

Title Regulation of mitochondrial activity in cucumber fruit, broccoli buds and carrot by carbon dioxide

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Abstract

Respiration rates based on O₂ consumption by intact commodity and by mitochondria from cucumber fruit (*Cucumis sativus* L.), broccoli (*Brassica oleracea* L.) and carrot (*Daucus carota* L.) held at 25°C in controlled atmospheres containing elevated CO₂ levels and 20% O₂ (the balance gas being N₂) were investigated. Respiration rate in intact commodity was measured using an automated system connected to a microcomputer. Elevated CO₂ stimulated, inhibited and had little effect on the respiration rates of cucumber fruit, broccoli and carrot, respectively. Based on the oxidation of exogenously applied succinate, NADH and malate, mitochondria from CO₂-treated cucumber fruit and broccoli buds oxidized these substrates at higher and lower rates, respectively, compared to rates of mitochondria from the respective control samples. Mitochondria from carrot treated with 60% CO₂ oxidized these substrates at rates more or less similar to that of control. The respiratory control ratios of mitochondria from CO₂-treated cucumber fruit and broccoli buds were lower and their respective ADP:O ratios were lower and higher, respectively, compared to those of mitochondria from the control samples. Addition of CO₂ to the reaction medium inhibited the activities of mitochondria from fresh cucumber fruit, broccoli buds and carrot, and their respective oxidative phosphorylation were less efficient. These results indicate that the regulation of respiration in intact cucumber fruit, broccoli buds and carrot by CO₂ is positively correlated to the activities of mitochondria extracted therefrom.