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Evaluation of different substrates in the production of *Ormosia arborea* (Vell.) Harms (Fabaceae) plantlets

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Workshop Information

I Workshop of Plant Biology (I Workshop de Biologia Vegetal) was held in the Bioscience Institute – UNESP, campus of Rio Claro, Brazil, during August 20 and 21, 2012. Workshop was a scientific event organized by Post-graduate students from that Institute aiming to integrate Post-graduate and Graduate students from different areas related to Plant Biology (Anatomy, Ecology, Evolution, Morphology, Physiology, and transitional areas) from different Universities. Workshop Organization offered a large number of speaking activities, scientific discussions, and extra short-courses to improve the knowledge and formation of students in Plant Biology.

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INTRODUCTION

Ormosia arborea (Vell.) Harms (Fabaceae, is a native tree species that occurs in the remaining Floresta Estacional Semidecidual of Mato Grosso do Sul state, which is in endangered species due to environmental devastation (Lorenzi 2000).

The success of environmental projects that includes the planting of native species depends on the plantlets quality, beginning with the production steps in the greenhouse to achieve the good development of the plants in the field. The seed quality and the substrate are among the factors that contribute to a better early development of the plants. According to Gomes and Paiva (2011), the substrates must have good physical and chemical characteristics, because they have the main function of supporting and providing nutrients to the plants. The best substrates must allow water and nutrients availability, absence of pathogens, and adequate pH and texture (Silva et al. 2001). Pereira (2008) emphasized that there is necessity of verifying, to each plant species, which substrate or best mixture of substrates allows obtaining high quality plantlets.

Aiming the choice of the best substrate for the production of *O. arborea* plantlets, this study purpose was to evaluate the effect of different substrate mixtures on the early development of *O. arborea* plants cultivated in tubes, under greenhouse conditions.

MATERIAL AND METHODS

The seeds of *O. arborea* were collected on the ground, in March of 2011, on the left margin of the Rio Ivinhema (22° 02' 56,7" S; 53° 41' 25,6" W), in Nova Andradina, State of Mato Grosso do Sul.

Seedlings were obtained from seeds chemically scarified in a concentrated sulfuric acid for 20 min, planted in nursery up to emergence. At 40 days, seedlings were transferred to tubes (175 cm^3) filled with different substrates, properly sifted. Thirty seedlings were used to each treatment and to the control: T1 – poultry manure + soil (1:3); T2 – soil + bovine manure (1:1); T3 – sugarcane filter cake + bovine manure (2:1), potassium chloride (1.5 g 10 L^{-1} of substrate), and ammonium sulfate (7 g 10 L^{-1} of substrate); Control – commercial substrate Tecnomax™, composed by peat, vermiculite, *Pinus* bark and charcoal.

The development of the plants was inspected for 105 days (from May to August of 2011), in a protected environment (under 50% artificial shading and diary irrigation). The temperatures varied from 6° C to 39° C, with average of 21.6° C. At the end of the experiment, the plants were submitted to the measuring of height (H), from the substrate level up to the apical bud; diameter at the stem base (SD), using a digital caliper (0.01 mm); and counting of the number of leaves per plant (LN). Then, 15 plants of each treatment and the control were split in root, stem, leaves, and cotyledons, all parts were dried in a stove at 105° C for 24 hours, for the determination of the dry mass using an analytic scale (0.0001 g).

The data were submitted to analysis of variance (ANOVA – one way or Kruskal-Wallis), and the Turkey and Dunn tests, considering 5% of probability to compare the results.

RESULTS AND DISCUSSION

The mortality rate in T1 was 100% within the first 15 days, and, therefore, the data regarding this treatment were not analyzed. The T2 treatment showed 50% of mortality at the end of the experiment, whereas in the T3 treatment and the control all plants survived. The high rates of mortality in T1 and T2 could be related with the physical characteristics of these substrates (compactness degree) and/or with the manure ratios used in the study, probably exceeding the tolerable to the species.

Lucena et al. (2006) observed that the behavior of *Leucaena leucocephala* (Lam.) De Wit and *Delonix regia* L. (Fabaceae) plantlets was different in response to the use of different sources of organic matter present in different substrates (bovine or poultry manure), which conducted the authors to the assumption that distinct species respond to the physical-chemical conditions that each type of manure add to the soils in different ways.

In a study carried out by Vieira et al. (2009) with *Trema micrantha* L. Blume (Cannabaceae) the use of 20%, 30% and 40% of poultry manure as substrate also resulted in high mortality. On the other hand, according to Frade Junior et al. (2011), 20% of broiler litter can be used in the composition of alternative substrates to the production of *Inga edulis* Mart. (Fabaceae) plantlets, combined with a material that gives the appropriate physical conditions. For *Coffea arabica* L. (Rubiaceae), broiler litter percentages varying from 34.4% to 36.1%, and bovine manure percentages from 32.7% to 37.0% resulted in better quality plantlets (Silva et al. 2009).

The LN did not vary between treatments (F = 0.49; *p*= 0.6204), whereas the SD (H = 11.3723; *p* =0.0034) and H (F= 4.6792; *p*= 0.0122) were statistically different, with the control showing the highest averages and differing from T2 regarding SD and from T3 regarding H (Table 1).

The data regarding total dry mass of the plants were statistically different (F= 2.0606; *p*= 0.1385), but, in relation to the dry mass of the aerial part, only the control, with the highest average, and T2, with the lowest average (F=6.2299; *p*=0.0046), showed a statistical significance. Moreover, in relation to the root dry mass, all treatments showed a statistical difference (F=15.4624; *p*=< 0.0001), with increasing values from T2, T3 to the control.

Concerning the effective gains, plants of the T2 treatment showed the lowest gains in the diameter at the stem base (SDG), only 0.27 mm, differing in relation to the plants growing in the remaining substrates (H=11.8526; *p*=0.0027), however, no significant difference was observed in relation the height gain (HG) (F=1.3362 *p*=0.2685). The partitioning of the dry mass between aerial part and root revealed a higher tendency to the equilibrium in the control plants, differing of T2 (F=4.2854 *p*=0.0199).

Comparing T2 and T3 treatments, the plants cultivated in the substrate containing organic components plus chemical fertilizers (T3) showed the highest average values for the analyzed parameters, except in relation to the height and the aerial part:root ratio. However, statistically significant differences, it was observed only for the root dry mass and for the stem diameter gain. These results, together with the survival of T3 plants, allowed us to recommend, besides the commercial substrate (control), the T3 substrate, which does not contain soil, for the production of *O. arborea* plantlets.

Table 1. Average values to the diameter at the stem base (SD), height (H), number of leaves (LN), dry mass of aerial part (APDM), dry mass of the root (RDM) and total dry mass (including cotyledons), gain in diameter (SDG) gain in height (HG) and aerial part:root ratio (Ratio AP:R) for *Ormosia arborea* cultivated in different substrates.

Substrate	SD (mm)	H (cm)	LN	APDM (g)	RDM (g)	Total mass (g)	SDG (mm)	HGH (cm)	Ratio AP:R
T2	2.08 B	6.41 AB	2.79	0.15 B	0.05 C	0.33	0.27 B	0.62	3.38 A
T3	2.39 AB	5.96 B	3.00	0.20 AB	0.07 B	0.37	0.70 A	0.76	2.95 AB
Control	2.51 A	6.86 A	2.97	0.24 A	0.10 A	0.40	0.65 A	0.91	2.50 B

Averages followed by same letters do not differ significantly at the level of 5% probability.

Santos et al. (2009) recommended a combination of subsoil, commercial substrate and chemical fertilizer for the production of other legume plantlets, as *Cassia ferruginea* (Schrader) Schrader ex DC and *Senna macranthera* (Collad.) Irwin et Barn. and only the use of the commercial substrate plus chemical fertilizer in the case of *Platypodium elegans* Vogel.

CONCLUSIONS

Considering all evaluated parameters, the commercial substrate (Tecnomax™ - control) has shown to be the most appropriate for the production of *O. arborea* plantlets and, amongst the proposed treatments, the substrate containing organic components and chemical fertilizers (T3) has shown to be the most efficient, and can also be recommended for the production of *O. arborea* plantlets. The addition of 25% poultry manure has shown to be inadequate to the substrate composition for *O. arborea*. Further studies, employing a lower proportion of this compound should be performed.

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References

Frade Junior EF, Araújo JA, Silva SB, Moreira JGV, Souza LP. 2011. Substratos de resíduos orgânicos para produção de mudas de ingazeiro *(Inga edulis* Mart*)* no Vale do Juruá- Acre. Enc Biosf 7:959–969.

Gomes JM, Paiva HN. 2011. Viveiros Florestais: Propagação sexuada. Ed. UFV: Viçosa.

Lorenzi H. 2000. Árvores Brasileiras: Manual de Identificação e Cultivo de Plantas Arbóreas Nativas do Brasil. Instituto Plantarum: Nova Odesssa.

Lucena AMA, Guerra HOC, Chaves LHG. 2006. Desenvolvimento de mudas de Leucena e Flamboyant em diferentes composições de substratos. Rev Verde 1:16–23.

Pereira CC. 2008. Efeito de diferentes concentrações do fito-hormônio GA3, e diferentes substratos na germinação de sementes de cafeeiro (*Coffea arabica* L.). 45 p. Monografia, Escola Agrotécnica Federal de Muzambinho, Brasil.

Santos JA, Pinto LVA, Pereira AJ. 2009. Avaliação do desenvolvimento morfológico inicial de quatro espécies de leguminosas arbóreas sob diferentes substratos. Available at ramses.ffalm.br/cognitum--/index.php/publicacoes/sicanp/sicanp 2009/60.html. Accessed 11 May 2012.

Silva RP, Peixoto JR, Junqueira NTV. 2001. Influência de diversos substratos no desenvolvimento de mudas de maracujazeiro-azedo*, (Passiflora edulis* Sims f. *flavicarpa* DEG). Rev Bras Frutic 23:377–381.

Silva CJ, Melo B, Silva CA, Pode CEM, Pereira S, Santos KAS. 2009. Desenvolvimento vegetativo de mudas de cafeeiro sob doses de cama de frango e esterco bovino curtido. Available at www.fundagres.org.br/biossolido/images/ FERTILIDADE/12.pdf Accessed 20 May 2012.

Vieira AR, Pereira AJ, Gonçalves EO. 2009. Crescimento de Mudas de *Trema micrantha* L. Blume em Diferentes Substratos Orgânicos. Rev Bras Agroecol 4:597–600.

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