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STUDY OF APPLYING DIFFERENT TREATMENTS ON CUT *ALSTROEMERIA* AND THEIR INFLUENCE ON THE SHELF LIFE

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Abstract

The importance of cut flowers and flower arrangements vary according to the standard of living. If the standard increases, the demand for beautiful, more expensive flower arrangements grows as well. At low standard of living, the costumers give up on, or reduce the acquisition of flowers considered, in this particular case, a luxury. Thus it is essential to know how long the flower can be a decoration, for how many days it stays fresh and beautiful, because it takes time to get the flowers from the grower to the shops and in our vase, which shortens their lifespan considerably. Another important aspect is the way in which we handle the flowers wilted during transportation and not recovered even after putting them into fresh water. What does salt, sugar or grandma's copper penny have to do with?
Objectives: The purpose of my thesis is the prolongation of the lifespan of the cut Alstroemeria. During our experiment we'll analyze the effect of some Hungarian and Dutch floral preservatives on the Alstroemeria. The results will then be compared while monitoring the life processes of the flowers in question.

Key words: *cut flowers, Alstroemeria, vase life, Bioplant, Chrysal, Oasis.*

INTRODUCTION

It is vital to consider the prolongation of the life of cut flowers when harvesting, transporting, storing, handling them in the flower shop, during work with flower arrangements or even putting them in a vase in our home. For the prolongation of its vase life, it is essential to know the life conditions and the life process relevant to the plant. Inorganic nutrients, water, light, air – carbon-dioxide and oxygen in particular – and the right temperature are absolutely essential to the growth and development of the plant.
The organic materials thus produced during the transformation – assimilation-in the leaf, are partly used for the plant structure, another part is dissolved during breathing and internal energy producing, then eliminated (as water, oxygen, carbon-dioxide, ethylene, etc.), or stored. From our point of view the stored organic materials are the most important (Szabó and Hegyi, 2005).
As soon as the cut flower runs out of one of the two substances it starts to fade immediately. First the water is consumed. If put in water in time the flower uses its sugar supplies in order to live (Schmidt, 2001).
We can assure the undisturbed life process of the cut flower by means of floral preservatives and salts (Klincsek, 1990).
Basically any preservative should have the following ingredients: nutrients (proteins, mainly simple sugars),disinfectants against micro-organisms, growth regulator substances, surface tension reducing substances (increases water absorption) (Schmidt, 2001).
Lack of hygiene causes development of micro-organisms leading to water turbidity and bad smell (The Beauty of Chrysal, 2009).

MATERIALS AND METHODS

The experiment took place at the University Sapientia, the Faculty of Technical and Human Sciences in Târgu Mures in the laboratory of ornamental plants.
Altroemeria aurantiaca „Virginia" was cut on 30th October 2011 and arrived from the Netherlands on November 4. Following the preparation of the solution and the cut, we put 10 threads in each vase. They faded on November 22, so the experiment lasted 19 days.
During the experiment we used three of the best known solutions used for conservation,

control water and a solution developed by own recipes (sucrose and chlorine). The different solutions in the vases were carefully labeled.
Floral preservatives used in the experiment:

- Chrysal Clear Rosa-Dutch liquid product,
- Chrysal Clear *Lilium* & *Alstroemeria*-Dutch granular product,
- Floralife Fresh Oasis-Dutch granular product-contains 94% sugar (dextrose), 3,8% citric acid, 1,7% of different salts and 0,5% preservation solution,
- Bioplant-Hungarian product in granular form containing mineral salts and disinfectant agents against decay.

Content of the other two vases:

- Sapientia-own recipe containing 50 ml of chloride and 30 g of sugar
- Control-tap water.

The equipment used.

1. Phyto-monitoring (PhyTech) system is a modern observation tool which recorded the following data throughout the experiment: air humidity (%) – Inp9 – RHS-2, air temperature (C°) – Inp8 – AT1, temperature of the water in the vase (C°) – Inp7 – ST-22.

We chose a leaf from each vase, put a plastic sensor on them for 9 minutes/day which helped us measure the temperature of the leaf, so we recieved data in every 3 minutes for each given solution. (C°) – Inp1 – LT1.

We used the same procedure for measuring the quantity of water flowing through the strain: using a device attached to the strain we measured this quantity (units) Inp12 – SF-5.

2. Digital caliper (Mitutoyo). Diameter measurement was carried out daily with a digital caliper (Mitutoyo) taking into account the influence of preservatives (in mm) on blooming. In case of the hydrangea we chose one flower from each vase and measured 3 flowers every day. From the *Alstroemeria* we measured one thread from each vase with all the flowers on it (5 paces).

3. Hansatech Fluorescence Monitoring System. Currently this is one of the most modern procedures for real time monitoring which does not affect or destroy the plant; the procedure can be applied on the plant in its natural environment with a test-retest reliability within a short period of time and high sensitivity changes in photosynthesis.

The method shows high sensitivity to functional changes of the photosynthetic device as well as how and where the different physical and chemical factors act (Fodorpataki, 2010).

We selected a leaf from each vase, applied the clips and allowed them to stay in dark for 15 minutes. Meanwhile the process of photosynthesis in the selected samples stopped, they had become dark-adapted. After applying the measuring device on the clips we read the data on the display.

F_o – minimal level of fluorescence

F_m – temporary maximum fluorescence

F_v/F_m – maximum or potential quantum performance

F_s – steady state chloro-fluorescence

F_m' – modulated maximum fluorescence

PS II – actual or effective quantum performance

4. GTH 2 device. These parameters were measured twice a day: in the morning at the beginning of the program and in the afternoon at to end of it. We used the GTH 2 device, which makes it possible to measure the three parameters simultaneously.

5. Ciras 2 – Measuring stomatal conductance. Ciras 2 is a system which measures leaf gas exchange, evaporation (E) and stomatal conductance (GS).

Evaporation is a phase transition from liquid to gas (water vapors) usually occurring on the surface. In case of the living organisms this phenomenon is called evaporation, transpiration. A gas analyzer consists of a digital monitoring unit and a unit of measurement. The most important part of the unit of measurement is a particle which can be sealed and measures the evaporation on the leaf surface. This part of the analyzer contains sensors which measure temperature, humidity inside as well as photon flux density on the leaf surface (light intensity). So we chose an adequate leaf from each vase, placed the particle sensors on the leaf and read the data on the display after the values were stabilized: E (Transpiration Rate) refers to evaporation, GS refers to stomata conductance (Fodorpataki, 2010).

6. Video camera. Using the Sony Steady Shot Camera DCR VX 2000 PAL we could record daily, hour by hour the changes occurring in alstroemeria the data being processed later. The video camera is an important part of the

experiment because it shows and illustrates the results spectacularly.

Measurement of water consumption. Each vase was labeled indicating the type of preservatives used and also used a scale on the vase, so we could see the daily water consumption. In order to avoid evaporation respectively to reduce evaporation to the minimum we wrapped the vases in a double layer of foil.

RESULTS AND DISCUSSIONS

The laboratory was monitored by the Phyto-monitoring system and GTH 2, so the humidity of the laboratory varied between 13,5 – 46%. Water temperature shows a close correlation with the values recorded in air, ranging from 22 – 22,75°C. Leaf temperature started being lower than the air temperature (0,5°C), but gradually increased towards the end along the wilting process.

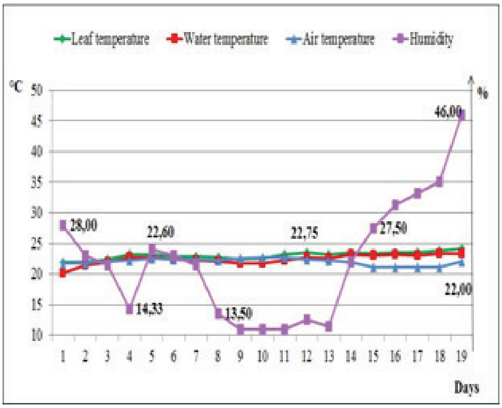

Figure 1. Ambient conditions during the experiment

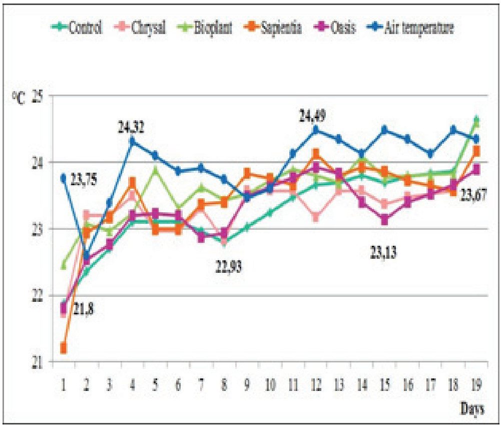

Figure 2. Leaf temperature

Leaf temperature was recorded and measured by the Phyto-monitoring system. The values of the administrated solutions tend to be close. Air temperature ranges from 22,5 – to 24,4°C and leaf temperature gradually approach air temperature values.

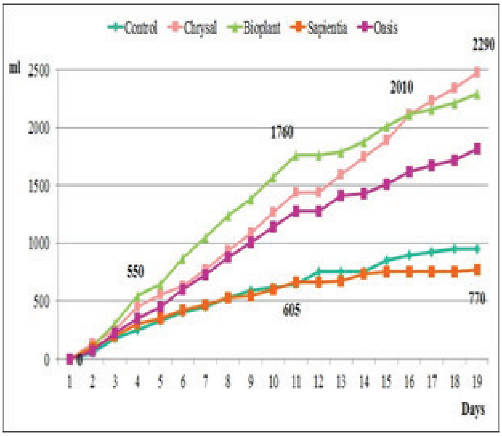

Figure 3. Water consumption dynamics

We noticed an increased water consumption in the case of the *Alstroemeria* as well, especially with Chrysal and Bioplant. Chrysal consumed 2470 ml of water in 19 days, Bioplant 2290 ml. Oasis consumed 1820 ml, Control 950 ml and Sapientia 770 ml of water.

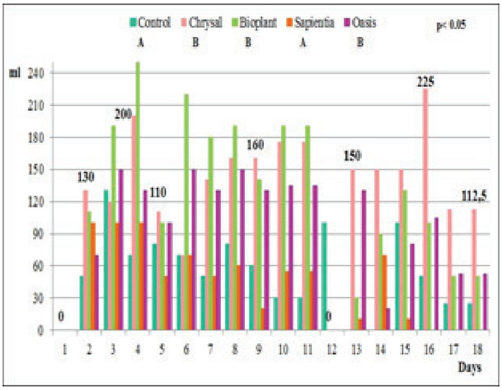

Figure 4. Daily water consumption

We filled the vases on the first day of the experiment, so we did not register any water consumption on that day. Bioplant was in the first place with a daily water consumption of 30-250, the highest daily intake was recorded on the fourth day (250 ml). It is followed by

Chrysal where daily consumption ranges from 110-225 ml. Control consumed between 30-150 ml, Sapientia between 10-100 ml and Oasis between 20-150 ml of water. We noticed a dramatic increase in water consumption in the last day before wilting.

By applying Games-Howell test we found significant differences between Chrysal, Bioplant, Oasis and Control, Sapientia.

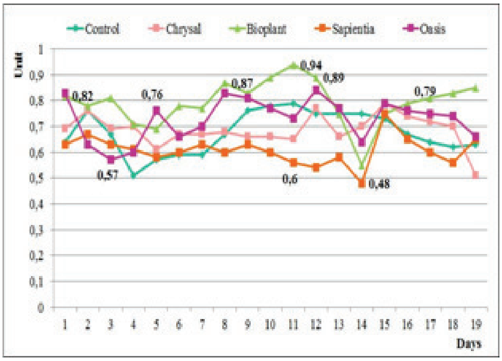

Figure 5. Water quantity in the stem

The water amount in the stem was measured by the Phyto-monitoring system. Figure 5. refers to water quantity values and they show significant variations among the different solutions.

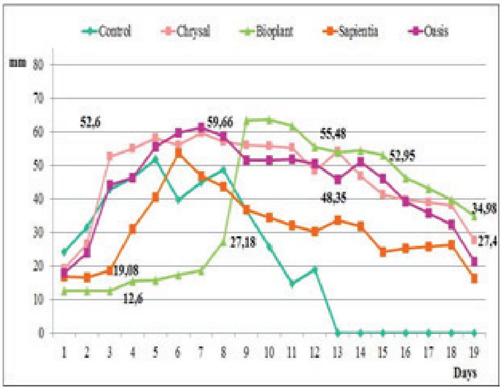

Figure 6. Flower diameter measured in Alstroemeria

We measured flower blooming on a daily basis. This procedure is to indicate the extent of and the pace (speed) of blooming. In case of Chrysal and Oasis the flowers started blossoming going through its every stage, Control on the other started the wilting process prematurely. Bioplant had difficulties in blossoming but eventually did bloom.

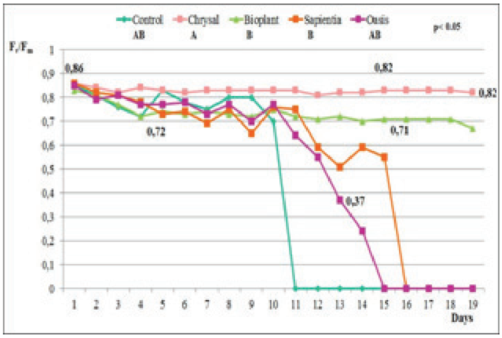

Figure 7. The potential quantum effect of the leaf

Ratio Fv/Fm indicates the maximum degree of use of light in photosynthesis. Values below 0,75 in this report indicate disturbances in the use of light. The graphic shows that this ratio remains constant only in the case of Bioplant and Chrysal. On day 11 Control drops below this value, Oasis on the 12th day and Sapientia on the13th.

Games-Howell test shows significant differences between Chrysal, Bioplant and Sapientia.

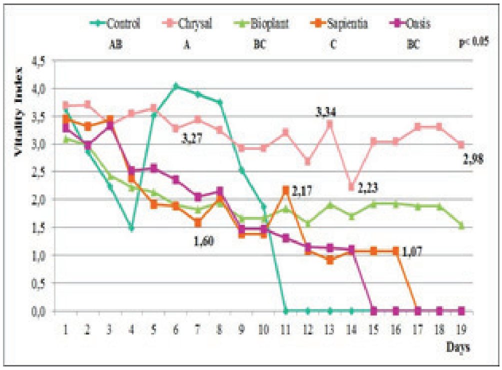

Figure 8. Vitality index

Vitality index of the photosynthesis is the parameter most sensitive to variations in environmental factors. Photosynthetic devices stop measuring when close to value 0 (zero). This happened on day 11 in the case of Control, then on day 15 in the case of Oasis, and on day 17 in the case of Sapientia. Using the Games-Howell test we found significant differences among all the administrations, except for Oasis and Bioplant.

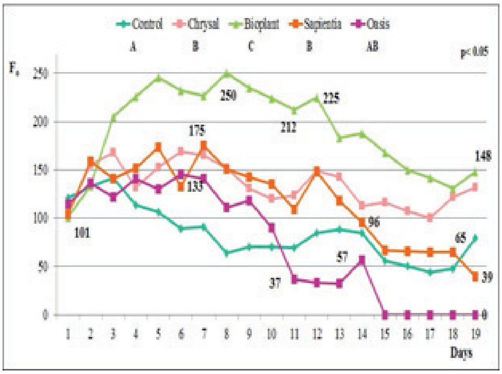

Figure 9. Basic fluorescence

Basic florescence shows the degree of organization of the antennae pigments in the tilacoide membranes in the chloroplasts of the leaves and the degree of energy transfer between the antennae. If there is a deficiency in the energy assimilation, the plant tries to compensate by the growth of rearranging pigments antennae. The phenomenon was evident in all three samples: Bioplant, Sapientia and Oasis. Chrysal and Control showed balanced behavior.

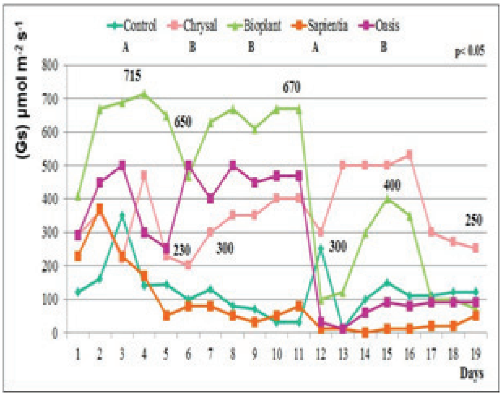

Figure 10. Stomatal conductance

Stomatal conductance indicates the operation of the stomata. Measurements were made by the Ciras 2 system.

Values are consistent with water consumption and the values measured in the strain Bioplant singles out in this respect followed by Oasis and Chrysal. Sapientia and Control show weak results. After applying the Games-Howell test results show major differences between Chrysal, Bioplant and Oasis, respectively the Control and Sapientia solutions.

CONCLUSIONS

From flowering point of view in the case of the, *Alstroemeria* we have reached the best results with the help of the Bioplant preservatives, closely followed by the Chrysal and then Oasis.

The physiological aspect of the flowers in the Bioplant treatment were better than that of other flowers. At the end of the experiment these flowers were still alive, so their vase life got 12 days longer. The Chrysal prolonged the vase life with 9 days, and the Oasis with 6 days.

Expenditures for the purchase of these solutions are worth all she money because the effects are clearly visible. Compared to the control, Bioplant and Chrysal solution have almost doubled durability of cut flowers in a vase.

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