

**Título:** MICROCLIMA, FISIOLOGÍA DE FAGUS SYLVATICA L. Y BIOLOGÍA DEL SUELO EN HAYEDOS DEL NOROESTE DE NAVARRA EN REGENERACIÓN NATURAL TRAS LA APLICACIÓN DE CORTAS A HECHO

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**El fichero de tesis** no ha sido incorporado al sistema.

**Resumen:** In the North of Spain, natural regeneration has been used for restoring numerous clear-cut beech (*Fagus sylvatica* L.) forests. Under natural regeneration, the sapling stage is followed by a transition thicket stage prior to development of a young high growing forest, which is then subjected to clearing measures. However, several factors can decrease survival of young seedlings within clear-cut areas and, consequently, both the common pattern of natural regeneration and microclimate are altered, with the subsequent influence on the development of seedlings. We studied anatomical and physiological characteristics of both sun and shade leaves in beech trees growing within an unmanaged beech forest and two stands clear-cut in 1996 or 2001 and then left to naturally regenerate from the disturbance. Stem density strongly differed among beech stands: 14,000 trees ha<sup>-1</sup> in the stand clear-cut in 2001, 44,000 trees ha<sup>-1</sup> in the stand disturbed in 1996 and 1,000 trees ha<sup>-1</sup> in the unmanaged forest. Physicochemical and biological properties including basal respiration, carbon biomass, enzymatic activities and presence of both arbuscular mycorrhizal (AM) and ectomycorrhizal (ECM) fungi- were also tested in soils. Our results demonstrated that parameters related to anatomy, photosynthesis and carbon metabolism in sun and shade leaves were affected by microclimatic conditions, being light and temperature within stands mainly determined by stem density. In addition, the dynamics of enzymatic activities in soils (urease, protease, &#946;-glucosidase, phosphatase, dehydrogenase, catalase- across the

four seasons of the year differed among unmanaged and disturbed beech stands. Moreover, changes in the composition of understory due to altered microclimate strongly affect the infectivity of native AMF in clear-cut beech forests and ECM colonization of beech roots showed seasonal dynamics in the disturbed areas. The composition of ECM communities differed between different stands and 40 % of ECM morphotypes only occurred in disturbed ecosystems. However, comparable numbers of different ECM morphotypes (24-25) were found in the three beech stand, which indicates that ECM diversity was quite high and similar within disturbed and unmanaged areas. Based on all these results, some recommendations for forestry management are suggested.