Influence of IBA and Boric Acid on Rooting of Stem-cuttings of *Aloysia triphylla* (L'Hérit) Britton

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Abstract

***Aloysia triphylla* (L'Hérit) Britton is a perennial and bushy plant, with simple, entire, lanceolate and whorl shaped leaves and originally from South America. It is used as medicinal plant in Brazil with stomatic and sedative properties. The employment of stem cuttings for propagation of pre-selected plants, acquired great importance, because it eliminates the juvenile phase of seedlings, which can be produced in a shorter period of time. The rooting of stem cuttings is stimulated by auxin and, boric acid supply is essential for growth and development of initial rootlets. This micronutrient is required 48 hours after plant segments have been placed into auxin solution and it can be supplied any time, including the seedling growth period. The experiment was carried out in the Department of Plant Production, UNESP-Botucatu-SP-Brazil, with stem-cuttings of *Aloysia triphylla* (L'Hérit) Britton, Verbenaceae obtained from the Medicinal and Aromatic Plant Garden. The aim of the work was to verify the influence of growth regulators and boric acid on stem cutting rooting of this species. The 15 cm-stem cuttings, without leaves, were submerged during 24 hs in the following solutions: water; 150 mg.L^{-1} of IBA; 150 mg.L^{-1} of IBA+ Boric acid; 250 mg.L^{-1} of IBA; 250 mg.L^{-1} of IBA + Boric acid. The statistical design was entirely randomized with 5 treatments and 3 replications, totalizing 15 plots with 10 stem cuttings each. They were planted on propylene trays with vermiculite and kept under spraying condition during twenty five days. The best results were observed in treatment 250 mg.L^{-1} of IBA+ Boric acid on number of roots, length of roots, rooting percentage, fresh and dry weight of leaves when compared with all other treatments. We can conclude that this treatment is the most suitable for stem cutting rooting of this species.**

INTRODUCTION

Aloysia triphylla (L' Hérit) Britton, is commonly known in Portuguese as "cidró", "cidrão" or "erva-cidreira" belonging to the Verbenaceae family. In English it is called lemon-scent verbena and in Spanish, "cedron." Flowers and leaves have oil-glands and the essential oil has pleasant aroma. It has been used in fragrance, food and pharmaceutical industry. According to Castro & Chemale (1995), although originally from South America it was taken to Southern Europe and later to Northern Africa, where it has been grown for perfumery and medicine using. It has been applied for the same purposes in Brazil and United States as well. The infusion of flowers and leaves of "cidró" at 1 or 2 % is used for nervous affection, melancholy, hypochondria, hysteria, stomatic infection, slow and troubled digestion and as antispasmodic agent. The oils have also been used in cosmetic industry.

A. triphylla can be propagated through layering , air layering and by simple or cross stem cuttings therefore eliminating the juvenile stage of seedlings leading to its development in a shorter period of time. The best plant spacing is 1.5 m among rows and 1.0 m among plants, however for a bushy shape, pruning must be performed at ground

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level and plants should be 2.0 x 2.0 m apart. The best climate to its development ranges from mild-temperate to subtropical.

According to Luckiwill (1981) and Ono (1986), who mention Silva (1985), the vegetative propagation has been used in order to improve clones, ecotypes or varieties preserving the relevant characteristics of economical importance. Iritani (1981) suggests that herbaceous stems should be treated with low concentration of auxin, while for nervate stems with difficult rooting, the concentration should be high, close to the phytotoxic level. According to Weaver (1982) and Hartmann and Kester (1983), one of the best rooting promoters is the IBA (indolbutyric acid) due to its fast auxin activity and an enzymatic system of fairly slow destruction. Concerning to the best season for layering Alvarenga & Carvalho (1968) reported that stem-cuttings absorb more rooting promoting solution under warm and dry conditions compared to the cold and wet ones. In studies carried out on different cropping seasons, Vaz (1981) has concluded that later seasons, that is, from July to September, are more appropriate for "marmeleiro" stem-cutting production. The author still reports that this fact seems to confirm the idea that, in specific seasons, there is a greater auxin translocation to the stem-cutting bottom, produced in the newly developed bud, and so leading to node and root development. Munhoz & Valenzuela (1978) have also reported a root percentage decrease in *Vitis vinifera* stem-cuttings as autumn was coming closer. The authors related this decrease to the co-factor content variation and/or to the formation and storage of root inhibitors.

Leonel & Rodrigues (1993) working with Lichia (*Litchi chinensis* Sonn.) stem cuttings reported that the most effective dose in stem cutting rooting was 2 000 mg. L^{-1} IBA + boron as A.I. drug and in its commercial formula as talcum (Q-muda, 0,5 % IBA). The most suitable season to take the stem cuttings out was September which corresponds to the beginning of Spring. Scalon et al. (2001) analyzed the auxin and boron association on "guaco", "alecrim" and "carqueja" stem cutting rooting harvested between April and August, immersed in 250 mg. L^{-1} IBA or IAA for 24 hours, both with or without boron (100 mg.L^{-1}), pure boron and water. The highest "guaco" rooting percentage was in water (91.5 %); for "alecrim" in water (78.5 %) and boron (64 %); and "carqueja" in water (95 %) and boron (99 %). The stem cuttings of "guaco" treated with boron and IBA + boron showed twice the root size (20.5 cm) when compared to the ones in water (10.5 cm). The highest "alecrim" rooting percentage was obtained in IBA (11.5 cm) and for "carqueja" it was in water (7.0 cm).

Lima et al. (2001) studied leaf area effect (0, 5, 25, 50 e 100 cm^3) and immersion time of stem cutting bottoms (0, 3, 6, 12 and 24 hours) in two species of "guaco" (*Mikania glomerata* and *Mikania laevigata*) and found that increasing leaf area has led to rooting increase and mortality decrease in both species. The recommended area was 100 cm^3. There was no influence from immersion time of stem cutting bottoms. Nagao *et al*. (2001) studied rooting of apical and basal 12 cm-stem cuttings having 2 leaves of *Artemisia canforata* (cânfora) using 5 concentrations of IBA (0; 250; 500; 1000; 2000 ppm) for an hour. The best result was obtained from apical stem cuttings in IBA concentration ranging from 250 to 500 ppm. In 2001, Momenté et al. studied apical and basal stem cutting rooting of *Solidago chilensis* (arnica brasileira) and the need of IBA exogenous application. Five IBA aqueous solutions have been prepared in different concentrations, and stem cuttings have been immersed for an hour. The results showed that apical stem cuttings presented higher rooting percentage and 250 ppm IBA concentration promoted better accumulation of dry matter in aerial parts and roots of "arnica".

Eugenia Formosa Wall and *Sterculia alata* Roxb. var *diversifolia* stem cuttings were harvested during summer, treated with 5000 and 10000 ppm IBA for 5 minutes and planted in thick sand. Roots started growing after 60 days. The 5000 ppm treatment in *E. Formosa* produced 40 % rooting while 1000 ppm led to 20 %. *S. alata* stem cuttings treated with 5000 and 10000 ppm IBA have produced 20 and 50 % rooting respectively (Mukhopadhyay and Gain, 1989). Stefanini et al. (2001) working on a pre-assay using IBA (150 and 250 mg.L^{-1}) and IBA + boric acid in the same doses in *Aloysia triphylla*

stem cuttings concluded that the highest rooting percentage occurred at 250 mg. L^{-1} IBA + boric acid.

The objective of this essay was to standardize the stem-cutting size to improve seedling production in a shorter period of time.

MATERIAL AND METHODS

The aim of the work was to study the influence of growth regulators and boric acid on stem cutting rooting of the species. Fifteen-centimeter cm-stem cuttings, without leaves, were submerged during 24 hs in the following solutions: water; 150 $mg.L^{-1}$ IBA; 150 $mg.L^{-1}$ IBA+ Boric acid; 250 $mg.L^{-1}$ IBA; 250 $mg.L^{-1}$ IBA+ Boric acid. The statistical design was entirely randomized with 5 treatments and 3 replications, totalizing 15 plots with 10 stem cuttings each. They were planted on propylene trays with vermiculite and held under spraying condition during twenty five days.

RESULTS

Boric acid, enhanced rooting in IBA treated cuttings (Table 1.)

DISCUSSION

The best results were observed in treatments 150 $mg.L^{-1}$ IBA + Boric acid and 250 $mg.L^{-1}$ IBA+ Boric acid in number and length of roots, number and dry weight of leaves when compared with all other treatments. Therefore, the highest rooting percentage occurred at 250 mg. L^{-1} IBA + boric acid. We can conclude that this treatment was the most suitable for stem cutting rooting for this species.

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Tables

Table 1. Means of ten stem cuttings and three replications of root number, length , and dry weight; rooting percentage; leaves number, fresh and dry weight of *Aloysia triphylla.*

Treatments	Number of roots	Length of roots	Dry weight of roots	Rooting percentage (%)	Number of leaves	Dry weight of leaves
Control	1.34 b	1.55 a	0.015 c	40.00	8.1 a	0.27 b
150mgL^{-1} IBA	4.70 ab	1.76 a	0.029 a	56.66	6.41 a	0.17 c
150mgL^{-1}IBA + boric acid	7.06 a	2.19 a	0.015 c	56.66	7.30 a	0.38 a
250mgL^{-1} IBA	3.50 ab	2.01 a	0.005 d	23.33	5.33 a	0.12 d
250mgL^{-1} IBA + boric acid	7.21 a	2.86 a	0.021 b	70.00	6.83 a	0.41 a

Means followed single letter (columns) are not different statistically by Tukey Test (5 %).