. **114:** 927-932.

[13] X. Wang, J. Jiao, M. J. Tsujita. Effect Of Sumagic on Growth of 'Connecticut King' Lily. ISHS *Acta Horticulture* 1995, **272**: 299-303.

[14] W. Zhou, and Q. Ye. Physiological and Yield Effects of Uniconazole on Winter Rape (*Brassica napus* L.). *Journal of Plant Growth Regulation.* 1996, **15** (2): 69-73.