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SHORT COMMUNICATION

Postharvest quality of cut aspidistra leaves as affected by colloidal silver

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ABSTRACT

The aim of the study was to evaluate the effect of colloidal silver on postharvest longevity and quality of *Aspidistra elatior* leaves. Colloidal silver was applied at three concentrations: 0.01%, 0.02% and 0.04%. Control leaves were placed in water. Treating aspidistra leaves with colloidal silver solutions increased greenness index of the laminas, thereby improving their aesthetic value. Aspidistra leaves exposed to colloidal silver at 0.01% and 0.02% increased their fresh weight.

***Keywords*:** *Aspidistra elatior*, cast-iron-plant, ornamental foliage, SPAD, vase life

1. INTRODUCTION

Aspidistra (*Aspidistra elatior* Blume) belongs to the family Asparagaceae and is native to dry woody areas of China and Japan. The plants produce thin rhizomes that grow basal leaves with long, stiff stalks. The leaves are large, elongated, pointed, dark-green, and stiff. Brown, inconspicuous flowers grow on the rhizomes just above the ground. Thanks to their exceptional postharvest longevity, the leaves of aspidistra are highly valuable at cut plant market [10]. Their longevity and decorative value may be improved by using appropriate

compounds and nutrients. Potential of nano-silver in improving the quality of cut leaves was investigated in the shoots of *Acacia holosericea* [4,6]. It was also used to prolong longevity of many cut flowers [1,3,7,9]. The aim of this experiment was to evaluate the effect of colloidal silver on the quality and postharvest longevity of *Aspidistra elatior* leaves.

2. MATERIALS AND METHODS

Cut leaves of *Aspidistra elatior* were purchased from commercial growers. Their longevity was experimentally prolonged with colloidal silver purchased from Sigma-Aldrich. It was used at the following concentrations: 0% (control), 0.01%, 0.02%, and 0.04%. Batches of four leaves were placed in 250 ml cylinders. The experiment was conducted in a room with controlled temperature and light conditions (20 ±2 ºC, 60 ±5% RH, 12 h photoperiod, 10-12 µmol m^{-2} s^{-1} light intensity – cool white florescent tubes). After seven days solution update was calculated, the leaves were weighted on an electronic scales and their chlorophyll content was measured with Chlorophyll Meter SPAD-502 (Minolta, Japan) and expressed as SPAD. This measurement consists in determination of the ratio of chlorophyll-related light absorption (wavelength 650 nm) and light absorption by leaf tissue (wavelength 940 nm). Chlorophyll content was measured for each leaf, in the center part of the lamina. Decorative value expressed in days was evaluated on ongoing basis. The results were analyzed statistically by means of one-way analysis of variance (ANOVA). Means were compared using Tukey's test for significance level of 5%.

3. RESULTS

The study demonstrated significant improvement in greenness index and fresh weight of the leaves treated with colloidal silver solutions (Table 1). They had significantly higher greenness index than the control ones, and silver concentration did not affect this parameter. Similar results were published by Jowkar et al. [2], who found higher content of chlorophyll in the leaves of 'Cherry Brandy' rose immersed in nano-silver solutions.

Table 1. Effect of colloidal silver treatments on postharvest quality cut aspidistra leaves

Colloidal silver concentration (%)	Relative chlorophyll content (SPAD)	Relative fresh weight (g)	Relative solution uptake (ml)	Vase-life (days)
Control	65.1 ± 0.54^{b}*	6.27 ± 0.75^{b}	19.2 ± 4.91^{a}	28 ± 3.21^{a}
0.01	69.8 ± 0.58^{a}	8.48 ± 0.91^{a}	24.0 ± 2.75^{a}	31 ± 2.55^{a}
0.02	67.9 ± 0.29^{a}	7.21 ± 0.82^{a}	22.3 ± 3.33^{a}	31 ± 2.34^{a}
0.04	68.5 ± 0.45^{a}	6.12 ± 0.33^{b}	22.1 ± 3.03^{a}	29 ± 2.58^{a}

* Date are presented as mean values ± SD (n = 12). Date with a different letter are statistically different ($P < 0.05$)

The leaves treated with 0.01% and 0.02% colloidal silver were significantly heavier than the control ones. The leaves immersed in water and the solution of the highest silver concentration (0.04%) weighted less (Table 1). Beneficial effects of nano-silver on fresh weight of flowers were also reported in roses [5,7].

Statistical analysis of the study results showed no significant effect of colloidal silver treatment on the amount of uptake solution. The leaves immersed in 0.01% solution revealed a tendency to use more solution than those in the other variants (Table 1). In the view of Liu et al. [4], nano-silver stimulated solution uptake by leafy shoots of *Acacia holosericea*. Cut flowers were also observed to use up more of the solution when it was supplemented with nano-silver particles [3,8].

No significant differences regarding leaf longevity were demonstrated for different colloidal silver concentrations. Mean values indicated the shortest longevity of the leaves kept in water, and the decorative value was retained for the longest period in the leaves treated with 0.01 and 0.02% colloidal silver (Table 1). A study by Liu et al. [4] confirmed a significant correlation between leaf longevity and pH of nano-silver solution, treatment method and silver concentration. Neutral solution of nano-silver at 4 or 40 $mg \cdot dm^{-3}$ (conditioning) and acidified solution at 0.5 or 5 $mg \cdot dm^{-3}$ (conditioning) significantly improved longevity of leafed shots of *Acacia holosericea*. Considering the presented results, further and more detailed studies on the effect of different types of nano-silver and their application on the postharvest quality of aspidistra leaves are recommended.

4. CONCLUSION

The results revealed that the treatment with colloidal silver improved the greenness index of cut aspidistra leaves, thereby improving their aesthetic value. Leaves exposed to colloidal silver at 0.01% and 0.02% increased their fresh weight.

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