

***Bellucia grossularioides* (L.) Triana and *B. dichotoma* Cogn. (Melastomataceae): Two Important Elements of Flora in Secondary Forest Succession of the Central Amazon**

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The aim of the comparative studies in autecology of common secondary forest species carried out at the EMBRAPA / SHIFT experimental site near Manaus, Amazonas is to acquire a better understanding of the mechanisms responsible for the successional pathways in Terra Firme secondary forests.

B. grossularioides and *B. dichotoma* are common tree species in the Central Amazon. They are similar in habit and morphological traits and occupy similar sites. Nevertheless, there are marked differences in their ecological behavior. *B. dichotoma* occurs in an earlier successional stage than *B. grossularioides*. A dense layer of litter on the ground around the trees, consisting of entire leaves of *B. dichotoma*, and the large, dark canopy shade the ground, preventing other species from becoming established under the trees. The delayed decomposition of the leaves might be the main reason for the competitiveness of *B. dichotoma* in secondary forests, leading sometimes to dominance. However, the

limited lifespan and height of *B. dichotoma* leads to the death of the trees in later successional stages. *B. grossularioides* grows much taller than *B. dichotoma*, the leaves are much smaller and the canopy is not as dense. The species occurs within a wider geographical range and a wider range of successional stages. In the Manaus region, *B. grossularioides* occurs more frequently than *B. dichotoma*, but never reaches dominance.

In the poster, growth-form type, leaf size, certain morphological and anatomical traits of the leaves and their phenolic content are discussed as characteristics which might be crucial to their ecological behavior (= morpho-physiological traits). Hypotheses are developed as to the importance of these characteristics of *B. grossularioides* and *B. dichotoma* for the spatial and temporal niches occupied in the successional sequence, their competitiveness in these niches and for their frequency and dominance in the plant community.

Botanical Composition and Quality of Enriched and Traditional Pastures in Northeastern Pará, Brazil

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The traditional agriculture of the small farmer in the northeastern region of Pará is based on the exploitation of the regenerative potential of the secondary vegetation (Capoeira): a fallow period is followed by burning the accumulated biomass of the Capoeira to fertilize the soil through the ashes and enhance the productivity of the subsequent food crops, mainly rice, maize, beans and manioc. In the last two decades cattle husbandry has become an important additional farming activity in the Bragantina region. Cattle keeping of small farmers is a separate exercise based on pastures. It is often a short-term engagement and the productivity and ecological stability of the conventionally managed pasture seems to be low. It is proposed that to integrate pastures as an intermediate stage into the agricultural cycle could be more appropriate for the smallholder situation. A pasture functioning as an intermediate stage could either precede or replace the traditional

Capoeira, but requires a higher biodiversity than a conventional pasture and still has to meet the nutritional demands of the cattle. The present study compares the botanical and chemical composition of the available forage and the cattle diets on conventional, Capoeira regeneration and legume-enriched smallholder pastures.

The experiment was established on a 3.2 ha field owned by a small farmer in Icarapé-Açu, which had been cultivated with annual crops (maize, beans, cassava) for 1.5 years preceded by the slash-and-burn of a 12 years old Capoeira. The area was divided in nine plots representing three types of pastures in three replications using a block design. A traditional pasture planted with quicuío-da-amazônia, *Brachiaria humidicola*, representing the conventional smallholder pasture, will be compared with *B. humidicola* pastures, of which one is enriched with a combination of herbaceous and bushy legumes, *Arachis pintoi*,

Chamaecrista rotundifolia, *Cratylia argentea*. and another with controlled natural regrowth of the Capoeira. The pastures will be grazed by three male crossbred cattle per treatment rotated between the three replications. Cattle diets will be determined by measuring differential biomass before and after grazing, direct observations and faecal examination. Forage samples will be taken according to the observations and analyzed for nutritive value (crude protein, neutral and acid detergent fibre, lignin, Ca, P, K, Mg, Na, digestibility of organic matter).

The cover, the botanical composition and the available forage biomass (kg dry matter per ha) will be compared in the three alternative pastures. Pasture productivity will be calculated as daily weight gain per animal and animal yield per area, and mean grazing pressure as kg live-weight per kg available dry matter produced per day. The forage diet determined by the feeding observations will be validated by the measured performance of the individual animals. The results of this study will show if the proposed ecologically more appropriate pastures meet the requirement for economic feasibility by supporting adequate animal performance.

Fruit and Seed Predation and Dispersal by Small Mammals in Different Biotope Types in Central Amazonia (Manaus, Brazil)

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Nowadays natural ecosystems get increasingly fragmented by human influence. Therefore it is important to know the ecological relationships within remaining fragments as well as between them. Habitat fragments and their organisms cannot be understood without knowing what happens around them.

The study has been carried out at the Embrapa-CPAA research site (Embrapa, Empresa Brasileira de Pesquisa Agropecuária, is situated 40 km north of Manaus) and has been supported by the German-Brazilian Cooperation Project SHIFT (Studies of Human Impact on Forests and Floodplains in the Tropics, Project ENV 23/2). The potential of predation and dispersal of mammals has been studied in three nearby situated habitat types (primary forest, secondary forest and mixed cultures). Predation experiments have been carried out using inajá-palmfruit (*Attalea maripa*) and brazil-nut (*Bertholletia excelsa*) in enclosures of different sizes. This way the activities of three classes of predators (invertebrates, small and respectively, large mammals) can be evaluated. Through tags it was possible to know the fate of most dispersed fruits and seeds. Using these fruits/seeds the aim was evaluating the predation/dispersal potential of small mammals for each fruit type. These experiments have not been designed to make any statements according to the biology of the corresponding plants, but to compare the probability of a fruit/seed of these types getting established successfully in these habitats.

Results:

- Small mammals: Abundances identified by life-trapping were very low and differed very little between primary and secondary forests; in the sites with mixed cultures they were totally absent. The trapped species correspond to the expectations (literature and personal communications). Introduced species (eg. *Rattus* sp.) have not been detected. In the mixed cultures no small mammals act as pests.
- Biotope types: Predation and dispersal occur most intensive in primary forest, in secondary forest they are low, and in the mixed culture sites neglectable. The increased food supply of the mixed cultures has not been proven to be attractive to small mammals. Two of the more than fifteen cultivated plant species have been predated by monkeys from the adjacent primary and secondary forests. Agutis (*Dasyproctidae*) and monkeys often pass from one biotope type to another and they also disperse seeds doing this. For small mammals no passing between these biotope types has been proven.

Enclosures: The results show that invertebrates act in a very low proportion as predators or dispersers of the fruit/seeds used (with exception concerning the inajá seeds: esp. beetles act as "pre-dispersal seed predators"). Small mammals and large ones act differently: in the case of brazil-nuts small mammals have a higher proportion in predation and dispersal, while in the case of inajá-fruits both classes of mammals act as predators as well as dispersers.