

Short Communication

Lithium Inhibition of the Thigmomorphogenetic Response in *Bryonia dioica*¹

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ABSTRACT

Pretreatment of young *Bryonia dioica* plants with lithium prevents the inhibition of elongation due to rubbing. Lithium treatment also suppresses the appearance of a specific cathodic isoperoxidase characteristic of rubbed plants.

Rubbing young internodes of *Bryonia dioica* plants significantly reduces their elongation (1, 8). Inhibition of growth has been shown to be correlated with a rapid increase in intensity of preexisting cathodic peroxidases and the specific appearance of an additional one due to irritation (2). Thigmomorphogenesis in this plant appeared as an accelerated senescence process, as a result of a wounding effect through the breakdown of epidermal hairs (2).

Since Li ion was shown to be able to inhibit the mechanically induced (by pricking) precedence (gaining of apical dominance) between cotyledonary buds of decapitated *Bidens pilosus* plants (6), we wondered if Li could be used as a simple and efficient tool to study the primary effects of thigmomorphogenesis in *B. dioica*.

MATERIALS AND METHODS

Plant Material and Growing Conditions. Young plants of *B. dioica* were raised from seeds in a greenhouse (natural light, ± 20 C), in Vermiculite. When the plants had developed two internodes, they were depotted and transferred to a controlled environment room (16 h light daily at 5,000 lux, 25 C, 70% humidity) on a mineral solution (11) supplemented or not with 1 mM LiCl. The Li-subcultured plants were identical in appearance (height, pigmentation) to those grown without Li, 1 week later, when they were treated by rubbing the ± 12 -mm-long third internode (from the top). The rubbing stimulus typically consisted of holding the internode between the thumb and the forefinger and gently rubbing them back and forth past each other for 3 s, once 48 h before growth measurement.

Peroxidase Activity and Isoperoxidase Patterns. Crude enzymic extracts were prepared from 500 mg fresh material in 0.5 ml 0.1 M Na-K phosphate buffer (pH 7.0) at 2 C, 24 h after the rubbing treatment. The macerates were centrifuged at 3,300g for 20 min,

and the supernatants were used for enzyme determination. Guaiacol-peroxidase activity and peroxidase isoenzyme patterns (by vertical starch gel electrophoresis) were determined as previously reported (3). The gel was developed with benzidine.

RESULTS AND DISCUSSION

Internode growth response to rubbing of Li-treated and non-treated plants is shown in Figure 1. In the absence of Li, the previously reported inhibition due to rubbing (2) was observed: mean elongation of irritated internodes was only 5.3 mm, while that of the control reached 21.9 mm. Irritated internodes of Li-treated plants on the contrary grew apparently normally, as did the controls since their elongation after 48 h was approximately the same.

The previously described changes in peroxidase activity and isoperoxidases due to rubbing plants in absence of Li were again

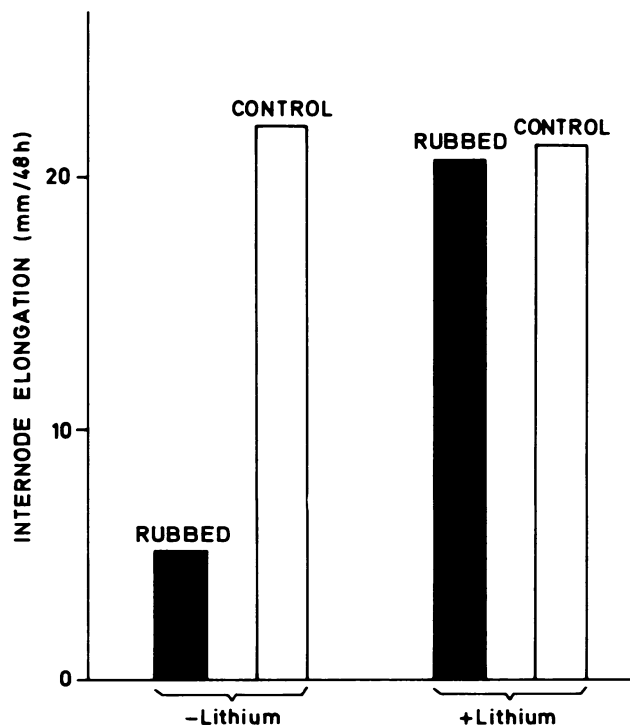


FIG. 1. Lithium effect on growth response of *Bryonia* to rubbing. Mean elongation (mm) of the internode 48 h after rubbing.

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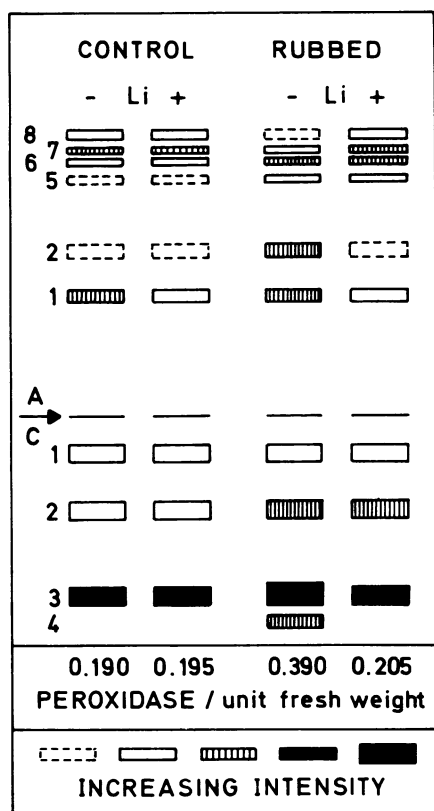


FIG. 2. Isoperoxidase zymograms (above) of control and rubbed internodes of *Bryonia* plants cultivated in absence (-) or in presence (+) of lithium, and total peroxidase activity of the same (below) expressed by the A at 420 nm after 1 min.

observed (Fig. 2). The cathodic isoenzymes, C₂ and C₃ increased in activity, and an additional one, C₄, appeared. The anodic bands were less affected. Peroxidase activity of rubbed Li-treated plants was practically unchanged compared to the controls. The most

interesting finding was the Li prevention of the isoperoxidase C₄ formation.

The Li inhibition of the thigmomorphogenetic response in *Bryonia* was thus correlated with the inhibition of the isoperoxidase C₄ appearance. The results actually do not allow us to decide whether C₄ is an enzyme formed *de novo* whose synthesis would be repressed by Li or if it results from some physicochemical changes in the subcellular arrangement of enzymes. Experiments are in progress to investigate the kinetics of changes in the membrane and cell wall-bound peroxidases in relation to rubbing and Li treatments. It has indeed been shown that basic isoperoxidases were electrostatically associated to membranes (4) and cell walls (5), and changes in the activity of membrane bound enzymes as a result of mechanical perturbation were already demonstrated (7). It was also proposed that Li perturbation of regulatory processes could be due to its interference with other alkaline ions on the ion fluxes mediated by the plasmalemma (6, 9, 10).

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