Traits of Leaf Anatomy of *Croton lanjouwensis* Jablonsky (Euphorbiaceae) in Different Strata of the Plant

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The distribution of *C. lanjouwensis*, commonly known as "Dima", is restricted to the Brazilian State of Amazonas. The species is a common tree in secondary forests. In the poster, the leaf anatomy of this species is described for leaves of different strata of a plant growing in an 11 year-old secondary forest of approx. 20 m in height, in order to study the phenotypic plasticity of the leaf as a whole and of single anatomic structures. Within the approach in vegetation ecology of the SHIFT project ENV 23, the anatomical studies on *C. lanjouwensis* are understood as a contribution to the autecology of common secondary forest species of the Central Amazon.

Samples of mature leaves were taken from a tree of 17 m in height, in an altidude of 9 m and 17 m, and additionally, from a young plant of 2 m in height. The analyses were carried out with fresh material, commencing with transversal cuts between the middle of the petiole and the leaf base at the central nerve. The epidermis was dissociated in Jeffrey solution, analyzing three areas of the leaf: apex, center and base. The epidermis of the leaf stalk and the lower surface of the leaf is partially covered with multicellular hairs. The vascular system in the petiole and central nerve is circular and central, with the phloem surrounding the xylem. In the leaves from the high stratum, the xylem in the petiole tends to be better developed than in the low stratum, and the leaves are smaller and thicker, with a layer of palisade cells developed stronger than in the low stratum. Stomata and hairs occur mainly on the abaxial surface of the leaf, but leaves from 2 m in height even showed some stomata on the adaxial surface. The stomata, which are of the paracytic type, are homogeneously distributed on the surface of the leaf, in contrast to the hairs, which are concentrated in the apical area of the leaf. The number of stomata and hairs per mm^2 of the leaves in 9 m and 17 m in height is larger than in 2 m in height. There are few anatomical differences in the leaves from 9 m and 17 m in height and taken from the same plant, but there is an increase of scleromorphic characteristics of leaves from 9 m to 17 m in height. Compared to the leaves in 2m in height, the scleromorphic characteristics of the leaves of higher strata are more evident.

The variation in selected anatomical characteristics of the leaves of *C. lanjouwensis,* related to different localities in the canopy, can be interpreted as an ecophysiological response of the plant to microclimatological differences occurring in the different strata of the secondary forest.

Morphological Traits and Ecological Behavior of Selected Secondary Forest Tree Species in the Central Amazon

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Thirteen common secondary forest tree species of Terra Firme sites near Manaus, Amazonas, Brazil, covering a wide range of growth-form types and of ecological behavior in the successional sequence, were selected for a comparative study designed to develop basic knowledge of their autecology. Growth-form, biometric traits and the morphological and anatomical characteristics of leaves and wood of the sample species were compared. Plant biomass and the mineral nutrient content of different organs were analyzed in individual plants. In addition, the life history of individual twigs and leaves was recorded.

The aim of the study was to detect causal links between the parameters measured and the ecological behavior of the species observed in the field, as a contribution to an autecological description of the species. The results show some characteristics which can be interpreted as "functional traits" of certain types of secondary forest plants: The progressive succession of secondary forest tree species commences with the large-leaved, short lived sample species (Treelets) and progresses to small-leaved, longer-lived species (Medium and Tall trees). The many liana species show a high plasticity with regard to the analyzed

traits and are therefore abundant in a large spectrum of sites. The analysis reveals at least three fundamentally different ecological types of secondary forest tree species and some of their functional traits:

Type 1: Treelet, fraction leaf biomass / overground biomass high - ± large leaves - low leaf area weight – leaves hairy;

Type 2: Low tree, large leaves - high leaf area weight - leaves ± hairy;

Type 3: Medium tree, fraction leaf biomass / overground biomass low - small leaves - low leaf area weight - leaves glabrous.

These sets of traits indicate different strategies for an efficient use of resources in a changing environment during a progressive succession.

From Monotonous to Enriched Bushy Pastures to Replace the Traditional Smallholder Management in North-Eastern Pará, Brazil

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Abstract

This study explores possibilities to replace the traditional pasture management of smallholders in the Bragantina region in northeastern Pará, Brazil. Whereas the practice of the smallholders is to keep a 'clean', monospecies grass-only pasture, biodiverse pastures could probably be ecologically more adequate and sustainable. Thus, two options are being tested, a Brachiaria humidicola pasture enriched with two bushy and one herbaceous legume, namely *Cratylia argentea, Chamaecrista rotundifolia* and *Arachis pintoi*, and a *Brachiaria humidicola* pasture allowing a controlled regrowth of secondary vegetation ("Capoeira"). The functionality of these two alternatives is currently being studied in a researcher managed on-farm experiment by comparing them with a traditional pasture and an undisturbed regrowth of Capoeira.

Keywords

Capoeira, cattle, enriched pastures, humid tropics, legumes, secondary vegetation, smallholder

1 Introduction

In the humid tropics smallholders' pastures reach an advanced state of degradation after 7 to 10 years due to decreasing soil fertility (SERRÃO & NEPSTAD 1985), insect pests and invading secondary vegetation, so-called 'Capoeira' (UHL et al. 1988). The stocking rate has to be gradually reduced until the costs of maintaining the pasture are no longer justified. At the end, usually after 10 to 15 years of use, pastures are abandoned and it is difficult to convert the area into agriculturally cultivatable land. Not only this degradation of monospecies grassland but also the experience with other monocultures in biodiverse woody ecosystems suggest that there is a need for ecologically more adequate solutions. This study proposes to abandon the concept of 'clean' grasslands and to find alternative pasture management strategies.

2 Material and Methods

2.1 The Grass/ Legume Pasture

One option to achieve greater diversity is to enrich traditional, sown pastures with legumes, which are particularly valuable because of their ability to fix nitrogen and to improve the animal diet. A combination of 5 m strips of *Arachis pintoi* combined with *Cratylia argentea* (foreground of photo) and 5 m strips of *Chamaecrista rotundifolia* (background) combined with *Brachiaria humidicola* is tested.

2.2 The Grass/ Capoeira Pasture

A second option is to tolerate the natural regrowth of the Capoeira vegetation in the pastures (LOKER, 1994). A precondition to a successful integration of pastures in the traditional slash-and-burn cycle is that the species composition under the heavy impact of cattle (eating, trampling) remains the same as in an undisturbed Capoeira.