

Interaction of the Beet necrotic yellow vein virus with the auxin signaling pathway in sugar beet

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Beet necrotic yellow vein virus (BNYVV) is the causal agent of Rhizomania, a viral disease of sugar beet with high economic importance transmitted by the plasmodiophorid *Polymyxa betae*. Upon BNYVV infection, plants display massive lateral root proliferation leading to the characteristic symptom of a “root beard” and reduced tap root weight. Auxin as the major plant hormone controls an array of developmental processes including the development of lateral roots. Therefore, it is supposed that BNYVV interacts with the auxin signaling pathway to induce lateral root proliferation but the mechanism responsible for that is still unknown. We identified an Aux/IAA protein (AUX28) from sugar beet as an interaction partner of the pathogenicity factor P25. Aux/IAA proteins are negative regulators of auxin response factor proteins that in turn control the transcriptional activity of auxin response genes. This interaction is crucial for the auxin signaling pathway as it determines the expression

of auxin responsive genes involved in lateral root development. P25 and AUX28 interacted in planta as demonstrated by bimolecular fluorescence complementation assay. Domain mapping revealed that P25 is able to interact with domain I and II of AUX28. Subcellular localization showed that P25 localizes to both cytoplasm and nucleus whereas the Aux/IAA protein localizes exclusively to the nucleus. In the presence of P25, the Aux/IAA protein was relocalized to the cytoplasm. This relocalisation must be followed by transcriptional changes of auxin responsive genes. This hypothesis was supported by expression analysis showing that several genes involved in lateral root development are induced upon BNYVV infection. The results provide for the first time evidence that BNYVV interacts with the auxin signaling pathway in sugar beet. A model explaining how BNYVV interacts with the auxin signaling pathway in order to induce lateral root development is presented.