(DOI): 10.5777/PAeT.V5.N3.03

This article is presented in English with abstracts in Spanish and Portuguese.

Brazilian Journal of Applied Technology For Agricultural Science, Guarapuava-PR, v.5, n.3, p.27-32, 2012.

Scientific paper

Grmination and initial development of *Tamarindus indica* L. using different substrates.

Gerarda Beatriz Pinto da Silva[1]

Geovânio Lima Barros[2]

Állisson Rafael Ferreira da Silva[3]

João Paulo Nobre Almeida[4]

Priscilla Vanúbia Queiroz de Medeiros[5]

Abstract

This study was conducted in a greenhouse at the Rural Federal University of the Semi Arid – UFERSA in Mossoró-RN. The seeds were collected from mature fruits obtained in the same Campus UFERSA. Five substrates were tested: 1- Solaris® + goat manure + Polifértil® sifted (1:1:1); 2- Solaris® + goat manure + Polifértil® sifted (2:1:1); 3- Solaris® + goat manure + Polifértil® sifted (1:2:1); 4- Arisco + goat manure (1:1:2); 5 Solaris® + goat manure + Polifértil® sifted (2:1:2). The sowing was done in trays of 128 cells by placing a single seed per cell. The experimental design used was of randomized blocks with four replications, where each repetition had 18 plants per treatment. The evaluated characteristics were: emergence speed index (ESI), shoot length (SL), root system length (RSL), number of leaves (NL), shoots dry matter (SDM) and dry matter of the root system (DMRS). The results were submitted to variance analysis and comparison of means by the Tukey Test at 5% probability. The substrates used in this work did not cause an increase in the rate of emergence rate, shoot length, root length, roots dry matter, dry matter of shoot and leaf number (NF) in the initial growth of tamarind.

Keywords: Propagation, seedlings, Solaris®, tamarind.

Germinação e desenvolvimento inicial de *Tamarindus indica* L. utilizando diferentes substratos.

Resumo

O trabalho foi conduzido em uma casa de vegetação da Universidade Federal Rural do Semiárido – UFERSA, em Mossoró-RN. As sementes utilizadas foram extraídas de frutos maduros obtidos no próprio Campus da UFERSA. Foram testados cinco substratos: 1- Solaris® + Esterco Caprino + Polifértil® peneirado (1:1:1); 2- Solaris® + Esterco Caprino + Polifértil® peneirado (2:1:1); 3- Solaris® + Esterco Caprino + Polifértil® peneirado (1:2:1); 4- Arisco + Esterco caprino (1:1:2); 5 Solaris® + Esterco Caprino + Polifértil® peneirado (2:1:2). A semeadura foi feita em bandejas de 128 células colocando-se uma única semente por célula. O delineamento experimental utilizado foi o de blocos casualizados com quatro repetições com 18 plantas por tratamento. As características avaliadas foram: índice de velocidade de emergência (IVE), comprimento da parte aérea (CPA), comprimento do sistema radicular (CSR), número de folhas (NF), matéria seca da parte aérea (MSPA) e matéria seca do sistema radicular (MSSR). Os resultados obtidos foram submetidos à análise de variância e para comparação das médias foi utilizado o teste de Tukey a 5% de probabilidade. Os substratos utilizados neste trabalho não promoveram incremento no índice de velocidade de emergência, comprimento da parte aérea, comprimento do sistema radicular, matéria seca do sistema radicular, matéria seca da parte aérea e número de folhas (NF) avaliados no desenvolvimento inicial de plantas de tamarindo.

Palavras-chave: Propagação, mudas, tamarindo.

Received in: 23/04/2012 Accepted for publication: 17/11/2012

1 Departament of Agronomy/ UNIVERSIDADE FEDERAL DE SANTA MARIA – UFSM. Av. Roraima, 1000 - Camobi CEP: 97105-900. Santa Maria – RS. E-mail: gerardabeatriz@hotmail.com

2 Agronomy / Universidade Federal do Ceará – UFC. E-mail: geovanio_05@yahoo.com.br

3 Master student in Agricultural Sciences at Universidade Estadual da Paraíba UEPB. E-mail: engallisson.rafael@hotmail.com

4 Master student in Postgraduate Program in Agronomy/Phytotechny at Universidade Federal do Ceará - UFC. E-mail: oaopaulonobre@yahoo.com.br

5 PhD in Phytotechny. UNIVERSIDADE FEDERAL RURAL DO SEMI-ÁRIDO – UFERSA. E-mail: pris_medeiros85@hotmail.com

Germinación y desarrollo inicial de *Tamarindus indica* L. utilizando distintos sustratos.

Resumen

Se realizó el trabajo en un invernadero de la Universidade Federal Rural do Semiárido - UFERSA en Mossoró-RN. Las semillas fueran recolectadas de frutos maduros obtenidos en el campus de la UFERSA. Fueran testados cinco sustratos: 1 - Solaris ® + estiércol de cabra + Polifértil® tamizada (1:1:1), 2 - Solaris ® + estiércol de cabra + Polifértil ® tamizada (2:1:1), 3 - Solaris ® + estiércol de cabra + ® Polifértil tamizada (1:2:1) 4 - Arisco + estiércol de cabra (1:1:2), 5- Solaris® + estiércol de cabra + Polifértil® tamizada (2:1:2). Las semillas fueran sembradas en bandejas de 128 células mediante la colocación de una semilla por celda. El diseño experimental fue de bloques al azar con cuatro repeticiones y con 18 plantas por tratamiento. Las características evaluadas fueron: índice de velocidad de emergencia (IVE), longitud de brotes (CPA), longitud de la raíz (RSE), número de hojas (NF), materia seca de la parte aérea (MSPA) y materia seca del sistema radicular (MSSR). Los resultados fueron sometidos a análisis de varianza y comparación de medias con prueba de Tukey al 5% de probabilidad. Los sustratos utilizados en este trabajo no han promovido aumento en la tasa de velocidad de emergencia, longitud de la parte aérea y de la raíz, peso seco de las raíces y de la parte aérea y número de hojas (NF), evaluados en el desarrollo inicial de las plantas de tamarindo .

Palabras clave: propagación, plantones, tamarindo.

Introduction

The tamarind (*Tamarindus indica L.*) belongs to the family Leguminosae, originating in tropical Africa, where dispersed by all tropical regions. It is a very decorative and fruit tree, reaching up to 25 m tall. Its fruit is an elongated pod with 5 to 15 cm long with dark brown bark, woody and brittle containing 3 to 8 seeds enclosed in a pulp brown and acid (DONADIO, 1988). The fruit is used primarily from the pulp, preparing sweets, ice cream, liqueurs, juices and concentrates and is even used as seasoning for rice, meat, fish and other foods.

Studies on the development of fruits and seeds are important for establishing harvest strategies and techniques appropriate for post-harvest storage to extend the life, improving the utilization of its potential for marketing of fresh fruit. To PANTÁSTICO (1975), the determination of maturity of fruits can be done by various methods, phenological (days after anthesis), visual observations (skin color, size and shape of the fruit) and physical (abscission, density and firmness). However, the results obtained with these methods may vary depending on the site of cultivation, cultivars and weather of the years of growth. Therefore, one of the most used indexes to determine the point of harvest is the number of days from flowering to full development of the fruit (WARRINGTON et al. 1999).

The tamarind tree is able to grow in many different soil types, even the most degraded. However, there is a period without production that lasts about 12 years, having the big tree longevity, surviving for a century or more (PATHAK et al., 1991). The formation of seedlings of tamarind, is made from the seeds sown in the soil at a depth of 2-3 cm on plots of land usually consist of a mixture of humus (3 parts) and farmyard manure well tanned (1 part). Upon reaching 10 cm in height, are carried into polyethylene bags and upon reaching 25 cm in height are suitable for the transplant (IPA, 1997).

Yet the production of seedlings of this plant is still done randomly, without a definite pattern, which was the biggest obstacle to their production, resulting in high costs. This is due in part to the time of plant development and the high spending inputs (pesticides and fertilizers), labor and equipment.

There are various mixtures used in the composition of substrates for the formation of the plants, needing to take into account the hydro physical and chemical properties, because these directly influence the water / air substrate, in the availability and absorption of nutrients. The best substrates should have easy availability of acquisition and transport, absence of pathogens, wealth of essential nutrients, and proper pH, texture and structure (SILVA et al., 2001). MINAMI et al. (1994), finds that 60% of success is a culture in deploying it with high-quality seedlings.

Thus, given the above, there is little explored approach with this culture, especially in the northeast where its consumption is more expressive. This study aimed to evaluate the germination and seedling development of tamarind produced using different substrates, in an environment with controlled irrigation.

Material and methods

This study was conducted in a greenhouse at the Federal Rural University of the Semi Arid - UFERSA in Mossoró-RN, from July to August 2010. The place where is installed the nursery has geographic coordinates 5º11'south latitude, 37º20' longitude W. Gr and 18 m high, with an average annual temperature around 27.5 °C and average annual rainfall of 673.9 mm, with hot and dry weather in the classification of Kopper. Seeds were collected from mature fruits of tamarind obtained in the very of Campus of UFERSA.

In this experiment, were tested five substrates in emergency assessment of tamarind plants: 1 - Solaris ® + Goat Manure + ® Polifértil sieved (1:1:1); 2 - Solaris ® + Goat Manure + ® Polifértil sieved (2:1:1) 3 - Solaris ® + goat Manure + ® Polifértil sieved (1:2:1) 4 - Arisco + goat manure + ® Polifértil sieved (1:1:2); 5 - Solaris ® + goat Manure + ® sifted Polifértil (2:1:2). The seeds were sown in trays of 128 cells by placing one seed per cell. The experimental design was a randomized block design with four replications, where each repetition has 18 plants per treatment.

The number of seedlings was recorded every day, was considered the seedling emerged when the cotiledonary leaves no longer touched the ground. The emergence began four days after seeding (DAS) and the number of seedlings was daily recorded, so we calculated the Speed Index of Emergence using the formula proposed by (MAGUIRE, 1962).

At the end of the evaluations the shoot and roots were collected, dried in an oven with forced air circulation and were weighed on an analytical balance with an accuracy of 0.001 g to determine the dry weight.

The results were submitted to analysis of variance and for comparison of the averages was used Tukey test at 5% probability, as recommended by Gomes (2000), with the aid of the statistical system for Variance Analysis - SISVAR (FERREIRA, 2000).

Results and discussion

It was not verified by analysis of variance F ($p < 0.05$) significant effect of treatments used as for all characteristics evaluated. The growth of seedlings of tamarind was not affected with the substrates used in this experiment, therefore no significant differences occurring between them.

In work using similar substrates in the culture of orange "pear", it was observed that the variance analysis also revealed that there were no significant differences in the average length of the graft between the substrates studied (MOURÃO FILHO, 1988).

The different proportions of Solaris ®, and Goat Manure Polifértil sifted ® did not result in increased germination percentage in any of the ratios analyzed. A similar result in tamarind seedlings obtained by QUEIROZ (2009) also found no differences between treatments with soil and cattle manure and goat. But similar behavior is observed between the percentage of plants germinated and germination speed index, as can be seen in Figures 1 and 2.

The germination was initiated 16 days after sowing and stabilized around 22 DAS. The substrates that had two proportions of the substrate Polifértil ® and goat manure outweigh the other, but not statistically differ in germination percentage. Treatments 3, 4 and 5 obtained averages respectively of 66.67, 69.44 and 68.06 percent of germination, and the lowest averages were found in treatments 1 and 2 with percentages 55.56 and 54.17 respectively. Similar behavior was observed in IVE, where the treatments 1 and 2 had lower averages than others.

It was observed that the length of the area as well as the number of leaves had higher averages in treatments 1, 2 and 3, namely where the plants took longer to emerge, provided the best quality seedlings, as can be seen in figures 2 and 3. HARTMAN et al. (1990) mention that the main effects of substrates manifest themselves on the roots, which can influence the growth of shoots. In the case of this experiment, the effects were not significant, it is likely that the time of evaluation has not been enough to better characterize the effect of the substrate.

In data obtained by ROCHA et al. (2003) in the culture of the pumpkin using a commercial substrate, we observed better performance only for root length. However, all plants had the same growth pattern with the passage of time, because according to GONCALVEZ and POGGIANI (1996), the proper development of seedling is associated with good capacity of aeration, drainage / water retention and availability of balanced nutrient substrates.

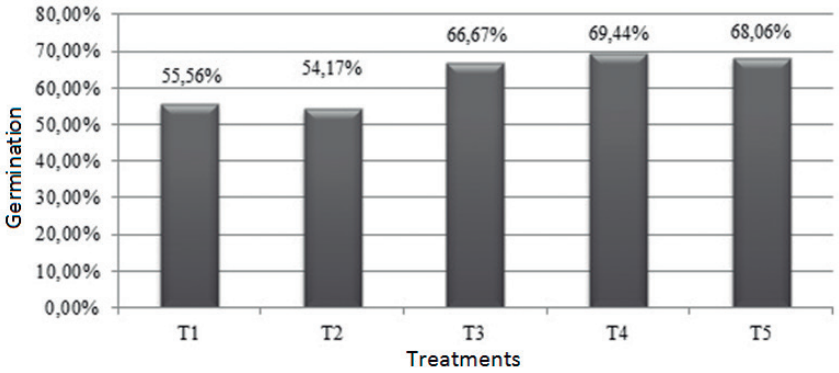

Figure 1. Effect of different substrates on the germination of tamarind seedlings. Mossoró - RN, 2010

T1-Solaris ® + Goat Manure + ® Polifértil sieved (1:1:1), T2-Solaris ® + Goat Manure + ® Polifértil sieved (2:1:1); T3-Solaris ® + Goat Manure + ® Polifértil sieved (1:2:1);T4-Arisco + goat manure (1:1:2); T5-Solaris ® + goat Manure + ® Polifértil sieved (2:1:2).

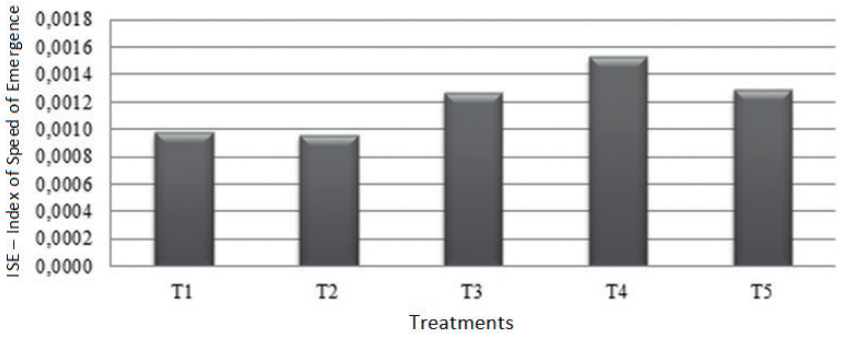

Figure 2. Effect of different substrates on the rate of emergence speed in seedling of tamarind. Mossoró - RN, 2010.

T1-Solaris ® + Goat Manure + ® Polifértil sieved (1:1:1), T2-Solaris ® + Goat Manure + ® Polifértil sieved (2:1:1); T3-Solaris ® + Goat Manure + ® Polifértil sieved (1:2:1);T4-Arisco + goat manure (1:1:2); T5-Solaris ® + goat Manure + ® Polifértil sieved (2:1:2).

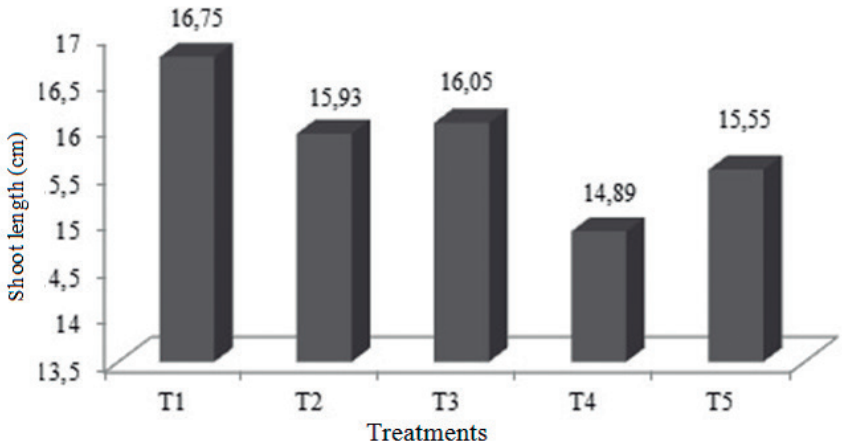

Figure 3. Effect of different substrates on shoot length in seedlings of tamarind. Mossoró - RN, 2010.

T1-Solaris ® + Goat Manure + ® Polifértil sieved (1:1:1), T2-Solaris ® + Goat Manure + ® Polifértil sieved (2:1:1); T3-Solaris ® + Goat Manure + ® Polifértil sieved (1:2:1);T4-Arisco + goat manure (1:1:2); T5-Solaris ® + goat Manure + ® Polifértil sieved (2:1:2).

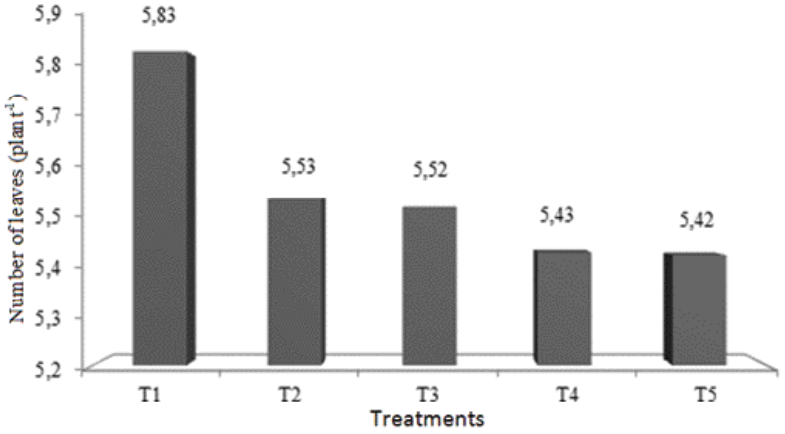

Figure 4. Effect of different substrates on the number of leaves in seedlings of tamarind. Mossoró - RN, 2010.

T1-Solaris ® + Goat Manure + ® Polifértil sieved (1:1:1), T2-Solaris ® + Goat Manure + ® Polifértil sieved (2:1:1); T3-Solaris ® + Goat Manure + ® Polifértil sieved (1:2:1);T4-Arisco + goat manure (1:1:2); T5-Solaris ® + goat Manure + ® Polifértil sieved (2:1:2).

The substrates have different levels of water availability according to their physical characteristics (FIGLIOLIA and PINA-RODRIGUES, 1995). Thus, these characteristics may have influenced the characteristics analyzed, further study is needed on the substrates used.

The lowest percentage of goat manure in the composition of some of the substrates, may have conditioned the plants to lower growth shoots and roots of seedlings as proposed by Rosa Junior et al. (1998).

Because the results were not significant, it is evident the need of having suitable proportions of the components used on substrates, especially organic matter, in order to obtain a suitable development of seedlings, since the substrate significantly influence the nutritional status of the plants and in the water movement and in the system soil-plant-atmosphere.

Conclusions

The proportions of substrates used in this work did not promote an increase in the rate of speed of emergence, shoot length, root length, dry weight of the root system, shoot dry matter and leaf number (NF) in the early development of plants of tamarind. As divergent results were found by other researchers, there is a need to go deeper in this subject to finding an ideal substrate for the cultivation economically viable for the culture of tamarind.

References

DONADIO, L.C.; NACHTIGAL, J. C.; SACRAMENTO, C. K. **Frutas exóticas**. Jaboticabal: FUNEP, 279p. 1988.

FERREIRA, D. F**. Análise estatística por meio do SISVAR (Sistema para Análise de Variância) para Windows versão 4.0**. **In. Anais** da Reunião Anual da Região Brasileira da Sociedade Internacional de Biometria. São Carlos: UFSCar, p.255-258, 2000.

FIGLIOLIA, M.B.; PIÑA-RODRIGUES, F.C.M. Considerações práticas sobre testes de germinação. In: SILVA, A.; PIÑA-RODRIGUES, F.C.M.; FIGLIOLIA, M.B. **Manual Técnico de Sementes Florestais**. São Paulo: Instituto Florestal, p.1-12, 1995. (Série Registros, 14).

GOMES, F. P. **Curso de estatística experimental.** 14. ed. Piracicaba: ESALQ/USP, 2000. 477p.

GONCALVEZ, J.L.M.; POGGIANI, F. **Substrato para produção de mudas florestais**. **In:** Solo-suelo - congresso latino americano de ciência do solo, 13, Resumos expandidos. Águas de Lindóia: SLCS/SBCS/ESALQ/USP/CEA-ESALQ/USP/SBM, 1996. (CD-ROM).

HARTMANN, H.T.; KESTER, D.E.; DAVIES JUNIOR, F.T. **Plant propagation**: **principles and practices.** 5. ed. Englewood Cliffs: Prentice Hall, 1990. 642p.

IPA. Empresa Pernambucana de Pesquisa Agropecuária. **Recomendações para o cultivo de frutas tropicais**. Recife, 1997.

MENEZES JÚNIOR, F.O.G.; MARTINS, S.R.; FERNANDES, H.S. Crescimento e avaliação nutricional da alface cultivada em "NFT" com soluções nutritivas de origem química e orgânica. **Horticultura Brasileira**. v.22, n.3, p.632-637, 2004.

MINAMI, K. et al. **Produção de mudas hortícolas de alta qualidade.** Piracicaba: ESALQ/SEBRAE, 155p. 1994.

MOURÃO FILHO, F.A.A.; DIAS, C.T.S. SALIBE, A.A. Efeito da composição do substrato na formação de mudas de laranjeira "pera". **Scientia Agricola**. [online]. v.55, n.1, p.35-42, 1998.

PANTÁSTICO, E.B. **Postharvest physiology, handling and utilization of tropical and subtropical fruits and vegetables.** Westport: AVI, 1975.560p.

PATHAK, R.K.; OJHA, C.M.; DWIVEDI, R. Adopt patchbudding for quicker multiplication in tamarind. **Horticulture,** [S.l.], v.36, n. 3, p.17, 1991.

QUEIROZ, J. M. O.; DANTAS, A. C. V. L.; ALMEIDA,V. O.; NEVES, C. G. Germinação de sementes de tamarindo em diferentes substratos. **In:** Congresso Brasileiro de Fisiologia Vegetal, Fortaleza-CE, 2009.

ROCHA, M. R. et al. Tecnologia alternativa para produção de mudas de abobora com a utilização de substrato orgânico. **Unimontes Científica,** v.5, n.1, 2003.