



A *psbA* Mutation (Val219 to Ile) Confers Resistance to Propanil and Increased Susceptibility to Bentazon in Smallflower Umbrella Sedge.

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Cyperus difformis L. (smallflower umbrella sedge) is an annual, C₃-type weed of rice (*Oryza sativa* L.) fields in both tropical and warm temperate regions of 40 countries, including the United States and Brazil. In California (CA) rice, propanil [*N*-(3,4-dichlorophenyl)propanamide] has provided efficient postemergence control of *C. difformis* populations showing resistance to acetolactate synthase inhibitors. Propanil-resistant (R) populations, however, were recently confirmed in CA rice fields. To date, propanil resistance in other weed species has been associated with enhanced aryl acylamidase (AAA)-mediated propanil conversion into 3,4-dichloroaniline. Our objectives were to determine the level of propanil resistance and cross-resistance to other photosystem II inhibitors in *C. difformis* lines, and to elucidate the mechanism of propanil resistance. The propanil-R line had a 14-fold propanil resistance and increased resistance to bromoxynil, diuron and metribuzin, but not to atrazine. The R line, however, displayed a four-fold increased susceptibility to bentazon. Interestingly, S plants accumulated more 3,4-dichloroaniline and were more injured by propanil and carbaryl (AAA-inhibitor) applications than R plants, suggesting that propanil metabolism is not the resistance mechanism. *psbA* gene sequence analysis indicated a valine-219-isoleucine (Val₂₁₉Ile) amino acid exchange in the propanil-R chloroplast D1 protein. The D1 Val₂₁₉Ile modification in *C. difformis* endows resistance to propanil, diuron, metribuzin, and bromoxynil but increased susceptibility to bentazon, suggesting Val₂₁₉ participates in binding of these herbicides. This is the first report of a higher plant exhibiting target-site propanil resistance, as well as the first instance of propanil resistance outside the *Poaceae* family. Tank-mixing bentazon and propanil, where permitted can control both propanil-R and – S *C. difformis* and prevent the spread of the resistant phenotype.

Palavras-chave: herbicide resistance, *Cyperus difformis*, *Oryza sativa*, *psbA* gene.

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