Influence of light availability on leaf construction costs and foliar chemical composition of beech (*Fagus sylvatica*), maple (*Acer pseudoplatanus*) and ash (*Fraxinus excelsior*)

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Abstract

In this study were investigated differences in leaf construction costs and chemical composition of leaves between beech and two valuable broadleaved species (maple and ash), along a light gradient (3-60% of above canopy radiation reaching the regeneration) in a fairly even-aged mixed-species thicket established by natural regeneration beneath a patchy shelterwood canopy.

Construction cost (CC, g glucose g^{-1}) was calculated following the approach of Vertregt and Penning de Vries (1987), slightly modified by Barthod and Epron (2005) from carbon (C, g g^{-1}) and ash (A, g g^{-1}) contents assuming that the reduction state of organic compounds is related to their carbon content. Leaf construction cost increased with increasing light in ash, but was independent of light in beech and maple. At common light, beech had the highest, ash the lowest (1.44 vs. 1.29 g glucose g^{-1}) and maple an intermediate value (1.37), with a significant difference among all three species.
In order to compare our results with those of authors that worked with two light categories (low- and high light) we computed and than compared also a mean value of CC for low light (<12% above canopy light) and for hight light (>35% above canopy light) domain. CC were 3.0% lower for ash (1.27 vs. 1.31) and 3.3% for maple (1.32 vs. 1.36) in low-light, whereas modification in CC for beech was 0.7% (1.44 vs. 1.43).

While the content of leaf nitrogen per leaf area (Na) is significant positively related to light for all species, the nitrogen content per leaf dry mass (Nm) remained almost constant to light variation with a significant difference between beech and the two other species for both parameters.

There was a positive correlation between leaf carbon concentration (C) and light in ash, but not in maple, or in beech. Significant differences between mean values of leaf carbon concentration of all three species could be detected, with beech showing the highest value (0.479 g g^{-1}), followed by maple (0.461) and ash (0.443).

The relationship between leaf total mineral concentration (TM) and light was significant in ash and maple, but not in beech. The mean values across the entire light range were for ash (59.2 mg g-1), followed by maple (46.5), and beech (31.1) with significant differences among species.

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