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

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Abstract

Flowers have an important role in our lives. They have been part of our celebrations since the beginning of time. Being associated to many occasions and events, they express a range of feelings and atmosphere. Flowers give us joy, they fill us with a sense of peace and purity, and in time of sorrow they bring comfort and relief. Their beauty can light up our darkest days. Our ancestors used flowers as the symbol of fertility and renewal. Flowers can be given as a gift almost any time and to anyone. Most people, women in particular, have a special talent in choosing flowers and offering them as a gift. In any culture or civilization flowers have always been a comforting presence for mankind. Objectives: The purpose of my thesis is the prolongation of the lifespan of the cut Hydrangea. During our experiment we'll analyze the effect of some Hungarian and Dutch floral preservatives on the Hydrangeas. The results will then be compared, while monitoring the life processes of the flowers in question.

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

INTRODUCTION

The lifespan of the cut flowers is a genetic endowment, a feature specific to the species (Horváth, 2001). Scientific knowledge offers the possibility to prolong the lifespan of the cut flower. 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).

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).

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The proper nutrient for cut flowers contains the following: water softener, pH regulator, water absorption increaser, nutrient (The Beauty of Chrysal, 2009).

Different bacteria and fungi can quickly spread in the water of cut flowers. The greatest damage caused by them is the clogging of the wood tissue, but they also present other risk factors such as the production of toxins and ethylene. Most disinfectant products on the market contain 8-hydroxy (8-HQ) or its salts. Silver salts have also a bactericidal effect.

The features of silver thiosulphate (STS) are more favorable: it successfully prevents the formation of ethylene and its bactericidal effect operates within the tissues. Of all the compounds, the most often used in floral preservatives are organic acids (citric acid, ascorbic acid, tartaric acid). Citric acid reduces the pH of water, improves water absorption and reduce, the risk of clogging of wood tissue. Floral preservatives contain mineral salts, often in the form of KCl, NaCl, Ca $(NO_3)_2$. Na and Cl have toxic effects on cells, therefore we use them only in low concentrations. Various metal salts (Mg, Cu, Al) significantly improve cut flower longevity. The simplest preservative is a

solution known as AKN. Content: potassium-ammonium sulfate, or alum (A), potassium (K) and sodium chloride, or table salt (N). Preparation: Dissolve in 1 l of water 0.8 g of alum, 0.3 g of 40% potassium and 0.2 g table salt, add 10 to 15 g of sugar beet (Schmidt, 2001).

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.

On 18th May 2011 we received 14 pots of *Hydrangea macrophylla* from the local greenhouse. On the same day we cut them. After preparing the solutions we put 7 of the flowers in each vase. They faded on June 2nd, so the experiment lasted 16 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,

-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 received 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. We chose one flower from each vase and measured 3 flowers every day.

3. Hansatech Fluorescence Monitoring System. The induction of chloro-florescence signals emitted depends on the vegetative state of the plant, so that gives information about the effects of different environmental factors on plants (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. Carbon-dioxide, relative humidity, temperature 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 is a system which measures leaf gas exchange, evaporation (E) and stomatal conductance (GS). 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 *Hydrangea* 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

Humidity in the lab was monitored by the Phyto-monitoring system and GTH 2, so it varied between 43-52%. Water temperature showed a close correlation with the values recorded in air, ranging from 22 to 25°C. Leaf temperature started as being lower than air temperature (by 0,5 to 1,5°C), but gradually increased towards the end of the experiment as withering set in.

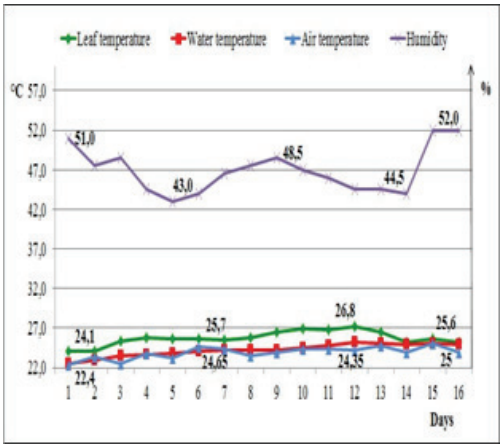

Figure 1. Ambient conditions during the experiment

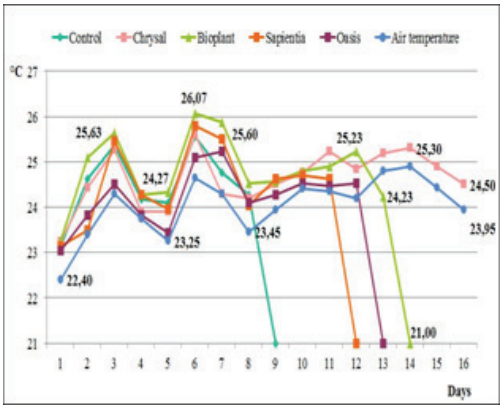

Figure 2. Leaf temperature

Leaf temperature was recorded and measured by the Phyto-monitoring system. There seems to be a similar tendency among the floral preservatives applied. Nevertheless, we noticed differences in the order of wilting: first, on the 9th day sample Control took ambiental temperature (21°C), then on the 12th day sample Sapientia and on 13th sample Oasis followed. Bioplant withers after 14 days. Only sample Chrysal maintains its beauty throughout the experiment.

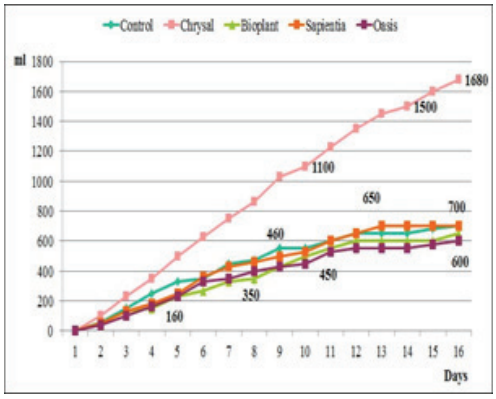

Figure 3. Water consumption dynamics

The highest water consumption was recorded in the experiment especially with Chrysal which consumed 1680 ml of water in 16 days. Then followed Sapientia and Control with a consumption of 700 ml of water and finally Bioplant consumed 650 ml and Oasis 600 ml of water.

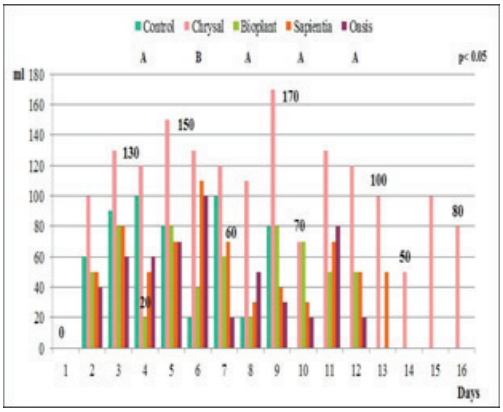

Figure 4. Daily water consumption

As shown in the figure, Chrysal is on the top with the highest values indicating daily water consumption: from 80-150 ml. Using the SPSS statistical program, the Games-Howell post hoc test showed that water consumption significantly increased in case of Chrysal in relation with the other solutions. The highest amount was recorded on the ninth day, when it was 170 ml. Control consumed daily from 20 to 100 ml of water, Sapientia between 30 to 110 ml, Bioplant between 20-80 ml, and Oasis between 20-100 ml.

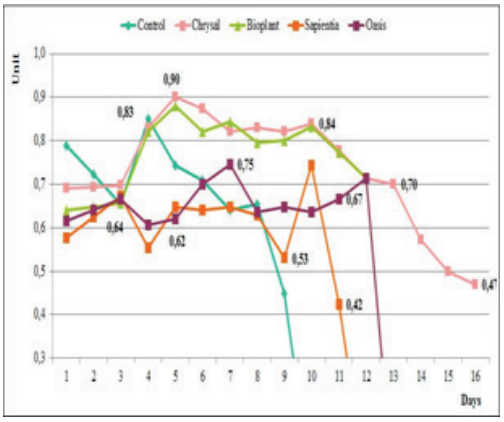

Figure 5. Water quantity in stems

In this process there is a general tendency among the solutions applied and the order of wilt: on the 9th day-Control, on the 12th day-Sapientia, then after on the 13th day Bioplant and Oasis.

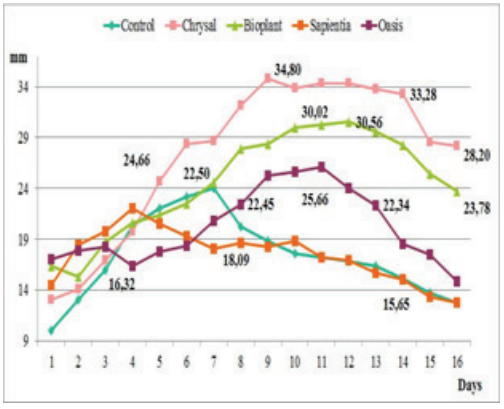

Figure 6. Flower diameter

Hydrangeas treated with Chrysal, Bioplant and Oasis opened quicker and fully to 8-9 days. Instead, those in Control and Sapientia had a slow opening.

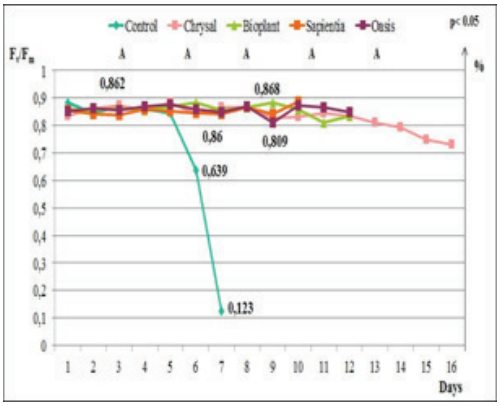

Figure 7. The potential quantum effect of the leaf

The relation between Fv/Fm stands for the maximum degree of use of light in photosynthesis. Values below 0,75 in this report indicate shortcomings in the use of light. The graphic shows that the quantity of light used remains almost constant throughout the experiment. Only values from sample Control drop below the average on day 6. In this case the Games-Howell test does not show significant differences between solutions.

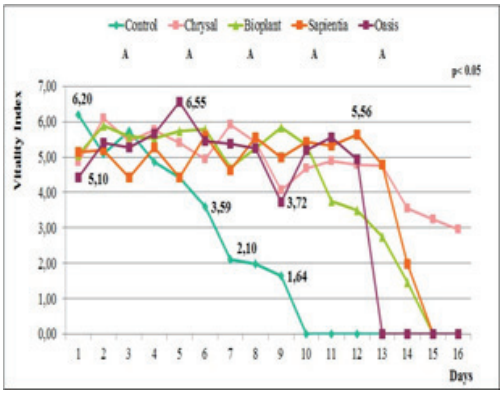

Figure 8. Vitality index

Comparing Control with the other solutions applied we found that all of them have higher vitality indices.
Photosynthetic devices stop when the values are close to 0 (zero). So it happened on day 10 in the case of Control, then on day 13 in the case of Oasis, and on day 15 in the case of Bioplant and Sapientia. Using the Games-

Howell test we did not find significant differences between the administrations.

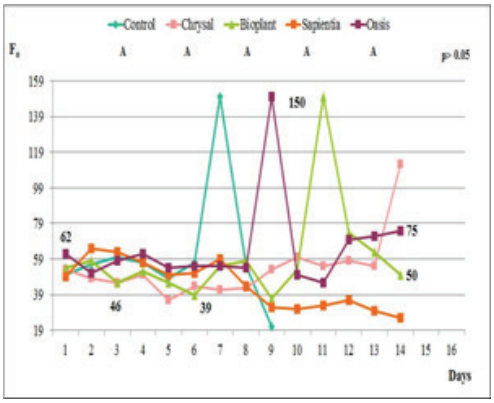

Figure 9. Basic fluorescence

On the 6th day Control, on the 8th Oasis, and on the 10th Bioplant values show a sudden increase, then fall dramatically. It senses deficiency in energy assimilation, thus trying to compensate by increasing the antennae pigment organization. Chrysal and Sapientia did not indicate such a deficiency. This time we applied the SPSS Tukey test which revealed no differences between doses.

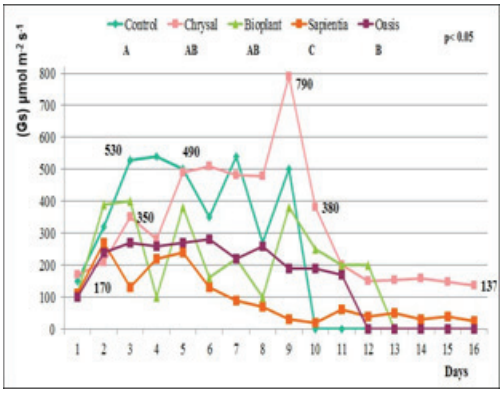

Figure 10. Stomatal conductance

Stomatal conductance indicates the way the stomata operate. Measurements were made using the Ciras 2 system. Values tend to be consistent with water consumption and the values measured in the stem. Chrysal stands out in this respect, followed by Control, but the latter gives up after the 9th day. Bioplant also shows potential till day 13. Oasis lasts until day 12. After applying the Games-Howell test the results show major differences between the solutions especially with Sapientia, however Chrysal and Bioplant show similar results.

CONCLUSIONS

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

The physiological aspect of the flowers in the Chrysal treatment were better than that of other flowers. At the end of the experiment these flowers were still alive, so their vase life got 10 days longer. The Bioplant prolonged the vase life with 8 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, Chrysal and Bioplant solution have almost doubled durability of cut flowers in a vase.

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