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Production of Ramets and Germination of Prestoea trichoclada (Arecaceae)—A Source of Palm Heart in Ecuador

DIEGO BONILLA[1] AND JAN P. FEIL[2,3]

[1] *Herbario Q.C.A. Facultad de Ciencias Exactas y Naturales, P.U.C.E., Quito-Ecuador, Apdo. 1701-2184*
[2] *Department of Systematic Botany, Institute of Biological Sciences, Aarhus University, Nordlandsvej 68, 8240 Risskov, Denmark*
[3] Author for correspondence.

ABSTRACT

Prestoea trichoclada is a common clustering palm on the slopes of both sides of the Andes. It is important economically because it is harvested for its edible palm heart.

We examined the potential for palm heart production in forest versus pasture by studying ramet production and seed germination. In forests, 16 ramets per individual are produced annually as compared to 6.3 in pasture. The production of ramets is weakly correlated with the number of stems per individual. Plants in the forest had lower ramet mortality rates than those in pasture. The rate of germination of seedlings is about 60% in both situations. Seedling recruitment was low in palms growing in pastures.

In Latin America several palm species are commercially harvested for palm hearts. The most important species for this harvest are *Bactris gasipaes* Kunth, *Euterpe edulis* Mart. (Balick 1984), *Euterpe chaunostachys* Dugand (Borgtoft Pedersen and Balslev 1990), *Euterpe oleracea* Mart. (Strudwick 1990), and *Prestoea trichoclada* Burret (Balslev and Henderson 1987).

In Ecuador, palms for palm heart production are *P. trichoclada* and *E. chaunostachys*. They provide palm hearts that are canned and exported. Occasionally, palm heart is sold locally. The first of these palms is the subject of this paper.

Prestoea trichoclada (Fig. 1) is a clustering species with 10 to 45 stems per plant (Fig. 2). The individual stems reach a maximum height of 9 m and about 9 cm in diameter. The palm is called "palmito" in Ecuador, where it is common on both slopes of the Andes between 1,000 and 2,500 m. The clustered habit makes sustainable harvest possible because new shoots will grow up to replace those used (Balslev and Henderson 1987).

The aim of the present study was to obtain data on the production of ramets and seedling establishment in primary forest compared to pastures (Fig. 3). This information is crucial to assess the reproductive potential of the palm in different environments and thereby its possible economic importance outside forests.

Study Site and Methods

The present study was conducted at the ecological station "Río Guajalito," located in the Province of Pichincha, at an altitude between 1,700 to 2,000 m (78°48′W, 0°13′S). The station consists of 400 hectares of primary forest of the lower montane rain forest vegetation type according to the classification of Harling (1979). The nature reserve is surrounded by secondary forest and grasslands. The annual precipitation is about 2,000 mm, and local farmers were asked for the relative rainfall distribution between months. At the study site, *P. trichoclada* dominates the forests along the banks of the river Saloya.

Ninety adult palms were selected randomly at three sites in forest and at three sites in pasture (15 palms at each site). In two cases individuals were not clearly distinguishable, and consequently, omitted from the sample.

Records for the monthly production of ramets were obtained from August 1992 through May 1993. It is noticeable that many of the small ramets never developed into stems. The mortality of the ramets was recorded along with the production of new ones. Since May 1993, the forest has been cut by colonists, and no further results could be obtained.

Three-hundred seeds were collected randomly from different individuals in the forest. Three seedbeds were established on forest and three were

established in the pasture (all the grass was removed before planting). At each seed-bed, 50 seeds were sown 10 cm apart and at a depth of 2 cm. After 3½ months the number of germinated seeds was recorded. Furthermore the number of seedlings was counted at each site within a square of 10 × 20 m.

Results

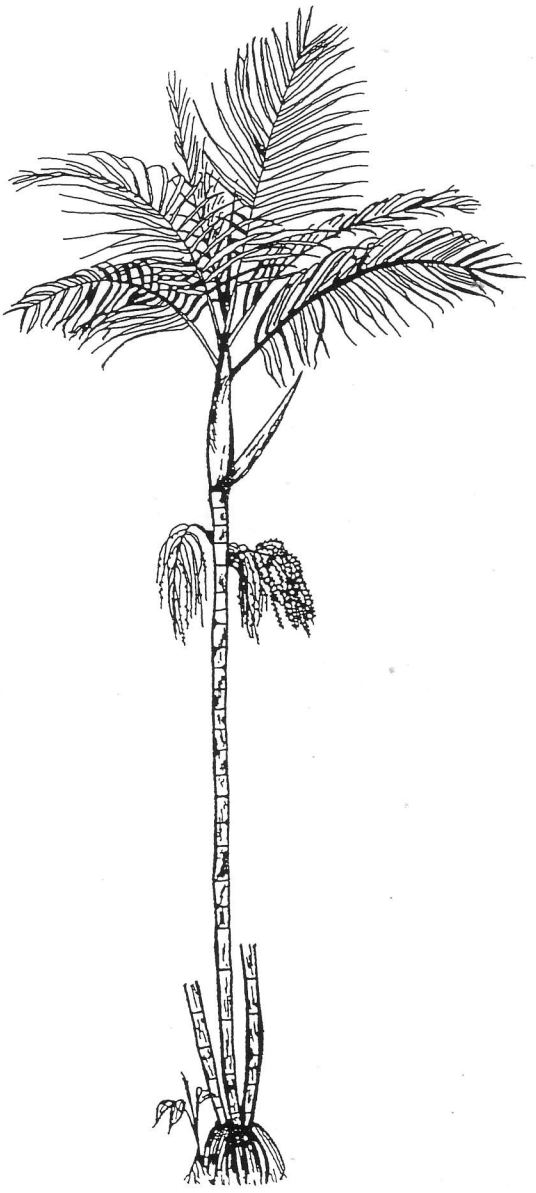
The average number of stems per individual was 18 in the forest (SD = 7.7; N = 43) as compared to 8.5 (SD = 5.8; N = 45) in pasture. On average each individual produced 13 (SD = 5.0) ramets per 10 months (16 per year) in the forest (N = 45) and 5.3 (SD = 2.2) ramets per 10 months) (6.3 per year) in the grassland (N = 45). The production varied greatly between months (Fig. 3).

During five months the mortality of ramets in forest and pasture was 45% and 63%, respectively. A statistical test (Mann-Whitney *U*-test) showed that both number of stems per individual, production of ramets, and mortality of ramets are significantly different between forest and pasture (at a 99.9% probability level).

It is noticeable that we found only a weak correlation or no significant correlation between number of stems per individual and production rate of ramets (in forest $r = 0.30$, $P < 0.05$; N = 43 and in pasture $r = 0.091^{NS}$; N = 45). In the seed-beds of the forest germination was 64% and outside the forest 58%. On the forest floor, 1.8 seedlings were present per m^2, whereas only 0.22 were found per m^2 in pastures.

Discussion

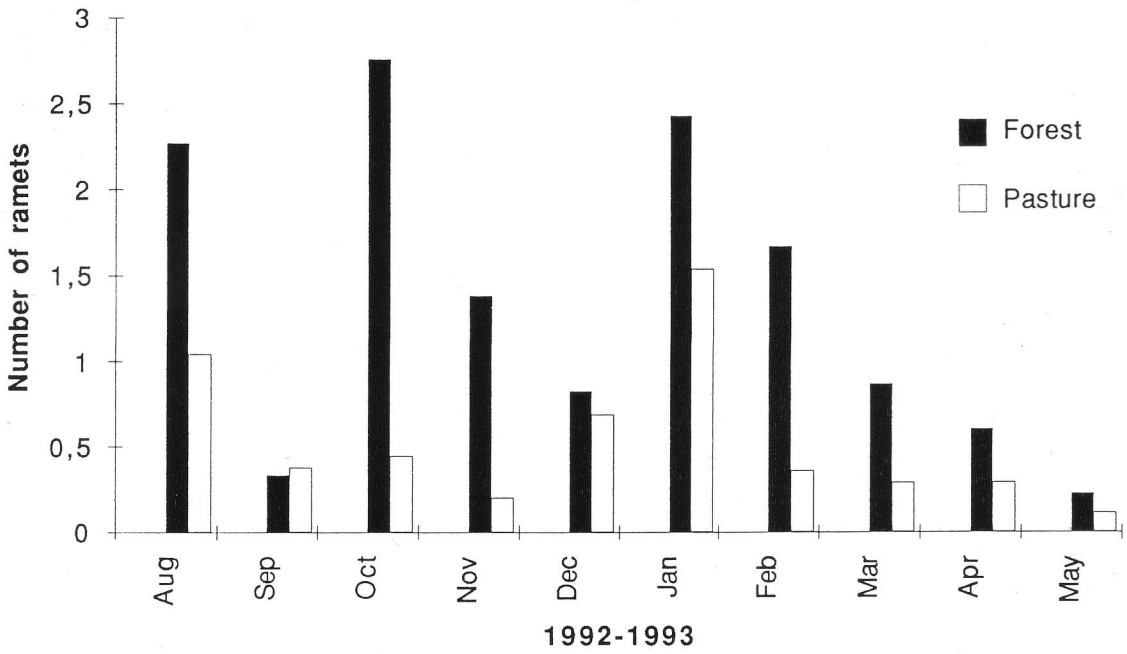
Lower light intensity and more constant temperatures and humidity on the forest floor may favor the production of ramets as compared with the pasture. Bannister (1970) reported that the constant humidity existing in forest favors the production and regeneration of *Euterpe globosa* Mart. in Puerto Rico. The same environmental conditions that cause high ramet production in forest also favor growth of the ramets already present. This was found for *E. chaunostachys* in Ecuador (Borgtoft Pedersen and Balslev 1990), *E. oleracea* in the Amazon estuary (Strudwick and Sobel 1988), *Podococcus barteri* Mann & Wendl in Cameroon (Bullock 1980), and *Rhapidophyllum hystrix* Pursh in Mississippi (Clancy and Sullivan 1990). Probably the same applies to *P. trichoclada*. This would explain the difference in number of stems per individual between forest and pasture. Also, it is likely that stems in pasture have previously been cut to obtain palm heart.



1. Habit of *Prestoea trichoclada*.

The poor correlation between the number of stems and the ramet production, indicates that clump size is not the main limiting factor for pro-

2. Tagging and counting of ramets in the forest.



3. Average production of ramets per individual in forest and pasture (N = 45).

4. *Prestoea trichoclada* in pasture.

duction of ramets. Thus, the fact that larger individuals are found in forest does not explain the higher production of ramets.

The production of ramets varied from month to month. Months with high ramet production seem to correspond with months with high precipitation.

Poorer growth conditions in pastures (Fig. 4) may explain the higher mortality rate of newly produced ramets. De Steven (1989) reported that the major part of the ramet mortality for *Oenocarpus mapora* Karsten in Barro Colorado Island is attributed to external factors such as herbivores, drought, and especially tree falls, and not to competitive resource limitation within the clone.

Apparently, the cattle on the pasture do not eat the palm ramets, but eat instead the leaves of young shoots. Protection against grazing in the early developmental stages would be necessary to lower mortality rates. In this way cattle and palm heart production could be combined.

Because germination is equally successful in and outside the forest, environmental conditions are not critical in the initial establishment stage. Probably the presence of grass would lower the germination rate considerably. The density of seedlings in forest is higher than in pasture. The reason may be that the density of palms is higher in the forest environment and that growth conditions in later life stages are better here than in the pasture.

In the forest each adult individual had an average of 18 stems. If one-fourth of the stems are assumed to be harvested, each individual could produce about four palm hearts. The price for one palm heart was in 1992 $0.23. The harvest of one specimen may thus produce about $1.00 income. Depending on the density of the palms the income per hectare may be around $100 when cut the first time. Harvesting may be possible every five to seven years (Knudsen in prep.).

Our study shows that even though the forest environment favors the reproduction of *P. trichoclada*, growth in pasture is possible. Especially, when destructive feeding by cattle is prevented and some trees are left on newly established pastures, palm heart could provide an additional income for the farmer.

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