

Growth and Increment of an Uneven-aged Mixed Coniferous Stand in the Higher Region of the Sierra Madre Oriental, Northeastern Mexico

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Abstract

1. Introduction

Accurate estimation of the growth and increment rates of trees and stands are of crucial importance for decision-making in sustainable forest management. Growth modelling is also an essential prerequisite for evaluating the consequences of a particular management action on the future development of an important natural resource, such as a woodland ecosystem.

2. Objective

The objective of the study was to generate information about the increment patterns of four species in an uneven-aged mixed coniferous stand, depending on several crown parameters.

3. Methods

This research was carried out in a 1.24 hectare uneven-aged mixed stand composed by *Abies vejari*, *Pseudotsuga menziesii*, *Pinus ayacahuite* and *Pinus hartwegii*. Based on increment cores obtained at 1.3 m height, the age, the 10 years diameter increment and basal area increment of each tree were determined. The relationships between diameter increment and diameter and between diameter increment and age were tested for each of the four tree species. The basal area increment pattern depending on different crown parameters were also determined.

4. Results and conclusions

High multiple correlation coefficients were obtained by examination of the relationship between basal area increment (i_g) of the trees and diameter ($d_{1.3}$), age and different crown parameters (crown projection area (Krs), crown surface area (Krm₁, Krm₃) and surface area of the light crown (Lkrm)). According to all these comparison parameters, the 2 pinus species showed a higher basal area increment than fir and douglas fir. The relative basal area increment (i_g/Krm_1 ; i_g/Krm_3) decreases first abruptly with increasing crown surface area and later on smoothly and is higher for the non tolerant species than for *Abies* and *Pseudotsuga*. Due to very different crown forms for the four tree species, the development of the relative basal area increment as a function of crown projection area (i_g/Krs over Krs) is also very different.

In contrast to even-aged pure stands and to selection forests, the relative increment (i_g/Krm ; $i_g/Lkrm$) of all species in the lower height zone (B) is equivalent or higher than in the upper height zone (A).

Keywords: Forest development, mixed stands, uneven-aged stands