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Growing greenhouse cut flower in hydro-culture

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Summary: The importance of hydro-cultural growing is significantly increasing. We have been dealing with the hydro-cultural growing of cut flowers at the Department of Ornamental Plant Growing and Maintenance of Gardens at the College Faculty of Horticulture at Kecskemét College since 1988. We started our experiments by growing carnation in growing establishment without soil then we introduced other species of cut flowers and potted ornamental plants into our research work.

Key words: hydroculture, carnation, Rose, PU sponge, Grodan, Phytomonitor

Introduction

Our aim was to examine the effect of Grodan and PU-sponge media on the growth, the yield of flowers, the diameter of the flowers and the length of the stem concerning the species of carnation 'Pink Castellaro'. In case of comparing the species our aim was to examine the effect on the development of the plants, the yield and the characteristics of the flowers: the diameter of the flower and the length of the stem.

The Phytomonitor instrument is placed in the French Filclaire greenhouse and we at the Floriculture and Park Maintaining Department measure rose culture parameters in hydroponics. We measure the following factors: air temperature, leaf temperature, radiation, relative humidity of air, stem diameter and soil moisture (*Lévai & Turiné,* 2009.)

Using Phytomonitor data processing make it possible to use nutriments in an optimal level thus apply a low-cost environmentally friendly technology.

The effect of the species on the flower diameter of carnation: Most of the species in the experiment reached or exceeded the parameters of 1st class products determined by the standards, minimum was 7.0 except for the values of 6,91 and 6,96 of 'Candy' and 6,87 and 6,89 of 'Ondina' average yearly flower diameter (*Lévai & Turiné,* 2005a).

The largest flower diameters of the red species were experienced in the case of 'Iury' and 'Rodolfo', from the point of flower diameter these species are worth being involved in hydro-cultural growing. In case of the 'Castellaro' species 'Pink Castellaro' produced significantly larger flowers (*Lévai & Turiné,* 2005b).

Experiments with the species:

- 'Danton' is of high growth, of good yield, with large flowers and long stem
- 'Gigi' is of high growth, of good yield, with large flowers and long stem
- 'Iury' is of high growth, of average yield, with large diameter of flower and long stem
- 'White Castellaro' is of high growth, of good yield, with large diameter of flower and long stem
- 'Pink Castellaro' is of high growth, of excellent yield, with large flower and long stem
- 'Candy' is of average growth, of excellent yield, with average size of flowers, with average long stem
- 'Rimini' is of high growth, of good yield, with large flowers, really long stem
- 'Rodolfo' is of high growth, of excellent yield, really large flowers, really long stem
- 'Ondina' is of average growth, of good yield, with average size of flowers, long stem
- 'Olivia' is of high growth, of excellent yield, with large flowers and long stem

Each of the species in the survey is adequate for hydro-cultural growing (*Lévai & Turiné,* 2005a,b; *Lévai & Turiné,* 2007).

Materials and methods

We made experiments of hydro-cultural growing of carnation with the following species: 'Danton', 'Gigi', 'Iury', 'White Castellaro', 'Pink Castellaro' and 'Candy', 'Rimini', 'Rodolfo', 'Ondina', 'Olivia'.

The experiments of carnation were carried out by the French Filclair growing establishment, growing was arranged in a closed, circular system. The planting of shoots with roots was arranged by 40 pieces/m^2 at the end of May. We applied PU-sponge as the medium of plantation for the comparative experiments, the length of the growing season was one year. The experiment was carried out by repeating the procedure four times. The supply of nutritional material was made by using complex chemical fertilizer, the pH of the nourishing solution was 5,0–6,5, the conductivity was 2,5–3,5 mS and these parameters were continuously controlled. We measured the quantity of the picked flowers from the beginning of blooming each time. We chose 10–10 of the picked flowers by random choice and measured the characteristics of flower quality: the diameter of the flower and the length of the stem.

In case of rose the effect of environmental conditions on plant growth are examined.

A PhyTech company plays a pioneer role in the Phytomonitoring™ system, it detects the plants remotely. It uses advanced methods, collects and analyses the data derived from wireless communication sensors and innovative softwares. The main purpose is the detection of early plant stress, optimal growth and quality of product to increase income.

Results

Evaluation The effect of the media on the height of the carnation

In case of the hydro-cultural growing of carnation both the polyurethane-ether sponge and Grodan had a good effect on the growth of the plant, both are adequate as a plantation media but the stock grown in the sponge was higher.

The effect of the media on the yield of the carnation

We managed to reach the average flower yield of 7–9 flowers per stem *(Figure 1.)* characteristic of the traditional chemo-cultural growing in case of hydro-cultural growing in polyurethane-ether sponge and in Grodan that is both are adequate plantation media for hydro-cultural growing.

The effect of the media on the flower diameter of the carnation

During the two growing seasons of the experiments the average diameter of the flowers planted in polyurethane-ether sponge and in Grodan reached the parameters of 1st class flowers that is 7-cm flower diameter. We did not experience significantly better results in case of the two media so both are adequate for the hydro-cultural growing of carnation.

The effect of the media on the length of the flower stem of carnation

The plantation media influenced neither the yearly nor the monthly length of the stem significantly in the years of research.

Taking the yearly average into consideration we reached the requirement of 1st class quality that is 55–60 cm stem length in case of both media.

Considering all the above both polyurethane-ether sponge and Grodan are adequate media for hydro-cultural growing.

The fluctuation of air temperature well indicates the change of the phases of the day *(Figure 2)*. The expansion of stem follows this cycle. It was pointed out that the higher was the daily maximum temperature the expansion of stems were more intensive. Respectively the fewer daily fluctuation made the stem expansion more stable. By the increase of daily temperature the expansion of stems are significant. The temperature of leaves increases paralell with the air temperature.

By the increase of temperature the relative humidity decreases. The temperature change of leaves follows the change of air temperature *(Figure 3)*. According to it the relative humidity is higher in the night and lower in the day.

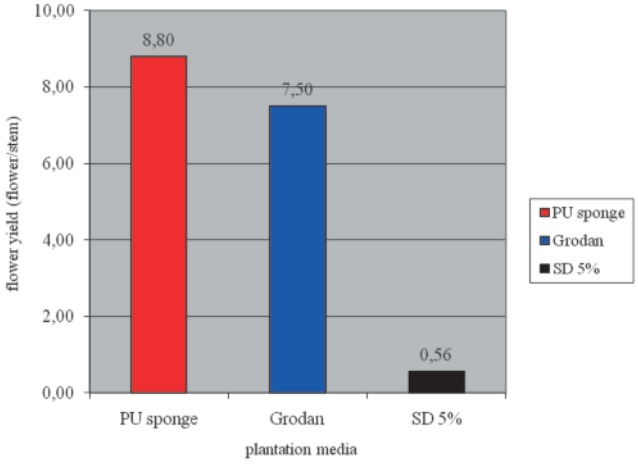

Figure 1. The effect of plantation media on the yearly yield of carnation 'Pink Castellaro'
(Kecskemét, 1999–2000.)

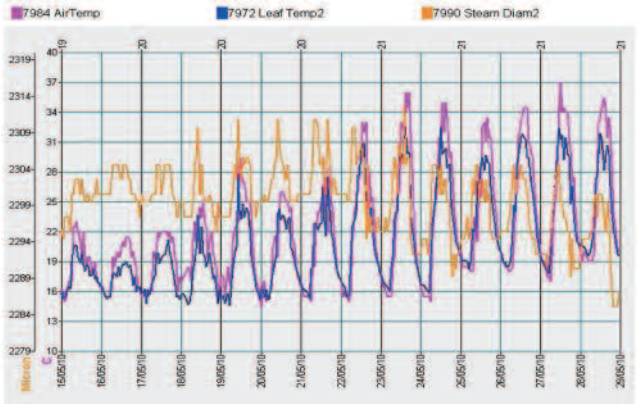

Figure 2. The effect of air temperature on rose leaf temperature and expansion of stem
(2010.Kecskemét,)

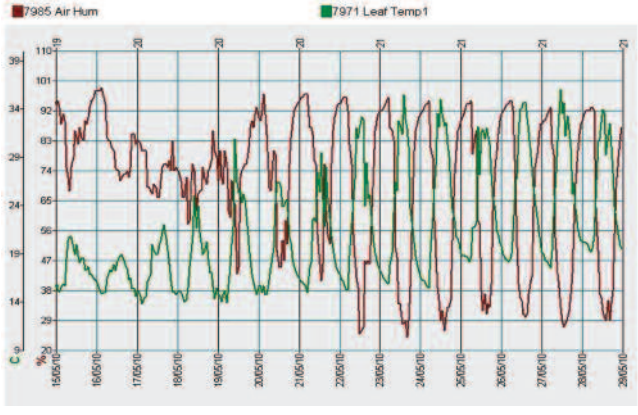

Figure 3. Rose leaf temperature in relation with the air humidity
(2010.Kecskemét

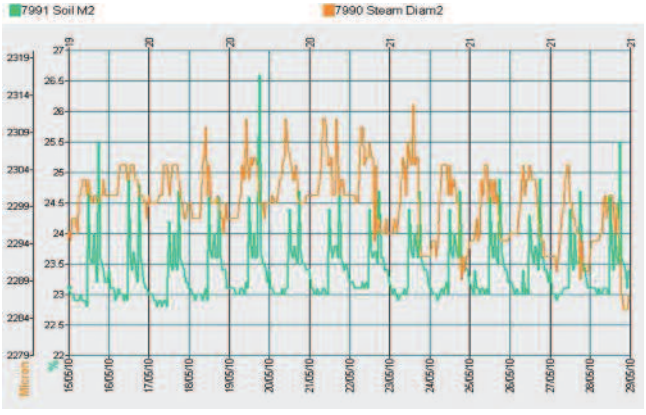

Figure 4. The expansion of rose stem in accordance with soil wetness (2010. Kecskemét)

The wetness of soil indicates the time of irrigation *(Figure 4)*. The expansion of stems well follows the wetness of the soil.

Discussion

Concerning environmental protection PU sponge is more and more adequate media for growing carnation since it can be used until complete decomposition.

Both PU sponge and Grodan have got a favourable effect on the growth of the plant, the yield of the flowers and the flower quality characteristics that is why Grodan is also an adequate media for the hydro-cultural growing of carnation.

Phytomonitoring is one of the growing decision support devices which gives fast information about the tendency of plant development. It is an information technology which provides the grower with incredibly valuable information about the plant physiologic stage.

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