

Managing Herbicide Resistance Using Alternative Rice Stand Establishment Techniques

Albert J. Fischer, Michael Moechnig, Randall G. Mutters, James E. Hill, Chris Greer, Luis Espino, James W. Eckert
University of California-Davis, Davis, CA 95616 ajfischer@ucdavis.edu

Five alternative stand establishment techniques were employed for four consecutive years since 2004: 1) conventional water-seed rice, 2) conventional drill-seeded rice, 3) water-seeded rice after spring tillage and a stale seedbed, 4) water-seeded rice after a stale seedbed without spring tillage, and 5) drill-seeded rice after a stale seedbed without spring tillage.

These systems highlighted the advantages of each in the shift of the weed seedbanks throughout the years. This season, the techniques were switched to take advantage of the impact the new system would have on weed recruitment and the established seedbank. Water seeded systems tend to favor aquatic weeds while dry or drill seeded systems tend to favor aerobic/dryland weeds. Added to the two basic techniques is the use of a stale seedbed where weeds are encouraged to germinate prior to seeding the crop then eliminated with a total herbicide like glyphosate (“stale seedbed” technique). This dramatically reduces the weed pressure on the crop as long as the soil surface is not disturbed after the stale seedbed glyphosate application.

This year, plots from this experiments received alternative treatments to validate the potential of shifting aerobic and anaerobic stand establishment, and the value of implementing a stale seedbed with glyphosate to deplete fields from all kinds of herbicide resistant weeds. Thus, plots where rice had been conventionally water seeded were heavily infested with aquatic weeds. Weeds almost disappeared from these plots when rice was drill seeded (no-till) following a stale seedbed with Roundup. Plots with heavy barnyardgrass and sprangletop infestations after 4 years of drill seeding rice were switched to water seeding after a stale seedbed with Roundup without any spring tillage and again, weeds were almost absent from these plots as a result of the change in rice establishment method. All this was achieved without any additional herbicide applied besides the Roundup. Herbicides can still be applied if 100% weed control is desired and to prevent seed set by late emerging weeds. Alternating rice establishment systems from aerobic (dry seeding) to anaerobic (water seeding) regimes (and vice versa) combined with the use prior to seeding of a total non-selective herbicide for which resistance does not yet exist in weeds of rice (such as Roundup or other) allows for a major reduction of herbicide resistant weed infestations in rice and of the overall herbicide use and associated costs. Yields were not different across treatments. Except for the rotation from conventional water seeding into a drill seeded no-till system, all other rotations had the same yields in areas with conventional weed control or where the only weed control treatment was glyphosate (stale seedbed). This clearly demonstrates the success of these strategies to 1) control herbicide-resistant weeds, and 2) lower herbicide use in rice. A spring-tilled water seeding after a stale-seedbed technique was implemented in a grower’s field in Glenn County using glyphosate. This practice was successful

in controlling a heavy infestation of mimic and obtaining good yields in a 10 acre field where mimic had been causing heavy yield and economic losses; the key for success with this technique is to allow for substantial weed emergence prior to applying glyphosate. This exercise confirmed what we had been observing in our experimental plots at the RES and demonstrates the feasibility of implementing one of the proposed alternative establishment under grower conditions.