

International Journal of Horticultural Science 2014, 20 (3–4): 107–109.

Agroinform Publishing House, Budapest, Printed in Hungary

ISSN 1585-0404

The effect of Ferbanat L nano-fertilizer on the growing of *Petunia x grandiflora* 'Musica Blue'

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Summary: During our experiment, the effect of Ferbanat L concentrations were examined by *Petunia x grandiflora* 'Musica Blue' production. The leaf and shoot length, number of flower buds, diameter of flowers, and the date of appearing the first buds were measured. The solution of Ferbanat L in 0.1 % concentration was the most effective on shoot length (21.7 cm). Remarkable increase was observed by the other treatment groups as well comparing to the control group (5.6 cm), the plants treated with solution of Ferbanat L 0.2% (16.5 cm) and 0.3% (14.4 cm) had significant effect as well. The nano-fertilizer had not positive effect on the other examined parameters as leaf and flower size, number of flower buds or chlorophyll content. The culture period shortened five days.

Keywords: *Petunia*, biostimulator, chlorophyll, shoot, leaf, flower diameter

Introduction

Today one of the important keys of the sustainable development is the use of bioactive regulators of natural origin in plant production for better quality and early crop. In our experiment we studied a newly developed product Ferbanat L (FL) in *Petunia x grandiflora* 'Musica Blue' production. *Petunia* (*Petunia*) belongs to the *Solanaceae* family. It is native to Argentina and Brazil (POLLOCK and GRIFFITHS, 2005). By crop of ornamental plants the role of growth-retardants is to speed, promote or inhibit the development of plants, because they increase the decorating value (HAMRICK, 2003). Using the growth regulators strived to speed the root growing, stimulate or inhibit shoot growth, promote the diameter of flowers, and have more flower in the shortest possible time and with less effort (NAGY, 1986). FRANCESCANGELI and ZAGRABIA (2008) treated red, white and blue flower colour *Petunia* plants with paclobutrazol, and found that the red-flowered plants uniformly reached a lower height than the other plants of the measured group. BOROWIAK and WUJESKA (2012) studied the effects of ozone on *Petunia*, bean and tobacco. It was found that the high ozone concentration was positively correlated with number of flowers by *Petunia*. NOUR et al. (2014) found that nutrient uptake of the *Petunia* plant is greatly affected live near the root mycorrhizal fungi. In Hungary EGYEDI and MARÓTI (1961) were the first researchers who studied the effect of biogene stimulators. So far a lot of product is in trade with different offer of the producers. Ferbanat L is a nano liquid fertilizer, its effect has been proven by many

cultures. The treated plants turn into more resistant against diseases, pests and weather extremes (VITALI, 2011). The main components of Ferbanat L are: vermicompost extract, micro elements, macro element, micro-organisms, water (VITALI, 2011). Due to the analysis of the Lithuanian Institute of Agriculture Agrochemical Research Centre the product contains among others 0,38% Potassium, 0,2% humin-acids and 0,39% fulvo-acid (ZAVIELISKI, 2011a). It accelerates the formation of proteins and carbohydrates, and the exchange rate of oxygen. Stronger root system develops, the photosynthetic processes are accelerated. This means that the growing period can be reduced even 1-2 weeks. It can be used with success as preventive treatment against stress effects (ZAVIELISKI, 2011b). More countries have experiments with this product, for example Lithuania, Russia, Egypt, Turkey, Romania, Tunisia, Kenya, South Africa. The yield for cereals showed 25-100 % increase due to the effect of the fertilizer. The increase of cucumber and tomato crop yield was 30-150 %, for an average of 100 % by grape (KLESKANOV, KLESHKANOVA, 2010a). In the case of wine grapes production of the nutritional properties was observed (KLESKANOV, KLESHKANOVA, 2009, 2010b, VITALI, 2013). With Ferbanat L the yield increases. The Ferbanat L can be used as an anti-stress formulation, which is perfectly integrated into the modern, intensive agricultural technology (KLESKANOV, 2010). In ornamental plant production it has positive effect too, in 0,2% concentration stimulates the root formation of *Pelargonium* 'Robert's Lemon' cuttings (TILLY-MÁNDY et al. 2011). Ferbanat L performs the 2092/91 and 834 /2007. EU recommendations (VITALI, 2009).

Materials and methods

The experiment was started on February 9, 2012, in Nyújtód which is a part of Târgu Secuiesc, Rumania. The plants were propagated from seeds in cell trays. Four groups were formed: control and three treated groups with 0.1%, 0.2% and 0.3% Ferbanat L solution spraying in March 8, March 22, April 5, April 15, April 28 of 2012. The length of shoots and leaves, the diameter of flowers, the date of appearance of the first flower bud, the number of flower buds per plant were measured. For chlorophyll content determination approximately 300 mg leaf sample was homogenized with quartz sand and supplemented to 100 ml with 80 % Acetone solution. Samples were elutriated in refrigerator for 24 hours. From each sample, the absorbance of 2 ml of the solution was measured with spectrophotometer at 644 nm and 663 nm wavelength. The results were evaluated in Microsoft Excel and PASW 18 software packages. By PASW 18 was used random arrangement factor analysis of variance. The type of alpha-error was determined 95%. The homogeneity of variances was checked Levene's test. Tukey and Games-Howell tests were performed to get results.

Results and discussion

Length of shoots. All the treatments had significant positive effect on the shoot length comparing to the control (5.6 cm) group. The longest shoots were obtained with the 0.1% Ferbanat L treatment (21.7 cm). This result differed significantly from the 0.3% Ferbanat L treatment (14.4 cm) but, formed an equal group with the 0.2% Ferbanat L treatment (16.5 cm). The groups of 0.2% and 0.3% didn't differ from each other significantly. The results were confirmed by PASW 18, too: besides 95% confidence level of the homogeneity of variances checked with Levene's test ($p = 0.517 > 0.05$) and by Tukey 's test was carried out in a one-factor ANOVA -test (Fig. 1).

Length of leaves. Tukey-test showed no significant difference between the groups. Best result was obtained with 0.1% solution (5.0 cm) comparing to the control group (4.7 cm), plants treated with 0.2 % (4.9 cm) and 0.3 % (4.8 cm) solutions produced longer leaves as well.

Number of flower buds. Ferbanat L had not positive result in this aspect as Tukey test proved. In the control group and treated with 0.2% solution formed the same number of buds (10.6 pc), more than plants treated with 0.1% (9.3 pc) and 0.3% (8,5 pc) solution. The application of the nano-fertilizer had positive effect on the date of appearance of the first buds, the treated groups started to flower 5 days earlier than the control group.

Diameter of flowers. The concentration of the solution proportionately reduced diameter of the flowers though due to the high standard deviation Tukey test showed

no significant difference among the groups. The largest flower was measured in the control group (7.13 cm in diameter) and the smallest flower in the 0.3% treated group (6.09 cm). The difference of 1.04 cm was remarkable difference in the diameter of flowers.

Chlorophyll content. The chlorophyll content of treated plant groups was the highest in the 0.2 % concentration Ferbanat L solution (601.7 $\mu\text{g/g}$), and lowest in the control group (532.93 $\mu\text{g/g}$). The difference between the groups treated with 0.1% (575.61 $\mu\text{g/g}$) and 0.3% (597.33 $\mu\text{g/g}$) was very small. In practical terms in horticulture Ferbanat L concentration of 0.2% is the most efficient for *Petunia x grandiflora* 'Musica Blue' variety in this aspect.

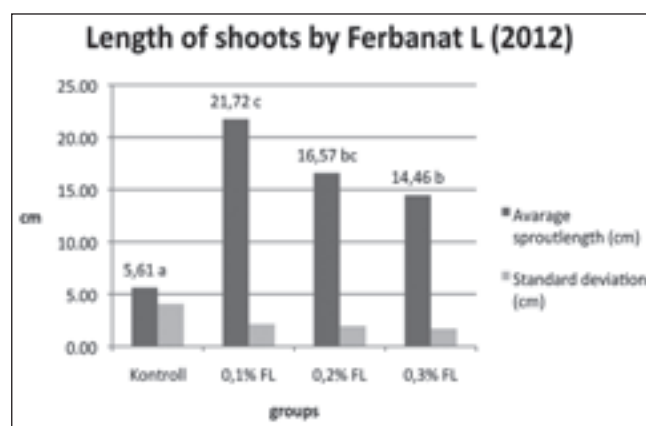


Fig. 1.: Length of sprouts by using Ferbanat L in *Petunia x grandiflora* 'Musica Blue'

Conclusions

Based on the results the use of Ferbanat L gave good progress towards the *Petunia x grandiflora* 'Musica Blue'. The most appropriate concentration was 0.1%, which gave the best results in the shoot length. Although in the aspect of leaf length and flower bud number the 0.1 % concentration gave weaker results than the control group, but the difference was not significant. In all the treated groups the flower buds appeared five days earlier comparing to the control, therefore earlier flowering occurred, so the growing period shortened (Fig. 2). It has importance in the horticultural practical aspect.



Fig. 2.: Difference among groups at the end of the experiment (from left to right: Control; 0,1% FL; 0,2% FL; 0,3% FL)

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