

## **An IPM<sup>1</sup> Approach to Managing Herbicide Resistant Ryegrass in Northeast Texas**

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### **BACKGROUND**



Annual ryegrass (*Lolium multiflorum*) is the most damaging weed in soft red winter wheat in Northeast Texas. It was originally introduced to this region as a forage plant for grazing, but has spread to crop fields and become a noxious weed. Annual losses from this pest in this region run in the millions of dollars. When the sulfonylurea (SU) herbicides (i.e. Amber, Glean) were developed in the mid 1980's, they provided excellent control of this weed. However, over time, efficacy of the SUs has decreased, causing the weed to reemerge as a difficult problem for area wheat producers.

Hoelon, an ACCase mode of action herbicide, replaced Amber and Glean in the late 1980s, but its efficacy has been declining over the past few years. Axial XL, another ACCase herbicide, was introduced in 2008 and has been the most effective herbicide for the control of annual ryegrass in recent years. Although Axial XL is still providing good ryegrass control in some regional wheat fields, we are beginning to see reduced control with this product in many fields across the region. Zidua, a new herbicide under development by BASF Corporation, has shown promise for controlling herbicide resistant ryegrass as a preemergence application, but it is not labeled at this writing.

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<sup>1</sup> IPM (Integrated Pest Management) is simply a crop management approach that combines cultural, biological, and chemical techniques to produce an economically and environmentally viable outcome.

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## **THE IPM APPROACH**

Wheat can be successfully grown in fields that are infested with herbicide resistant annual ryegrass. Each of the following suggestions will improve the chances of success in infested fields. When all of these tactics are employed together in an IPM approach, the odds of producing a profitable wheat crop are greatly enhanced.

## **CULTURAL CONTROL**

Annual ryegrass populations (both resistant and susceptible) in cropland can be greatly reduced by using cultural and mechanical means in combination with chemical control techniques.

### **Crop rotation**

The most effective management technique to control herbicide resistant annual ryegrass populations is crop rotation. Where resistant ryegrass is observed following a timely Axial XL application, the best option is to rotate that field to another crop for one or two years. The best rotation option appears to be corn, followed by grain sorghum, cotton, and soybeans. Sunflowers may be an additional option but more research needs to be done to ascertain the agronomic viability of sunflowers in this region.

Crop rotation enables growers to attack their ryegrass populations from several angles. First, rotation to summer annual crops allows growers to reduce ryegrass populations that emerge over the fall and winter months with tillage and/or non-selective herbicides. In addition, the introduction of other classes of herbicides into the rotation crop program will further suppress any ryegrass “escapes” from the fall-winter management program.

Sometimes crop rotation is not a good option. Soils with the worst ryegrass infestations in the region are the Crockett and Wilson silt loams. The Crockett series consist of deep, moderately well drained, loamy soils on uplands. They have slopes ranging from 1 to 5 percent. In contrast, The Wilson series consists of deep, poorly drained soils. Wilsons are relatively flat, with slopes in the 0 to 1 percent range. Both of these soil types are often referred to as “greyland” soils.

These soils are best suited to grow wheat and cotton. Grain sorghum has some problems with lodging when grown on these soils, but its drought tolerance would be advantageous. They are too droughty to produce dependable yields of corn and soybeans. Cotton is not a good short term

option for most producers in the region as it requires specialized harvesting equipment. These considerations have made wheat the crop of choice for these greyland soils.

### **Plant Certified Seed**

Plant certified seed or at least clean your bin run seed prior to planting. These are relatively inexpensive ways to keep your ryegrass infestations confined to specific fields, and minimize its spread to non-infested fields. Over the past 30 years, we have seen many fields that became infested with ryegrass from “bin run” wheat seed that had not been cleaned prior to planting.

### **Clean Harvesting Equipment**

Harvesting equipment should be cleaned before moving from infested fields to minimize the spread of ryegrass seed. It would be best to harvest the ryegrass infested fields last.

### **Plant Ryegrass Infested Fields Late**

Ryegrass seed begins to germinate in the fall as soil temperatures cool, and rainfall returns to the region. But not all ryegrass is created equal. Improved ryegrass varieties developed and introduced annually for forage production germinate more uniformly than the native ryegrass (often referred to as “feral” ryegrass) that has evolved from the earliest plantings in the region. Feral ryegrass populations exhibit greater dormancy and have plants that germinate later in the growing season. We used Gulf ryegrass for comparison because the feral ryegrass populations we see today likely evolved from the Gulf introductions of the 1950s. The following table illustrates this phenomenon.

<b>Ryegrass Cultivar</b>	<b>First Flush Percent Emergence</b>	<b>Second Flush Percent Emergence</b>
Certified Gulf Ryegrass	79	21
Feral Ryegrass	44	56

Since the highest percentage of feral ryegrass seedlings emerged late in this study, it stands to reason that late tillage will destroy more of these seedlings.

### **Consider Planting into a Stale Seedbed**

Some local producers have been planting wheat in a stale seedbed with good success. They prepare the seedbed early in the fall, and allow the ryegrass seed in the germination zone to

emerge. Just prior to planting, they spray the field with glyphosate (i. e. Roundup), and then plant the wheat seed. Spraying after planting but before the wheat has emerged is another option.

This practice fits well into a resistant ryegrass management system, when the wheat is planted as late as possible to reduce the ryegrass germination prior to the onset of cold weather. Leaving the soil undisturbed will minimize the movement of additional ryegrass seed into the germination zone. Local ryegrass populations are not as susceptible to glyphosate as they used to be, but it is still effective on seedling ryegrass.

### **Use Row Placed Phosphate Fertilizer**

Research has consistently shown that row placed phosphate fertilizer is one of the best management practices for wheat, as well as other row crops. One pound of phosphate in the row is roughly equivalent to two pounds, broadcast. This is one of the few inputs that can be reduced with no penalty in yield.

This practice is also advantageous in a resistant ryegrass management program. Row placed phosphate is readily accessible to seedling wheat, and it enables the plants to rapidly gain a competitive advantage over seedling ryegrass emerging between the rows. Vigorous, well-nourished seedling wheat plants are very competitive with seedling ryegrass plants. This early advantage to wheat is critical, as ryegrass becomes more competitive as the growing season progresses.

### **Plant an Earlier Maturing Variety**

Late maturing varieties are generally developed in more northern climates, and their progression is determined more by day length than temperature. This “safety mechanism” prevents the plants from jointing too early in mild winters and succumbing to a late freeze in the spring. These varieties spread by tillering in the fall and early winter but do not produce very much early forage. They are designed to spend more of their life span in colder weather, and often under snow cover.

In contrast, earlier maturing varieties are developed in southern breeding programs and their development is often controlled more by temperature than day length. They generally produce more fall and early winter forage, which is desired by livestock producers. It is this same early

forage characteristic that makes these varieties attractive in a resistant ryegrass management program.

Variety	Maturity Group
USG 3120 AGS 2035 Terral LA 841	Early
USG 3555 USG 3201 USG 3409 Syngenta Coker 9553 Syngenta Magnolia	Medium Early
Syngenta Oakes Terral TV 8525	Medium Late
Pioneer 25R30 Pioneer 25R40 Terral TV 8861 USG 3251	Late

We experienced an herbicide failure with Axial XL in our variety study near Royse City last year and it compromised our yield data. However, we were able to measure the competitive advantage that these early varieties have in a resistant ryegrass management program.

Variety	Forage Rating	Number of Ryegrass Seed heads/60 sq. ft.	Yield Bu/A
USG 3555	4.5ab	35.6abc	91.0abc
Coker 9553	4.0bc	20.8ab	87.7abcd
Syngenta Magnolia	4.4abc	16.7ab	84.2bcde
Pioneer 25R40	2.2fgh	115.3d	70.6ghij
Terral 8861	2.5efgh	69.7bc	64.1jk

Forage Rating Scale: 5 = highest forage production, 1 = lowest forage production

Terral 8861 and Pioneer 25R40 were among the highest yielding wheat varieties in our other trials in 2012. However, their slower growth characteristics in the fall and early winter allowed the ryegrass plants a competitive edge in this study. In contrast, the three earlier maturing varieties here (USG 3555, Coker 9553, and Magnolia) produced more early forage, which smothered the ryegrass seedlings. This allowed them to produce higher yields.

## **CHEMICAL CONTROL**

### **Two Step Herbicide Program**

1. Spray Axiom at 6 ounces per acre when ryegrass is in the 1-2 leaf stage of ryegrass development. A good rule of thumb is to spray the wheat crop when you can “row” the wheat. Axiom has both preemergence and postemergence activity, so you want to have the wheat plants emerged before spraying. However, Axiom is most effective on small ryegrass, so the sooner you can apply it after wheat emergence, the better.
2. Apply Axial XL at 16.4 ounces at the 2-3 tiller stage of ryegrass development. In northeast Texas, this normally falls in early to mid-January.

The following varieties have shown good tolerance to the 6 ounce rate of Axiom. Axiom treated wheat produces slightly less early forage, but the plants recover by harvest and produce normal yields:

**USG 3555, USG 3295, USG 3251, Syngenta Magnolia, Syngenta Coker 9553, Syngenta Oakes, Syngenta Jackpot, Terral TV 8525, Terral TV 8861, Terral TV 8558, Pioneer 25R30, Pioneer 25R40, and Pioneer 25R47.**

All of these varieties appear to be safe choices to use with Axiom at 6 ounces. Terral LA 841 was also evaluated in these studies, but it does not appear to be as tolerant to Axiom as the others.

Growers will likely still see some ryegrass plants survive this two-step treatment. However, the ryegrass “escapes” will be suppressed by the wheat crop, and are not visible until after the wheat is headed. Our research has shown these late emerging ryegrass plants are not competitive, and do not significantly reduce grain yields.

Thousands of acres in Northeast Texas were sprayed with the two step program in 2013. Most producers were well satisfied with the results.