

## **Target-Site Resistance to Propanil in Smallflower Umbrella Sedge and Ricefield Bulrush from California Rice: Implications for Management.**

Albert J Fischer, Ibrahim Abdallah, Rocio Alarcón-Reverte, Kassim Al-Khatib, and Rafael M Pedroso, University of California, Davis

Smallflower umbrella sedge (*Cyperus difformis*; CYPDI) and ricefield bulrush (*Schoenoplectus mucronatus*; SCHMU) are major weeds of California rice which recently evolved resistance to propanil, an important photosystem II (PSII)-inhibiting herbicide. We conducted a series of experiments aimed at assessing levels of resistance present in newly-obtained biotypes obtained from field-collected CYPDI and SCHMU populations, as well as elucidating their propanil resistance mechanism. Such information is essential for proper management of resistant (R) populations in rice fields and for the design of applied prevention and management practices to delay the spread of resistance. Propanil-R CYPDI and SCPMU lines studied displayed at least a 14-fold level of propanil resistance. Our results indicate that, unlike all previous cases of propanil resistance in plants, an amino acid alteration at propanil's target-site in CYPDI and SCHMU entails resistance to not only propanil but also diuron, metribuzin, and bromoxynil, which are also PSII inhibitors. Such modification, however, is here shown to possess a novel attribute for propanil-R lines displayed an increased susceptibility to the PSII inhibitor bentazon, another important herbicide used in rice worldwide. Tank-mixing bentazon and propanil can thus be seen as an interesting option to manage and prevent the spread of the resistant phenotype, but seems unlikely due to the current ban on bentazon usage in California. One can expect propanil resistance to spread by the movement of seeds rather than carried by pollen due to the mutated gene being part of the chloroplast genome. Therefore, efforts to minimize seed movement across fields - such as proper equipment sanitation and leaving resistant fields as last harvest - might play a major role in slowing down the spread of propanil-R CYPDI and SCHMU within California's rice-growing areas.