CORRECTION FROM 2008 CONFERENCE

(P12)
BENZYLADENINE FOLIAR SPRAYS INCREASE OFFSETS IN *SEMPERVIVUM* AND *ECHEVERIA*

Dennis Carey, Brian Whipker, Ingram McCall, Wayne Buhler[1]

ABSTRACT

A benzyladenine based plant growth regulator (PGR) named Configure (Fine Americas, Walnut Creek, CA) was applied to 2 cultivars of *Sempervivum* and 1 species of *Echeveria.* Applications were made as a single foliar spray applied 3 weeks after potting (WAP) in concentrations of 50, 100, 200, 400 $mg \cdot l^{-1}$. The number of offsets produced by the plants were counted at 10 WAP. The number of offsets produced by the parent plants increased with the concentration of Configure. Thus, Configure can be used to to increase production of *Sempervivum* and *Echeveria* offsets for use in propagation houses. Subsequent rooting of the offsets was not affected by Configure, but smaller offsets did not root as well as larger offsets.

INTRODUCTION

Sempervivum and *Echeveria* are small succulent plants that are popular in the horticulture trade for use in containers, green roofs, and xeriscape gardens. They are available in many different rosette shapes, and colors. Some cultivars are hirsute also. Propagation of *Sempervivum* and *Echeveria* is via offsets (a.k.a. pups, chicks) that form at the end of short stolons produced by the mother plant. Eventually the offset forms roots and the plant clump spreads outward. Offsets may be collected before they have formed roots and then may be rooted separately from the mother plant. Prior experiments report succulents such as holiday cactus (Boyle et. al., 1995, 1992, & 1988, Ho et. al., 1985) and sedum (Boe et. al., 1972), have increased branching and flowering with the application of benzyladenine-based chemicals. The purpose of this experiment was to determine the effect of benzyladenine (BA) on offset production of *Sempervivum* and *Echeveria*.

MATERIALS AND METHODS

Two cultivars of *Sempervivum* ('Red Heart' and 'Green Wheel') and one species of *Echeveria* (*E. setosa*) were used. The plants were placed in 11 cm round [575 ml volume (4 inch)] pots in a peat-based media (Berger BM6 - Berger Peat Moss, St. Modeste, Quebec, Canada) on March 8, 2007. On March 30, the plants were sprayed with Configure. The plants were sprayed at 50, 100, 200, or 400 $mg \cdot l^{-1}$. An untreated control was also included. The experiment was a completely randomized design with five single plant replications. On May 20, the number of offsets were counted. In addition, on July 5, the number of flower stalks on the

1 Graduate Research Assistant, Professor and Corresponding Author, Research Technician, Associate Professor, Dept. of Horticulture Science, North Carolina State University, Raleigh, NC, 27695-7609

Echeveria setosa plants were counted. Data were tested by analysis of variance in the generalized linear model (PROC GLM) and regression (PROC REG) (SAS Institute, Cary, NC). Means were separated by least significant differences (LSD) at $P < 0.05$.

In addition, the ability of *Sempervivum* offsets to root was investigated to determine if the treatment on the parent plant affected the rooting of the offset. On July 12, 2007, mid-sized offsets were harvested from parent plants off treatment, measured, and placed into 1203 cell packs in a peat-based media (Berger BM6). The experiment was a completely randomized design with six single plant replications. On September 27, the offsets were measured, and the roots were evaluated on a subjective 0-3 quality scale. Data were tested via the generalized linear model (PROC GLM). Means were separated by least significant differences (LSD) at $P < 0.05$.

RESULTS AND DISCUSSION

All three plants responded to increasing levels of benzyladenine by producing more offsets (Fig. 1.). In addition, the *Echeveria setosa* plants produced earlier flower stalks in response to higher rates of benzyladenine. *Sempervivum* 'Red Heart' produced an average of 13%, 20%, 24%, and 71% more offsets than the control with 50, 100, 200, and 400 $mg \cdot l^{-1}$ benzyladenine sprays. *Sempervivum* 'Green Wheel' produced an average of -4%, 26%, 180%, and 324% more offsets than the control with 50, 100, 200, or 400 $mg \cdot l^{-1}$ benzyladenine sprays. *Echeveria setosa* produced 11%, 0%, 144%, 222% more offsets than the control with 50, 100, 200, and 400 $mg \cdot l^{-1}$ benzyladenine sprays (Fig 1.).

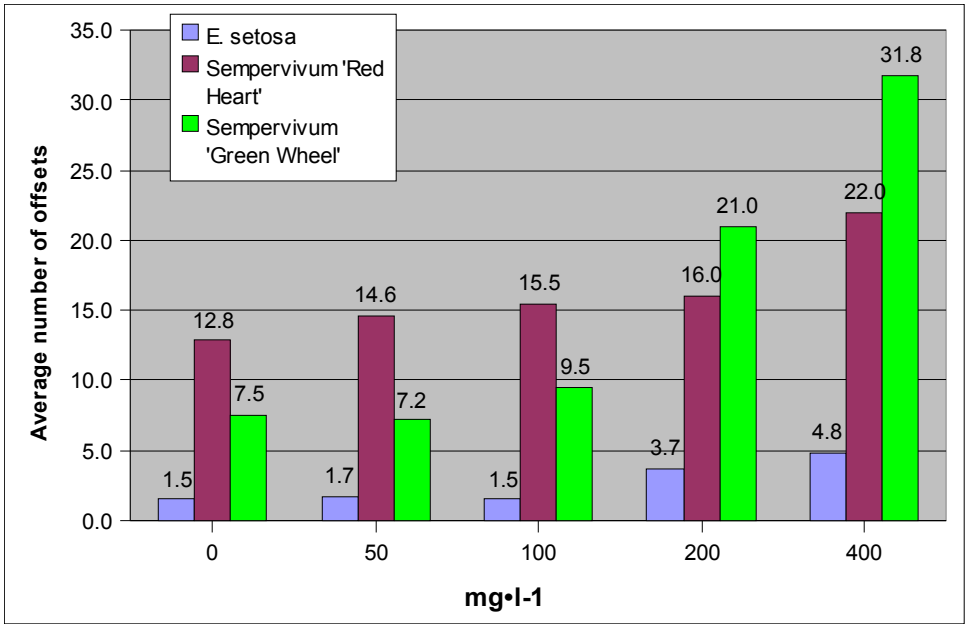

Figure 1: The number of offsets produced by *Echeveria setosa*, *Sempervivum* 'Red Heart', and *Sempervivum* 'Green Wheel' with single foliar sprays of Configure at 50, 100, 200, and 400 $mg \cdot l^{-1}$.

Additionally, the *Echeveria setosa* plants produced more flower stalks than the control at rates of 100 $mg \cdot l^{-1}$ or higher (Fig. 2.). They produced 100%, 600%, and 700% more flower

stalks on average than the control by July, respectively with 100, 200, or 400 mg·l^{-1} benzyladenine. In general, the more offsets produced by a plant, the smaller they were.

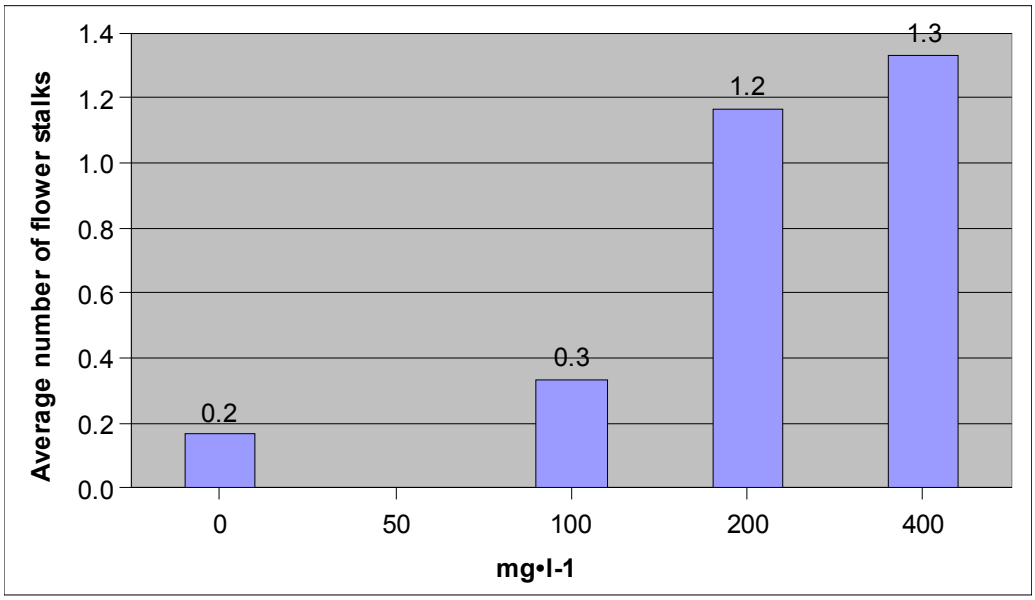

Figure 2: The number of flower stalks produced by *Echeveria setosa,* with single foliar sprays of Configure at 50, 100, 200, and 400 mg·l^{-1}.

The treatment level of the parent plant did not affect the rooting ability of the offsets (Table 1). However, the starting size of the offset did affect rooting ability (Table 2.). When the parent plant was treated with higher levels of BA, it produced more offsets and the offsets tended to be smaller than untreated plants. Smaller offsets had a lower root quality and grew more slowly. Offsets with a diameter less than 1.0 cm rooted less successfully than larger offsets. So there appears to be a balancing act between producing more offsets, for use in propagation, and the speed with which the offset grows in propagation.

Table 1: Mean root quality of rooted *Sempervivum* offsets for each treatment level of Configure. Treatment levels given in mg·l^{-1}. Mean root quality is based on a qualitative scale from 0=dead, 1=very poor or no roots, 2=root mass length is <2x the height of the pup, 3=root mass length >2x height of pup. Root quality means compared using Fischer's Protected LSD at P<0.05

Treatment	Mean root quality
0	2.46a
50	2.67a
100	2.50a
200	2.67a
400	2.33a

Table 2: Mean root quality of rooted *Sempervivum* offsets partitioned by offset diameter. Mean root quality is based on a qualitative scale from 0=dead, 1=very poor or no roots, 2=root mass length is <2x the height of the pup, 3=root mass length >2x height of pup. Root quality means compared using Fischer's Protected LSD at P<0.05

Offset diameter	Mean root quality
Less than 0.5cm	1.5a
0.5cm to 0.99cm	1.3a
1.0cm to 1.49cm	2.6b
1.5cm to 1.99cm	2.5b
2.0cm to 2.49cm	2.5b
Greater than 2.5cm	3.0b

CONCLUSIONS

These results have significance to the industry as commercial propagators can greatly increase the number offsets per plant by using benzyladenine. Given the high level of activity of benzyladenine in these experiments, it is clear that it can be used to increase the productivity of stock plants of *Sempervivum* and *Echeveria*. If a grower is growing these plants for sale, then the recommended rate of Configure is 400 $mg \cdot l^{-1}$ so that the plant produces the largest number of offsets. However, if the plants are being used as stock plants, then the recommended rate of Configure is 100 to 200 $mg \cdot l^{-1}$. This way the grower produces more offsets but they are large enough to root and grow well. If the growers wanted to harvest offsets over a period of time instead of all at once, they could treat the stock plants with 400 $mg \cdot l^{-1}$ Configure and then harvest only the largest offsets. After a few weeks the smaller offsets will have grown and can be harvested and placed into propagation.

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