DISTINCT AND COMMON REQUIREMENTS FOR *MI-1*-MEDIATED RESISTANCE TO APHIDS AND ROOT-KNOT NEMATODES

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The tomato *Mi-1* gene, encodes a nucleotide binding leucine-rich repeat (NB-LRR) protein, is an atypical resistance gene as it confers resistance to wide ranging groups of pests. How *Mi-1* triggers plant defense to pests as diverse as root-knot nematodes (RKN) and phloem feeders like potato aphids, whiteflies and psyllids is poorly understood. We have used high-throughput virus-induced gene silencing (VIGS) and microarray approaches to identify genes in the *Mi-1* signalling pathway. The VIGS screen utilized a *Nicotiana benthamiana* cDNA library in tobacco rattle virus and assessed the suppression of a pest-independent hypersensitive response triggered by a constitutive active form of Mi-1, Mi-DS4. This screen identified several genes that suppressed *MiDS4* cell death. Among these is Somatic Embryogenesis Receptor Kinase 1 (*SERK1)* a LRR transmembrane receptor kinase. Interestingly, silencing *SERK1* in tomato attenuated *Mi-1*-mediated resistance to aphids but not to RKN demonstrating for the first time a distinct requirement for *Mi-1* resistance to these two pests. Using microarray analysis we found the paralogous tomato *WRKY* genes, *SlWRKY72a* and *-b* to be transcriptionally up-regulated during *Mi-1* resistance to RKN. Silencing these two genes in tomato resulted in a reduction of *Mi-1*-mediated resistance as well as basal defense against RKN and aphids. In addition, using Arabidopsis T-DNA insertion mutants we found their Arabidopsis ortholog, *AtWRKY72*, also to be required for basal defense to RKN as well as to the oomycete *Hyaloperonospora arabidopsidis*. *At*WRKY72 target genes, identified by microarray analysis, appear largely to be non-responsive to salicylic acid (SA) defense hormone analogs indicating that *At*WRKY72 utilizes SA-independent defense mechanisms.