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Photosytem II genes display a potential mechanism of Lepidopteran resistance.

Fall armyworm (FAW) and southwestern corn borer (SWCB) are insect pests of maize which cause large amounts of feeding damage annually in the United States. Previous proteomic analysis of resistant and susceptible lines of maize showed proteins involved with the photosynthetic pathway were differentially expressed in the resistant line. The high chlorophyll fluorescent (hcf) mutants contain defects in the photsystem I or II pathways. These defects lead to disrupted electron transport within the photosynthetic pathway. Preference tests comparing several hcf mutants to wild-type siblings determined genes involved in photosynthesis had an effect on insect feeding. Antibiosis tests were performed using mutant and wild-type leaf tissue to determine their effect on larval weight gain. Leaf feeding damage was assessed using the AlphaEase software from digital images. Individual larval weights were determined in milligrams. hcf7-N1029D significantly decreased larval feeding damage for both FAW and SWCB. hcf*-88-3005-3, hcf11-N1250A, and hcf48-N1282C significantly increased larval feeding damage for both Lepidoptera. The combined data from both the antibiosis and preference tests reveal that photosystem II genes have a significant effect on larval feeding which is unrelated to leaf color. Further, these genes are contained within the stromal thylakoid where fatty acid precursors are produced for epicuticular wax synthesis. Previous data has determined epicuticular waxes exhibit resistance to Lepidopteran insects. Electron microscopy was performed on several hcf mutants to determine their effects on the structure of epicuticular waxes. Comparisons between mutant and wild-type tissue show substantial differences in wax distribution and accumulation.