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The Regulation of Maize Mesocotyl Growth by Ethylene and Carbon Dioxide

Takeaki NISHIZAWA and Hiroshi SUGE

1) Institute of Genetic Ecology, Tohoku University

2) Institute of Genetic Ecology, Tohoku University

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Abstract:

Ethylene stimulated the elongation of maize mesocotyls of whole seedlings under red light. Maximum elongation was obtained with $1\mu\text{l}^{-1}$ ethylene. The length of mesocotyls was still much longer than in ethylene-free air when ethylene concentrations were increased to 10, 100 or 1,000 μl^{-1} . Ethylene also induced lateral expansion of mesocotyls at ethylene concentrations of $0.1\mu\text{l}^{-1}$ or above and the diameter increased at higher ethylene concentrations. Carbon dioxide, in the range of 1-4%, also stimulated mesocotyl extension and expansion. Maximum growth of mesocotyls was obtained in a mixture of ethylene and carbon dioxide. Removal of either endogenously evolved ethylene or carbon dioxide or of both gases reduced elongation. In contrast to the effects in red light, ethylene inhibited the growth of mesocotyls in darkness while carbon dioxide inhibited this effect of ethylene. Thus, ethylene and carbon dioxide acted cooperatively under red light and antagonistically in darkness.

Keywords:

Carbon dioxide, Darkness, Ethylene, Maize, Mesocotyl, Red light

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