

ABSTRACT

This thesis deals with the influence of microclimatic conditions (air temperature near tree/shrub top, temperature of the stem and root zone) on the wood phenology of trees (*Picea abies*) and shrubs (*Pinus mugo*) growing on the same site in the alpine tree line (ATL) ecotone. Phenological and microclimatic research was carried out in the Giant Mountains at 1,370 m a. s. l. in the 2017 vegetation period, with the aim to compare the course of wood formation depending on the microclimate, to determine the temperature thresholds of wood growth and differences in the morphology of trees and shrubs.

Based on the microclimate analysis of trees and shrubs, individual variables were determined (average, average minimum, average maximum, daily amplitude of air, stem and root zone temperatures) characterizing the growing season. The collection of micro-drills of trees and shrubs took place from April to October in an interval of 6 – 11 days, which were subsequently processed and examined in the laboratory. The following phenophases of wood development were distinguished: cambial, enlarging, wall-thickening, mature cells and cells of the previous ring. Subsequently, differences in the number of cells of individual phenophases were identified between trees and shrubs. Furthermore, the temperature thresholds for the individual phenological phases were calculated and compared with the threshold temperatures reported in literature.

The results show a slightly higher average air temperature near the tree top and the stem for trees, a larger difference was shown at the root zone temperature due to the overshadowing of the soil by shrub crowns. Maximum temperatures near the shrub top and stem are higher than for trees because shrubs benefit from radiation warming near the active surface, while minimum temperatures near the shrub tops and stems are lower due to nighttime radiation cooling. However, the thermal microclimate of trees and shrubs is similar. Threshold values of air temperature at the beginning of cambial activity were found to be 2.1 °C higher for trees, while root zone temperature thresholds were 0.9 °C higher for shrubs. Air and root zone temperature thresholds phenophase of enlarging cells were 3-3.5 °C higher for shrubs. Thus, the fluctuation of the thresholds and the microclimate does not seem to be a crucial factor for the existence of shrubs high above the ATL. Shrubs during the growing season created significantly fewer cells (up to 25) compared to trees that have larger cells. Therefore, trees need more time for cell differentiation and maturation and their growing season, the growth period (130 days), is longer than for shrubs (105 days). Probably the most important factor favoring shrubs against trees is a shorter time to finish wood in the growing season, so shrubs can expand to higher altitudes.

Key words: phenology, xylogenesis, plant growth, alpine tree line, *Picea abies*, *Pinus mugo*, the Giant Mts.