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THE SPECIFICITY OF TYROSINE NITRATION QUESTIONS THE REDUNDANCY OF AtMKK4 AND AtMKK5 DURING PLANT DEFENSE RESPONSES

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Hypersensitive response, peroxynitrite, MAPK, tyrosine nitration, Arabidopsis

Peroxynitrite is a reactive nitrogen species formed from the reaction between NO and O_2^-, both produced concomitantly during the hypersensitive response (HR) in plants. Accordingly, using the specific dye HKGreen-2 in a photometric assay, we recently demonstrated that infection of *Arabidopsis thaliana* plants with an avirulent strain of *Pseudomonas syringae* (Pst AvrB) induces peroxynitrite accumulation[1] with a timing that correlates with an increase in tyrosine-nitrated proteins[2].

In plants, peroxynitrite is not involved in NO-mediated cell death and its physiological function is poorly understood. However, it is emerging as a potential signaling molecule during the induction of defense responses against pathogens and this could be mediated by the selective nitration of tyrosine residues in a small number of proteins.

In an attempt to identify specific targets of Tyr-nitration displaying signaling functions during the HR, we focused our interest on MAPK cascades, a complex network of phosphorylation events involved in plant defense responses and known to be regulated by Tyr-nitration in animals. In this context, we demonstrated that AtMKK4 is specifically nitrated on two Tyr residues, namely Y76 and Y94, leading to an inhibition of its activity. According to the location of both Tyr close and inside the ATP-binding site, AtMKK4 nitration prevents the binding of ATP to the protein. *In vivo* peroxynitrite-treatment strongly delays the hypersensitive cell death induced in tobacco plants by the active AtMKK4. Interestingly, despite 78% of sequence homology with AtMKK4, AtMKK5 is not nitrated by peroxynitrite and its activity is not modulated by such a treatment. This raises the question of AtMKK4 and AtMKK5 redundancy in mediating defense signal in plants and highlights the specificity of Tyr-nitration for signaling modulation.

REFERENCES

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