Problems with glyphosate-resistant (GR) Italian ryegrass escalated during 2016 in Mississippi. In my opinion, last year was the worst to date for this weed. The reasons why can be debated, but the fact is GR Italian ryegrass has spread at an alarming rate across Mississippi, especially considering Italian ryegrass seed are not spread by wind.

Across the Mississippi Delta, the weather over the 5 to 6 weeks has allowed for extensive field preparations for 2017 behind corn, soybean, rice, and even cotton in some cases. The lack of rainfall during September and early October also prevented excessive weed germination following harvest. The best chance for reliable GR Italian ryegrass control is with residual herbicides applied in the fall. The following paragraphs contain management suggestions for 2016-17.

Apply residual herbicides when weather permits between mid-October and mid-November.

In years past, research has demonstrated that September or early-October is too early to apply a fall residual herbicide for GR Italian ryegrass. Fields should not be treated with a fall residual until at least the latter half of October to maintain control through the fall emergence window, which usually ends during mid-December. In previous years, applications in early-November provided excellent GR Italian ryegrass control until spring burndown. Most fields are currently so dry that at least one rainfall event is needed prior to application of fall residual herbicides, which will greatly improve efficacy. The probability of good days for field work decline later in the fall, so monitor the 10-day weather forecast over the next couple of weeks and apply a residual herbicide as appropriate.

Boundary, Command, s-metolachlor, trifluralin, and Zidua have performed most consistently for controlling GR Italian ryegrass. S-metolachlor or Zidua could be utilized in fields that will be planted to corn, cotton, or soybean the following year. Boundary may be safely applied if the field will be planted in corn or soybean, and trifluralin could be utilized in fields slated for cotton or soybean. In fields where the 2017 crop will be rice, Command (2 pints per acre) is the only fall residual herbicide option.

Control emerged GR Italian ryegrass in the fall with aggressive tillage or application of paraquat.

None of the residual herbicides available for GR Italian ryegrass offer postemergence activity. Should the current weather pattern change and GR Italian ryegrass begin emerging, these emerged plants must be controlled before the residual herbicide is applied. If the field has not already been tilled in preparation for next year, then the first flush could be destroyed during that tillage operation. When relying on tillage to control emerged GR Italian ryegrass, pay close attention to the clods behind the disk. To completely kill GR Italian ryegrass seedlings, the clods must be crumbled and not just turned over. Emerged GR Italian ryegrass will survive on the clods if they are not sufficiently crumbled.

Destroying GR Italian ryegrass with tillage in the fall may require an additional, unplanned pass across the field, so
controlling emerged plants paraquat may be a better option. Because GR Italian ryegrass seedlings are small, the paraquat rate does not need to be as high as required in the spring. Paraquat is recommended at 1 lb active ingredient/acre in the spring while 0.5 to 0.75 lb active ingredient/acre should be sufficient to control GR Italian ryegrass in the fall. Paraquat may be tank-mixed with Boundary, Command, s-metolachlor, or Zidua. If you choose to use trifluralin and emerged GR Italian ryegrass has been completely destroyed by tillage, then paraquat should not be required.

Regardless of how you choose to control emerged GR Italian ryegrass in the fall, this is an absolutely critical component of the management plan and should not be overlooked. The effective fall residual herbicides will not kill even the smallest emerged GR Italian ryegrass seedlings. Escapes of just a few scattered one- to two-leaf seedlings in October will tiller and expand into large clumps in the spring, potentially resembling herbicide failure.

**Manage GR Italian ryegrass on ditch banks, turn rows, and field borders.**

Where GR Italian ryegrass was only present on the turn rows or edges of the field last year, spot-treating these areas is a practical way to save on herbicide cost and possibly prevent the problem from becoming more severe in the future. You may choose to wait and spray field borders and turn rows with clethodim (Select Max or various two-pound clethodim products) or paraquat after GR Italian ryegrass emerges. Another option would be treating these areas with a residual herbicide in the fall. Either of these practices could be an economical option in fields not completely covered with GR Italian ryegrass. Be cautious if you choose to spot-treat areas with a residual herbicide. Italian ryegrass has extremely stiff straw that does not rapidly deteriorate, so it is not uncommon to see GR Italian ryegrass residue complete with seed still standing in the fall. This seed from the previous year can be spread by a combine or it may spread into the field where land planes or dirt buckets were utilized.

In fields with severe GR Italian ryegrass infestations, management must include both fall and spring control tactics. One benefit of fall management, whether it is a residual herbicide application or tillage, is keeping the GR Italian ryegrass population low enough for good spray coverage during spring burndown. For a comprehensive GR Italian ryegrass control program, see Mississippi State University’s Information Sheet 1359 “Herbicide Programs for Managing Glyphosate-Resistant Italian Ryegrass”. (Appended below)
Control Italian Ryegrass Early

By Jason Bond, MSU-DREC Research/Extension Weed Specialist

Control failures with clethodim on glyphosate-resistant (GR) Italian ryegrass were common across the entire Delta, not just Mississippi, in 2016. With some exceptions, GR Italian ryegrass was larger during the early application window (January to early February) in 2016 than in previous years due to mild weather during late fall and early winter. Also, GR Italian ryegrass plants were stressed at the time of application from a prolonged period of wet weather. Although it is wet in most areas right now, saturated conditions have not persisted as they did during the winter of 2016. However, this could change quickly.

Early burndown applications with clethodim generally work slowly (5 to 6 weeks for optimum effect), so making the application as early as possible has several benefits. Without fail, smaller weeds are easier to kill. Currently, most of the GR Italian ryegrass I have seen in the Mississippi Delta is still at a manageable size. However, the warm temperatures could stimulate rapid growth. In addition to GR Italian ryegrass still being relatively small, the “spring flush” has not begun. Lastly, making an early burndown application in January or early-February for GR Italian ryegrass allows time to determine how well the first application worked and flexibility in deciding how to control escapes.

An early burndown targeting Italian ryegrass is more critical in fields to be planted to corn than those that will be planted to other crops. The window for burndown herbicide application is shortened in corn because of the early planting dates. Due to the competitive nature of Italian ryegrass, it is essential to control this weed prior to planting corn. Clethodim must be applied at least 30 days prior to planting corn. If the clethodim application for GR Italian ryegrass was not timely, then corn planting may have to be delayed to avoid crop injury.

An early burndown application with GR Italian ryegrass as a target should include the maximum rate of glyphosate plus 16 ounces of Select Max or 8 ounces of 2-lb clethodim formulation. Auxin herbicides like 2,4-D and/or dicamba may be added to the herbicide mixture if the maximum rate of clethodim is utilized. Italian ryegrass that escapes the early burndown application of clethodim should be treated with paraquat (3 to 4 pints of Gramoxone SL or 2 to 2.67 pints of 3-lb paraquat).
Herbicide Programs for Managing Glyphosate-Resistant Italian Ryegrass in Mississippi

Jason A. Bond and Thomas W. Eubank

Herbicide Programs to Manage Resistant Italian Ryegrass.\(^1\)

<table>
<thead>
<tr>
<th>Crop</th>
<th>Fall(^2)</th>
<th>Winter(^4,5)</th>
<th>Spring(^6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn</td>
<td>S-metolachlor(^*) at 1.27 lb/A of active ingredient or Boundary at 2 pt/A or Zidua at 2.5 oz/A or double disk</td>
<td>Clethodim at 0.094–0.125 lb/A of active ingredient</td>
<td>Paraquat(^*) at 0.75–1 lb/A of active ingredient or two applications of paraquat spaced 10–14 days apart</td>
</tr>
<tr>
<td>Cotton</td>
<td>S-metolachlor(^*) at 1.27 lb/A of active ingredient or Zidua at 2.5 oz/A or trifluralin at 1.5 lb/A of active ingredient or double disk</td>
<td>Clethodim at 0.094–0.125 lb/A of active ingredient</td>
<td>Paraquat(^*) at 0.75–1 lb/A of active ingredient or two applications of paraquat spaced 10–14 days apart</td>
</tr>
<tr>
<td>Soybean</td>
<td>S-metolachlor(^*) at 1.27 lb/A of active ingredient or Boundary at 2 pt/A or Zidua at 2.5 oz/A or trifluralin at 1.5 lb/A of active ingredient or double disk</td>
<td>Clethodim at 0.094–0.125 lb/A of active ingredient</td>
<td>Paraquat(^*) at 0.75–1 lb/A of active ingredient or two applications of paraquat spaced 10–14 days apart</td>
</tr>
<tr>
<td>Rice</td>
<td>Command at 2 pt/A or double disk</td>
<td>Clethodim at 0.094–0.125 lb/A of active ingredient</td>
<td>Paraquat(^*) at 0.75–1 lb/A of active ingredient or two applications of paraquat spaced 10–14 days apart</td>
</tr>
</tbody>
</table>

(1) Glyphosate-resistant Italian ryegrass is prevalent across much of Mississippi. This guide is to help aid producers in the management and/or prevention of Italian ryegrass. Intensive scouting is necessary to determine if control options employed have failed. **Timely applications are critical in controlling escaped populations.**

(2) The most effective residual glyphosate-resistant Italian ryegrass control has been achieved when residual herbicides are applied from mid-October to mid-November. **Paraquat** (Gramoxone SL at 2–3 pints per acre or the 3-pound paraquat formulation at 1.33–2 pints per acre) plus surfactant should be added to soil residual herbicides if glyphosate-resistant Italian ryegrass is emerged before application.

(3) The S-metolachlor rate should be increased to 1.6 pounds per acre of active ingredient on heavier-tex-
tured soil. When applying a product that contains meto-
lachlor (Parallel PCS, etc.), the rate should be increased
by 25%.

(4) Winter applications should be made from mid-January
to mid-February and applied when glyphosate-resistant
Italian ryegrass is no more 4–6 inches tall.

(5) Preplant applications of Clethodim (Select Max, Arrow,
Volunteer, etc.) should be made at least 30 days before
planting corn or rice. The higher rate of Clethodim
should be used if no residual herbicide was applied in
the fall. **Multiple applications of Clethodim targeting
glyphosate-resistant Italian ryegrass are discour-
gaged due to the potential for resistance development.**

(6) Spring applications should be made from March 1 to
March 20 based on careful scouting for emerged
glyphosate-resistant Italian ryegrass. **Postemergence
herbicide options for Italian ryegrass are limited
following corn emergence. Italian ryegrass should
be controlled before planting corn.** Spray coverage is
critical for weed control with contact herbicides such as
paraquat. Be sure to use a spray nozzle (flat fan, twin
jet, etc.) that will ensure thorough coverage of the
weed. Avoid use of AI (air induction) nozzles with con-
tact herbicides.

(7) Research indicates that the addition of atrazine (corn) at
1 quart per acre, metribuzin (soybean) at 4 ounces per
acre, or diuron (cotton) at 1.5 pints per acre will
increase efficacy of paraquat against glyphosate-resis-
tant Italian ryegrass. Sequential applications should be
based on careful scouting for emerged glyphosate-
resistant Italian ryegrass.
By Jason Bond, MSU-DREC Research/Extension Weed Scientist  2/17/2017

Controlling glyphosate-resistant (GR) Italian ryegrass is expensive. The most successful management programs require multiple passes across the field and cost approximately $40 to $44 per acre according to the Mississippi State University crop planning budgets. Spending that amount of money on management of one weed species when no crop is present in the field is hard to justify.

Data generated at the Delta Research and Extension Center indicate that corn and rice are the most sensitive to interference from GR Italian ryegrass. While cotton and soybean are negatively affected by interference from GR Italian ryegrass, they are less sensitive than corn and rice. Poor stand establishment and early-season growth has been observed in all four crops, even when 100% GR Italian ryegrass control is achieved before planting. In soybean, no yield reductions were detected due to the presence of GR Italian ryegrass; however, soybean maturity was delayed 17 days in plots containing GR Italian ryegrass residue compared with weed-free plots. Lengthy delays in maturity have negative implications for harvesting scheduling and logistics.

The question of using spring tillage to control GR Italian ryegrass is common this time of year. Tillage when Italian ryegrass is small (fall through January where possible) can be an effective control tactic because an implement such as a disk can successfully bury small plants that have not yet developed a massive root system. However, tillage in the spring (late-February to March) with the intent of controlling GR Italian ryegrass is nearly futile.

Once temperatures begin to warm, Italian ryegrass enters a phase of rapid growth, similar to wheat. Italian ryegrass has an extensive fibrous root system. If established and rapidly growing plants are uprooted with a disk, they will generally re-root following the next rainfall. For maximum effectiveness against GR Italian ryegrass, spring tillage would require two to three trips with a disk followed by a harrow to remove soil from the roots. After those multiple trips across the field, a portion of the Italian ryegrass may die if it does not rain. That level of tillage is not always possible due to soil conditions, and it is certainly often impractical, in the spring in the Mississippi Delta. In many areas, if a field dries sufficiently to make three to four tillage passes, it will be too dry to plant.
A spring burndown herbicide program for GR Italian ryegrass should include the maximum rate of glyphosate plus 16 ounces of Select Max or 8 ounces of 2-lb clethodim formulation. Auxin herbicides like 2,4-D and/or dicamba may be added to the herbicide mixture if the maximum rate of clethodim is utilized.

If temperatures remain warm and winter weeds continue to grow rapidly, GR Italian ryegrass will quickly get too large for effective control with clethodim. Paraquat should be used to target GR Italian ryegrass that is > 8 to 10 inches. Large GR Italian ryegrass (12 to 24 inches) will require two applications of paraquat (3 to 4 pints of Gramoxone SL or 2 to 2.67 pints of 3-lb paraquat) spaced 10 to 14 days apart. Photosystem II inhibitors such as atrazine, metribuzin or diuron should be added to paraquat applications to maximize control. Choice of Photosystem II inhibitor depends on the crop to be planted.