Enhanced Protection Against Fungal Attack by Constitutive Co–expression of Chitinase and Glucanase Genes in Transgenic Tobacco

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Plants respond to pathogen attack by the induction of a battery of defenses, suggesting that different protective mechanisms may have complementary roles in the overall expression of disease resistance. We have investigated possible functional interactions between two different hydrolytic enzymes, chitinase and glucanase, by constitutive co-expression in transgenic tobacco of genes encoding the rice RCH10 basic chitinase and the alfalfa AGLU1 acidic glucanase. Hybrid plants were generated by crossing transgenic parental lines exhibiting strong constitutive expression of cauliflower mosaic virus (CaMV) 35S enhancer / RCH10 and CaMV 35S double promoter / AGLU1 gene fusions, respectively. Evaluation of disease development in these hybrids, heterozygous for each transgene, and in homozygous selfed progeny, showed that combination of the two transgenes gave substantially greater protection against the fungal pathogen Cercospora nicotianae, causal agent of frogeye, than either transgene alone. Productive interactions between chitinase and glucanase transgenes in vivo point to combinatorial expression of antimicrobial genes as an effective approach to engineering enhanced crop protection against fungal disease.