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Effect of soil moisture on ground vegetation in artificial gaps of a beech forest

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The coverage of ground vegetation and soil moisture were studied in artificial gaps and under closed canopy in a beech dominated forest stand in Northern Hungary. Two different sized artificial gaps (diameter: 35-40m and 15-20m) were created at the research site. Ground vegetation coverage was estimated as an indicator of soil moisture. Sampling was carried out in a regular, 5*5 m grid system in 1*1 m quadrats. Relative light intensity was also measured using transects across the gaps, and three light zones were determined. Continuous soil moisture measurements were carried below the closed canopy. Actual evapotranspiration (AET) was calculated for non-rainy periods based on these data for characterizing the tree water use in the stand. Soil water content was measured in a large and in a small gap in non-regular grid scheme, about monthly, during the vegetation period. Relationship between soil water content and coverage of ground vegetation was examined. The effect of relative light intensity was also determined. Relative light intensity (PACL) under the homogeneous beech canopy is around 5-10%. Depending on gap size, it increases up to 10-36% towards the centre of the gap. Cover of herbaceous vegetation was significantly higher at centres of gaps, independently of the absolute amount of light. The soil water content in the gaps (25-30%) and below the closed canopy (12-23 %) contrasts strongly, especially in drier periods (Mann-Whitney, $p<0.01$). A transitional soil moisture zone could be differentiated at the gap edges. The coverage of dominant species correlated with soil moisture. Based on the determined evapotranspiration values, it is confirmed that the tree water use is considerable (about 40% of the precipitation) which clearly explains the differences in soil moisture and consequently the ground vegetation cover between the stand and the gaps.