

Herbicide Performance In Stale Seedbed Rice Production

Dr. Jason A. Bond

Weed Scientist, Mississippi State University, Delta Research and Extension Center

John-Kirk Manning

Mississippi State University, Delta Research and Extension Center

L. Chris Vaughn

Mississippi State University, Delta Research and Extension Center

Most rice in the midsouthern United States is grown using conventional tillage; however, conservation tillage has gained acceptance in many rice-growing areas. Conservation tillage includes both no-tillage and stale seedbed systems. Rice is planted into the residue of a previous crop in a no-till system, whereas in the stale seedbed system, previous crop residue is destroyed by tillage in the fall, and seedbeds remain fallow during the winter. The adoption of conservation tillage in rice has been encouraged because of its economical and environmental benefits. Preplant weed management, difficulties in establishing stand, and varieties that have performed poorly in no-till systems are factors that have limited the commercial use of conservation tillage techniques for rice.

Conservation tillage systems rely on herbicides to remove winter weeds prior to planting. Burn-down herbicide programs in Mississippi usually consist of glyphosate or glyphosate plus 2,4-D applied 3 to 4 weeks prior to planting. However, control from burndown herbicide applications is often incomplete and weeds regrow prior to planting. Furthermore, residue left on the soil surface could interfere with placement of pre-emergence (PRE) herbicides, possibly reducing control from these applications.

Barnyardgrass and sprangletop species are capable of decreasing rice yields by 70 and 36%, respectively. Command (clomazone), Prowl (pendimethalin), Facet (quinclorac), and Bolero (thiobencarb) are the only herbicides with labeling for application to rice that are effective against annual grasses when applied pre-emergence (PRE). Although Facet may be applied PRE to rice, it has little activity against sprangletop species. Prowl and Bolero are effective in controlling sprangletop species, but labeling requires that rice seed must have imbibed water prior to application. Command controls sprangletop species and may be applied at planting. However, at current prices, Prowl costs approximately 58% less than Command and Bolero.

Research was conducted at the Mississippi State University Delta Research and Extension Center in Stoneville to address herbicide performance in a stale seedbed rice production system. The objectives of this research were to (1) evaluate the impact of tillage system on the efficacy of pre-emergence herbicides in rice, (2) compare the response of a rice variety and a rice hybrid to applications of Command and ammonium sulfate in a stale seedbed system, and (3) determine the response of three rice varieties to three application timings and two formulations of pendimethalin in a stale seedbed system.

The study to evaluate the impact of tillage system on the efficacy of pre-emergence rice herbicides was conducted in 2008. Tillage systems included fall stale seedbed and conventional tillage. Herbicide treatments consisted of Command (1.6 pt/A), Prowl H2O (2.1 pt/A), and Facet (0.67 pt/A) applied PRE immediately after planting. Herbicide rates were the maximum for a single application to a clay soil. Rice injury

and control of barnyardgrass and browntop millet was visually estimated at 15, 30, and 45 days after application (DAT). Tillage system did not influence control of barnyardgrass or browntop millet at any evaluation. Barnyardgrass control from Command, Prowl H2O, and Facet was equivalent 15 DAT; however, Command was more effective than Prowl H2O and Facet 30 DAT. By the final evaluation, Command and Prowl H2O controlled more barnyardgrass than Facet. Facet never controlled browntop millet >70%. Browntop millet control from Command and Prowl H2O was equivalent and at least 85% at all evaluations. The efficacy of pre-emergence herbicides was not negatively impacted by the stale seedbed rice production system.

A second study compared the response of a rice variety and hybrid to PRE applications of Command and early post-emergence applications of ammonium sulfate fertilizer in a stale seedbed rice production system. The rice variety, Cocodrie, and the rice hybrid, XL723, were seeded into a stale seedbed at an early planting date, March 24. Command at 1 and 1.6 pt/A was applied PRE. Ammonium sulfate (0 and 100 lb/A) was applied when rice reached the two- to three-leaf stage. Rice stand density was determined 14 days after rice emergence (DAE). Visual herbicide injury and rice height were recorded at weekly intervals from emergence until flood. Rice yield was measured at season's end. Ammonium sulfate application had no effect on visual estimates of rice injury or rice height. Injury was greater for XL723 than Cocodrie at all evaluations. Command at 1.6 pt/A injured Cocodrie and XL723 more than Command at 1 pt/A. Averaged across herbicide and fertilizer treatments, XL723 produced higher rice yield than Cocodrie. Regardless of cultivar, rice yield was reduced by Command at 1.6 pt/A when no ammonium sulfate was applied; however, no yield reductions due to Command application were detected where ammonium sulfate at 100 lb/A was applied. Although visual injury was greater for the rice hybrid, this injury did not translate into a yield reduction.

The third study was conducted from 2005 through 2007 and determined the response of three rice varieties to three application timings and two formulations of pendimethalin in a stale seedbed rice production system. The rice varieties Cocodrie, Lemont, and Wells were planted in a stale seedbed rice production system. Two formulations of pendimethalin, an emulsifiable concentrate (Prowl EC) and a capsule suspension (Prowl H2O) were applied at 1 lb ai/A. These rates corresponded to 2.4 pt/A for Prowl EC and 2.1 pt/A for Prowl H2O. Pendimethalin treatments were applied 0, 3, and 7 days after planting. No visual injury was detected for any variety. Seedling density, days to 50% heading, and rice yield were not impacted by pendimethalin formulation or application timing. The practice of planting varieties with excellent seedling vigor into non-disturbed soils with greater available moisture may provide an opportunity to use pendimethalin as a pre-emergence herbicide for rice production.

Research with other areas of rice production have demonstrated that rice yields in a reduced tillage system are similar to those in a conventional tillage system when growing conditions are favorable, particularly during the early parts of the season. Based on results of the current research, herbicide performance is not diminished when rice is grown in a stale seedbed production system. Δ