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Arabidopsis non-host resistance genes for enhancing disease resistance in soybean

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Soybean (*Glycine max L. Merr*) is considered worldwide as one of the most valuable crops. Soybean contains high protein (40%) and oil (20%) content. In addition to its important role in human nutrition, soybean is a major protein source for both aquaculture and animal feed. Unfortunately, soybean is susceptible to many pathogenic organisms that suppress its yield valued over five billion dollars annually. Growing of disease resistant soybean cultivars is the major method of controlling many of these diseases. Unfortunately, complete resistance against many pathogens is not available in soybean. Transfer of non-host resistance conferring immunity to multiple soybean pathogens could be an ideal approach in generating broad-spectrum and durable disease resistance in soybean cultivars. In order explore this possibility, we conducted a genetic screen for identifying Arabidopsis mutants that are susceptible to two soybean pathogens: (i) the oomycete pathogen, *Phytophthora sojae* and (ii) the fungal pathogen, *Fusarium virguliforme*. We identified 30 *Phytophthora sojae* susceptible (PSS) mutants, PSS1 through PSS30 of which 14 were later found to be susceptible also to *F. virguliforme*. By applying a map-based cloning method, we have isolated PSS1, PSS5, PSS6, PSS21, PSS25 and PSS30 genes. Overexpression of PSS1 and PSS30 enhanced immunity of transgenic soybean lines against two most serious pathogens*, F. virguliforme* and soybean cyst nematode. PSS1 encodes a glycine rich protein with unknown function. Our initial study indicates that PSS1 may be involved in autophagy. PSS30 encodes a folate transporter (AtFOLT1). Investigation of Arabidopsis atfolt1 mutants or mutants with compromised folate biosynthesis showed a lack of: (i) infection-specific folate induction and (ii) non-host and host resistance in Arabidopsis. These observations suggest an essential role of folate in plant immunity. Our study has indicated that incorporation of non-host resistance genes could be an ideal approach for breeding disease resistance in soybean.