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TOPOGRAPHIC FREQUENCY OF TREES IN THE TABONUCO FOREST OF THE LUQUILLO MOUNTAINS

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ABSTRACT

A previous study of tree productivity in the subtropical wet forest of the Luquillo Mountains of Puerto Rico was used to expose the frequency of 12 timber tree species to six different topographic sites, convex versus concave surface, lower versus upper slopes, and windward versus leeward aspects. All but one of the species are found in all six locations and the frequency of all have concentrations suggesting that if that is also where they grow best, they should be selected there for productivity, and should best be replanted there.

Key words: *Montane topography, subtropical wet forest, forest tree frequency, Puerto Rico.*

INTRODUCTION

The recent discovery on the lower slopes of the Luquillo Mountains that a quarter of the trees selected for timber production have been growing about double the rate of the rest (Wadsworth *et al* 2010) has encouraged the search for visible evidence reliably identifying this difference. The same study provided partial evidence; growth more rapid with tree crowns at least intermediate in the forest canopy, with surrounding forest density of less than 25 m^2/ha, and tree crown areas of at least 20 m^2. On mountains growth differences may be reflected topographically where each tree species may naturally congregate. Readily visible montane topographic mountain sites include the contour of the surface, steepness, and aspect relative to the prevailing wind.

METHODS

Building on the previous study, the data used are for the 1,425 trees of the subtropical wet forest (Ewel and Whitmore 1973) below 600 m elevation (Table 1). These trees, of 12 of the most common species, were selected for future timber productivity, between 10 and 30 cm dbh (diameter of the trunk at 1.4 m above the ground), of erect form and apparently in good health. In 1983 the following topographic locations were noted for each tree: ridges (convex surfaces), side slopes, and valleys (concave surfaces); degrees of slope downward; and for trees on slopes of 20 degrees or more the aspect toward 8 principal directions. To accentuate contrasts only trees in extremes were compared. This means only convex versus concave surfaces, slopes of less than 20 degrees versus more than 40 degrees, and windward (NE-SE) versus leeward (NW-SW).

For trees in each of these categories tree diameter at breast height was converted to basal area, to add tree size to the significance of location. Summed basal area in one of the two paired locations was divided by that in the opposite location to further expose any contrast. Finally, to equalize the departures among species, the divided basal areas were again divided by the general weighted average for each category, bringing in all cases the relation of aggregate basal area to one. Then values between 0.5 and 1.5 were arbitrarily considered to be without concentration or the opposite.

Table 1. Relative frequency of prominent tree species, by topography, in the tabonuco forest. Those especially concentrated (more than 1.5) or uncommon (less than 0.5) in bold.

Species	**Trees**	**Basal area Proportion / mean**		
		Convex / Concave	**<20º / >40º**	**Windward / Leeward**
Buchenavia tetraphylla (Aub.) How. Gtanadillo	49	4.07	1.47	1.58
Cecropia schreberiana Miq. Yagrumo hembra	61	0.23	0.18	0.17
Chionanthes domingensis Lam. Hueso blanco	41	0.92	0.00	1.83
Dacryodes excelsa Vahl Tabonuco	354	1.52	0.18	0.83
Homalium racemosum Jacq.Caracolillo	41	0.35	0.82	0.75
Inga laurina (Sw.) Willd. Ex. L. Guama	62	0.45	1.00	0.08
Manilkara bidentata (A. DC.) A. Chev. Ausubo	120	0.49	2.94	2.08
Matayba domingensis (DC.) Radlk. Negra lora	141	0.79	1.94	0.50
Ormosia krugii Urban Palo de matos	108	0.68	0.35	0.58
Schefflera morototoni (Aubl.) M. S. F. Yagrumo macho	121	0.37	0.18	0.50
Sloanea berteriana Choisy Cacao motillo	43	0.12	0.35	1.33
Tabebuia heterophylla (DC.) Britton Roble blanco	284	0.52	0.82	1.83
Total and weighted averages	1,425	1.00	1.00	1.00

RESULTS

A remarkable feature in Table 1 is that decimals appear throughout, indicating that all species can grow everywhere. That is why the identification of concentrations is not simply an ocular process. The species with most concentrated frequency on convex surfaces are *Buchenavia attenuata* and *Dacryodes excelsa*. On concave surfaces they are *Sloanea berteriana, Cecropia schreberiana*, and *Homalium racemosum.* On the slopes the species most concentrated below 20 degrees are *Manilkara bidentata, Matayba domingensis*, and *Buchenavia attenuata.* On slopes steeper than 40 degrees the concentration is of *Chionanthes domingensis, Cecropia schreberiana, Dacryodes excelsa,* and *Schefflera morototoni.* Concentrated on the windward aspect are *Manilkara bidentata, Tabebuia heterophylla,* and *Chionanthes domingensis.* To the leeward are *Inga laurina, Cecropia schreberiana, Matayba domingensis,* and *Schefflera morototoni*. The two pioneer species, *Cecropia schreberiana,* and *Schefflera morototoni* are most concentrated on the same topography, concave surface, more than 40 degree slopes, and windward aspects. The only species not found on one site, the lower slopes, was *Chionanthes domingensis.*

CONCLUSIONS

The proven occurrence of almost all 12 species throughout six distinct topographic positions on the mountain, with only one exception, and yet all with concentrations somewhere suggests that this may be true of many other tropical montane tree species. Found throughout the forest, these species have much broader tolerances than their concentrations, the latter unproven as preferences . But it does provide a basis for a next step, the relation of topographic frequency to growth rates for each species. If for this there appear some generalities they would be novel and useful in identifying without growth data promising crop trees and deciding where if replanting becomes necessary.

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