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Scientific paper

Rooting cuttings of forage peanut treated with IBA

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Abstract

Obtaining seeds of peanut (*Arachis pintoi* Krapov. & WC Greg.) cost high, and the propagation is an alternative to enable the utilization of this species as pasture. In order to find the dose of Indole Butyric Acid (IBA) more suitable for rooting of forage, an experiment was conducted in a greenhouse where the treatments were at concentrations of 0, 1000, 2000, 3000, 4000 mg L^{-1} IBA in solution with alcohol. Cuttings with 20 cm long were used and their leaves were removed. The design was completely randomized design with 4 replications; each replication consisted of 40 cuttings. In general, concentrations up to 1000 mg L^{-1} had a positive effect, increasing length and dry root and shoots in addition to increasing the number of rooted cuttings. Doses above 2000 mg L^{-1} proved to be toxic to the roots of forage peanut.

Key words: Indole Butyric Acid, *Arachis pintoi* Krapov. & WC Greg., cutting.

Introduction

Brazil is noteworthy in the international scenario for being the largest exporter of cattle beef in the world. According to the Food and Agriculture Organization (FAO), in each five kilos of cattle beef commercialized in the world, one kilo has Brazilian origin, considering that the bovine feed in Brazil is mostly based in pasture.

Arachis pintoi Krapov. & W. C. Greg., known as forage peanut, originary from Brazil (FERGUSON et al., 1992), and it is a perennial legume which is been indicated for forage, since it presents a good production of dry matter and it has its points of growth close to the soil, which hinders their removal by animal feed (PEREIRA et al,. 1996).

The implantation of pasture with forage peanuts is performed by seeds or vegetative propagation (VALENTIM et al., 2003), however the establishment of this forage is slow, mainly when it is done from seeds (FISHER and CRUZ, 1994).

Pasture implanted trough seeds is, undoubtedly, the most used way for most of the forage species, due to the practicality and efficiency of this method. However, it is necessary to have seeds with high degree of purity and germination, which does not always happen. In the specific case of the forage peanuts, the obtaining of seeds limits its propagation through this way, in consequence of the reproductive characteristics of the genus *Arachis,* which have the fruit development below the soil surface, and when mature they fall from the pod, making the harvest a very difficult process, once it is necessary to revolve

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and sieve the soil to recover pods (FERGUNSON, 1994). This fact, economically, generates high cost in the seed production, which makes the use of the species difficult in the implantation of pasture. In this context, the production of forage peanut seeds becomes economically interesting due to the high cost of the seeds of this species, besides pastures implanted by seedlings present a faster establishment.

The propagation of plants by cuttings consists in the emission of roots by the cuts, being influenced by internal and external concentration of auxins, as well as by the degree of lignification of the tissues, in which cutting of more herbaceous tissues, i.e., less lignified, have better rooting (FERRI, 1997). According to FACHINELLO et al. (1995), seedlings with well-developed root and shoot reduce the time of crop establishment, which is an important fact, since it reduced the time of competition of the crop with weeds and increases the probability of success in its implantation. Thus, procedures which provide better quality seedlings are tools of great value for the establishment of forage peanut.

The process of rooting of the cutting happens by endogenous and exogenous auxins (HARTMANN et al., 1990), and the application of exogenous auxin will stimulate changes in the tissues followed by their differentiation in roots (PASQUAL et al., 2001).IBA is the most used synthetic auxin since it has good chemical properties, and it is a molecule photostable and poorly sensitive to degradation when compared to the other commercial auxins, besides it has localized action (NOGUEIRA, 1983; FACHINELLO et al., 1995; HOFFMANN et al., 1996). According to FACHINELLO et al. (1995), the use of IBA is common practice aiming to provide the cutting of species with short roots. However, the ideal quantity of IBA applied to the base of cuttings to provide stimulus of the root initiation ranges between the different species, and high dosages may promote phytotoxic of inhibitor effect, disfavoring the rooting (PIO et al., 2002).

Due to the insufficiency of works about techniques of aid to the vegetative propagation of forage peanut, the aim of this work was at finding the ideal dose of IBA for the rooting of cuttings of forage peanut.

Material and methods

The work was developed between August 2009 and July 2010 in the Department of Agronomy of the Universidade Estadual do Centro Oeste do Paraná – UNICENTRO (State University of Mid West), located in the municipality of Guarapuava – PR, where the climate is Cfb (Subtropical humid mesothermic), without dry season, with fresh summers and moderated winter, according to the classification of Köppen, in altitude of approximately 1100 m. The geographic coordinates are 25°23'26'' S. and 51°27'15'' W.

The experiment was conducted in greenhouse with 40, 10 and 2 m of length, width and height, respectively, with micro sprinkler system of irrigation. The cuttings were made from stolon standardized with 20 cm of length, approximately 4 nodes and without leaves, Treatments were 0, 1000, 2000 and 4000 mg L^{-1} of IBA in solution with alcohol, in which the cuttings were placed 2.5 cm from the basal part in contact with the solution of IBA, in the concentration of the treatments, with time of immersion of 5 seconds.

The cuttings were transported to the greenhouse. The design used was the completely randomized, with 4 replications, and each replication consisted in 40 cuttings.

At 21 days it was performed the counting to determine the percentage of rooted cuttings. The root length was determined by the method 'line-intercept method', in which the root length is estimated in the base of the number of intersections of the root with the net that is super-imposed to them, described by TENNANT (1975).

The sprouts and the roots were conditioned in paper bags and placed in oven with forced air at 60°C for 72 hours for drought, and after this period, weighted in analytic weight in order to determine the dry matter of shoot and root.

The statistical evaluation was composed by analysis of variance and to the regression test using the software SISVAR.

Results and discussion

The root length of the seedlings forms from cutting of forage peanuts were positively influenced by the use of IBA in concentrations of until 2000 mg L^{-1}, and when the cuttings were submitted to doses superior to mg L^{-1}, there was inhibitory effect to root length, reducing its length, fact which occurred mainly when it was used 4000 mg L^{-1} (Figure 1).

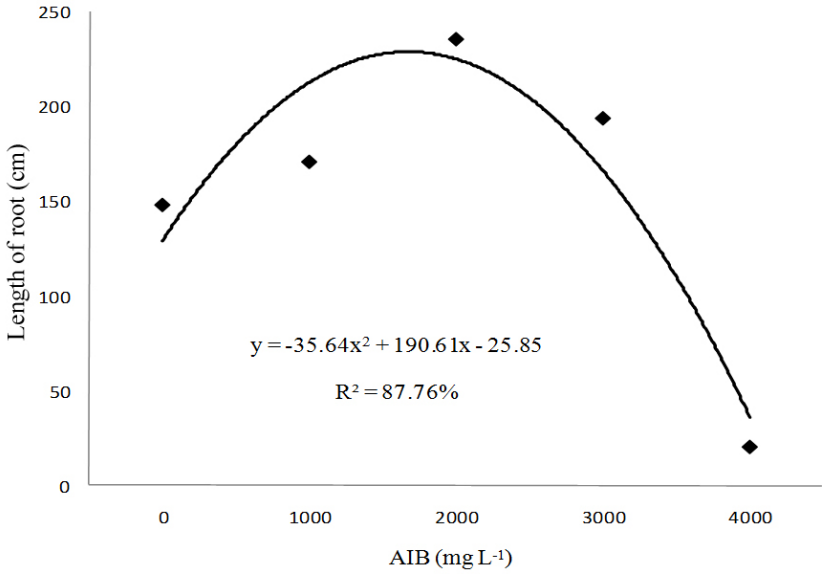

Figure 1. Length of root of forage peanut (*Arachis pintoi* Krapov. & W. C. Greg.) in function of the dose of IBA used. Guarapuava-PR, CEDETEG, 2010..

In the variable mass of root dry matter (Figure 2), it was obtained results similar to the root length, results which was already expected since these variables are closely linked. The application of IBA in concentrations up to 2000 mg L^{-1} provided increase in the mass of dry matter, and when it was used doses superior to 2000 mg L^{-1} there was phytotoxity, inhibiting the growth and reducing the mass of root dry matter.

PASQUAL et al. (2001) concluded that the treatment with auxins, specially IBA, in the base of the cuttings, provides beneficial effects in the weight and quality of the root system which was formed, as the results found in Figure 2, being still similar to those found in other crops (FACHINELLO et al., 1995; DUTRA et al., 2002; GONTIJO et al., 2003).

According to NACHTIGAL (1999), there is no reference to the mass of dry matter and appropriate length of root. However, these factors are related to the capacity of plant survival and development after the period of root formation, as it was observed in Figure 1 and 2, for forage peanut, the use of IBA in the base of the cuttings in doses up to 2000 mg L^{-1} enables a considerable increase of the mass of dry matter and root length, enabling thus better rooting of seedlings in comparison with the control (without application of IBA), which confirms the positive effect of the IBA in the formation of seedlings of forage peanut.

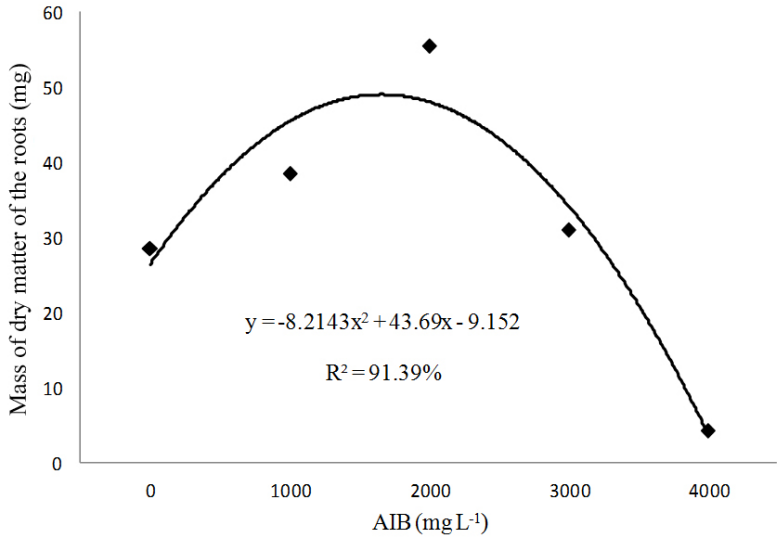

Figure 2. Mass of dry matter of the roots of forage peanut (*Arachis pintoi* Krapov. & W. C. Greg.) in function of the dose of IBA used. Guarapuava-PR, CEDETEG, 2010

In Figure 3, it is presented the production of mass of dry matter in the sprouts in relation to doses of IBA, in which the use of doses of up to 1000 mg L^{-1} caused an increase in this variable, and in doses superior to 1000 mg L^{-1} there was a reduction of the mass of dry matter of sprouts, probably the doses superior to 1000 mg L^{-1} have directed higher quantity of reserves and photoassimilates for the formation of roots (Figure 1 and 2), reducing thus the mass of dry matter of the sprouts (Figure 3).

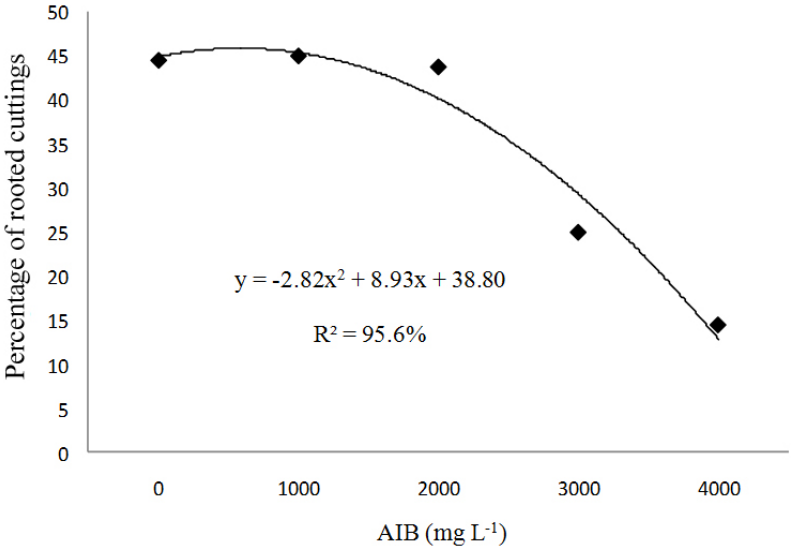

Figure 3. Mass of dry matter of the sprouts of forage peanut (*Arachis pintoi* Krapov. & W. C. Greg.) in function of the dose of IBA used. Guarapuava-PR, CEDETEG, 2010.

CARVALHO (2005) mentions that the exogenous application of the growth regulator provided effect over the mass of dry matter of the sprouts in the cuttings, considering that the formation of sprouts in the phase of rooting does not harm the process of formation of seedling, and a good development of sprouting ensures a higher range of survival of the seedlings in flied, fact also observed by WAREING and PHILLIPS (1989), thus it is necessary a good development of the root and shoot system.

For the percentage of the rooted cuttings (Figure 4), the concentration of 1000 mg L^{-1} presented, even though a small, but an increase in the percentage of cuttings rooted compared to when it was not used the IBA. From the concentration of 1000 mg L^{-1}, with the increase in the dose of auxin, it was reduced the percentage of cuttings rooted, so doses superior to 1000 mg L^{-1} have effect of phytotoxity, decreasing the percentage of rooted cuttings.

Similar results were found by Hiroto et al. (2002) who observed higher percentage of cuttings in quince with concentration of 1000 mg L^{-1} of IBA.

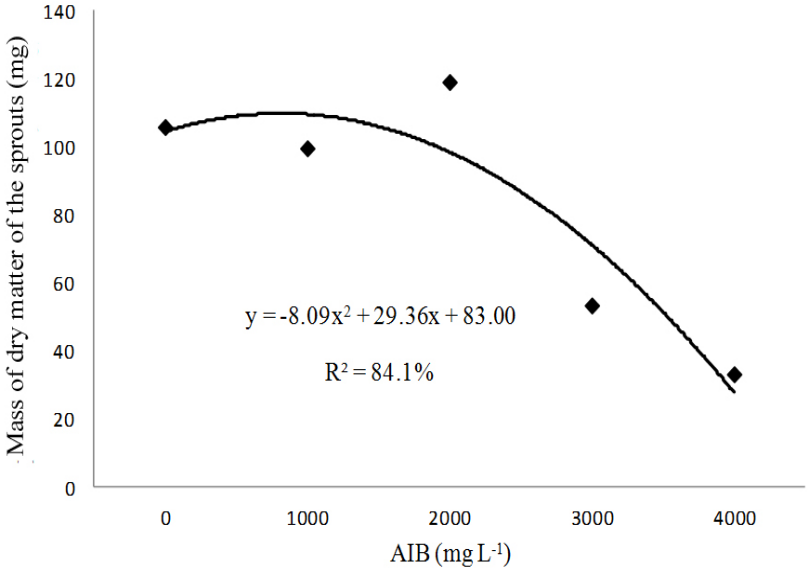

Figure 4. Percentage of rooted cuttings of forage peanut (*Arachis pintoi* Krapov. & W. C. Greg.) in function of the dose of IBA used. Guarapuava-PR, CEDETEG, 2010.

Although the concentrations of IBA of up to 2000 mg L^{-1} have resulted in better rooting, increasing the mass of dry matter and root length (Figure 1 and 2), this dose restricted in part the growth of the sprouts (Figure 3) and reduced the percentage of cutting rooted (Figure 4).

It is considered that it is of great importance a good development both of root and shoot so that they will assure the survival of the seedlings in field, besides it is necessary to aim a higher percentage of rooted cuttings, since it increases the economic viability of the implantation of pasture by seedlings of forage peanut.

According the results the dose of 1000 mg L^{-1} was the only one that provided an increase in all the variables analyzed, enabling a better balance between mass of dry matter of the sprouts and root, and increase of the number of rooted cuttings and root length .

Conclusions

With the research was possible to establish that the peanut (*Arachis pintoi)* respond positively to IBA application. The dose of 1000 mg L^{-1} of IBA is the most indicated for the root of cuttings of forage peanut.

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References

BASTOS, D.C.; MARTINS, A.B.G.; SCALOPPI JUNIOR, E.J.; SARZI, I.; FATINANSI, J.C. Influência do ácido indolbutírico no enraizamento de estacas apicais e basais de caramboleira (*Averrhoa carambola* L.) sob condições de nebulização intermitente. **Revista Brasileira de Fruticultura**, v.26, n.2, p.284-286, 2004.

CARVALHO, C.M.; CUNHA, R.J.P.; RODRIGUES, J.D. Enraizamento de estacas semilenhosas de lichieira utilizando ácido indolbutírico. **Revista Brasileira de Fruticultura**, v.27, n.1, p.95-97, 2005.

DUTRA, L.F.; KERSTEN, E.; FACHINELLO, J.C. Época de coleta, ácido indolbutírico e triptofano no enraizamento de estacas de pessegueiro. **Scientia Agricola**, v.59, n.2, p.327-333, 2002.

FACHINELLO, J.C.; HOFFMANN, A.; NACHTIGAL, J.C.; KERSTEN, E.; FORTES, G.R. de L. **Propagação de plantas frutíferas de clima temperado**. 2.ed. Pelotas: UFPel, 1995. 179 p.

FERGUNSON, J.E. Seed biology and seed systems for *Arachis pintoi*. **In:** KERRIDGE, P. C.; HARDY, B. (Eds.) **Biology and agronomy of forage *Arachis***. 1.ed. Cali: CIAT, 1994. p.122-133.

FERGUSON, J.E.; CARDOZO, C.I.; SÁNCHEZ, M. S. Avances y perspectivas en la producción de semilla de *Arachis pintoi.* **Pasturas Tropicales**, v. 14, n. 2, p.14-22, 1992.

FERRI, C.P. Enraizamento de estacas de citros. **Revista Brasileira de Fruticultura**, v.19, n. 1, p.113-121, 1997.

FISHER, M.J.; CRUZ, P.C. Some ecophysiological aspects of *Arachis pintoi*. In: KERRIDGE, P. C.; HARDY, B. (Eds.). **Biology and Agronomy of forarge *Arachis***. 1.ed. Cali: CIAT, 1994. p.53-71.

GONTIJO, T.C.A.; RAMOS, J.D.; MENDONÇA, V.; PIO, R.; ARAÚJO NETO, S.E.; CORRÊA, F.L.O. Enraizamento de diferentes tipos de estacas de aceroleira utilizando ácido indolbutírico. **Revista Brasileira de Fruticultura**, v.25, n.2, p.290-292, 2003.

HARTMANN, H.T.; KESTER, D.E. **Propagacion de plantas: principios y prácticas**. 1.ed. México: Compañia Editorial Continental, 1990. 760p.

HIROTO, C.H.; CHALFUN, N.N.J.; CHAGAS, E.A. Efeito de diferentes substratos no enraizamento de estacas lenhosas de marmeleiro Portugal em duas concentrações de ácido indolbutírico. **In: Anais** do Congresso Brasileiro de Fruticultura, Belém. 2002. v.1, p.17.

HOFFMANN, A.; CHALFUN, N.N.J.; ANTUNES, L.E.C. et al. **Fruticultura comercial: propagação de plantas frutíferas**. 1.ed. Lavras: UFLA/FAEPE, 1996. 319p.

NACHTIGAL, J.C. **Obtenção de porta-enxertos 'Okinawa' e de mudas de pessegueiro (***Prunus persica* **(L.) Batsch) utilizando métodos de propagação vegetativa**. Tese (Doutorado em Produção Vegetal) - Faculdade de Ciências Agrárias e Veterinárias, UNESP, Jaboticabal. 1999. 165f

NOGUEIRA, D.J.P. Os porta-enxertos na fruticultura. **Informe Agropecuário**, v.9, n.101, p.23-41, 1983.

PASQUAL, M.; CHALFUN, N.N.J.; RAMOS, J.D. **Fruticultura Comercial: Propagação de plantas frutíferas**. 2.ed. Lavras: UFLA/FAEPE, 2001. 137p.

PEREIRA, L.V.; ANDRADE, R.P.; KARIA, C.T. Efeitos do pericarpo e do tratamento de sementes no estabelecimentode *Arachis pintoi*. **In: Anais** da Reunião Anual da Sociedade Brasileira de Zootecnia, Fortaleza, CE. 1996. v.1. p.392-394.

PIO, R. **Ácido indolbutírico e sacarose no enraizamento de estacas apicais e desenvolvimento inicial da figueira (*Ficus carica* L.).** Dissertação (Mestrado em Agronomia) - Faculdade de Ciências Agrárias e Veterinárias – UFLA, Lavras. Lavras. 2002. 109f.

RUFATO, L.; KERSTEN, E. Enraizamento de estacas de pessegueiro (*Prunus persica* (L.) Batsch), cvs. Esmeralda e BR 2, submetidas à estratificação e ao ácido indolbutírico. **Revista Brasileira de Fruticultura**, v.22, n.2, p.191-194, 2000.

RUFATO, L.; ROSSI, A. de; LOMBARDI, S.R.; RIBEIRO, E.; KERSTEN, E. Efeito de diferentes concentrações de floroglucinol no enraizamento de estacas de duas cultivares de pessegueiro (*Prunus persica* L. Batsch) tratadas com AIB. **Revista Brasileira de Fruticultura**, v.21, n.3, p.297-300, 1999.

TENNANT, D.; A Test of a Modified Line Intersect Method of Estimating Root Length. **The Journal of Ecology**, v.63, n.3, p.995-1001, 1975.

VALENTIM, J.F.; ANDRADE, C.M.S.; MENDONÇA, H.A.; SALES, M.F.L. Velocidade de estabelecimento de acesso de amendoim forrageiro na Amazônia Ocidental. **Revista Brasileira de Zootecnia**, v.32, n.6, p.1-12, 2003.

WAREING, P.F.; PHILLIPS, I.D.J. **Growth and differentiation in plants**. 1.ed. England: Pergamon Press, 1981. 344 p.