

ANATOMY, MORPHOLOGY, PHYSIOLOGY AND ECOLOGICAL SIGNIFICANCE OF DWARFED TREES

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Abstract

Suppressed trees in the shrub layer significantly differ from non-dwarfed trees of the same species in anatomical and morphological features. Some of those features visible in cross-sections have been examined in detail. Missing or even incomplete tree-rings, hardly visible ring-boundaries, few and small earlywood-pores and the greater difficulty to determine the age of the tree by counting bud-scale scars are characteristic for both diffused-porous (*Acer pseudoplatanus* L.) and ringporous dwarfed hardwoods (*Fraxinus excelsior* L., *Castanea sativa* Mill.). Compared to non-suppressed trees dwarfed trees are very large in number. They play an important role in the (forest) recovery of the Alps and are of intrinsic importance for growth dynamics of a stand. Dwarfed trees contribute to wood-anatomical descriptions of taxa.

Keywords: stunted/suppressed/dwarfed trees, broad-leaved trees, wood anatomy, tree ring, dendroecology, environment, bud-scale scars, age determination, Switzerland

INTRODUCTION

In early stages of forest development greater differentiation processes take place. These differentiation processes are expressed even in tree morphology and wood anatomy. Generally trees suppressed by competition are very small. However, their number exceeds that of non-suppressed trees. Dwarfed trees may develop into big "normal" trees as soon as growth conditions are improved. And this is why suppressed trees are of intrinsic importance for the growth dynamics of a stand.

Up to now surprisingly few dendroecological investigations deal with environmentally suppressed trees in the shrub layer (Baas et al., 1984; Grosser, Burger, 1985; Wang, Li, 1989). It should be noticed that most workers do not differentiate between 'dwarf trees' and 'dwarfed trees'. Whereas maximum height in genotypical dwarfs (dwarf trees) is fixed by genetic information, dwarfed trees are, in addition to their genetically predetermined height, very strongly limited in growth by external factors, e.g. by the availability of light and/or nutrients, competition etc.

The few investigations published on dwarfed trees deal with bonsai trees. In these publications artificially induced dwarfism in trees is compared with genotypic dwarfism. In contrast naturally suppressed trees grow in the shrub layer of high forests. In the present study (ecological) stunted trees are essentially light-limited. Heights below 1m are common. Dwarfed trees are of considerable high age (Rubner, 1910). Besides some morphological features, dwarfed trees show anatomical characteristics which are completely different from those of non-suppressed trees. Nevertheless, tree taxonomy based on wood anatomy generally concentrates on non-suppressed trees.