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Carbon sequestration by young Norway spruce monoculture

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Many studies have been focused on allometry, wood-mass inventory, carbon (C) sequestration, and biomass expansion factors as the first step for the evaluation of C sinks of different plant ecosystems. To identify and quantify these terrestrial C sinks, and evaluate CO_2 human-induced emissions on the other hand, information for C balance accounting (for impletion of commitment to Kyoto protocol) are currently highly needed. Temperate forest ecosystems have recently been identified as important C sink. Carbon sink might be associated with environmental changes (elevated [CO_2], air temperature, N deposition etc.) and large areas of managed fast-growing young forests. Norway spruce (*Pice abies* L. Karst) is the dominant tree species (35%) in Central European forests. It covers 55 % of the total forested area in the Czech Republic, mostly at high altitudes.

In this contribution we present C sequestration by young (30-35 year-old) Norway spruce monocultures in highland (650-700 m a.s.l., AT- mean annual temperature: 6.9 ˚C; P- annual amount of precipitation: 700 mm; GL- growing season duration: 150 days) and mountain (850-900 m a.s.l.; AT of 5.5 ˚C; P of 1300 mm; and GL of 120 days) areas and an effect of a different type of thinning. However, the similar stem diameter at the breast height and biomass proportions among above-ground tree organs were obtained in the both localities; the trees highly differ in their height, above-ground organ's biomass values and total above ground biomass, particularly in stem. On the total mean tree biomass needle, branch and stem biomass participated by 22 %, 24 % and 54 % in highland, and by 19 %, 23 % and 58 % in mountain area, respectively.

Silvicultural management affects mainly structure, density, and tree species composition of the stand. Therefore, dendrometric parameters of a tree resulted from genotype, growth conditions and from management history as well. Low type of thinning (LT; common in highland) stimulates rather tree height increment comparing to stem thickness increment, whereas high type of thinning (HT; common in mountains) has an opposite effect. It leads to lower stem tapering under LT than HT management. HT stimulates more tree stability and biomass increment of all aboveground tree organs comparing to LT. Contrariwise, total aboveground biomass on the stand level was lower about 15 % in stand with HT management comparing to LT one in highland.

Results from the tree ring analysis showed significant differences in early to late wood proportion; where early wood formed about 54 % and 79 % and late wood about 46 % and 21% in highland and mountain locality, respectively. High late wood proportion leads to higher wood density and C woody content in highland comparing to mountain areas.

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