

## Mechanical injury in plants triggers local and long distance response using biochemical signals

It is well-known that when the mammal skin undergoes a physical injury there is a local response to repair the damage cells but, at the same time, there is also a diversity of signals that stimulate the immune system to avoid the entrance of potential pathogen through the damage area. Although, plants do not have immune system, when any plant organ (root, stem or leaf) undergoes a mechanical injury this triggers an initial local response to repair the damage cells by different wound healing strategies. This response activates also the generation of biochemical signals alerting adjacent cells that something is happening. In this context, the metabolism of two families of molecules called reactive oxygen and nitrogen species (ROS and RNS) become very active. Among these molecules, hydrogen peroxide ( $H_2O_2$ ) and nitric oxide (NO) have remarkable functions because they participate in several events: i) initiate the appropriate response and ii) communicate to adjacent cells the existence of cellular damages.

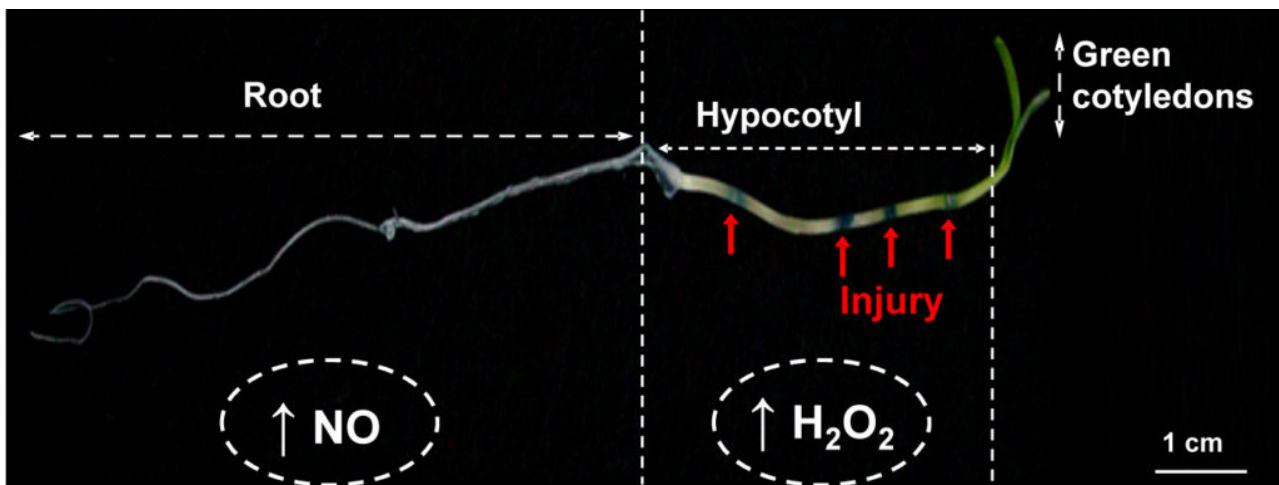


Fig. 1. Appearance of a 7-day-old *Cakile maritima* seedling after mechanical injury (red arrow). The damage cells are visualized with blue color which indicates that its plasma membrane integrity is affected. Hydrogen peroxide ( $H_2O_2$ ) content increases after 3 h in the injured area (local response). At the same time, it is triggered an increase of nitric oxide (NO) in the root which is an undamaged organ (long distance response).

It should be remarked that depending on the cellular concentration of these two molecules ( $H_2O_2$  and NO), the function could be different such as signals (low concentration) or molecular weapons (high concentration) against potential pathogens. These molecules are present in all living organism and saving the distances between plants and animals, it is important that these molecules exert similar functions to safeguard cellular integrity. Figure 1 illustrates a working model

using *Cakile maritima* seedling as model. When the hypocotyl of this plant is wounded, after 3 h, it is detected a local response characterized by a higher production of H<sub>2</sub>O<sub>2</sub> in the area of the damage cells which alter the activity of some antioxidant enzymes. At the same time, it is observed an increase of the molecule NO in root cells, which is recognized to be involved in multiple functions and indicate an active RNS metabolism in this organ.

Taken together, the data suggest that there is a spatial distribution of the metabolism of ROS and RNS in plants under a mechanical injury. ROS metabolism seems to be exacerbated in the injury area (hypocotyl) provoking an oxidative stress, but there are also long-distance signals in unwounded tissues where the metabolism of RNS appears to be more active. These local and long distance responses seem to be coordinated enabling the injured seedlings to survive.

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## Publication

[Mechanical wounding promotes local and long distance response in the halophyte \*Cakile maritima\* through the involvement of the ROS and RNS metabolism.](#)

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