Size reduction of ornamental sunflowers by the application of daminozide

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ABSTRACT

The expansion of floriculture in Brazil in the last years is due to the development and structuring of new markets, professionalization of the components of the production chain and the more extensive purchasing of flowers and ornamental plants. The sunflower (*Helianthus annuus* L.), a species used for oil production, for bird feed and as silage for livestock, has gained a place and distinction among ornamental plants for cut flowers. In order to make ornamental sunflowers suitable for commercial production, technologies are needed that can adapt the species to greenhouse cultivation. Sunflowers are naturally tall plants, which is unsuitable for ornamental purposes. In order to facilitate their production in a protected environment as well as in the field, inhibitors of gibberellin synthesis can be utilized to reduce the size of sunflower plants. The aim of this study was the reduction in size of the ornamental sunflower hybrid BRS Oasis by the application of daminozide (B-Nine 850 PS™) at fifteen days after planting, testing different concentrations. The concentrations evaluated were 4,000, 6,000 and 8,000 $mg.L^{-1}$, which were compared to a control using water. The results obtained demonstrated that the size of the plants treated with the three concentrations of daminozide was smaller than that of the control. Therefore, for economical reasons, the use of 4,000 $mg.L^{-1}$ of daminozide is suggested.

Key words: B-Nine – floriculture – gibberellin inhibitor – *Helianthus annuus* – plant growth regulator – ornamental plant.

INTRODUCTION

The Brazilian market for flowers and ornamental plants has shown a substantial growth in demand and has been expanding in the last few years with the improved quality of products and an increased commercialized volume. It has responded positively to the offering of new products, thereby stimulating research into breeding and cultivation treatments. Sunflowers have a great potential as an ornamental plant because of their short growing cycle and easy propagation, but mainly because they have attractive inflorescences that are much sought after as cut flowers (Dasoju et al., 1998; Anefalos and Guilhoto, 2003). In the local market, although there is no official classification, ornamental sunflower inflorescences of 8-11 cm in diameter are commercialized as small flowers, those of 12-16 cm in diameter as medium flowers, and those more than 16 cm in diameter as large flowers (NAIR MIE NOMI, 2007).

The ornamental sunflower BRS Oasis, developed by Empresa Brasileira de Pesquisa Agropecuaria (EMBRAPA), has inflorescences with ornamental characteristics (Oliveira and Castiglioni, 2003), which allow it to be used as a cut flower. However, its size, which can reach up to 3 m in height, is unsuitable for its eventual purpose. To have a production and offering of ornamental sunflowers as cut flowers during the whole year in regions with a temperate climate, where frost occurs, it is necessary to grow the plants in a protected environment or greenhouse, demanding the development of techniques to reduce the size of the plants.

Inhibitors of gibberellin synthesis are widely used in floriculture to reduce the size of various ornamental plants (Whipker, 2001). One the most common agents for this purpose is daminozide (N-dimethylaminosuccinamic acid) (Weaver, 1972; Fahl et al., 1985). The ideal concentration of the plant growth regulator depends on the plant species, variety, number of applications made and size of the plant at the time of application (Lopes, 1977). Daminozide has been recommended for the size reduction of ornamental plants at concentrations varying from 2,000 to 8,000 $mg.L^{-1}$ (Hertwig, 1977; Nell et al., 1980).

The aim of this study was to reduce the size of ornamental sunflower plants, variety BRS Oasis, by the application of daminozide (B-Nine 850 PS™) at fifteen days after planting, testing different concentrations.

MATERIALS AND METHODS

This investigation was carried out in the period of February to May of 2006 in the municipality of Fazenda Rio Grande (PR, Brazil), located 25º37'32"S and 49º15'29" W and having an altitude of 910 m. The effect of the application of the plant growth regulator daminozide (B-Nine 850 PS™) was studied at concentrations of 4,000, 6,000 and 8,000 mg.L^{-1}, in the BRS Oasis hybrid of the ornamental sunflower, *Helianthus annuus* L., which is single-headed with male sterility, and has yellow disc florets and brownish ray florets. In the control treatment, water was applied under the same conditions in which the plant growth regulator was applied. The application of the regulator was effected at fifteen days after planting, when the plants showed two pairs of definitive leaves.

A complete randomized block design was used with four treatments and four replications, where ten plants were studied per parcel. The variables analyzed were: plant height, determined from the level of the soil to the point on the stem of the inflorescence; the stem diameter, determined at fifty centimeters below the inflorescence; and the head diameter. These variables were evaluated when 50% of the plants were with completely expanded ray florets and all the disc florets visible, corresponding to phenological stage R5.5 (Schneiter and Miller, 1981). The data obtained were submitted to analysis of variance. Initially, the variances of the treatments were determined with respect to their homogeneity by Bartlett's test. All variances were shown to be homogeneous, where the transformation of the data was not necessary and the means of the treatments were evaluated using the F test. When the results revealed the existence of significant differences between the means of the treatments, these were compared by Tukey's test at a significance level of 5%.

RESULTS AND DISCUSSION

The evaluations were carried out at 62 days after planting. There was a significant difference among the treatments for all the variables analyzed (Table 1). Although there was a significant difference in the height of the plants treated with the three concentrations of daminozide versus the control, no difference was seen between concentrations. The results agree with those of various authors who obtained a significant reduction in size of ornamental plants utilizing concentrations between 4,000 and 8,000 mg.L^{-1} (Cathey, 1975; Nell et al., 1980; El-Keltawi et al., 1996). Similarly, these findings agree with authors who obtained significant size reductions in ornamental plants utilizing an application of daminozide in *Ruellia colorata* L. at a concentration of 4,000 mg.L^{-1}, achieving a decrease in stem height of 13.85% (Carlucci, 1991) and in *Viola* × *wittrockiana* L applying daminozide at a concentration of 5000 mg.L^{-1}, obtaining a decrease of 18.94% in stem height (Gliožeris et al., 2007).

Table 1. Stem height (SH), stem diameter (SD) and head diameter (HD) of the ornamental sunflower BRS Oasis, after application of daminozide at different concentrations 15 days after planting (Fazenda Rio Grande, PR) in May 2006**.**

Concentration of daminozide (mg.L^{-1})	SH[1] (m)	SD[1] (cm)	HD[1] (cm)
0	2.300 a	1.274 a	9.20 a
4000	2.010 b	1.185 b	8.33 b
6000	1.986 b	1.144 b	8.21 b
8000	1.861 b	1.119 b	8.13 b
DMS	0.12	0.50	0.4

[1]Means followed by different letter in the column differ statistically, based on Tukey's test at the 5% level of probability.

Height diameter (Table 1) at all the concentrations tested was smaller than that of the control. Although there are no published reports on the effect of reducing stem diameter on the quality and life of post-harvest flowers of ornamental sunflower, this has been determined for chrysanthemum (*Dendranthema grandiflora* Tzevelev) (Nardi et al., 2001).

The head diameter (Table 1) at all the concentrations tested was smaller than that of the control. Considering that the ornamental sunflower market pays differently for flowers of smaller diameter, this could be a problem. However, according to the informal local standard for classification of ornamental

sunflowers (NAIR MIE NOMI, 2007) the diminution of the diameter of the flowers would permit them to be classified as medium inflorescences.

Considering that the reduction in the size of the plants was similar at the three concentrations of daminozide tested, it is suggested that, after the evaluation of the post-harvest quality of the flowers, 4,000 mg L^{-1} of daminozide be utilized for economic reasons.

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