

Publication

Fruit-bearing branchlets are carbon autonomous in mature broad-leaved temperate forest trees

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In order to evaluate the degree of carbon autonomy for fruit development, the carbon source-sink relationship in fruit-bearing branchlets of mature deciduous forest trees was manipulated in situ. The tests included half and complete defoliation, girdling or the combination of both treatments, which were applied on fruiting branchlets by using a canopy crane. Concentrations of non-structural carbohydrates (NSC) were analysed in different branchlet tissues and fruits, to identify situations of carbon imbalances induced by the treatments. NSC concentrations of branchlets were generally lower under treatments resulting in decreased fruit growth. All three investigated species (*Carpinus betulus*, *Fagus sylvatica* and *Tilia platyphyllos*) exhibited complete carbon autonomy of fruiting at the level of whole, undisturbed branchlets, since neither a decrease of total infructescence biomass, nor of individual fruit mass occurred on girdled, un-defoliated branchlets. On girdled, 100% defoliated branchlets, fruit biomass relative to controls decreased by approximately 50% in *Carpinus* and *Tilia*, but by almost 80% in *Fagus*, which can be explained by different proportions of photosynthetically active infructescence tissues among the species. In contrast to the other two species, *Tilia* branchlets did not import carbon to compensate for assimilate loss after defoliation.

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