

Temperature responses of substrate carbon conversion efficiencies and growth rates of plant tissues

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ABSTRACT

Growth rates of plant tissues depend on both the respiration rate and the efficiency with which carbon is incorporated into new structural biomass. Calorespirometric measurement of respiratory heat and CO₂ rates, from which both efficiency and growth rate can be calculated, is a well established method for determining the effects of rapid temperature changes on the respiratory and growth properties of plant tissues. The effect of the alternative oxidase/cytochrome oxidase activity ratio on efficiency is calculated from first principles. Data on the temperature dependence of the substrate carbon conversion efficiency are tabulated. These data show that ϵ is maximum and approximately constant through the optimum growth temperature range and decreases rapidly as temperatures approach temperature limits to growth. The width of the maximum and the slopes of decreasing ϵ at high and low temperatures vary greatly with species, cultivars and accessions.

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