

Independent chitin signalling cascades allow variability in immune response execution

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Cell-surface perception of microbes triggers a range of rapid immune responses in plants that include the induction of cell isolation by plasmodesmal closure, the production of reactive oxygen species, and changes to gene expression. We have profiled cell responses to chitin and determined that different signalling cascades are triggered in different regions of the cell membrane to mediate specific and localised responses. This independence of responses to chitin in different domains of the cell membrane allows cells to differentially execute immune responses and that this is relevant to chitin responses in leaves of different ages in the same plant. When compared to mature leaves, young, expanding leaves do not close their plasmodesmata in response to chitin, have a reduced transcriptional response to immune elicitors, and are more susceptible to a bacterial pathogen. Disconnecting leaf age from physiology, we determined that both plasmodesmal closure and the magnitude of transcriptional responses are dependent on whether the leaf is a carbon sink or a carbon source. To probe the relevance of differential regulation of plasmodesmata in sink and source tissues, we forced plasmodesmal closure in young sink leaves and found this perturbed the normal outputs of growth and defence. Thus, we propose that the different signalling cascades triggered by chitin allow sink leaves to not close their plasmodesmata during immune responses and thus prioritise carbon use for growth over defence.