Effect of Pentakeep-V on *Begonia x tuberhybrida* 'Nonstop' line

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ABSTRACT

In this study the 5-amino-levulic acid containing Pentakeep-V nano-fertilizer was examined in 0.3 ml/l, 0.5 ml/l and 0.7 ml/l concentrations with irrigating or spraying treatment on *Begonia x tuberhybrida* 'Nonstop' seedling production. The experiment was conducted in Zajzon, in a 300 m² heated plastic tunnel, from January 2012 to June 2012. Best result was obtained with 0.5 ml/l concentration in the case of all examined parameters. Pentakeep-V had positive effect in all examined concentrations with both ways of treatments on all measured parameters instead of plant height. The plant growing time was shortened thanking to the treatments. Using additional artificial light plants developed more and bigger flowers. Spraying was more effective comparing to irrigation. All the treatments had positive effect on chlorophyll content in the leaves. Summarizing Pentakeep-V nano-fertilizer can be offered in 0.5 ml/l concentration with spraying treatment in the seedling production of *Begonia x tuberhybrida* 'Nonstop'. Additional light enhances the effect in most examined parameters that is needed in the general practice during short day growing period.

Keywords : annual, *Begonia* , biostimulator, Pentakeep , retardant

INTRODUCTION

Begonia x tuberhybrida breeds and varieties are more and more prevalent in the market in recent years. The long-term flowering and decorating *Begonia x tuberhybrida* demands tropical, sub-tropical climate, and is a perennial sub-shrub in its native area. The relatively long germination time makes the growing of *Begonia x tuberhybrida* more difficult for the raising of seedlings: it takes about 3 to 5 months and in the winter months is necessary supplemental light, too. Eugene created the modern base of large-flowered tuberous *Begonia* with breeding of *Begonia* 'Erecta Super' variety in 1878. This name was used by all the German companies for all large-flowered varieties. Tubers are frost sensitive. The stem is fleshy, very juicy, mostly straight, except for by hanging versions. Slightly branched tuberous begonia has cluster inflorescences, comparing to

usual all begonia-varieties. Zhang *et al.* (2013) found that "carbohydrate accumulation may be the proximate trigger of anthocyanin biosynthesis under autumn conditions". They also reported that in green leaves of *Begonia semperflorens* net photosynthetic rate is much higher than by red leaves, (Zhang *et al.*, 2011). (Faust *et al.* 2005) carried out experiments on more annual plants by daily light integral (DLI), and found that in the case of *Begonia semperflorens* high DLI did not reduce the flowering time and the length of sprouts well (Faust,2005).Romocera(2011)notedthatcytokinin increased the plant's regenerative capacity by *Begonia semperflorens* cv. 'Ambassador' White version in the micropropagation. Pentakeep-V is a new developed yield-enhancing, conditioning fertilizer. The active substance of it is 5-amino-levulinic-acid, which is -inter alia- the chlorophyll precursor (Kosáry, 2008). Pentakeep-V plant

reduces sodium uptake, thereby making greater brine tolerance of the plant (Watanabe *et al*, 2000). Pentakeep-V fertilizer carried out experiments in Japan since 2000. Manufacturer and distributor of Pentakeep-V is Cosmo Seiwa Agriculture Co., Ltd. (2000), and this company performed experiments on *Ficus benjamina* plants. Stronger shoots and brighter and fresher green coloured leaves would have become because of treatment effect. Likewise experiment was conducted in Japan in 2001, on *Primula* 'Julian Scarlet' variety. Compared with the control plants gave 20 days sooner finished goods, the number of these plants from frost damage was much higher by Pentakeep-V treated ones. The company also tested on the *Rosa* 'Golden Gate' varieties the effect of Pentakeep-V. The best results were got in length of sprouts by the 0.1 % Pentakeep-V solution group (Cosmo Seiwa Agriculture Co., Ltd., 2001). *Saintpaulia ionantha* specimens were used by Tillyné *et al.* (2010) to test the Pentakeep-V. It was found that plants got the value for marketable condition two weeks earlier than by the control ones. Tillyné *et al.* (2010), found that the Pentakeep-V, used in 0.3 % concentration had positive effect on the chlorophyll content of *Tillandsia usnoides*. Muranyi (2006) tested Pentakeep-V on vegetables, and concluded that the effect of the fertilizer the yield has increased 12 %. Ostrowska *et al.* (2008) studied from the perspective of Pentakeep-V, how resistant will be cucumber against *Erysiphe cichoracearum* and *Sphaerotecha fuliginea* pathogens in case of the use of Pentakeep-V. Yoshida *et al.* (2005) measured the effect of Pentakeep-V on *Tulipa* 'Leen van der Mark' and 'Ballerina' varieties. Both varieties have significantly increased by using the yield of onions compared to the control two thousand-fold dilution treatment. Measures used by Nowak (2006) on potted and cut *Chrysanthemum x grandiflorum* varieties in 2006. Because of the effect of Pentakeep-V the leaves would have been more vibrant coloured. Increase in fresh weight and height was observed too. Szwonek and Buczek (2006) experimented on apples, strawberries and blueberries with using Pentakeep-V. In the case of apple trees yield increase was achieved. By strawberries had negative results for the treatment in respect of marketable yield and sugar content of the fruit concerned. The use of Pentakeep-V significantly increased the yield of 'Bluecrop' blueberry varieties. Smolen and Sady (2010)

found that by use of the Pentakeep-V decreased calcium, sodium, and iron content on spinach, and increased potassium content. Krzyminska (2007) measured the yield of corms and bulbs of *Allium christopii Tulipa* 'Lucky Srtike', *Lilium* 'Star Gatzler' and *Gladiolus* 'White Friendship'. The treatments had positive effect. Lozek and Slamka (2006) on plough land examined the effect of Pentakeep-V on grape, tomato, green pepper, melon and hop. It was found that the increase is due to increased revenues multiplied. Awad and Youssef (2008) used the Pentakeep-V biostimulator by *Phoenix dactylifera L.* plants. It was found that the fertilizer improves the plant salt tolerance. Awad (2008) also found that the use of Pentakeep-V in 0.04% solution treated group, and in 0.08% solution treated group got a significant increase by chlorophyll content of *Phoenix dactylifera L. cv.* 'Kalas', and had in marketable condition 4-5 months sooner than the control plants, and the 0.02% solution treated group. The active substance in the Pentakeep-V 5-aminolevulinic acid (ALA), which is the most important feature by producing profin in precursor biosynthesis, such as red blood cells (heme) and chlorophyll, and increases the activity of the cells. (Cosmo Oil Co., Ltd).

MATERIALS AND METHODS

The experiment was conducted in Zajzon, in a 300 m² heated plastic tunnel, from January 2012 to June 2012. Some of the analyzes occurred in Zajzon, another part of them continued in the Corvinus University of Budapest, in the laboratory of Faculty of Horticulture, Floriculture and Dendrology Department and in plant protection laboratory of Brasov County Institute. The testplant was *Begonia x tuberhybrida* 'Nonstop' series. The propagation started with sowing in December 2010 in plant-trays. The seedlings were planted into plant cell-trays on 19 January, and after four weeks were potted into 9 cm diameter pots, and on 13 March the plants were transplanted into 13 cm diameter pots for the market sale.

The concentrations used in the experiment: 0.3 ml/l, 0.5 ml/l and 0.7 ml/l. Two different spray application methods were compared: irrigating and foliar spray. In the case of irrigating the begonias obtained 75 ml/pot treatment at all treatments. During the foliar spray plants obtained 7.5 to 10.5 ml / plant Pentakeep-V solution was delivered, depending on its concentration of the fertilizer.

Half of the population after the pricking received no supplemental light and the other half received it. The treatments were performed seven times in both groups: 26 January 2012, 10 February, 25 February, 14 March, 30 March, 8 April and 15 April. The evaluation of the plants was measured by the following properties: plant height (in cm), mature leaf size (cm²), the adult plant stem diameter (in mm) the mature flower diameter (in cm).

To determine chlorophyll content in the leaves two different methods were used. One of them was carried out at the site of a Konica Minolta brand of SPD-502 portable chlorophyll meter (Konica Minolta Sensing Inc, 2003). These measured results were compared under laboratory conditions, spectrophotometric assays. For laboratory determination 250-300 mg leaf samples were collected. With quartz sand the samples were homogenized and completed with 80 % Acetone solution to 10 ml. After 24 hour rest in refrigerator the light absorbance of the solution was measured on 663 and 640 nm wave length.

RESULTS AND DISCUSSIONS

The effect of the Pentakeep-V on vegetative organs. I supplemental light for maximum height (17.82 cm) was achieved with 0.05% solution spraying compared to the control group (19.2 cm). Also in the case without supplemental light dispensed spraying of 0.05% concentration was a better result (18.15 cm) compared to the watered group. The results by the supplemental light by 0.07% spraying solution was obtained (16.1 cm) without supplemental light has resulted in 0.07% solution irrigation (17.5 cm). Concerning the system application, the use of spray Pentakeep-V was the most effective, so to the control, as compared to watered group.

Begonia growth in terms of leaf area, the highest level have reached in the 0.07% concentration, without supplemental light, sprayed spread (111.7 cm²). By supplemental light, also sprayed with 0.03% concentration was the most effective using Pentakeep-V (108.3 cm²). Taking account of the application method, the application via the leaf surface of the plants is remarkable influenced with and without supplemental light, too. By irrigating plants in case of supplemental light, leaf area was the smallest comparing to the control and to the spraying. Independently of the application

method, we got the most letters by supplemental light. And if Pentakeep-V used during production without supplemental light, the leaf surface also increased comparing to the supplemental light of the control group.

The investigation of plant stem diameter the best results have been achieved with supplemental light (7.9 mm) completed 0.05% spraying solution. The 0.03% solution spraying also showed satisfactory results when supplemental light was applied (7.2 mm). The worst results were obtained without using supplemental light and Pentakeep-V, by the control group (4.2 mm).

The effect of Pentakeep-V on flowering. We conclude that no significant changes were found between the groups at each measurement. The highest flowers were got with supplemental light, irrigation afford the 0.05% solution of uses. Similar results were obtained without supplemental light grown begonias, where Pentakeep-V in 0.07% concentration was used with irrigation. If application methods are considered, we can conclude that in all cases compared to the control treatment had positive effect on the average and maximum values obtained for both irrigation lighting conditions. The light does not affect the size of the diameter of the flowers. This is certainly the fact that what the flower begonia plants develop their flowers (end of April - mid May), has been the amount of natural light is sufficient for them. Given the volume of the flowers on the basis of the average values of the spray application rate by 0.05 % concentration solution and supplemental lighting treated group showed the best results (3.42 p). The effect of treatments, the colour of flowers became more vibrant. The more plants and more flowers resulted in the onset of flowering was occurred more and two weeks earlier. In a culture that 5-6 months means minimum of two weeks early flowering, which is the implied horticultural practice perspective is very important. The Pentakeep-V -treated plants in each case compared with the control resulted more and larger flowers.

Changes in the chlorophyll content. The chlorophyll content was detected by two laboratory measurements, on average samples. Therefore, one result obtained by every treated group. The value of the total chlorophyll content of the treated groups were higher than by control group. The highest value was obtained with the

0.3% concentration of solution spraying, with supplemental lighting (460 mg/g). The application methods evaluated, concluded that the effect of spraying Pentakeep-V was the most successful (448.59 mg/g). Comparing to the control group, in both cases, considerably increased the amount of chlorophyll in plants. If chlorophyll content of leaves is examined in both measurement methods by tuber begonia can be concluded that the results of all Pentakeep-V -treated groups was higher than in control plants. Even better result, can only be measured when the next Pentakeep -V plus supplemental light will be used.

CONCLUSIONS

Plant groups treated with Pentakeep-V grew smaller if obtained additional assimilating light comparing to the control. The dwarfing effect mentioned by the producer didn't prevail without additional light. Biggest leaf surface developed if plants were sprayed with 0.7 ml Pentakeep-V solution and grown under additional light.

Treated plants developed more and bigger flowers in all treatments comparing to the control. Highest number of flowers appeared if sprayed with 0.5 ml/l Pentakeep-V. The same concentration dispensed as irrigation resulted the biggest flower diameter. Assimilating light had positive effect in all treatments for all parameters. Meantime the colour of the flowers became brighter and the growing period shortened two weeks. These are remarkable in practical aspect as well.

The chlorophyll content of the leaf is an important marker of the physiological state of the plant. This parameter rose mentionable thanking to all treatments comparing to the control. There wasn't difference between the Pentakeep-V concentrations and ways of treatment. Additional light resulted further chlorophyll growth.

Summarizing Pentakeep-V nano-fertilizer can be offered in 0.5 ml/l concentration with spraying treatment in the seedling production of *Begonia x tuberhybrida* 'Nonstop'. Additional light enhances the effect in most examined parameters that is needed in the general practice during short day growing period.

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