

Spread and Management of Herbicide Resistant Weeds in California Rice.

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Weeds are considered a serious problem in California rice fields. Decades of using a continuously-flooded rice cropping system in California have selected specific weed species that display similar ecological requirements and growing patterns to rice. Although effective preplanting weed control and proper cultural practices including water management is used in weed management program in rice, herbicides continue to be the most important component of any weed management program in rice. With the excessive reliance on a few herbicides and lack of crop rotation, however, several weeds in rice fields have evolved resistance to herbicides including California Arrowhead, Smallflower Umbrella Sedge, Ricefield Bulrush, Late Watergrass, Redstem, Barnyardgrass, Early Watergrass, and Junglerice. In California, rice has more herbicide-resistant weeds than any other crop or region in the United States which result in more complex and expensive weed management program. Prevention, early detection and rapid response to herbicide resistant weeds is a key to manage these biotypes and prevent them from further spreading. In addition, understanding the molecular base for herbicide resistance is essential for any successful weed management program in California rice cropping system where the use of non-chemical weed control is not possible. Understanding resistance mechanisms including active site mutation, metabolic, over expression, and sequestration would help making the correct decision to manage resistant weeds. Our 2015 survey of herbicide resistant weeds in California rice fields showed that 80% of the samples tested (total is 30 samples) of smallflower umbrella sedge have resistance to sulfonylurea herbicides and propanil and the other 20% have only resistance to sulfonylurea herbicides. Resistance to thiobencarb, cyhalofop, clomazone, bispyribac and penoxsulam was evident in several populations of late water grass. We also discovered multiple resistance in a population of early watergrass where plants were resistance to penoxsulam, bispyribac, and thiobencarb. In bulrush, propanil and sulfonylurea herbicides resistance was evident in only one population. In sprangletop, there are several populations with resistance to thiobencarb, cyhalofop and clomazone. The wide spread of herbicide resistant weeds in rice field is a threat for California rice cropping system and require especial attention using IPM approach to manage these weeds.