The Role of Ethylene in Cotyledon Curling of Japanese Radish (Raphanus sativus var. longipinnatus)

Kubo, Yusuke

Exogenous treatment of ethylene, the plant hormone is involved in the curling of cotyledons of Japanese radish (Raphanus sativus var. longipinnatus). However, even without giving ethylene from outside, some cotyledons curl when grown in airtight conditions. The mechanism regulating cotyledon curling is as yet unknown. Therefore, this study focuses on the effect of endogenously produced ethylene on curling of cotyledons in Japanese radish and on the mechanism of the curling. To clarify the effect of endogenously produced ethylene on curling of cotyledons, two different types of treatments were conducted: 1-methylcyclopropene (an inhibitor of ethylene perception in plants) and no treatment (control). The results indicated that the sprouts treated with the inhibitor had less curled cotyledons than the control group. This suggests that endogenously produced ethylene causes cotyledons to curl. To investigate the effects of ethylene on the morphology and number of cells, curled and non-curled cotyledons were thinly sectioned and observed using light microscopy. The results indicated that ethylene did not affect cell number but inhibited lateral cell growth on abaxial (lower surface) cell layer in the cotyledons, and this differential growth caused the downward curvature of cotyledons. Previous studies reported that ethylene caused the curling of some leaves, such as the true leaves of tomato, by promoting cell growth on the adaxial (upper surface) side of leaves, a phenomenon known as epinasty. The current study presents a new mechanism responsible for leaf curling and may contribute to the quality control of industrial sprout production.

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