

## **Evolution of imidazolinone-resistant weedy rice in Malaysia: the current status**

### **ABSTRACT**

Weedy rice (*Oryza sativa* f. *spontanea* or *O. sativa* complex) has become a severe threat to Malaysian rice (*Oryza sativa* L.) granaries after the direct-seeding method of rice cultivation was introduced in the late 1980s. Since then, researchers have studied the biology and ecology of weedy rice and espoused the evolutionary theory of the origin of Malaysian weedy rice. This review paper aimed to synthesize the body of knowledge about weedy rice and the evolution of herbicide-resistant (HR) weedy rice in Malaysia. The imidazolinone (IMI) herbicide component of the Clearfield® Production System (CPS) rice package is among the most effective tools for weedy rice control. However, dependence solely on this technology and farmers' ignorance about the appropriate use of IMI herbicides with the CPS rice package have resulted in the evolution of IMI-resistant (IMI-R) weedy rice. This has reduced the efficacy of IMI herbicides on weedy rice, ultimately nullifying the benefit of CPS rice in affected fields. At present, it is assumed that IMI-R weedy rice populations are widely distributed across the rice granaries in Malaysia. Therefore, it is important that integrated management measures be adopted comprehensively by Malaysian rice growers to curb the spread of IMI-R weedy rice problem in Malaysia, especially in fields planted with CPS rice. This review focuses on the biology of Malaysian weedy rice, the history of the establishment of weedy rice in Malaysian rice fields, the impact of HR rice technology on the evolution of IMI-R weedy rice in Malaysia, the distribution of resistant weedy rice populations across Peninsular Malaysia rice granaries, the weedy rice resistance mechanisms, and weedy rice management. The synthesis of all this information is helpful to researchers, policy makers, the private agricultural industry, advisers to farmers, and proactive farmers themselves with the goal of working toward sustainable rice production.

**Keyword:** AHAS mutation; Clearfield® rice; Herbicide resistance; Imidazolinone herbicides; Malaysian rice fields