

Hairy roots and transformation with disease resistance genes **(Primary Investigator: Jack Widholm)**

Disease resistance genes can be placed into soybean hairy roots to determine if they are effective and then into plants to actually improve soybean disease resistance. Genes that are identified in the microarray and gene shuffling sections of this project will be tested in hairy roots and inserted into soybean plants in order to increase resistance.

The genes to be used initially include those that increase the fungal-toxic compounds phenolics, a phytoalexin glyceollin and lignin. All these compounds increase in response to fungal infection of soybean and are correlated with resistance. Antifungal and anti-SCN proteins like chitinase, β -glucanase and protease inhibitors will also be used.

Genes can be easily inserted into soybean hairy roots using *Agrobacterium rhizogenes* to obtain clonal roots within two months. One can then determine if the inserted genes are expressed and what effect this has on the biochemistry and growth of the roots. The roots can then be used as a test system by infecting them with pathogens such as fungi that cause several important soybean diseases or with eggs of the soybean cyst nematode. In both cases, infection can be assayed and past work by the research team has shown varieties that carry some resistance to a disease like SDS or SCN also show this trait with the hairy root assay.

Genes will also be placed into soybean plants using bombardment of embryogenic cultures, a method that takes about seven months to obtain transformed seed. Gene expression will be followed in the progeny, and high expressing plants will be tested for disease resistance using appropriate greenhouse or field tests.