

EARLY AND LATE EVENTS IN PLANT-HERBIVORE INTERACTIONS

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Successful defence depends on the plant's ability to recognize an attacking "enemy" as early as possible. Early defence responses require enemy-initiated signalling cascades. The activation of specific responses requires recognition and appropriate response towards the attacking enemy and most of the events which finally lead to gene activation (the signalling pathway) occur within a few minutes. Damage-induced ion imbalances and modulations of channel activities are the first events occurring in the plasma membrane (PM) and result in rapid perturbations of the PM potential (V_m) involving variations of cytosolic Ca^{2+} concentrations and the production of reactive oxygen species (ROS), such as H_2O_2 and NO. The sophisticated signalling network for plant defence responses is elicited and driven by both herbivore-induced factors (e.g., elicitors, effectors, and wounding) and plant signalling (e.g., phytohormone and plant volatiles) in response to arthropod factors. Furthermore, the ability of plants to withstand herbivores relies on direct and indirect chemical defence. By using toxic phytochemicals, plants can deter and/or poison herbivores, while by releasing volatile organic compounds (VOCs) into the atmosphere plants can attract predators of the herbivores. Interacting downstream networks of kinases and phytohormones mediate the signal and result in concerted gene activation. Here I review and discuss early and late events occurring during herbivore attack that are responsible for cascades of events and signal transductions, eventually leading to indirect and direct plant responses.