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Asexual propagation of peach palm by division of the clump and extraction of the off-shoots

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ABSTRACT

The peach palm (*Bactris gasipaes*) is a native Amazonian palm tree that produces fruits and palm hearts, and is now attracting the interest of the farmers in other parts of Brazil given the economical potential of palm heart production. Traditionally the peach palm is propagated by seeds, which yield segregating progenies due to cross-pollination. To guarantee the uniformity and quality of elite selections, the alternative is the propagation of superior genotypes from off-shoots (tillers), because an efficient *in vitro* cultivation protocol does not exist. The objective of the present study was the development of a more appropriate technique of vegetative propagation by division of the clump, in order to multiply plants selected in the improvement program. A peach palm clump contains between 2 and 20 off-shoots after cutting for palm heart; these can be separated one from the other with iron wedges, and extracted immediately or left for recovery for subsequent extraction. The experimental design was randomized blocks with three replications, using a 3x5 factorial, where the factors were: height of the off-shoots (<30, 30-60, >60 cm) and recovery time after the separation of the off-shoots from the clump (0, 30, 60, 90 and 120 days). The off-shoots between 30 and 60 cm and left around a month of recovery in the field after separation from the clump presented 65% of survival, while those left around four months presented 80% of survival.

Keywords: *Bactris gasipaes*, vegetative propagation, clump division, off-shoot height, field recovery time.

RESUMO

Propagação assexuada em pupunheira por divisão da touceira variando o tempo de cicatrização dos perfilhos

A pupunheira (*Bactris gasipaes*) é uma palmeira nativa da Amazônia que produz frutos e palmitos e, atualmente está despertando o interesse dos produtores rurais em outras partes do Brasil por seu potencial econômico para produção de palmito. O método de propagação tradicionalmente utilizado na pupunheira é por sementes, a qual apresenta segregação importante devido à polinização cruzada. O presente trabalho teve como objetivo o desenvolvimento de uma técnica mais apropriada de propagação da pupunheira por divisão de touceiras, para fins de multiplicação de plantas selecionadas no programa de melhoramento. Uma touceira de pupunha contem entre 2 e 20 perfilhos após manejo para palmito, que podem ser separados um do outro com o ferro de cova e extraídos imediatamente ou deixados para recuperação e posterior extração. O delineamento experimental foi de blocos ao acaso com três repetições, seguindo esquema fatorial 3x5, onde os fatores foram altura dos perfilhos (<30, 30-60 e >60 cm) e tempo de retirada dos perfilhos após a separação da touceira (0, 30, 60, 90 e 120 dias). Os perfilhos com altura entre 30 e 60 cm deixados por um mês de cicatrização no campo após a separação da touceira apresentaram sobrevivência de 65% e quando deixados por quatro meses apresentaram sobrevivência de 80%.

Palavras-chave: *Bactris gasipaes*, propagação vegetativa, dissecação de touceira, altura de perfilhos, tempo de permanência no campo.

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The peach palm *Bactris gasipaes* is an Amazonian tropical palm tree. The economic potential of the species lies in the fruit and palm heart (Mora Urpi, 1984; Mora Urpi *et al*., 1997).

The interest in cultivating peach palm for palm heart production is constantly increasing in Brazil, especially in the states of São Paulo, Rio de Janeiro, Espirito Santo, Bahia, Paraná, and in the northern region (Amazonas, Pará, Rondônia and Roraima). One of the limiting factors in palm heart production is the genetic material used, that in all the established plantations has been by seed, occurring a great genetic variability because of cross pollination. This reflects directly in the palm heart length (7 to 65 cm) but not in the palm heart diameter that interferes directly in yield of industrial palm heart (Yuyama, personal communication).

Breeding of species that can be propagated asexually is, apparently, less complicated than those with sexual reproduction, because at any stage of the program the individual that presents desirable attributes can be perpetuated as a clone. To date, the use of micro-propagation in the peach palm to establish a protocol has not been successful.

Its hybrid origin and allogamy explain the wide genetic variation in the peach palm (Mora Urpi, 1981). Because of this, propagation by seed in the first generations does not widely reproduce desirable agronomic traits and generates plants genetically different among each other with great variation in production. This fact is a great economic disadvantage for the producer and limits fruit industrialization (Pinedo, 1987).

According to Mora Urpi (1982), the propagation method used in the peach palm is by seed, that because of its heterozygote condition presents very great genetic segregation. Guaranteed seed quality requires plant selection and controlled pollination.

There are few references on palm tree vegetative propagation using off-shoots. The date palm (P*hoenix dactylifera*), a palm tree similar to the

peach palm because it has base off-shoots, was not successfully propagated through off-shoots (Eeuwens, 1978; Sharma *et al*., 1980; Choo, 1984). The first attempt to use peach palm off-shoot clone propagation was carried out in 1775 (Patiño, 1960). Popenoe & Jimenez (1921) separated off-shoots from the peach palm with 7 cm diameter and 1.22 to 2.0 m height, but did not inform the survival results. Other authors did not inform the survival rates, but emphasized the importance of the initial 7.5 to 15 cm clump diameter, to remove the off-shoots (Fournier, 1965). Off-shoot height up to 100 cm resulted in 23% survival 45 days after transplant (Gonzales & Dominguez, 1977); 18-month-old off-shoots, presented 65% survival 70 days after transplant (Sattler, 1986). Chumbimune (1996), after extracting the palm heart, used the commercial peach palm clump leaving the soil piled up around the off-shoot base for two months; later, 30 and 60 cm long off-shoots were transplanted to the definitive field in the wet season with 90% survival, although they did not present experimental information.

Pinedo (1987) reported that cloning from off-shoots was not greater than 25%. Pinedo & Tanchiva (1989) reported 78.5% survival 45 days after separating the off-shoots that varied according to the genetic factor (with and without thorns) and AIB application, and the combination without thorns/ without AIB gave the best response; after 3.5 months the survival mean decreased to 5.37%.

Quinteiro & Lopez (1993) used ANA auxine at 60 mg L^{-1} to promote root sprouting in the off-shoots. Tracz (2005) in a study on peach palm vegetative propagation from off-shoots obtained survival means ranging from 16.6 to 26.6% for rooting and from 10 and 16.6% depending on the genetic material used.

According to Mora Urpi (1999) none of the experiments on propagation by off-shoot separation in peach palm have been successful, with low off-shoot rooting percentages and survival and very slow growth. Yuyama *et al*. (2002) quoted the study by Garcia (1988) on vegetative propagation using off-shoots where at first 25% took but only 10% survived and the survivors did not tiller or flower.

The objective of the present study was to propagate the peach palm asexually by dividing the clump and separating the off-shoots after different periods of time in the field, before transplanting to the nursery to form populations of genetically superior matrices.

MATERIAL AND METHODS

The experiment was set up in February 2007, in the area of the Tropical Fruit Culture Experimental Station from INPA, located at km 40 on the highway BR 174, Manaus-Boa Vista, in Brazil. The climate is the "Af" type in the Köppen classification, with drought from June to October, 28°C mean annual temperature, 2350 mm mean annual rainfall and 80% relative air humidity (Ribeiro, 1976).

A compete randomized experimental design was used with three replications and the treatments were placed in a 3 x 5 factorial scheme. The factors were: off-shoot height (<30, 30-60 and >60 cm); and the time the off-shoots remained in the field (0, 30, 60, 90, 120 days) after dividing the clump.

Each experimental plot consisted of 10 pots containing soil substrate (Yellow Latosoil) mixed with sawdust. Clumps were used of plants from the "trial on the peach palm half sib progeny test of the Pampa Hermosa population, Yurimaguas-Peru" for palm heart selection that were over 10 years old (Yuyama *et al*., 2002). The experiment consisted of two phases, field and nursery. The first started with plant selection (clump) by the total number of off-shoots (over three). A total of 150 plants was selected and each off-shoot was measured and identified by size (height <30 cm, 30-60, and >60 cm from the off-shoot or culm to the fork). An iron wedge was used to cut the clump dividing or separating the off-shoots that were then left in the same place according to the times considered in the trial (0, 30, 60, 90 and 120 days) before transplanting to the pots. The 20 L plastic pots were filled with a mixture of agricultural surface soil collected from 20 cm of the surface layer and sawdust in a 2:1 ratio. After filling the pots, the leaf area was reduced by 50% and the subterranean part (roots) was disinfected by submersion in Bordeaux mixture solution for 1 minute and then planted in the pots. Before transplanting to the pot each off-shoot was assessed for height, stem diameter and leaf number.

In the second phase, "sombrite" was placed on the nursery cover with 50% light passage and shortly afterwards the treatments were installed and distributed according to the experimental design.

The assessments were monthly, from installation in the nursery until 12 months (February 2008) observing height (from the base to the fork), stem diameter and leaf number.

The data were submitted to analysis of variance by the F test and the means were compared by the Tukey test at 5% probability (Gomes, 1987).

RESULTS AND DISCUSSION

The off-shoot height performed differently during the eight months after transplant to the pot in the nursery. Plants lower than 30 cm had gradual and constant death until the sixth month and then they tended to stabilize. The shoots between 30 and 60 cm height performed best, with more than 60% survival at eight months and showed a tendency to stability in the fifth month. Survival continued to increase in the shoots over 60 cm tall until the eighth month without sign of stabilization (Figure 1).

Assessment of the time of off-shoot removal from the clump after cutting showed difference in the survival of the transplanted off-shoots. A greater percentage of the plants that were removed after one and four months survived, over 65%, followed by those removed after two months (60%) and those removed after three months (51%), eight months after transplant. The treatment where the clump was divided and the off-shoots separated, immediately followed by transplant to pots and removal to the nursery, had the lowest survival, 30% (Figure 2).

Partitioning of the treatments

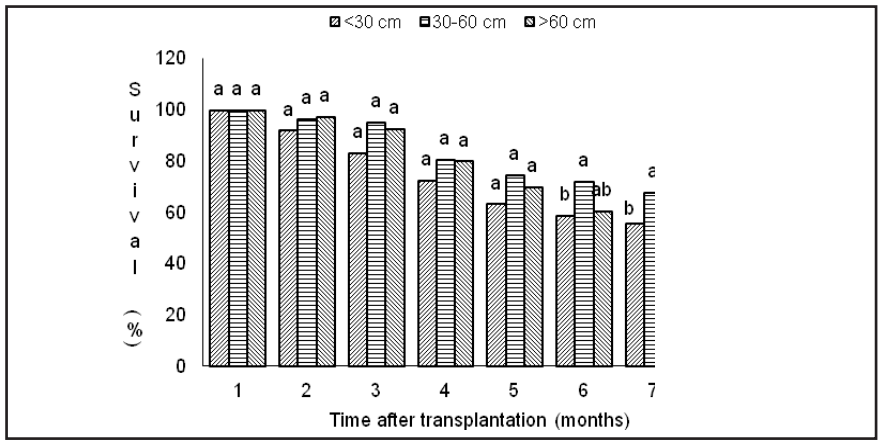

Figure 1. Survival of seedlings with different plant height (<30, 30-60 and> 60 cm) during the eight months after transplanting to pots (sobrevivência de mudas com diferentes alturas da planta (<30, 30-60 e >60 cm) durante o período de 8 meses após o transplante para vaso). Manaus, INPA, 2007/8.

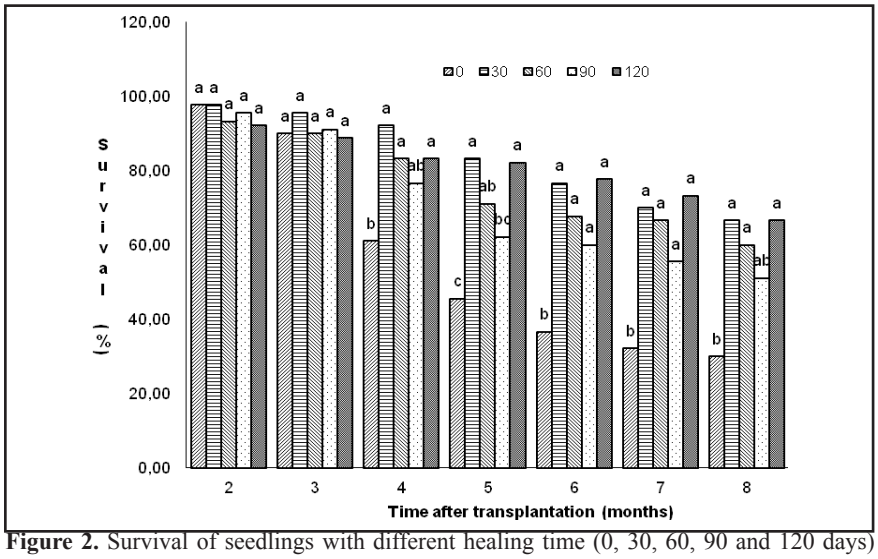

Figure 2. Survival of seedlings with different healing time (0, 30, 60, 90 and 120 days) during the period of eight months after transplanting to pots (sobrevivência de mudas com diferentes tempos de cicatrização (0, 30, 60, 90 e 120 dias) durante o periodo de 8 meses após o transplante para vaso). Manaus, INPA, 2007/8.

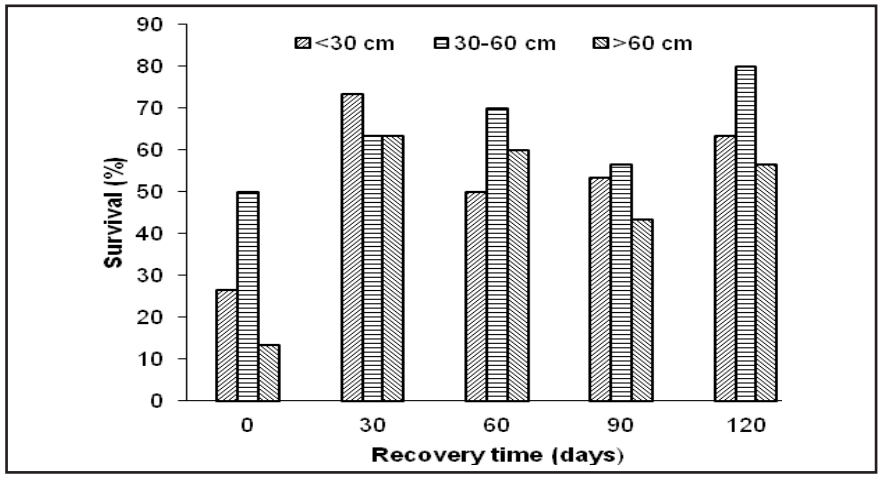

Figure 3. Survival of seedlings of the unfolding of treatments in the eighth month after transplantation to pots (sobrevivência das mudas do desdobramento de tratamentos no oitavo mes após o transplante para o vaso, do experimento de propagação vegetativa de pupunheira por divisão de touceiras). Manaus, INPA, 2007/8.

showed that there was interaction between the two factors assessed for off-shoot survival after transplant (Figure 3). A similar result was reported by Chunbimune *et al.* (1996). Therefore, the asexual propagation technique, by separating the off-shoots from the clump, can be used to increase the number of promising plants in peach palm genetic breeding programs. The principal difference between the technique used by Chunbimune *et al.* (1996) and that of the present study was the use of off-shoots less than 60 cm in height that were left for at least one month in the field after separation from the clump, without removing them from the location, for their recovery and healing.

These results showed that it is possible to propagate the peach palm from the clump, selecting off-shoots between 30 and 60 cm in height. After dissection the off-shoots should be left in the field for at least 30 days, to recover and heal the split before being replicated to pots.

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