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Roots as a Substrate in Layering in Lychee

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ABSTRACT: The research was carried out with the objective of evaluating the effect of different substrates based on grass roots, on air layering in lychee plants. The grass seedlings were planted in plastic pots with a capacity of 10 liters with a mixture of soil, sand and barnyard manure (3:1:1). The treatments were composed of Esfagno as a control and forage roots: Tifton, Jiggs, Mombaça and Tanzânia. Ninety days after planting, their roots were removed and placed to dry for later use in layering. After drying the roots, batches weighing 30 grams were made for all species and batches were separated for layering. Air layering was performed on adult lychee plants, in branches between 1 and 2 cm in diameter, with each treatment of five layering. Five plants of each treatment were collected for evaluation. The setting index, green mass and dry mass of the roots were evaluated. Grass roots can be used as a substitute for Esfagno in air layering in lychee trees. The substrates formed by roots of Mombaça and Tanzânia grass showed the best results in replacement of Esfagno in air layering in lychee trees and may be a solution for use in the production of seedlings of this fruit tree.

KEYWORDS: Lychee trees, Seedlings, Grass.

INTRODUCTION

Lychee (*Litchi chinensis* Sonn *),* a fruit-bearing species belonging to the Sapindaceae family (JIANG et al., 2013). With the increase in production and the delay in obtaining lychee seedlings, the air layering technique is used, which has advantages such as a high percentage of rooting and independence of infrastructure for the acclimatization of seedlings (CASTRO and SILVEIRA, 2003). This procedure has resulted in a shorter period of juvenility, seedlings genetically identical to the matrices and more adapted to field conditions (CARVALHO; SALOMÃO, 2000).

The air layering method for litchi, compared to other types of propagation, has the advantage of presenting a high percentage of rooting, ease of propagation, without the need for infrastructure for seedling production (SMARSI et al., 2008).

Lychee seedlings are produced using vegetative propagation techniques (VIEIRA et al., 2019), and layering is the most used method for producing larger seedlings, reducing the time to produce quality fruits and preserving the characteristics. genetic characteristics of the mother plant (HARTMANN et al., 2011), however, the success of this process depends mainly on the substrate used, which is responsible for ensuring favorable conditions for root development, such as aeration, permeability, water and nutrient retention (FREITAS et al., 2011). According to Campos et al. (2015), the type of substrate may be one of the most important factors in determining the success of rooting.

Substrates go far beyond just supporting the plants, they must provide the plant with the water and nutrients it needs, and the root system with the necessary oxygenation, easy to handle, low cost, high availability and long-lasting (QUINTERO et al., 2011).

With the increase in seedling production and the advancement of agricultural activities linked to the fruit and ornamental seedlings sector, concerns about the origin of the substrates used, the most used are of commercial origin, presenting easier purchase, but with high prices. , mainly due to the freight charged (KRATZ et al., 2013). Thinking about reducing costs and enhancing the resources of the farmer's property, it is proposed to use grass roots for the air layering technique to replace the conventional substrate (Esfagno). The roots have a low cost, and can be produced on the property itself.

Alternative substrates that can be used to minimize very high costs are grass roots such as Tifton, Jiggs, Mombaça and Tanzânia, all of which produce a very thick root with storage capacity.

The research was carried out with the objective of evaluating the effect of different substrates based on grass roots, on air layering in lychee plants.

MATERIALS AND METHODS

The research was conducted in the seedling production nursery and in the IFES region. The nursery is covered with a polyolefin screen with 50% shading, nursery sector of the Federal Institute of Espírito Santo (IFES-Campus Santa Teresa), district of São João de Petrópolis, Santa Teresa, ES, with geographic coordinates 19º56'12" S and 40º35'28"W, with an altitude of 155 m. The climate of the region is characterized as Cwa, mesothermic, with a dry season in the winter and heavy rainfall in the summer (Köppen classification) (ALVARES et al., 2013), with an average annual rainfall of 1,404.2 mm and an average annual temperature of 19.9°C, with a maximum of 32.8°C and a minimum of 10.6°C (INCAPER, 2011).

The experimental design was in randomized blocks (DBC) with 5 treatments and 4 replications, with each treatment composed of 10 air layering and each plant constituted a block. The grass seedlings were planted in plastic pots with a capacity of 10 liters with a mixture of soil, sand and barnyard manure (3:1:1). Irrigations were performed daily, using micro-sprinklers throughout the experiment, with three daily irrigations, lasting 15 minutes. The treatments were composed of Esfagno as a control and forage roots: Tifton, Jiggs, Mombaça and Tanzânia.

Ninety days after planting, when the development of the plants reached the cut-off point for use by animals, their roots were removed and placed to dry for later use in layering. After drying the roots, batches weighing 30 grams were made for all species and batches were separated for layering. Air layering was performed on adult lychee plants in the IFES region, in branches between 1 and 2 cm in diameter, with each treatment of five layering, totaling 100 layering. Five plants of each treatment were collected for evaluation.

The setting index, green mass and dry mass of the roots were evaluated. The experimental data were submitted to analysis of variance using the F test, meeting the model's assumptions using the Shapiro-Wilk test to verify normality, and the treatment means were compared using the Tukey test at a 5% probability level.

RESULTS AND DISCUSSION

According to Table 1, it is observed that in the variable green mass and dry mass the layering containing Tanzânia grass, Mombaça and Esfagno did not differ statistically, and were statistically superior to the other treatments. Air layering containing Jiggs grass presented the worst result in these variables.

In terms of setting and callus production, there was no statistical difference in any of the treatments (Table 1). According to Hartmann et al. (2011), the wound made at the time of girdling contributes to callus formation, as cellular activity in the injured area is stimulated by an increase in respiratory rate and an increase in auxin, carbohydrate and ethylene levels, stimulating the formation of calluses and also of roots, being a precursor to the formation of adventitious roots.

Table 1. Average values of green matter, dry matter, setting index and callus index

	Variables			
Treatments	Green Matter (g)	Dry matter (g)	Handle Index (%)	Callus Index (%)
Jiggs	1.543 c	0.742 b	80 a	80 a
Tifton	1.761 bc	0.825 b	100 a	100 a
Tanzânia	2.665 a	1.155 a	100 a	100 a
Mombaça	2.669 a	1.178 a	100 a	100 a
Esfagno	2.852 a	1,331 a	100 a	100 a
CV(%)	23.55	20.81	19.64	19.64

Means followed by the same letter in the column, in the same column, do not differ from each other by the Tukey test, at a 5% probability level.

Esfagno presents itself as a material with greater water retention capacity, lightness, acid pH, easy handling and sterility, these points may have influenced the results presented. Esfagno has as main characteristics its lightness, acid pH, high water retention capacity, easy handling and sterility (BONETTI, 1992).

Hartmann et al., (2011) mention that before the formation of roots we have the formation of calluses in some species. However, Lins et al. (2015) in studies with Esfagno and coconut fiber in 'Bengal' lychees at different times of the year and found the lowest rooting rates in May and July, however, at this time they had the most developed callus mass. This fact indicates that the formation of roots in lychee layers does not depend on the formation of calluses, especially when it comes to substrates such as coconut fiber and seaweed (VIEIRA et al., 2019)

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Mombaça grass and Tanzânia grass showed similar characteristics to commercial material (Esfagno), this fact may be due to the physiological characteristics of forages, in addition to these characteristics, they have a high content and capacity to store carbohydrates and proteins. Another important point presented by these grasses is, according to Herling et al. (2001), resist periods of water stress and compete for nutrients in the soil, promoting sufficient mass for propagation by layering.

Souza et al. (2015), studying the characteristics of Esfagno, found water retention capacity (35.73 mL 50 cm-3), total porosity (82.40%), electrical conductivity (194.80 µS cm-1) and hydrogenion potential in the aqueous extract of the substrate (5.0), resources that are considered ideal for the development of roots in layering.

Vieira et al. (2019), in studies with Tifton 85 grass, reported that this, as a substrate, presented easy handling and cultivation, in addition to good adaptation to Brazilian soil conditions. The observation is that Tifton, like the other substrates used in this research, may have conferred lightness, aeration and good moisture retention in the layering, a fact that suggested the results of this research, however, further characterization studies of these substrates are needed.

In addition to the characteristics, these grass species can also be used for grazing, as well as in hay and silage, with good acceptance by cattle, buffaloes, horses, sheep and goats (SANTOS et al., 2010). Vieira et al. (2019), cite the good result of Tifton 85 grass, the root system used as an alternative substrate to Esfagno due to the strong potential of lychee stratification, which can replace Esfagno as a substrate in air layering in lychees.

CONCLUSION

Grass roots can be used as a substitute for Esfagno in air layering in lychee trees.

The substrates formed by roots of Mombaça and Tanzânia grass showed the best results in replacement of Esfagno in air layering in lychee trees and may be a solution for use in the production of seedlings of this fruit tree.

REFERENCES

1) ALVARES, C.A., STAPE, J.L., SENTELHAS, P.C., GONÇALVES, J.L.M. & SPAROVEK, G. Köppen's climate classification map for Brazil. Meteorologische Zeitschrift, v.22, n.6, p.711-728, 2013.
2) BONETTI, E.J. Some substrates used in the propagation of ornamental species, cuttings and seeds. Lavras: ESAL, 1992. 9 p.
3) CAMPOS, G.N.F.; ARRIEL, E.F.; NOBERTO, M.N.S.; JUNIOR, J.A.F.; SILVA, V.V.M.; FREIRE, A.L.O. Cloning of Cnidoscolus quercifolius by air layering. Forest Sciences. v.25, n.3, p.743–749, 2015.
4) CARVALHO, C.M.; SALOMON, L.C.C. Lychee culture. Viçosa: UFV, 2000. 38 p. (Extension Bulletin, 43).
5) CASTRO, L.A.S.; SILVEIRA, C.A.P. Vegetative propagation of the peach tree by air layering. Brazilian Journal of Fruticulture, Jaboticabal, v. 25, no. 2, p. 368-370, 2003.
6) FREITAS, S.D.J; CARVALHO, A.D.; BERILLI, S.D.S.; SANTOS, P.C.; MARINHO, C.S. Substrates and Osmocote® in the nutrition and development of micropropagated seedlings of pineapple cv. Victory. Brazilian Journal of Fruticulture, v. 33, p.672–679, 2011.
7) HARTMANN, H.T.; KESTER, D.E.; DAVIES JUNIOR, F.T.; GENEVE, R.L. Plant propagation: principles and practices. 8th ed. New Jersey: Prentice Hall, 2011. 915 p.
8) HERLIN, V.R.; RODRIGUES, L.R.A.; LUZ, P.H.C. Grazing management. In: Symposium on pasture management: planning and production systems in pastures. p.157-192, Piracicaba. Anais... Piracicaba: Luiz de Queiroz Agrarian Studies Foundation, 2001.
9) INCAPER Planning and programming of actions for Santa Teresa. Technical assistance and rural extension program PROATER, Department of Agriculture, 2011.
10) JIANG, G. et al. Identification of a novel phenolic compound in litchi (Litchi chinensis Sonn.) pericarp and bioactivity evaluation. Food Chemistry, v.136, p.563-568, 2013.
11) KRATZ, D.; WENDLING, I.; NOGUEIRA, A. C.; SOUZA, P.V.D. Physical and chemical properties of renewable substrates. R. Árvore, Viçosa, v.37, n.6, p.1103-1113, 2013.
12) LINS, L.C.R.; SALOMON, L.C.C.; CECON, P.R.; SIQUEIRA, D.L.D. The lychee tree propagation by layering. Brazilian Fruit Growing Magazine. v.37, n.2, p.480–487, 2015.
13) QUINTERO, M.; GONZÁLEZ, C.; GUZMÁN, J. Substrates for vegetable crops and cut flowers. In: V. Flórez R. (Ed.), Substrates, climate management, automation and control in soilless cropping systems. Bogota: One. national from Colombia, p.79-108, 2011.
14) SANTOS, M.V.; FREITAS, F.C.L.; FERREIRA, F.A.; CARVALHO, A.J.; BRAZ, T.G.S.; CAVALI, J.;RODRIGUES, O.L. Tolerance of Tifton 85 to glyphosate at different times of application. Planta Daninha, v.28, n.1, p.131–137, 2010.

15) SOUSA, G.G.; ROSA, Y.B.C.J.; DE MACEDO, M.C.; AND SOARES, J.S. BR Acclimatization of Brassavola tuberculata Hook soaked with ANA on different substrates. Horticultura Brasileira, v.33, n.2, p.208-215, 2015.
16) SMARSI, R.C.; CHAGAS, D.A.; REIS, L.L.; OLIVEIRA, G.F.; MENDONÇA, V.; TROPALDI, L.; WORST.; SCARPARE FILHO, J.A. Indolebutyric acid concentrations and substrate types in the vegetative propagation of lychee. Brazilian Journal of Fruticulture, Jaboticabal, v. 30, no. 1, p. 7-11, 2008.
17) VIEIRA, K.M.; BAITELLE, D.C.; PAIXÃO, M.V.S.; SANTOS, P.C.; BARONI, D.F.; CARVALHO, A.J.C. Tifton roots replace sphagnum moss as substrate for air-layering litchi tree. Horticultural Act. v.1266. p.405-411, 2019.