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EFFECT OF PREPARATIONS FROM THE CHRYSAL SERIES AND BENZYLADENINE ON THE POSTHARVEST LONGEVITY OF SHOOTS OF THE ST. JOHN'S WORT (*HYPERICUM CALYGINUM* L.)

Summary. The conditioning of shoots of the St. John's wort (*Hypericum calycinum*) in solutions of the Chrysal RVB and Chrysal Clear RVB preparations before placing them in water extended their postharvest longevity by 17.3 and 16.4 days, respectively. Benzyladenine at concentrations of 50 and 100 mg/dm³ decreased the postharvest longevity of the *H. calycinum*. Chrysal RVB and Chrysal Clear RVB contributed to a higher index of leaf greenness.

Key words: vase life, preservatives, florists' green, index of leaf greenness

Introduction

In the recent years, extending the longevity of the florists' green, leaves or leafy shoots, has greatly gained in importance to meet the requirements of customers, who expect more interesting compositions with florists' green as an indispensable element. To extend the longevity of both, flowers and florists' green, ready-made preparations as well as growth regulators from the group of cytokinins, gibberellins and growth retardants are usually used.

The life processes occurring in cut flowers and leaves follow different patterns, hence preparations intended for cut flowers are often of little use leaves or leafy shoots. It is therefore essential to conduct a search for effective solutions for of florists' green (SKUTNIK 1998).

The most popular on the Polish market are ready-made preparations of the firm Chrysal International. They have a well-established position throughout the world. Mil-

lions of producers, traders and customers use preparations from the Chrysal series (MOLLENAAR 1998). Until recently, the firm has recommended Chrysal RVB for florists' green, but there has appeared on the Polish market a new preparation for extending the postharvest longevity of green additions to bouquets, called Chrysal Clear RVB.

In the present article an assessment is made of the effect of the preparations Chrysal RVB and Chrysal Clear RVB as well as benzyladenine on the postharvest longevity of leafy shoots of the *Hypericum calycinum* L.

Material and methods

The shoots of *H. calycinum* were obtained from plants growing in the ground. They were cut 10 cm above soil level. The shoots chosen for experiments had 60 cm in length and were cut diagonally at the base.

Leafy shoots of *H. calycinum* were conditioned and then placed in solutions of benzyladenine (BA) at concentrations of 25 and 50 mg/dm³. Conditioning in aqueous solutions of Chrysal RVB and Chrysal Clear RVB at a concentration of 2 ml/dm³ lasted 12 h in a cold room at a temperature of 5°C. Shoots placed in water were the control treatment. The reaction of the solutions was slightly acidic (pH ±5.0).

The postharvest longevity of leafy shoots was determined in a room with a temperature of 18-20°C, a 12-hour photoperiod, lighted by fluorescent lamps emitting white light with a quantum irradiance intensity of 25 µmol/m² per 1 s, and a relative air humidity of 70%. Every day during the experiment water was changed and benzyladenine solutions replenished. The longevity of leafy shoots was determined in days. The loss of ornamental qualities was set at that point in when 30% of the area of leaf blades had turned yellow and/or wilted. After the experiment had finished, a Chlorophyll Meter SPAD-502 apparatus (Minolta) was used to determine the index of leaf greenness, which is correlated with chlorophyll content (GREGORCZYK and RACZYŃSKA 1997, GREGORCZYK et AL. 1998). Index of initial leaf greenness – 58.8.

The experiment consisted of nine treatments with three replications, five shoots in each. One treatment (a conditioning solution × benzyladenine concentration) included 15 shoots.

The results of the experiment were subjected to a two factorial analysis of variance and the means were compared using Duncan's test at the $\alpha = 0.05$ significance level.

Results and discussion

Leafy shoots of the *H. calycinum* preserved longevity for nearly four weeks. In comparison with the control, the most long-lived were those which had been conditioned for 12 h in aqueous solutions of Chrysal RVB and Chrysal Clear RVB. The application of benzyladenine in a holding solution had a detrimental effect on the property studied. Whether or not the shoots had been conditioned, benzyladenine at concentrations of 50 and 100 mg/dm³ decreased their postharvest longevity by 4.4-7.5 days, on the average (Table 1).

Table 1. Effect of Chrysal and benzyladenine on the postharvest longevity of *Hypericum calycinum* shoots (days)

Tabela 1. Wpływ preparatów Chrysal i benzyloadeniny na pozbiorną trwałość pędów dziurawca kielichowatego (dni)

Conditioning	BA concentration			Mean for conditioning
	0 mg/dm ³	25 mg/dm ³	50 mg/dm ³	
0	26.0 b	18.5 a	19.5 a	21.3 a
Chrysal RVB	43.3 c	18.8 a	18.0 a	26.7 b
Chrysal Clear RVB	42.4 c	21.6 a	18.0 a	27.3 b
Mean for BA concentration	37.2 b	19.6 a	18.5 a	

Means followed by the same letter do not differ significantly at $\alpha = 0.05$.

Preparations for extending the longevity of florists' green are the latest product of Chrysal International. Their efficiency has been proved in *Achillea filipendulina*, *Ajuga reptans*, *Anemone japonica*, *Aster dumosus*, *Astilbe ×arendsii*, and *Centaurea pulcherrima* (POGROSZEWSKA and WIATER 1998), as well as *Cordyline 'Glauca'* and the *C. stricta* (KOZIARA and SUDA 2008). In the experiment with *Asparagus falcatus* an extension of the postharvest longevity has been obtained using Chrysal RVB, a preparation recommended for cut flowers (SKUTNIK and RABIZA-ŚWIDER 2008). However, the Chrysal preparations are not always effective. KOZIARA and SIKORA (2006) showed that Chrysal Clear reduced the postharvest longevity of leaves of the *Dieffenbachia* and the *Syngonium*, while having no effect on the longevity of the *Spathiphyllum*. Although cytokinins are treated as growth regulators extending the longevity of leaves (BORKOWSKA 1997), the research conducted on florists' green seems to indicate that their efficiency crucially depends on the species.

In the case of asparaguses, benzyladenine extended longevity only in the *Asparagus setaceus*, but was not found effective in the *A. densiflorus* 'Meyerii' and 'Myriocladus' (SKUTNIK et AL. 2006). Benzyladenine at concentrations of 50 and 100 mg/dm³ extended the longevity of leaves of the *Arum italicum*. It is worth noting, however, that the efficiency of benzyladenine at a concentration of 100 mg/dm³ was only visible in this species in the case of leaves that had been conditioned in gibberellic acid (JANOWSKA and SCHROETER-ZAKRZEWSKA 2008). In a study by POGROSZEWSKA and WOŹNIACKI (2005), the conditioning of leaves of the *Campsis radicans* in benzyladenine extended their longevity. Benzyladenine at a concentration of 1 mmol/dm³ also significantly extended the longevity of leaves in *Cordyline 'Glauca'* (KOZIARA and SUDA 2008). According to SKUTNIK and RABIZA-ŚWIDER (2008), the soaking of shoots of *Asparagus falcatus* in a 1 mmol/dm³ benzyladenine solution increased their longevity 1.5 times. In turn, the conditioning of shoots of this species in a BA solution proved ineffective, which shows that not only the plant species, but also the form of application of growth regulators affect the postharvest longevity of florists' green. The soaking and conditioning in benzyladenine produced a favourable response in leaves of the *Spathiphyllum*. In the *Dieffenbachia* BA shortened longevity, and in the *Syngonium* it had no effect

(KOZIARA and SIKORA 2006). All those studies show that species of even the same family respond to the growth regulators in various ways.

With a decrease in the longevity of leafy shoots of the *H. calycinum*, chlorophyll content in the leaves was observed to fall, which is closely connected with the advancing process of senescence. The final chlorophyll content in the leaves depended significantly on the kind of solution used for conditioning and on the concentration of benzyladenine. The lowest level of chlorophyll was displayed by control leaves, which lost as much as 41.8% of the green pigment. In the other treatments the leaves lost from 23.5 to 28.6% of the initial chlorophyll content (Table 2). Worth noting is the fact that in the treatment with the use of benzyladenine the index of leaf greenness was high even though the longevity of the leafy shoots was very low. However, this was not due to a favourable effect of benzyladenine on chlorophyll content, but to the fact that in those treatments the whole leaf blades dried in a characteristic way rather than lost colour.

Table 2. Index of leaf greenness (SPAD value) of *Hypericum calycinum* at the moment of loss of decorative value

Tabela 2. Indeks zazielenienia liści (SPAD) dziurawca kielichowatego w momencie utraty walorów dekoracyjnych

Conditioning	BA concentration			Mean for conditioning
	0 mg/dm ³	25 mg/dm ³	50 mg/dm ³	
0	32.2 a	39.5 b	41.7 b	37.8 a
Chrysal RVB	40.6 b	42.3 b	39.7 b	40.9 b
Chrysal Clear RVB	42.0 b	40.5 b	39.6 b	40.8 b
Mean for BA concentration	38.3 a	40.9 b	40.3 b	

Means followed by the same letter do not differ significantly at $\alpha = 0.05$.
Initial index of leaf greenness: 58.8.

There is little information in the literature about the effect of the Chrysal preparations on chlorophyll content in leaves. KOZIARA and SUDA (2008) report, that at the end of their experiment, leaves of *Cordyline* 'Glauca' and the *C. stricta* treated by Chrysal Clear had the lowest chlorophyll content in comparison with the control leaves and those treated with benzyladenine and gibberellic acid. In the *C. australis*, the treatment of leaves with Chrysal Clear brought a positive result and caused a smaller loss of chlorophyll. The same authors observed a positive effect of benzyladenine on chlorophyll content in leaves of the *C. stricta* and the *C. australis* 'Red Star'. In *C. 'Glauca'*, the highest chlorophyll content was recorded in leaves treated with benzyladenine and in the control. In the *Asparagus setaceus*, a higher chlorophyll content was recorded in shoots when they were conditioned or soaked in benzyladenine (SKUTNIK et AL. 2006). In the *Arum italicum*, placing the leaves in a benzyladenine solution at a concentration of 50 mg/dm³ had a favourable effect on their chlorophyll content (JANOWSKA and SCHROETER-ZAKRZEWSKA 2008). In the *Lilium* 'Star Gazer', preparations ProVide (100 mg/dm³ GA₄₊₇) and Promalin (100 mg/dm³ GA₄₊₇ + 100 mg/dm³ BA) were effec-

tive in arresting the degradation of chlorophyll in leaves of plants kept at 4°C, while ProGibb (100 mg/dm³ GA₃) and ABG-3062 (100 mg/dm³ BA) turned out to be ineffective. A combination of light (40 μmol/m² per 1 s) with Promalin made it possible to replace the low storage temperature of flowers, because it proved effective in inhibiting chlorophyll degradation (RANWALA and MILLER 1998).

Conclusions

1. The conditioning shoots of *Hypericum calycinum* in solutions of the Chrysal RVB and Chrysal Clear RVB before placing them in water extended their postharvest longevity by 17.3 and 16.4 days, respectively.

2. Benzyladenine at concentrations of 50 and 100 mg/dm³ decreased the postharvest longevity of the *H. calycinum*.

3. Chrysal RVB and Chrysal Clear RVB contributed to a higher index of leaf greenness.

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WPLYW PREPARATÓW Z GRUPY CHRYSAL I BENZYLOADENINY NA POZBIORCZĄ TRWAŁOŚĆ PĘDÓW DZIURAWCA KIELICHOWATEGO (*HYPERICUM CALYGINUM* L.)

Streszczenie. Kondycjonowanie pędów dziurawca kielichowatego w roztworach Chrysal RVB i Chrysal Clear RVB i umieszczenie ich następnie w wodzie wydłużyło ich pozbiorcza trwałość średnio o 17,3 i 16,4 dnia. Benzyloadenina o stężeniu 50 i 100 mg/dm³ zmniejszyła pozbiorcza trwałość dziurawca kielichowatego. Chrysal RVB i Chrysal Clear RVB spowodowały uzyskanie wyższego indeksu zazielenienia liści.

Słowa kluczowe: trwałość pozbiorcza, pożywki, zieleń cięta, indeks zazielenienia liści

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