Journal of Global Biosciences
Vol. 3(1), 2014, pp. 266-273

ISSN 2320-1355
http://mutagens.co.in

TYPES OF CUTTING AND AIB CONCENTRATION OF *SIPARUNA GUIANENSIS* AUBLET PROPAGATION

Valentini, Carla M.A.[1], Almeida, Juliane D.[2], Coelho, Maria F.B.[3] and Rodríguez-Ortíz, Carmen E.[4]

[1]Departamento de Química e Meio Ambiente, Centro Federal de Educação Tecnológia de Mato Grosso. Avenida Juliano Costa Marques, s/n Cuiabá, Mato Grosso, Brazil. 78.050-560.
[2,4]Universidade Federal de Mato Grosso, Programa de Pós graduação, Av. Fernando Correa da Costa s/n Cuiabá, Mato Grosso, Brazil. 78070-900.
[3]Universidade da Integração Internacional da Lusofonia Afro Brasileira, Av. da Abolição, 7. Redenção, Ceará, Brazil. 62790-000.

Abstract

Siparuna guianensis Aublet is a medicinal plant native of the savanna of Brazil used especially in the form of bath to treat colds, fevers and body aches, and has attracted the attention of researchers to the need for conservation of germplasm. The aim of this study was to evaluate the propagation by cuttings of shoots in different concentrations of indole butyric acid (IBA). The experimental design was completely randomized in factorial scheme 5x2 (IBA concentrations - 0, 500, 1000, 1500 and 2000 mg L^{-1} and cutting types - apical and subapical) in four replications of ten cuttings. The percentage of survival, budding, new leaves and roots were evaluated at 90 days. The characteristics of apical cuttings showed a quadratic behavior in relation to concentrations of IBA. The highest percentage of survival occurred in the apical cuttings, and further development of shoots and rooting occurred in subapical cuttings at a concentration of 1000 mg L^{-1} IBA. *Siparuna guianensis* can be propagated by cutting subapical pretreated with IBA during 120 seconds.

Key words: *Siparuna guianensis, clonal propagation, auxin*.

Date of Online: 28-02-2014

INTRODUCTION

The exploitation of plants by direct extraction in tropical ecosystems has led to drastic reduction of their natural populations, being necessary to the development of research involving conservation of the species using both cultivation to maintain active collections “ex situ” as new germplasm banks [1]. *Siparuna guianensis* Aublet (Siparunaceae) is a medicinal and aromatic that has been identified by scholars as a priority for conservation of germplasm [2]. In many countries of America, the decoction of leaves of *Siparuna guianensis* is used as a drink against stomach disorders [3]. Vegetative propagation is considered important for *Siparuna guianensis* because the seeds have low germination [4]. Traditional system of production seedling by cuttings has been recommended to use cuttings 10-15 cm long, keeping two to three upper leaves and eliminating the other [5]. The indole butyric acid (IBA) has been the most widely used to stimulate rooting, being more stable and less soluble than endogenous auxin, indole acetic acid (IAA) [6]. Thus, the aim of this study was to evaluate the propagation of *Siparuna guianensis* using apical and subapical cuttings submitted for 120 seconds at various concentrations of auxin IBA.

MATERIALS AND METHODS

The cuttings were obtained from plants of *Siparuna guianensis* in Bosque Paulo Siqueira (15°33'33,81"S and 56°03'34,30"W), at 230 meters above sea level, the city of Cuiabá, Mato Grosso State, Brazil. The cuttings were in the dormant period and were collected from semi-hardwood shoots with 0.2 to 0.3 cm in diameter and about 40 cm long. The experiment was conducted at the Seed Laboratory of the Federal University of Mato Grosso (LAS) in the city of Cuiaba (15°36'70"S and 56°03'91"W). Measures of average temperature and relative humidity in LAS mini-greenhouses were made with Thermo-Hygro Clock Gehaka, and measurements of average temperature and relative humidity outside was provided by the National Institute for Space Research [7].

The branches were more uniform apical cuttings and segmented into subapical, approximately 15.48 cm ± 2.33 (Standard Error) long and 2.69 ± 0.40 (Standard Error) diameter. The base of the cuttings was cut bevel just below the bud and the last peak in straight cut and were left in cuttings two terminal leaves cut in half. The cuttings were then given treatment plant with 0.5% sodium hypochlorite for 10 minutes. They were then rinsed with water and immersed in hydro-alcoholic solution at 50% IBA at concentrations of 500, 1000, 1500 and 2000 mg L^{-1} and a control (0 mg L^{-1}) with distilled water for 120 seconds. After this treatment the cuttings were immersed in 1% Benomyl, and planted to 1/3 of its length in plastic trays of size 26x16x10 cm containing washed sand as substrate sterilized. Before planting the cuttings, the sand was moistened to 50 % of its field capacity.
Were observed per plot at 90 days after planting the cuttings: a) percentage of survival (PS): number of live cuttings per plot calculated in percentage, b) percentage of budding (PB): ratio between the number of cuttings with new buds in relation to the number of cuttings per plot, c) rooting percentage (PR): ratio between the number of rooted cuttings and the total number of cuttings per plot, d) percentage of new leaves (PF): ratio between the number cuttings with new leaves and the total number of cuttings per plot. The experimental design used was completely randomized in a factorial 5x2 (IBA concentrations - 0, 500, 1000, 1500 and 2000 mg L^{-1} and cutting types - apical and subapical) in four replicates of ten cuttings. The regression analysis to analyze the concentration of IBA was done separately for apical cuttings and subapical [8].

RESULTS AND DISCUSSION

The average air temperature in the laboratory, in small greenhouse and outside, as well as the relative humidity of the laboratory in small greenhouse and external measures during experiment are shown in Figure 1. As there was no information about the behavior of *Siparuna guianensis*, as the propagation by cuttings, and to prevent large variations occurring between the minimum and maximum temperature in the nursery, we chose to work in the laboratory, which with the use of air conditioning, maintain a more uniform temperature. The choice of small greenhouse was also interesting that we always relative humidity above 90%, regardless of the relative humidity of the laboratory. Most work cites moisture as an important factor, but does not mention the content adequate water for rooting substrate [9]. However it is recommend wetting the soil to its field capacity [10].
There was a greater survival of apical cuttings with the increase in the concentration of IBA, while the cuttings to subapical survival was less than 30 % (Figure 2). Corroborates these results the study of *Syzygium malacensis* propagation in which there was a higher survival of apical cuttings (72.96 %) than the subapical (39.91 %), using concentrations of 0, 100, 200 and 400 mg L^{-1} IBA [11]. The percentage of budding in apical cuttings to increase with increasing concentration of IBA, averaging 45% for a concentration of 2000 mg L^{-1} (Figure 3A). The opposite occurred with the subapical cuttings, which showed at 1000 mg $L^{-}1$, 60 % of budding (Figure 3B), but we cannot say anything about trends because R^2 was very low. In research on the propagation *Tibouchina* cf. moricandiana Baill with middle and apical cuttings, and use of IBA at concentrations of 0, 500, 1000 and 2000 mg L^{-1} at different times 0, 1 and 5 minutes, obtained the highest budding on apical cuttings independent of IBA concentration and immersion time of cuttings, and more budding in middle cuttings was obtained at a concentration of 1214.7 mg L^{-1} IBA in 1 minute immersion [12] similar to results found in this work.
The larger value of new leaves in the apical cuttings (40%) occurred at a concentration of 1500 mg L^{-1} (Figure 4A) and subapical cuttings no good fit in the regression model (Figure 4B) and the concentration 1000 mg L^{-1} was the average percentage of 60 % of new leaves this behavior similar to that observed for the characteristic percentage of budding (Figure 3). The formation of new leaves no element showing the formation of roots, as many cuttings have sufficient supply of nutrients that allows the formation of new leaves, regardless of the supply in the nutrient solution [13]. However, it is important to note that auxin is synthesized in apical buds and young leaves, where it is translocated to the base of the plant by a mechanism of polar transport [14] and thus the presence of new leaves have great influence on rooting, as they are producing auxins, rooting co-factors and carbohydrates needed to maintain cell [15].
The apical cuttings showed higher rooting with increasing concentration of IBA (Figure 5A), but not subapical cuttings rooted at concentrations of 0 and 500 mg L^{-1}, and 1000 mg L^{-1} gave 60 % rooting,

whereas concentrations 1500 and 2000 mg L^{-1} declined by two thirds of that rooting (Figure 5B), indicating a possible toxicity. These results were corroborated with the study of *Acca sellowiana* Berg. in which had the reaction of phytotoxicity in herbaceous cuttings when were used doses over 4000 mg L^{-1} IBA [16]. Differences in rooting capacity are observed between portions of the same branch [17] and rooting the basal cuttings is usually better than that of apical cuttings, due to increased availability of carbohydrates present. Cuttings apical and subapical of *Ixora cocciena* L.) were subjected to treatment with IBA at concentrations of 0, 500, 1000 and 2000 mg L^{-1} with immersion time of 10 seconds [18], and it was found that the cuttings subapical showed better results than the apical cuttings, according the present work. This may have occurred because of apical cuttings do not accumulate reserve substances in quantities sufficient to induce the formation of roots [19]. Moreover, in a study similar to this, [20] found that immersion of apical cuttings *Siparuna guianensis* for 60 seconds with a solution of IBA 500 mg L^{-1} showed higher percentage of survival and rooting the cuttings in relation subapical. This result confirms that lower doses of IBA (with 1000 mg L^{-1}) are efficient, but this differentiated behavior indicates the type of cuttings to be driven studies varying the immersion time AIB using *Siparuna guianensis* cuttings from different positions on the branch. According to the results of this study the propagation of *Siparuna guianensis* can be made by cutting the shoot subapical with the pre-immersion treatment in an alcoholic solution with IBA at a concentration of 1000 mg L^{-1} during 120 seconds.

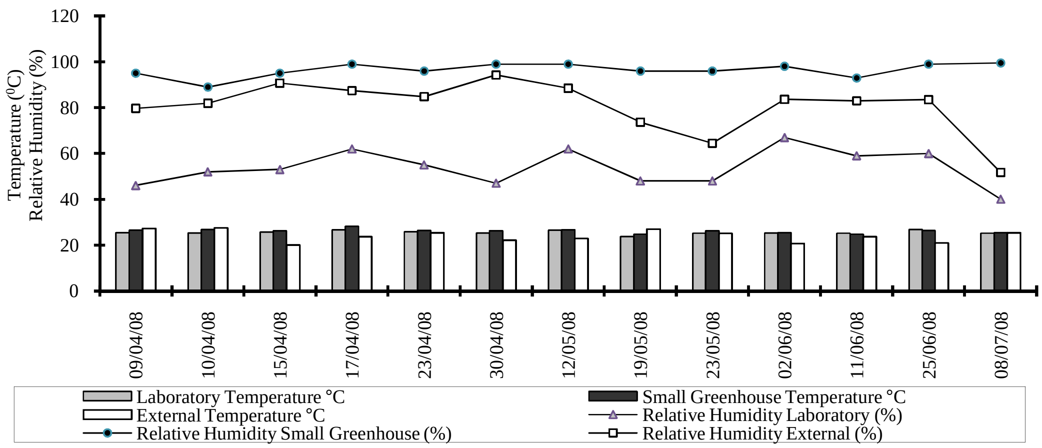

Figure 1. Average data of temperature and relative humidity in the laboratory, external and small greenhouse during the experiment. Cuiabá, Mato Grosso, Brazil. 2008.

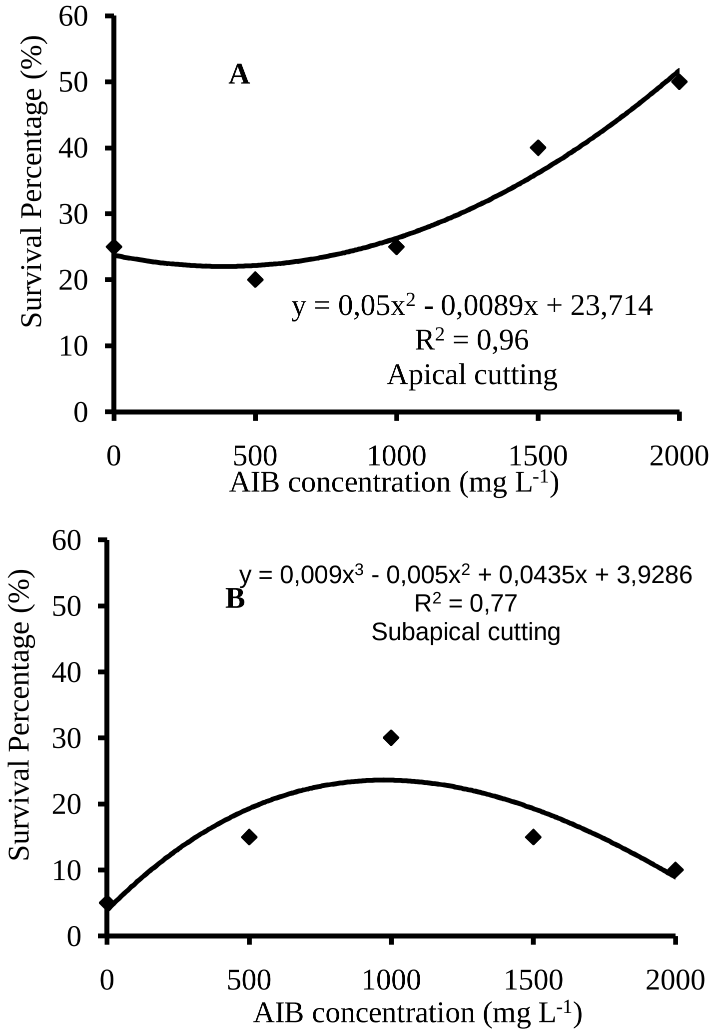

Figure 2. Mean percentage survival of apical cuttings (A) of subapical cuttings (B) of *Siparuna guianensis* in different concentrations of IBA. Cuiabá, Mato Grosso, Brazil. 2008.

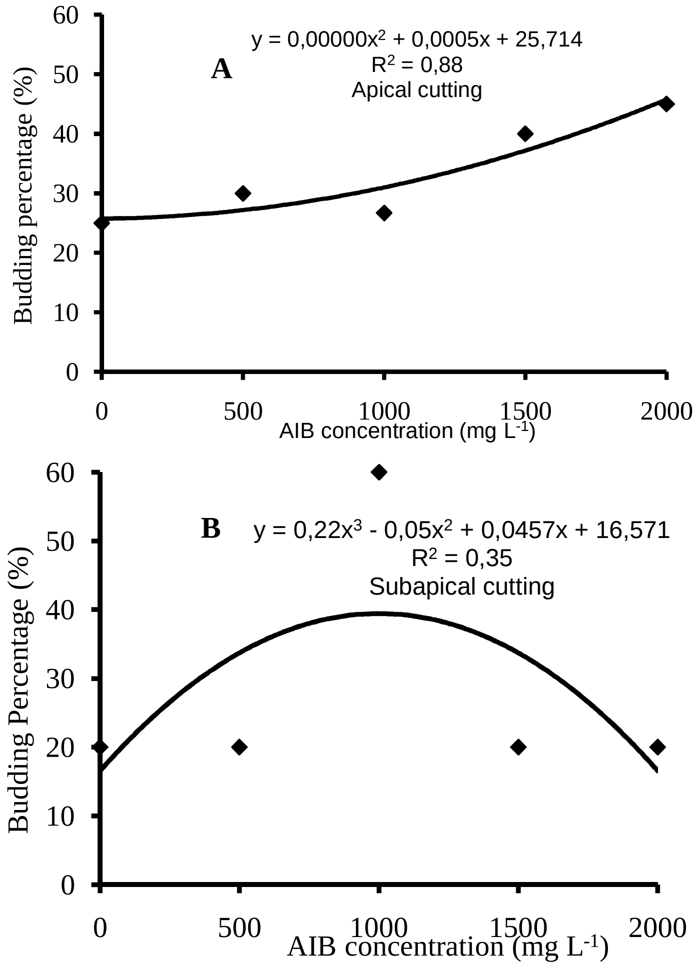

Figure 3. Percentage of buddings on apical cuttings (A) and subapical cuttings (B) of *Siparuna guianensis* in different concentrations of IBA. Cuiabá, Mato Grosso, Brazil. 2008.

Journal of Global Biosciences **Vol. 3(1), 2014 pp. 266-273**
ISSN 2320-1355

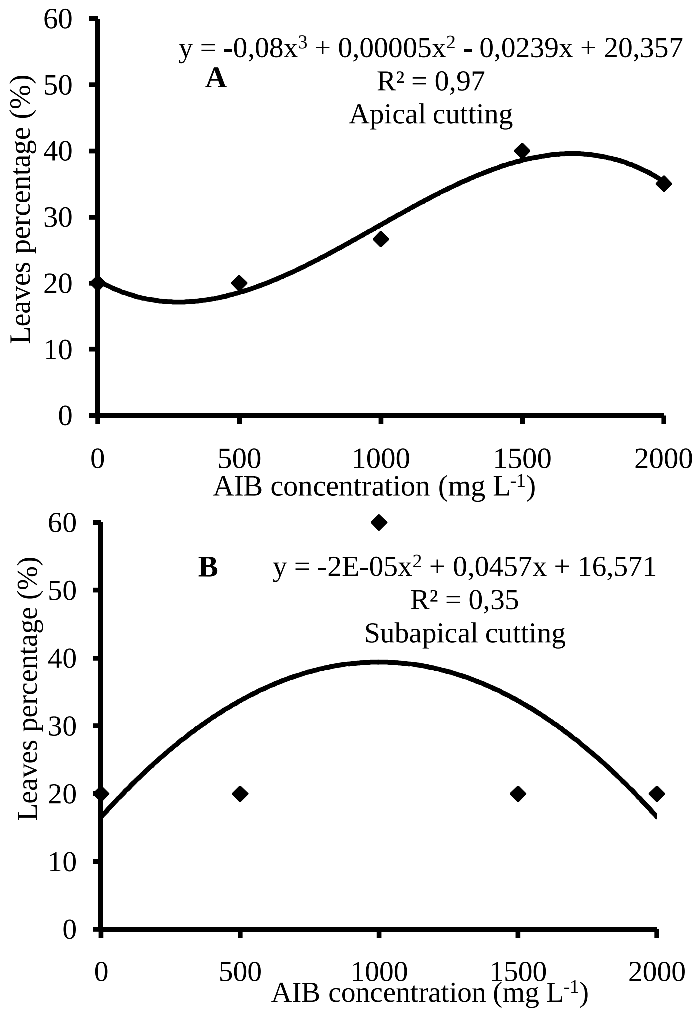

Figure 4. Percentage of young leaves of apical cuttings (A) and subapical cuttings (B) of *Siparuna guianensis* in different concentrations of IBA. Cuiabá, Mato Grosso, Brazil. 2008.

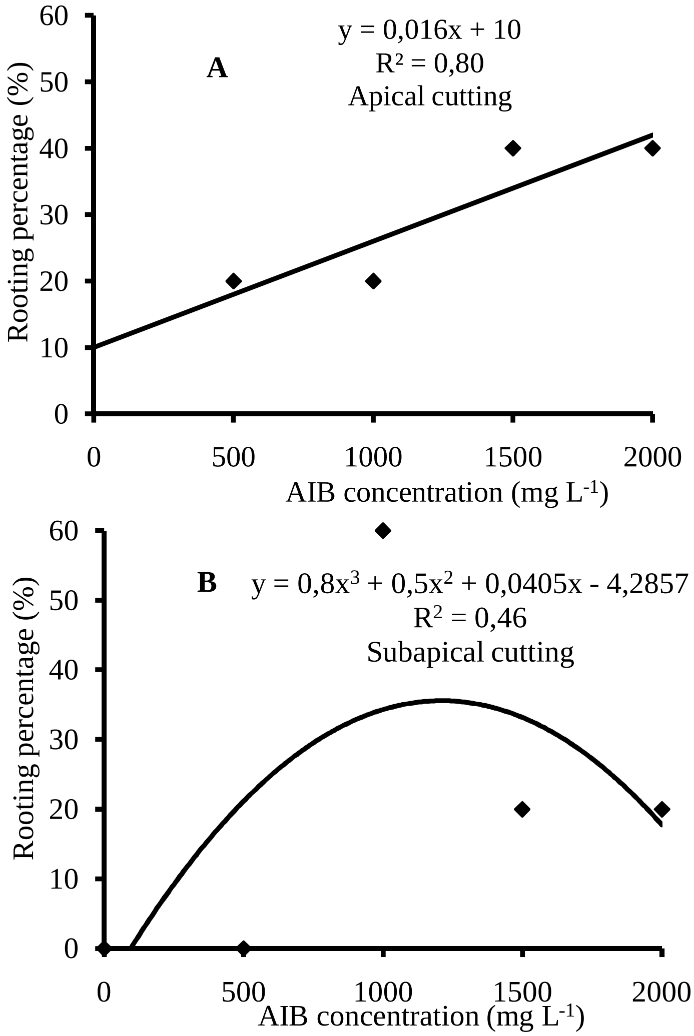

Figure 5. Percentage of rooting apical (A) and subapical cuttings (B) of *Siparuna guianensis* in different concentrations of IBA. Cuiabá, Mato Grosso, Brazil. 2008.

REFERENCES

1. Sousa, I.A., Sacramento, I.V.S. and Ming, L.C. 2006, Propagação por estaquia de três acessos de *Baccharis trimera* em fenologia reprodutiva, Revista Brasileira de Plantas Medicinais, 8: 189-192.
2. Vieira, F.R. and Alves, R.B.N. 2003, Desafios para a conservação de recursos genéticos de plantas medicinais e aromáticas no Brasil, In: Coelho, M.F.B., Costa Junior, P., Dombroski, J.L.D. (Org). Diversos Olhares em Etnobiologia, Etnoecologia e Plantas Medicinais, Cuiabá: UNICEN Publicações, pp.157-181.
3. Renner, S.S. and Hausner, G. 2005, Monograph of Siparunaceae, Flora Neotropica, 95, 256 p.
4. Valentini, C.M.A., Rodriguez-Ortiz, C.E. and Coelho, M.F.B. 2010, *Siparuna guianensis* Aublet (negramina): uma revisão, Revista Brasileira de Plantas Medicinais, 12: 96-104.
5. Antunes, L.E.C., Chalfun, N.N.J., Ramos, J.D., Pasqual, M. and Veiga, R.D. 1996, Influência de diferentes períodos de estratificação, concentrações de ácido indol-butírico e substratos no enraizamento de estacas de figueira, Ciência e Agrotecnologia, 20: 307-314.
6. Ferriani, A.P., Bortolini, M.F., Zuffellato-Ribas, K.C. and Koehler, H.S. 2006, Propagação vegetativa de estaquia de azaléia arbórea (*Rhododendron Thomsonii* HOOK), Semina: Ciências Agrárias, 27: 35-42.

7. INPE. Instituto Nacional de Pesquisas Espaciais. 2008, Clima. Access: <http://satelite.cptec.inpe.br>
8. Ferreira, D.F. 2008, SISVAR: um programa para análises e ensino de estatística. Revista Científica Symposium, 6: 36-41.
9. Hartmann, H.T., Kester, D.E., Davies Jr, F.T. and Geneve, R.L. 2008, Plant propagation: principles and practices. 8. ed. New Jersey: Prentice-Hall, 770 p.
10. Cock, J.H., Toro, J.C. and Roca, W.M. 1982. Multiplicacion acelerada de material genético promisorio de yuca. Cali, Colombia: Centro Internacional de Agricultura Tropical, 28 p.
11. Martins, A.B.G., Graciano, F.A., Silva, A.V.C. 2001. Clonagem de jambeiro-rosa (*Syzygium malacensis*) por estaquia de ramos enfolhados. Revista Brasileira de Fruticultura, 23: 365-368.
12. Ribeiro, M.N.O., Paiva, P.D.O., Silva, J.C.B. and Paiva, R. 2007, Efeito do ácido indolbutírico sobre estacas apicais e medianas de quaresmeira (*Tibouchina fothergillae* Cogn.), Revista Brasileira de Horticultura Ornamental, 13: 73-78.
13. Poggiani, F. and Suiter Filho, W. 1974. Importância da nebulização intermitente e efeito do tratamento hormonal na formação de raízes em estacas de eucalipto. IPEF, 9: 119-129.
14. Aguiar, R.S., Santos, C.E, Zietemann, C., Assis, A.M., Morais, V.J. and Roberto, S.R. 2005, Enraizamento de estacas semi-lenhosas do pessegueiro 'Okinawa' submetidas a diferentes dosagens de ácido indolbutírico. Acta Scientiarum, 27: 461-466.
15. Paiva, H.N. and Gomes, J.M. Propagação vegetativa de espécies florestais. Viçosa: Imprensa Universitária, UFV, 2001. 46 p.
16. Franzon, R.C., Antunes, L.E.C. and Raseira, M.C.B. 2004, Efeito do AIB e de diferentes tipos de estacas na propagação vegetativa na goiabeira serrana (*Acca sellowiana* Berg), Revista Brasileira Agrociência, 10: 515-518.
17. Zuffellato-Ribas, K.C. and Rodrigues, J.D. 2001, Estaquia: uma abordagem dos principais aspectos fisiológicos. Curitiba: Imprensa Universitária, UFPR, 39 p.
18. Bastos, D.C., Azevedo, F.A., Pereira, G.A. and Scarpe Filho, J.A. 2003, Efeito do ácido indol butírico e do tipo de estaca no enraizamento de *Ixora coccinea* L. Cerrados: Revista de Ciências Agrárias, 6: 7-11.
19. Norberto, P.M., Chalfun, N.N.J., Pasqual, M., Veiga, R.D., Pereira, G.E. and Mota, J.H. 2001, Efeito da época de estaquia e do AIB no enraizamento de estacas de figueira *(Ficus carica* L.), Ciência e Agrotecnologia, 25: 533-541.
20. Valentini, C.M.A., Almeida, J.D., Coelho, M.F.B. and Rodríguez-Ortíz, C.E. 2011, Propagação de *Siparuna guianensis* Aublet (Siparunaceae) por estaquia caulinar, Revista Brasileira de Ciências Agrárias, 6: 495-501.