Texas Rice Research Foundation

2004 Research Report

Title

Water Management and Weed Science

Research in Rice

Project Leaders

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and

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Duration

Year One of Four Years
I Executive Summary

**Objective 1:** Due to land area restrictions this study had to be planted in the same plot area as 2003. The decision was made late and therefore the land preparation was late. Normally the 2003 plot areas would not have worked until after the 2004 plots are planted. The reduced rotation appeared to reduce the MC yield but not the RC where the best treatments were near 4000 lb/ac dry rice. MC drain timing greatly influences MC yield and milling. Pre drain N application had little impact on MC parameters. The RC yield, milling and maturity was influenced by MC drain timing, between crop dry period, RC flood timing.

**Objective 2:** The results for Eagle Lake and Beaumont were very similar to 2003. Weed pressures were slightly higher as were control cost. Beaumont had the heaviest weed pressure and a good spectrum of broadleaf weeds and grasses. Eliminating the early postemergence herbicide treatments reduced yield by about 60% while no weed control reduced yield by almost 95%. Broadleaf signalgrass was the dominate weed at Eagle Lake a lighter weed density. Eliminating the early postemergence herbicide treatments only reduced yield by about 9% while no weed control only reduced yield by almost 34%. The dominate weed at Ganado was barnyardgrass and control was difficult. Only 6 of 30 treatments provided adequate control. Eliminating the early postemergence herbicide treatments reduced yield by about 50% while no weed control reduced yield by almost 90%.

**Objective 3:** Studies were conducted at three locations looking at a number of herbicide treatments on Alligatorweed. The new Dow AgroSciences product DE638 has received a full label with a trade name of GRASP. With good soil moisture, a single application of GRASP applied one week before flood will provide 95% season long control. If soil moisture is less than optimum then tankmixing 0.5 pt/ac of Grandstand with GRASP will provide similar control. Grandstand also appears to enhance the activity of Regiment.

**Objective 4:** Working with County Extension Agents and Consultants no fields could be located with paspalum. Fields with paspalum in the last rotation and off season had none this year. Attempts to locate fields with perennial barnyardgrass in Jefferson County were also unsuccessful. The producer had eliminated the problem at the only confirmed infestations with increased cultivation during the summer prior to planting.

**Objective 5:** Studies has been initiated at Eagle Lake and Beaumont. The first and second applications have been made. Several ratings have been made. No data is available at this time.

**Objective 6:** Studies has been initiated at Eagle Lake and Beaumont. The first and second applications have been made. Several ratings have been made. No data is available at this time.

**Objective 7:** In the 2005 Rice Production Guidelines, the weed management, cutting height, and some water management sections have been revised. The herbicide-weed species table has been updated. In 2004, 34 cooperator studies were conducted with commercial industry at the three locations with a total of 1,140 plots. Grant funds from these studies were used to pay part time workers, purchase a new 9 row reduced tillage plot drill for Eagle Lake, and two electric carts to reduce the on station miles of the large trucks. The drill will be used to plant all studies at Eagle Lake and Ganado that have a ratoon component.
II Objective 1: Evaluate the impact of ratoon crop water and nitrogen management on main and ratoon crop yield and milling.

Production costs continue to increase and rough rice prices remain constant or decline. For the Texas rice industry to survive and rebound from acreage decline over the recent years, it must take advantage its strengths. The long growing season is a major strength and should be exploited in ratoon crop (RC) production. RC rice has a lower per unit cost as the only inputs are water and fertilizer. Research is desperately needed to better define guidelines on when to pursue a RC and develop an integrate management system to increase and stabilize RC yields. These studies look at the impact of RC water and N management on RC production. RC N is defined as all N applied after main crop (MC) heading.

The study was conducted at Eagle Lake. The plot areas were located on a Nada fsl. The research area is normally rotated with 1 yr rice and 2 yr fallow. Limited plot space and high research demand required that this study be located in the same area as last year. Cocodrie rice was drill seeded in 36 plots that were 30 feet wide. The rice was drilled on 7.5 inch centers at 80 lb/ac on 21 March. The plots consisted of 10 rows. The center 8 eight rows were harvested for MC yield and the center 4 rows were harvested for RC yields. The strips of rice were mechanically divided into 6-16 ft subplots. Subplots were separated by 4 ft alleys. Each of the 36 bays was surrounded by levees for individual irrigation and draining. These areas received standard and uniform management except for the MC drain time, RC reflood time, and RC N management. Applications of P and K were made based on soil test. The MC received 197 lb/ac N in four applications (25% preplant incorporated, 35% prior to flood establishment, 20% at PD and 20% at boot). Standard field plot techniques were used and a 4 inch cm flood was established when the rice reached the five leaf stage and was maintained until the prescribed MC drain times.

A split plot design with three replications was utilized. Drain and reflood times were main plots and RC nitrogen rate and timing as subplots. Drain times were 15, 20, and 25 d after 5% MC heading. RC was flooded either 1 d after harvest, 10 d after harvest, or flushed and flooded 10 d after harvest. RC N treatments were 70 or 100 lb/ac applied in one application just prior to RC flood or split. The RC N was applied in a single preflood application, split pre MC drain and preflood, or preflood and 20 days postflood. RC N applied pre-MC drain was applied 10 d after 5% heading in the MC which was 5 d before the first scheduled drain. N rates for this application was one third of the total RC nitrogen, but never less than 35 lb/ac. The balance was applied just prior to RC flood establishment. This results in six RC N management treatments. MC and RC yield and milling were monitored using standard techniques.

Main Crop Results - The MC drain timing and pre drain N are the only components that could affect the MC. Draining at 15 days caused the main crop to mature (reach 20% grain moisture) earlier by as much as 10 days. This may be a false reaction as the rice may just senesce due to forced dry down. The pre drain N delayed maturity. This is opposite from the earlier work with Lemont. Remember the delay was only a day or two and this is only one year’s data. Every attempt is made to harvest at 18 to 20% moisture but weather is usually the final deciding factor. The 20 and 25 day drain treatments were harvested at below optimum conditions. This was only partly due to the weather. The plots appeared less mature than they actually were. The latest drain plots were harvested at just over 15%. The pre drain N appeared to hasten maturity slightly.
but again this is only one year’s data. The highest MC yield was obtained when the rice was
drained at 25 days after 5% heading. The MC yield is at least 1000 lb/ac less than other studies
at Eagle Lake. This probably reflects the impact of rice following rice. The trend shows that
draining any earlier than 25 days after 5% MC heading reduced yield. A pre drain N application
reduced yields slightly (less than 200 lb/ac but significant). The accelerated maturity and/or
harvest moisture of the 15 day drain treatment reduced MC whole milled grain. This may also
be the result of the lower yield and shedding of the lower grains on the panicle.

**Ratoon Crop Results** - *Drain timing and pre drain N* – The affects of drain timing carry
forward in the ratoon crop. Early MC draining hastened MC maturity but it delayed the RC.
Draining at 15 days after 5% heading in the MC caused the MC to mature by about 10 days but
delayed the RC maturity by 11 days. Thus, the total crop duration was essentially unchanged.
Pre drain N did not affect RC maturity. The highest RC yield was obtained when the MC was
drained at 25 days after 5% heading in the MC. Earlier drains reduced the RC yield by as much
as 750 lb/ac. The application of pre drain N to the MC reduced the RC yield. This is contrary to
earlier research with Lemont.

**Between crop dry period** – Earlier research with Lemont had shown that the duration of the dry
period between the MC drain and RC flood would affect many parameters of the MC. The
timing of the dry period can also be important. The 20E dry period started at 10 days earlier (15
days after 5% MC heading), which reduced the yield by about 750 lb/ac in the RC. In the earlier
research with Lemont the optimum dry period was 15 to 20 days for RC yield. The optimum dry
period is not as well defined by this single year’s data. The clear message from this year is do
not interrupt the dry period with a flush. A flush can reduce the RC yield by as much as 1200
lb/ac. The dry period can also affect the milling yield. The optimum dry period for RC milling
would appear to be 20 to 25 days. The optimum dry period for Lemont milling was 10 to 15
days. A flush reduced the RC whole milled grain by about 2.5%.

**Water management** – The water management treatments were:

- **D15Hvst** – drain 15 days after 5% MC heading and flood immediately after harvest.
- **D15Hvst+10** – drain 15 days after 5% MC heading and flood 10 days after harvest.
- **D15FlshHvst+10** – drain 15 days after 5% MC heading and flush immediately after
  harvest then flood 10 days after harvest.
- **D20Hvst** – drain 20 days after 5% MC heading and flood immediately after harvest.
- **D20Hvst+10** – drain 20 days after 5% MC heading and flood 10 days after harvest.
- **D20FlshHvst+10** – drain 20 days after 5% MC heading and flush immediately after
  harvest then flood 10 days after harvest.
- **D25Hvst** – drain 25 days after 5% MC heading and flood immediately after harvest.
- **D25Hvst+10** – drain 25 days after 5% MC heading and flood 10 days after harvest.
- **D25FlshHvst+10** – drain 25 days after 5% MC heading and flush immediately after
  harvest then flood 10 days after harvest.

It seems strange that the longer the flood is held on the MC the earlier the RC matures. The RC
matured the earliest when the MC was drain 15 days after the initiation of heading and the RC
was flooded immediately after harvest. All other water management treatments delayed maturity by as much as 11 days. Even though the MC matured earlier when the flood was drain 15 days after the initiation of heading and the RC would have been flooded and fertilized earlier, this treatment delayed RC maturity. Flushing the RC and delaying flooding reduced the RC yield by at least 700 lb/ac. The yield patterns are confusing at this point and do not agree well with prior research with Lemont. It will be better to look at multiple years before defining the absolute best management. Draining 25 days after initiation of MC heading and flooding immediately after harvest was among the top treatments as in prior studies. The obvious things not to do are drain at 15 days after initiation of MC heading and flushing at harvest. Water management can also influence RC whole milled grain. Flushing at harvest reduces RC whole milled grain by at least 2%. Draining the MC early also reduced the RC whole milled grain by at least 2%. For RC, the most consistent message from the research to date are do not drain at 15 days after initiation of MC heading and do not flush the RC crop. The maximum TC yield was obtained when the MC was drained at 25 days after initiation of MC heading and the RC was flooded immediately after MC harvest. Flushing reduced the TC yield by up to 1500 lb/ac. Delaying the RC flood by 10 days was better than flushing.

- **Nitrogen management** – The effect of N management treatments were:

  - 70 – 70 lb/ac of N applied Urea in a single application preflood.
  - 35_35_0 – 70 lb/ac of total N with 35 lb/ac applied 10 days after initiation of MC heading as ammonium sulfate and 35 lb/ac of N applied Urea applied preflood.
  - 0_35_35 - 70 lb/ac of total N with 35 lb/ac of N applied Urea applied preflood and 35 lb/ac applied as ammonium sulfate at 20 days after RC flood establishment.
  - 100 – 100 lb/ac of N applied Urea in a single application preflood.
  - 35_65_0 – 100 lb/ac of total N with 35 lb/ac applied 10 days after initiation of MC heading as ammonium sulfate and 65 lb/ac of N applied Urea applied preflood.
  - 0_65_35 - 100 lb/ac of total N with 65 lb/ac of N applied Urea applied preflood and 35 lb/ac applied as ammonium sulfate at 20 days after RC flood establishment.

The highest yields were obtained with single applications and the higher N rates. Splitting the 70 lbs resulted in the lowest yields. Whole milled increased with the higher N rate. There was no distinct advantage to splitting the 100 lbs. TC yield pattern was similar to the RC yield pattern. The highest yields were obtained with single applications and higher rate exhibited a slight yield advantage. All splits yielded lower to the single 100 lb/ac treatment. Spitting the 70 lbs with a pre drain application was the least efficient N treatment.
III Objective 2: Evaluate the efficacy and economics of weed management systems using current commercial herbicides in early and late season treatments alone and in all combinations.

Economics of Effective Weed Control in Texas


Effective weed control and the associated cost is a primary issue with Texas rice producers. Weeds reduce rice yields and grain quality. The objective of this research was to determine the effective weed control and the associated cost using selected commercially available herbicide programs. Studies were conducted near Beaumont, Eagle Lake, and Ganado, Texas. The Beaumont site is located in Jefferson County on a League c, the Eagle Lake site is located in Colorado County on a Nada fsl, and the Ganado site is located in Jackson County on an Edna fsl. Cocodrie rice was planted on 9 April at Eagle Lake, 10 April at Ganado, and 15 April at Beaumont. At Eagle Lake and Ganado, rice was drill seeded to moisture (approximately 2 cm deep) then culti-packed prior to the preemergence application. At Beaumont, the rice was drill seeded to a depth of approximately 1 cm, then culti-packed prior to the preemergence application. The plots were then flushed to facilitate soil seed contact and germination. Rice was flush irrigated as necessary from this time until flood establishment at 6-leaf or 1-tiller. Fertility management was uniform across all plots and followed normal recommendations. Icon seed treatment was used for water weevil control. No other insect or disease controls were required. Five commercial early season herbicides treatments and six commercial pre-flood herbicides treatments were selected for evaluation. Untreated checks were included to evaluate weeds species present and relative pressure. Applications were made preemergence, early postemergence, or late postemergence (pre-flood) based on the herbicide labels. The study was a split plot design with four replications. The late postemergence treatments were the main plots and the preemergence and early postemergence treatments were the subplots. Applications were made with a carbon dioxide back pack sprayer in a carrier volume of 187 l/ha. All combinations of the early and late treatments were evaluated for crop injury and weed control at each location. Ratings were taken at 7 d intervals starting 7 d after the application until flood establishment. Then ratings were taken at 14 d intervals until 5% heading in the rice. Average herbicide and application costs were determined by surveying eight dealers.

Rice was harvested when the rice was between 18 to 20 % grain moisture and grain yield was calculated on 12 % grain moisture basis. Effective weed control was evaluated by; 1) no significant yield reduction based on LSD (0.05) or 2) herbicide programs providing greater than 90 % weed control for most of the rating period.

At Eagle Lake, the only rice injury occurred with Command applied preemergence. Injury ranged from 8 to 14 % and was not detectable at 14 d. The dominate weed at Eagle Lake was broadleaf signalgrass with moderate pressure from annual sedge. Rice yield was not reduced using 21 of the 30 herbicide treatment programs. There was close agreement between the two evaluations systems. The only single applications not resulting yield reductions were Bolero + Propanil early postemergence and Clincher applied late postemergence. Nineteen herbicide programs resulted in at least 90 % weed control for at least three of the rating periods. These 19 were included in the 21 programs not reducing yield. The cost of the 21 programs ranged from
about $31 to $93 per ac as yields ranged from 6950 to 7850 lb/ac.

At Ganado, the only rice injury occurred with Command applied preemergence. Injury ranged from 8 to 14 % and was not detectable at 14 d. Broadleaf signalgrass control was evaluated. Yield was not significantly reduced by 23 of the 30 herbicide programs. This was in close agreement with the 90 % control method. No late post emergence application alone provided effective weed control. Single applications of Command preemergence and early postemergence applications of Command, Bolero + Propanil and Bolero+Propanil+Facet all provided effective weed control. The cost of the 23 programs ranged from about $31 to $93 per ac as yields ranged from 6850 to 7660 lb/ac.

At Beaumont, 10 to 12 % rice injury was obtained with early postemergence applications of Bolero+Propanil and Bolero+Propanil+Facet. This injury was detectable during the first two ratings. The weed spectrum was more complex with barnyardgrass, hemp sesbania, and annual sedge. Rice yield was not significantly reduced using 19 of the herbicide programs. No single application at late postemergence provided effective control. Single early postemergence applications of Bolero+Propanil and Bolero+Propanil+Facet resulted in no significant yield reduction. There was reasonable agreement between the two evaluation systems. The cost of effective control ranged from about $28 to $93 per ac as yields ranged from 6700 to 7500 lb/ac.

IV Objective 3: Evaluate the influence of growth stage and soil moisture on alligatorweed control with DE638 and Regiment applied alone and in combination with several commercial herbicides.

Alligatorweed [Alternanthera philoxeroides (Mart.) Griseb.] Control in Rice with DE-638.

J.H. O’Barr, G.N. McCauley, J.M. Chandler and V.B. Langston,

ABSTRACT

DE-638 (penoxsulam) was evaluated near Eagle Lake and Rock Island, TX for alligatorweed [Alternanthera philoxeroides (Mart.) Griseb.] control in rice. Applications were made at two timings; early post emergence (EPOST) at the rice three leaf stage with alligatorweed 3-5 inches tall, and late postemergence (LPOST) when rice was at the five leaf stage and alligator weed 6-8 inches tall. DE-638 was applied at 0.027 lbs active ingredient (ai)/acre (A) alone and in combinations with 2 lbs ai/A Stam and 0.5 pints/A Grandstand EPOST and with 4 lbs ai/A Stam and 0.67 pints/A Grandstand LPOST. A tankmix of Stam/Grandstand without DE-638 was also evaluated at each timing. DE-638 alone provided greater than 80% alligatorweed control. Addition of Grandstand to DE-638 improved alligatorweed control to better than 93%. A tankmix of DE-638 with Stam provided less than 50% control. A tankmix of Stam/Grandstand without DE-638 provided about 20% control. Moisture was critical for good weed control and efficacy increased when soil was moist prior to herbicide application.
Regiment Effect on Rice Growth and Yield


ABSTRACT

Field research was conducted in 2003 to evaluate the effects of Regiment (bispyribac-sodium) on rice growth and yield. Experiments were conducted at the Texas Agricultural Experiment Station Research and Extension Centers near Beaumont and Eagle Lake, TX. Each experiment was conducted as a randomized complete block and treatments were replicated four times. Treatments of Regiment were applied early postemergence (EPOST), preflood (PREFL) and postflood (POSFL) alone; EPOST followed by (fb) PREFL or POSFL; and PREFL fb POSFL. Regiment rates were 0.020, 0.025, and 0.030 lb ai/A for all EPOST, PREFL, and POSFL applications, respectively. An EPOST combination of Stam, Bolero and Facet was applied for comparison. A weedy check was included at Beaumont; however, a blanket application of Command was applied in Eagle Lake to provide season long weed control throughout the study. Rice was visually evaluated for stunting, and plant samples were measured biweekly for root and shoot length and dry weight. Yield was determined by mechanically harvesting the center 4 rows of each 6-row plot.

All Regiment combinations, except for the POSFL treatment, injured rice 10 to 15% at 14 days after treatment (DAT) of PREFL at Beaumont. By 34 DAT rice had recovered from injury, with the exception of Regiment POSFL (10%). At 5 DAT in Eagle Lake, only treatments that included a PREFL application caused injury (26-30%). By 42 DAT rice injury had diminished to 5% or less. Root length decreased proportionally with increasing total amount of Regiment applied in Beaumont at 14 DAT preflood. By 42 DAT root stunting had diminished and did not differ between treatments. Root weight at Beaumont, 14 DAT, was significantly reduced by EPOST and EPOST fb PREFL applications. Root weight with the EPOST treatment remained significantly lower at 42 DAT but root weight with the EPOST fb PREFL treatment had recovered. At 14 DAT in Eagle Lake only the single PREFL application significantly reduced root weight. At 42 DAT, there were no significant differences among root weights, regardless of rate or timing of applications.

Shoot length at Beaumont 14 DAT did not differ from the control, with the exception of Regiment EPOST fb PREFL. There were no differences in shoot length at 42 DAT. Regiment applied EPOST and EPOST fb PREFL reduced shoot weight at 14 DAT, but shoot weight had recovered by 42 DAT. There were no differences in shoot weight detected in Eagle Lake, at either evaluation date. Rice yield at Beaumont did not significantly differ among Regiment treatments, and all herbicide treatments yielded higher than the weedy check. Rice yields with Regiment at Eagle Lake were not different from the weed-free check. The only yield reduction with Regiment treatments occurred with Regiment PREFL (6499 lb/A) compared to Regiment EPOST (7320 lb/A).

In conclusion, Regiment application, especially at the PREFL timing injured rice up to 30%. Root injury, expressed as root length and weight, increased with Regiment rate.
treatments had little effect on shoot length and weight. Rice injury had diminished by harvest, and, in general, rice injury did not translate into yield reductions.

V  **Objective 4: Assess control of perennial grasses (perennial barnyardgrass and *Paspalum* species) with commercial and experimental herbicides.**

Working with County Extension Agents and Consultants no fields could be located with paspalum. Fields with paspalum in the last rotation and off season had none this year. Attempts to locate fields with perennial barnyardgrass in Jefferson County were also unsuccessful. The producer had eliminated the problem at the only confirmed infestations with increased cultivation during the summer prior to planting.

VI  **Objective 5: Evaluate fall and spring vegetation management prior to planting in a reduced tillage system.**

Studies has been initiated at Eagle Lake and Beaumont. The first and second applications have been made. Several ratings have been made. No data is available at this time.

VII  **Objective 6: Determine the impact of tillage intensity in rice production systems on the level of weed management inputs required to optimize control.**

Studies has been initiated at Eagle Lake and Beaumont. The first and second applications have been made. Several ratings have been made. No data is available at this time.

VIII  **Objective 7: Evaluate and correct the weed science information presented in the Texas Rice Production Guidelines. Establish cooperative research with commercial industry to accomplish this task.**

In the 2005 Rice Production Guidelines, the weed management, cutting height, and some water management sections have been revised. The herbicide-weed species table has been updated. In 2004, 34 cooperator studies were conducted with commercial industry at the three locations with a total of 1,140 plots. Grant funds from these studies were used to pay part time workers, purchase a new 9 row reduced tillage plot drill for Eagle Lake, and two electric carts to reduce the on station miles of the large trucks. The drill will be used to plant all studies at Eagle Lake and Ganado that have a ratoon component.
Rice Response to Clomazone as Influenced by Soil Type and Planting Date


ABSTRACT

Preemergence weed control in rice is an important component of a successful weed control program in rice (Oryza sativa). Grasses such as barnyardgrass [Echinochloa crus-galli (L.) Beav.] and broadleaf signalgrass [Brachiaria platyphylla (Griseb.) Nash] are two of the most predominate species in Texas rice production systems. Clomazone, a carotenoid biosynthesis inhibitor, is a low cost and effective preemergence herbicide that effectively controls these species. However, clomazone has the potential to cause significant rice injury under various edaphic and environmental conditions.

The objectives of this research were to better understand rice response to clomazone as influenced by soil type, clomazone rate, and planting date. Field studies were conducted in 2002-2003 in a silty clay loam soil near Beaumont, and fine sandy loam soils near Eagle Lake and Ganado, Texas. Four rates of clomazone were applied at 0.2, 0.3, 0.4 and 0.5 lbs active ingredient/A at three planting dates March, April, and May 15 at each location. Season long visual injury ratings and yield were collected. The type and duration of injury differed with each of the planting dates. Bleaching duration was greatest with March plantings with bleaching visible for 40 DAT. The intensity and duration of injury was least with the April plantings. May plantings resulted with high injury with stand reductions up to 20% at Eagle Lake. This injury was short lived in the surviving rice. Rice injury increased with clomazone rate as expected. Injury was greater on fine sandy loam soils. No significant differences in yields were noted at each planting date, however delaying planting to May caused a significant reduction in yield. Our data suggests that injury can be minimized for a fine sandy loam soil in Texas by planting in mid March at a rate of 0.3 to 0.4 lbs ai/A clomazone. For silty clay loam soils, planting in April, and applying 0.5 lbs ai/A clomazone would provide the least injury.

Imazethapyr Photodegradation in Rice Paddy Water


ABSTRACT

With the introduction of imidazolinone tolerant rice varieties, imazethapyr has become a potential herbicide for red rice control in cultivated rice. Little is known about the behavior of this herbicide in the aquatic rice environment, particularly the effects of water quality. Since changes in turbidity, nutrients and other water quality parameters may affect the persistence of chemicals in an aquatic environment, data about imazethapyr dissipation in a rice field warrants further study. A laboratory experiment was conducted in 2004 to evaluate the photodegradation of imazethapyr in three rice paddy waters. Paddy water samples were collected from three locations, including Beaumont, TX (BM), Clarksdale, MS (CD) and Eagle Lake, TX (EL). Deionized water (DW) buffered at pH 7.0 was also included in the study as a control. All water samples were fortified with imazethapyr at 15 μg/ml and subjected to irradiation with UV lamps.
(100 W) for 0, 1, 2, 6, 12, 24, 48, 72 and 96 hours at 25ºC in a growth chamber. The experiment was conducted as a randomized block design with four replications. To calculate half-life, for each water source the logarithm of the remaining herbicide concentration was plotted against time in hours. The slope of the line $k$ (rate constant) was calculated using least square regression. Rate constants were compared between water samples using the Fisher’s Protected LSD test at $p \leq 0.05$. The results showed that the half-life of imazethapyr was different among water samples. The order of imazethapyr photodegradation was $DW = EL > BM = CD$. Differences in degradation rates correlate well with the relative light attenuation of the water samples and to water pH.

Acetolactate Synthase (ALS) Activity in Red Rice Ecotypes (*Oryza* spp.) and Imidazolinone Tolerant/Resistant Rice Cultivars (*Oryza sativa*) in Response To Imazethapyr Treatments


**ABSTRACT**

Imazethapyr has been effective in controlling red rice in imidazolinone tolerant rice. However, some red rice ecotypes have demonstrated some tolerance to imazethapyr including the black hull TX 4. An experiment was conducted to determine if three red rice ecotypes including LA 5, MS 5 and TX 4 have acetolactate synthase resistant to imazethapyr. Three red rice ecotypes (LA5, MS5 and TX4) were compared with a tolerant (‘CL-121’), a resistant (‘CL-161’) and a conventional (‘Cypress’) rice variety. Based on enzymatic activity, the mean $I_{50}$ values were 1.5, 1.1, 1.5, 1.6, 20.8 and 590.6 μM of imazethapyr, respectively, for LA 5, MS 5, TX 4, Cypress, CL-121 and CL-161. Based on these values, CL-161 was the most resistant of the plants tested and was 32 times more resistant than CL-121 and approximately 447 times more resistant than the average of the red rice ecotypes and ‘Cypress’. The results indicated that CL-161 resistance is probably due to an altered ALS enzyme. The red rice ecotypes did not differ from the Cypress cultivar and showed high susceptibility to imazethapyr when compared with the tolerant CL-121 and the resistant CL-161. This demonstrates that resistance to ALS-inhibiting herbicides has not yet developed in these red rice ecotypes as far as enzyme activity is concerned. Other mechanisms may be causing resistance such as increased herbicide metabolism or differential absorption and translocation.

The Effect of Flooding Time on Red Rice Control With Newpath™

Applied at Different Rice Stages

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**ABSTRACT**

Newpath™ (active ingredient imazethapyr) is a new tool to control red rice in commercial rice production. It can provide good control of red rice, but evaluation of flooding time on red rice
control is needed to more effectively use this herbicide. Field studies were conducted at the Texas Agricultural Experiment Station at Beaumont in 2002 to evaluate the effects of flooding time on red rice control with Newpath™ applied at different rice stages. The experiment was conducted as a factorial in randomized block design with four replications, with the flooding time as a main factor and Newpath™ application stage as a secondary factor. Newpath™ was applied in preemergence (PRE) at 4 oz/A followed by 4 oz/A in postemergence (POST) at two rice stages. The rice stages were 2 to 4 leaf and 5 to 6 leaf. The flooding times were 1, 7, 14 and 21 days after herbicide treatment DAT. One untreated check was added for each combination of flooding time and application stage. The imidazolinone tolerant rice variety planted was ‘CL-161’. Data collected included initial rice plant stand, visual rice plant injury, and visual red rice control at 14, 21 and 28 days after treatment (DAT) as well as rice grain yield at the end of the season. The results showed that Newpath™ at 4 oz/A (PRE) followed by 4 oz/A (POST) did not significantly injure the ‘CL-161’ rice variety. There was no interaction between Newpath™ application timing and flooding time for rice grain yield. Rice grain yield was reduced when flooding was delayed 21 DAT. The application of Newpath™ increased rice grain yield regardless of application timing. There was no interaction between application timing and flooding time with respect to red rice control evaluated at 14 and 21 DAT. Red rice control was reduced when flooding was delayed until 21 DAT. Red rice control was also reduced when Newpath™ was applied at the 5- to 6-leaf stage compared with the 3- to 4-leaf stage. A significant interaction between Newpath™ application timing and time of flooding was apparent for red rice control evaluated 28 DAT. When Newpath™ was applied at the 3- to 4-leaf stage, flooding could be delayed until 14 DAT without adversely affecting red rice control. However, the best control was achieved when the rice flood was done within 7 DAT when the herbicide was applied at the 5- to 6-leaf stage.