Salicylic acid-mediated defense against potato infection by *Spongospora subterranea*

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Powdery scab of potato is a soilborne disease caused by *Spongospora subterranea f. sp. subterranea* (*Sss*). The main symptoms caused by *Sss* are root galling and tuber blemishes. The pathogen also vectors potato mop-top virus (PMTV) that causes tuber necrosis. Both pathogens reduce the economic value of potato crops and impede foreign trade. Effective control methods are currently unavailable, emphasizing the need to investigate sources of host genetic resistance. Potato hairy roots were used to study gene expression responses to *Sss*, and to validate gene involvement using gene editing. Following *Sss* inoculations, differential expression of plant defense-related genes was observed in the hairy roots. Based on defense marker gene expression, a pivotal role was indicated of salicylic acid (SA)-mediated defense against *Sss*. This was further investigated by assessing the impact of SA-mediated defense on *Sss* infection. Transgenic hairy root lines were generated, including those overexpressing the SA receptor *StNPR1* and those with knockdown of a second SA receptor, *StNPR3*, using CRISPR/Cas9-based gene editing. Reduced *Sss* propagation was observed in the *StNPR1*-overexpressed lines and the *StNPR3*-knockdown lines. Consistent with these results, pretreatment of hairy roots with SA also reduced *Sss* propagation, supporting the role of SA-induced defense mechanisms against *Sss*. Variations in susceptibility to *Sss* across potato cultivars have also been observed, suggesting a genetic basis for disease resistance. Transcriptomics using RNA-seq on hairy root samples from different cultivars after *Sss* infection has given insights into involvement of SA-mediated defense and other potential mechanisms for preventing *Sss* infections.