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Cultivation of Helianthus annuus L. cv. Sunflower Sunspot Dwarf with silicon application

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Abstract: In recent years Brazil has been presenting a constant production of flowers and ornamental plants, with an increase in diversity, quantity and quality. As for the Sunflower ornamental dwarf, in addition to the production of vegetable oil, may be an alternative in floriculture. The objective of the present work was to verify the effect of the use of silicon doses in the production and development of chapters of the ornamental dwarf sunflower crop cultivated in a pot under protected environment. The experiment was conducted from seeds of the hybrid Helianthus annuus L. cv. Sunflower Sunspot Dwarf. The substrate used in the vessels was based on pinus bark with vermiculite, perlite and rooting. The seeds were seeded in trays of expanded polystyrene, and after germination were transplanted in polypropylene pots with 10 replicates, totaling 50 plants. The irrigation system used was the micro sprinkler and the recommended fertilization for the crop weekly. The application of silicon was performed weekly at doses 0,0 g L^{-1} (Witness); 0.5 g L^{-1}; 1.0 g L^{-1}; 1.5 g L^{-1} and 2.0 g L^{-1}. The evaluations of the agronomic parameters were: plant height, stem and inflorescence diameters. For the plant height variable, the control group had the highest growth. For stem diameter and inflorescence there was no significant difference between treatments. The weekly application frequency and the silicon doses did not result in significant differences in stem diameter and inflorescence parameters evaluated for the ornamental plant *Helianthus annuus* L. cv. Sunflower Sunspot Dwarf compared to the witness.
Keywords: Asteraceae, influence of fertilization silicated, ornamental plants.

Introduction

The activities related to floriculture have great prospects for growth in the sector, which was evaluated in the year 2015 around 5%. It is attractive to Brazilian producers, considering that they employ about 8 thousand producers in approximately 15 thousand hectares, with more than 3 thousand varieties produced in Brazil (IBRAFLOR, 2015).

The use of sunflower as an ornamental flower in pots is recent and the cultivar Helianthus annuus L. cv. "Pacino" was one of the first species destined for this type of cultivation (ECKER, 2013). According to Lorenzi (2013) the sunflower (*Helianthus annuus* L.) is a species belonging to the family of the Asteraceae and genus *Helianthus*, originating in countries of North America and Central America with a center of origin in Mexico.

The study of genetic improvement in the *H. annuus* species can contribute to new cultivars such as the Sunny Smille, with characteristics such as dwarf size (reduced), height between 40 and 50 cm and inflorescence close to 15 cm in diameter (ROMAHN, 2011). Among the numerous ornamental species, Schoellhorn et al. (2003) report that in the last decades the sunflower has gained prominence as an ornamental plant and production a vase and cut flowers.

According to Zobiole et al., (2010) sunflower cultivation may be an alternative to floriculture. Because the sunflower is of wide climatic adaptability, presenting tolerance to variations of temperatures, which makes possible its adaptation to any region of the country.

In a study developed by Epstein (1999), it indicates that silicon (Si) has a positive effect on agriculture in order to minimize biotic and abiotic factors of stresses suffered by the plant. One can cite as benefits: less perspiration; More rigid sheets; Reduction of water stress, among others.

For Epstein and Bloom (2006), silicon is an essential element and its deficiency will make it impossible for the plant to complete the vegetative

and reproductive stages of its life cycle and its deficiency can be corrected only with the supply of this element. Although traditionally it does not appear in the list of essential nutrients (TROEH & THOMPSON, 2006).

According to Carvalho et al. (2009), the sunflower can be considered silicon accumulating culture, increasing its production and improving its quality when in contact with this chemical element. For the authors Epstein and Bloom et al. (2006), silicon is considered essential and its deficiency will make it impossible for the plant to complete the vegetative and reproductive stages of its life cycle.

The objective of this work was to verify the effect of the use of silicon doses in the production and development of the chapters of the dwarf garden sunflower (*Helianthus annuus* L. cv. Sunflower Sunspot Dwarf) cultivated in a protected environment.

Methods

The experiment was carried out in the city of Maringá - Paraná, located in the geographic coordinates of 23 ° 23'53 "S and 51 ° 58'24" O and an average altitude of 508 m, developed in a protected environment with a 200 micron plastic cover, curtain (50%), average temperature between 27 ° C and 16 ° C, with relative humidity (RH) close to 50%.

To provide the different doses of the treatments was used the commercial product whose composition is: SiO_2 (94.6%); Al_2O_3 (3.38%); TiO_2 (0.21%); Fe_2O (0.23%); CaO (0.42%); MgO (0.44%); Na_2O (0.18%); K_2O (0.11%); MnO (0.01%) and P_2O_5 (0.43%). The treatments evaluated in the experiment were: 0.0 g L^{-1} (Witness); 0.5 g L^{-1} (T2); 1.0 g L^{-1} (T3); 1.5 g L^{-1} (T4) and 2.0 g L^{-1} (T5), with weekly application.

The variety used was dwarf garden sunflower *Helianthus annuus* L. cv. Sunflower Sunspot Dwarf. A 128 cell expandable polystyrene tray was seeded with one seed per cell. After seven days the seedlings were transplanted into black and polypropylene containers, with dimensions 10 cm in diameter in the upper portion and 7.8 cm in diameter in the lower portion, with a height of 7.5 cm in height, all of them the containers had twelve holes in the base to assist in excess irrigation drainage. The substrate used for both steps was based on pinus bark, with the addition of vermiculite, perlite, rooting, macro and micronutrients, for both steps. The chemical analysis of the substrates presented the following characteristics: pH ($CaCl_2$): 5.6; K: 0.60 cmolcdm^{-3}; Mg: 4.3 cmolc dm^{-3}; Al: 0.05 cmolc dm^{-3}; H + Al: 5.35 cmolc dm^{-3}; P: 52.9 mg dm^{-3}; Si: 71.24 g Kg^{-1} substrate and dry density: 200 kg m^{-3}.

The irrigation was by micro-sprinkler four times, daily, with a duration of 2 min at pre-defined times, totaling an average volume of 20 mL in each period.

After the transplant, from the second week the fertirrigation was started, in the average amount of 180 mL pot-1, with the formulated NPK: 10-30-20 in the concentration 3.0 g L^{-1} of water being composed of N: 10%; P: 30%; K: 20%; Mg: 1.30%; Bo: 0.0125%; Cu 0.0125%; Fe: 0.05%; Mn: 0.025%; Mo: 0.0050% and Zn: 0.025%. From the fourth week, NPK was formulated as follows: 20-20-20 in the concentration 2.0g L^{-1} of water composed of N: 20%; P: 20%; K: 20%; Mg: 0.05%; B: 0.0068%; Cu: 0.0036%; Fe: 0.05%; Mn: 0.025%; Mo: 0.0009% and Zn: 0.0025% until the last week of cultivation, aiming to optimize the development of the root system and aerial part.

The parameters evaluated weekly were stem diameter, plant height and inflorescence diameter, which are the important characteristics for commercialization.

The experimental design was in randomized blocks, with one genotype and 5 applications, with 10 replicates. The data were submitted to analysis of variance and the means were compared by the Tukey test at 5% probability.

Results and discussion

The plants presented a reduction in the height that probably occurred due to the higher Si presence made available by the higher doses of this element, which promoted the accumulation of silicon in the plant, due to the weekly application of silicon, with a higher silicification rate in the plant.

For the evaluation of the periods of application of silicon in relation to the height of the plants, there was no significant difference until the fifth week. In the interval of weeks 6 and 7, a statistical difference was observed between doses, with the dose of 0 g L^{-1} (control) being the one with the highest plant height at the 5% probability level, as applied the treatments (Figure 1).

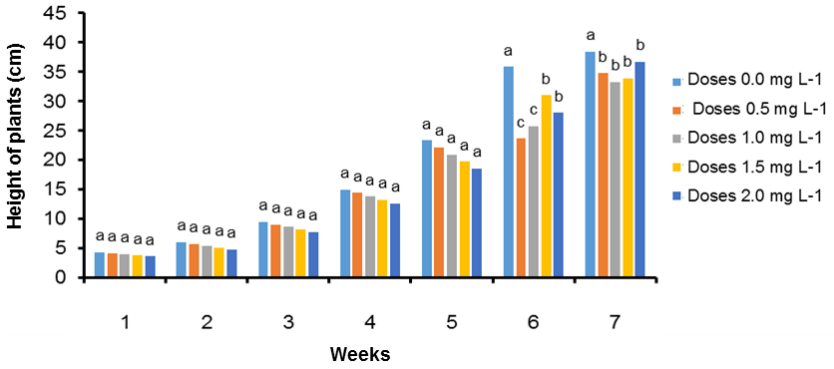

Figure I - Averages for the agronomic parameter: plant height (PH), after the weekly application of silicon in *Helianthus annuus* L. cv. Sunflower Sunspot Dwarf. Maringá, Japan Park, 2015.

Due to the weekly application of silicon in the substrate in *Helianthus annuus* L. cv. Sunflower Sunspot Dwarf, for the parameters, stem diameter and inflorescence diameter there were no statistical differences between the doses evaluated, as shown in Table I.

Table I - Weekly application of silicon doses to the substrate in *Helianthus annuus* L. cv. Sunflower Sunspot Dwarf for the variables stem diameter and inflorescence

Treatment	Parameters	
Doses of Si (g L^{-1})	DC (mm)	DI (cm)
0.0	7.17 a	13.02 a
0.5	6.99 a	11.94 a
1.0	7.00 a	11.65 a
1.5	7.18 a	12.14 a
2.0	7.54 a	13.41 a
C.V. (%)	14.36	12.48

* Means followed by lower case letters, in the same column, do not differ by Tukey test at 5% significance.

When observed the agronomic parameter diameter of the inflorescence it was observed that the behavior was similar to the diameter of the stem, that is, a proportional increase occurred in the dose, although without significant differentiation. This is corroborated in similar works performed with different cultures (CARVALHO et al., 2009).

Oliveira et al., (2013) and Carvalho et al., (2009) in ornamental sunflower studies verified that there were no increases in stem diameter in the use of silicon, corroborating the results obtained in the present experiment.

Kamenidou et al., (2008) report an increase in the mechanical strength of flower stems with the application of silicon and, probably, the increase of the cell wall thickness of sclerenchyma cells and higher lignin content. The obtained data suggest an improvement the quality of the flower due to the brief increase of the stem diameter.

The most important characteristics that influence the commercialization of ornamental sunflower are the diameter and length of the stem and the diameter of the inflorescence (SLOAN & HARKNESS, 2006), as these are highlighted in the consumer's buying choices.

Carvalho et al., (2009) observed that the use of silicon caused an increase in the mean diameter of the inflorescences proportional to the increase of the silicon doses evaluated, similar to the results obtained in this work. In a study by Almeida et al., (2009) mini-dairy also observed that the use of silicon did not have a significant effect on the development or the production of inflorescences.

Conclusions

The weekly application frequency and the silicon doses did not result in significant differences in stem diameter and inflorescence parameters evaluated for the ornamental plant *Helianthus annuus* L. cv. Sunflower Sunspot Dwarf in comparison to the witness.

References

ALMEIDA, E.F.A.; PAIVA, P.D.OL.; CARVALHO, J.G.; OLIVEIRA, N.P.P.; FONSECA, J.; CARNEIRO, D. N.M. Efeito do silício no desenvolvimento e na nutrição mineral de copo-de-leite. **Revista Brasileira de Horticultura Ornamental.** v.15, nº 2, p. 103-113, 2009.

CARVALHO, M.P; ZANÃO JÚNIOR, L.A.; GROSSIR, J.A.S.; BARBOSA, J.G. **Silicio melhora produção e qualidade do girassol ornamental em vaso**. Ciência Rural, Santa Maria, v.39, n.8, p.2394-2399, 2009.

EPSTEIN, E. **Silicon. Annual Review of Plant Physiology and Plant Molecular Biology**, Palo Alto, v.50, n.1, p.641- 664, 1999.

EPSTEIN, E.; BLOOM, A.J. **Nutrição mineral de plantas: princípios e perspectivas.** Londrina: Editora Planta, 2006. 406p.

ECKER, A. E. A. **Longevidade de girassol anão ornamental com aplicação de silício**. Dissertação (Doutorado em Agronomia). Universidade Estadual de Londrina. Londrina, 2013. 71p.

LORENZI, H. **Plantas para jardim no Brasil: herbáceas, arbustivas e trepadeiras**. 1 ed. Nova Odessa. São Paulo: Instituto Plantarum. 2013.

OLIVEIRA, J.T. L.; CAMPOS, V.B.; CHAVES, L.H.G.; FILHO, D.H.G. Crescimento de cultivares de girassol ornamental influenciado por doses de silício no solo. **Revista Brasileira de Engenharia Agrícola e Ambiental.** Campina Grande, PB v.17, n.2, p.123–128, 2013.

KAMENIDOU, S.; CAVINS, T.J.; MAREK, S. Silicon supplements affect horticultural traits of greenhouse-produced ornamental sunflowers. **HortScience**, v.43, p.236- 239, 2008.

SLOAN, R.C.; HARKNESS, S.S. Field evaluation of pollen free sunflower cultivars for cut flower production. **HortTechnology**, Alexandria, v.16, n.2, p.324-327, 2006.

ROMAHN, V. **A grande enciclopédia ilustrada das plantas e flores: herbáceas**. São Paulo: Editora Europa, v, 6, 2011, 1578 p.

SCHOELLHORN, R. et al. **Specialty cut flower production guides for Florida: sunflower. Gainesville**: University of Florida, IFAS Extension, 2003. 3p.

TROEH, F. R.; THOMPSON, L. M. **Solos e fertilidade do solo**. 6. ed. Andrei. São Paulo, 2007. 718p.

ZOBIOLE, L. H. S.; CASTRO, C.; OLIVEIRA, F. A.; OLIVEIRA JÚNIOR, A. **Marcha de absorção de macronutrientes na cultura do girassol**. Revista Brasileira de Ciência do Solo, v.34, p.425- 433, 2010.