LI, HAIYAN*, LINDA E. HANSON and ANN C. SMIGOCKI, USDA-ARS Molecular Plant Pathology Laboratory, 10300 Baltimore Ave., Beltsville, MD 20705. **_Rhizoctonia_ resistance conferred by a sugar beet polygalacturonase-inhibiting protein gene in genetically modified tobacco.**

Polygalacturonase-inhibiting proteins (PGIPs) are cell wall leucine-rich repeat (LRR) proteins recognized as having a role in plant defense. PGIPs inhibit fungal polygalacturonase (PG) enzymes that break down the polygalacturonate chain in plant cell walls to initiate disease development. The interaction between PGs and plant PGIPs favors the accumulation of oligogalacturonides which elicit a wide range of plant defense responses. We cloned sugar beet *PGIP* (*BvPGIP*) genes to characterize their function in resistance mechanisms. *BvPGIP1*, unique to a sugar beet root maggot resistant germplasm, and *BvPGIP2* that differs from *BvPGIP1* in eight amino acids, were reconstructed for constitutive expression and introduced separately into *Nicotiana benthamiana*. Independently derived transgenic plants were identified by genomic PCR, Southern blot and RT-PCR analyses. Plants exhibiting high levels of expression were infected with either *Rhizoctonia solani* AG2-2 or AG4, isolates that cause many plant diseases in a wide range of commercially important crops. Two weeks post-inoculation with fungal-colonized barley grains, disease symptoms (stem rot and subsequent seedling death) were severe on control plants but were limited or greatly reduced in transgenic *BvPGIP1* and *BvPGIP2* plants. With AG2-2, seedling death was significantly reduced by 70% - 82% in *BvPGIP1* and *BvPGIP2* plants compared to the controls. With AG4, seedling death was reduced by 50% in *BvPGIP1*, whereas, *BvPGIP2* plants did not show enhanced resistance as compared to the control. This varied response between the two AG isolates has been observed with other tests that point to independent resistance for these pathogens. Our initial results demonstrate that sugar beet *BvPGIP* genes play an important role in plant defense and could provide an approach for controlling fungal diseases in sugar beet and other crops.