27. Herbicide Tolerant Rice

Rice was harvested from 3.0 million acres in 2000 in the United States. Rice is a unique crop in that, unlike all other field crops, it is grown in flooded fields. Rice is planted either in a dry seeded system or a waterseeded system.

Weeds are the most serious pest affecting rice production in the United States. Weeds compete with rice for nutrients, moisture, sunlight and space. Red rice is the most troublesome weed in rice production of Louisiana, Arkansas and Missouri. Red rice and domesticated rice belong to the same genus and species, and share the same biological and physiological characteristics; thus it is difficult to selectively chemically control red rice in rice. Waterseeding is a cultural method of controlling red rice as red rice cannot germinate and emerge in anaerobic conditions. Barnyardgrass is the number one weed problem in California.

Waterseeding (muddy waterseeding or clear waterseeding) is used as a cultural method to control red rice, particularly in Louisiana. In the muddy water system, flood is established and presoaked rice seed is broadcast aerially. Before the rice seed is planted, the flooded field is tilled, thereby muddying the water and killing the germinated red rice which is the biggest weed problem that would emerge in clear water. The diverse weed flora (terrestrial and aquatic) in rice fields usually necessitate the use of two or more herbicides for the control of a range of weeds. Aquatic weeds have developed resistance to bensulfuron in California (28% of the total acres were infested with resistant weeds).

There are currently two varieties of transgenic herbicide tolerant rice being developed. Liberty Link rice withstands the applications of the non-selective herbicide, glufosinate while Roundup Ready rice can tolerate the applications of glyphosate. Research suggested that single or sequential applications of glufosinate provided excellent control of red rice, barnyardgrass and broadleaf signalgrass. Researchers have reported excellent control (90% or greater) of 3-4 leaf red rice from sequential glufosinate rates as low as 0.27 lb AI/A compared to a single application of 1 lb AI/A.

The main benefit offered by transgenic rice would be greater control of red rice which is a major problem in the Delta and Gulf Coast producing areas. In California, where red rice is not a severe threat, production losses due to other weeds that are resistant to common herbicides are a problem. Use of transgenic rice would allow the postemergence applications of non-selective herbicides, glufosinate and glyphosate, for the effective control of the resistant weeds. Since these herbicides control a broad spectrum of weeds that infest rice fields, the overall amount of active ingredients required for weed control will be reduced. With an effective herbicide for controlling red rice and resistant grasses, rice growers would no longer need to practice waterseeding, which is more costly than dryseeded rice due to additional costs for water, tillage and seed.

Impacts of Herbicide Tolerant Transgenic Rice
Change in Pesticide Use: 3.8 million lbs/yr. decrease in herbicide active ingredients
Change in Net Income: $49.2 million/yr. increase

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