**Short Communication**

**Temperature Sensitivity of the Latent Phase in Ethylene-induced Elongation**

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**ABSTRACT**

The temperature sensitivity is reported for the latent period preceding ethylene-induced elongation in the adaxial half of the leaf petiole of *Helianthus annuus*. When intact plants were exposed to 10 μl of ethylene/l of air over the temperature range 18 to 35 °C, the minimum latent time was 62 minutes at 26 °C and the maximum was 132 minutes at 18 °C. The temperature coefficient, Q10, changed from 2.1 below 28 °C, to 0.7 above. In 100 μl of ethylene/l of air, the latent time was reduced by 14% at 18 °C, but was significantly increased at 28 and 38 °C. These results show that the latent period in the elongation response of the petiole to ethylene cannot be reduced below about 60 minutes by raising either the leaf temperature or the atmospheric ethylene concentration.

Ethylene selectively promotes elongation growth in the adaxial half of the leaf petiole in many dicotyledons, causing downward curvature to give the so-called epinastic response. In *Helianthus annuus*, this response is transient and is completed in 6 to 8 hr at 28 °C (5). During this period, the epidermal and cortical cells in the adaxial half of the petiole elongate, but the underlying cause of the ethylene effect is not known. Rapid elongation growth in plant tissues is commonly attributed to the action of IAA, because this can accelerate the elongation of etiolated coleoptiles and stems within a few minutes of its application (1). In these organs the latent period preceding the elongation response is inversely related to temperature and IAA concentration (4). Its brevity at temperatures above 30 °C has led to the view that IAA can activate a preexisting mechanism that regulates wall plasticity (2). To determine whether there is any evidence for the operation of a similar system in ethylene-induced elongation, the effect of temperature at two ethylene concentrations has been investigated for the elongation response in *Helianthus* leaf petioles. The lag preceding ethylene-induced stem elongation in *Callitriche platycarpa* has been reported to be reduced from 2 to 0.5 hr by a 10-fold increase in ethylene concentration (3), although the temperature regime was not specified.

**RESULTS AND DISCUSSION**

The mean latent period in 10 μl of ethylene/l of air ranged from 62 min at 28 °C to 132 min at 18 °C (Fig. 1). It can be seen that the mean minimum was in the vicinity of 28 °C, while the shortest individual value recorded was 52 min at 28 °C. The temperature sensitivity was thus quite different from that which governs the latent period following IAA application to

![Fig. 1. Effect of temperature and ethylene concentration on the latent period preceding the petiole elongation response to ethylene.](image-url)
coleoptiles (4). This difference is emphasized by the temperature coefficient, $Q_{10}$, for the petiole elongation response, which was 2.1 for the range 18 to 28 C, but 0.7 in the range 28 to 38 C. Although at 18 C the mean latent period was reduced by 14% to 114 min, when the ethylene concentration was increased from 10 to 100 μl of ethylene/l of air, at higher temperatures, namely 28 and 38 C, the period increased by 12 and 19 min, respectively. This shows that above 18 C, physical factors such as the solubility of ethylene in the petiole tissue, or the rate of ethylene diffusion through the tissue, do not contribute significantly to the length of the latent period. These findings together with the fact that the minimum latent time was of the order of 1 hr suggest that the latent period represents the time taken for ethylene to initiate the metabolic synthesis of a factor or factors able to stimulate cell elongation in the adaxial half of the petiole. This hypothesis is supported by findings of the author (unpublished) that the ethylene response is abolished if the petiole is pretreated with cycloheximide.

**LITERATURE CITED**