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Acetylcholine as a Signaling System to Environmental Stimuli in Plants : I.

Contribution of Ca^{2+} in heat-stressed Zea mays seedlings

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Abstract:

Plant growth is influenced by transport of water, ions and hormones under various environmental stresses. If acetylcholine (ACh) mediates the opening and/or closing of ion channels in plants just as in animal systems, it is important to detect such evidence. The effect of heat stress on the acetylcholinesterase (AChE) activity and Ca^{2+} as a trigger of ACh release can be determined in selected organs of dark grown Zea mays seedlings. The enzyme activity in the coleoptile node was 3-7 fold higher than that of other organs. By heat stress, the AChE activity increased about 20% in the node. Cytochemical evidence for AChE activity was found only in the node. This reaction appeared in the cortical cells around the vascular system. After heat stress, the localization of AChE was radically changed in the node. AChE activity was detected in all endodermal cells surrounding the vascular system. Further, fluorescent labeled Ca^{2+} in the node was identified in cortex cells around the vascular system, epidermis and adhering peripheral cortical cells with a laser scanning confocal microscope. Following heat stress, Ca^{2+} was found more in the cortical cells and whole endodermal cells between the cortex and stele. The appearance of AChE and Ca^{2+} in endodermal cells after heat stress seems to be correlated with ACh function controlling ion channels.

Keywords:

AChE activity, ACh response, Ca^{2+} , Heat stress, Ion channels, Zea mays[\[Full-text PDF \(1335K\) \]](#) [\[References \]](#)

