JACKLIN SEED by Simplot

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RESEARCH NEWSFLASH

Introducing the...

Gly-Ryes™

Jacklin Seed's Glyphosate-Tolerant Perennial Ryegrasses

by Doug Brede, Ph.D.

Imagine a turfgrass that tolerated the herbicide, glyphosate. Weed control of problem species like *Poa annua* would be a breeze.

The little plot that wouldn't die. A random mutation in this one rye plot out of thousands started the whole process. Despite two full-strength glyphosate applications, plants in this 1999 plot were still alive.

Jacklin Seed is proud to announce the release of the first two in a series of perennial ryegrasses that can tolerate rates of glyphosate that obliterate *Poa annua*. Glyphosate is the active ingredient in Roundup®, Departure®, Buccaneer® and other generic herbicides. Prices of generic glyphosate have taken a nose-dive in recent years, making *Poa* control possible with **Gly-Rye™** for as little as 94 cents an acre!

Glyphosate-tolerant cotton and soybean comprise over 90% of US agriculture. The great thing about **Jacklin's Gly-Rye™** is that it is not a GMO. The tolerance trait was found as a natural mutation and bred into varieties that withstand 8-12 fl. oz. of glyphosate product per acre, applied in summer. Note that all glyphosate formulations differ slightly in concentration so tolerance is better expressed in terms of 0.25 lbs. acid equivalent per acre.

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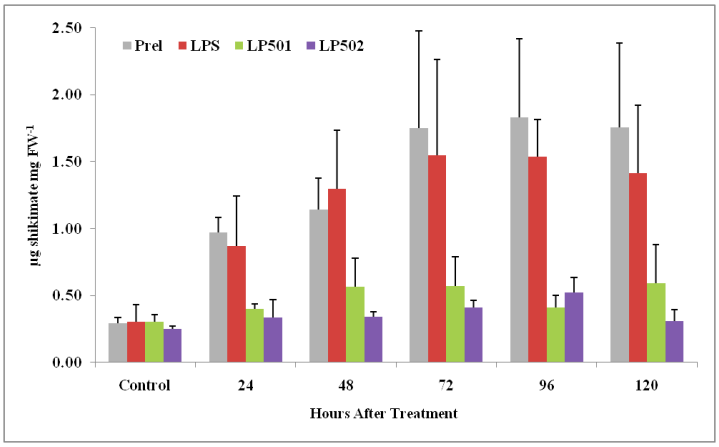
In the breeding nursery it quickly became clear what a breakthrough we had. Sensitive plants died and glyphosate-tolerant ones thrived. It took breeders several years to refine and concentrate two copies of the naturally mutated gene into each plant.

The Science Behind Jacklin's New Gly-Rye™

by Christian Baldwin, Ph.D.

Every year many new turfgrass cultivars come to market with the promise of improved performance. Unfortunately, many of these claims are not backed by scientific research. Therefore, Jacklin Seed enlisted the help of Dr. Carol Mallory-Smith at Oregon State University to prove that **'JS501'** and **'Replay'** are indeed glyphosate tolerant. Dr. Mallory-Smith has an extensive



Shikimate accumulation in fresh tissue of four perennial ryegrass cultivars after glyphosate was applied at a rate of 12 fl oz/A. Vertical bars represent standard error of the means. Prelude and LPS are glyphosate sensitive; LP501 (now 'JS501') and LP502 (now 'Replay') are glyphosate tolerant. Figure courtesy of Dr. Carol Mallory-Smith, Oregon State University.

background with herbicide-tolerant crops, including research on the ill-fated Roundup Ready® bentgrass.

Before diving into this research project, let's back-up and briefly review glyphosate's mode of action in plants. Glyphosate is able to kill plants because it inhibits the EPSPS enzyme (or 5-enolpyruvylshikimate-3-phosphate synthase). This enzyme is important to plants because it is a critical step in the formation of three amino acids. Without these amino acids, a series of events starts which is lethal to plant growth. A by-product of inhibiting EPSPS is the accumulation of a toxic precursor, shikimate-3-P. Glyphosate-sensitive plants show a significant accumulation of shikimate, while tolerant plants will have minimal

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Introducing the Gly-Ryes™ , continued

Throughout 2011 the ***NewsFlash*** will contain update articles on applications and precautions of **Gly-Rye™**. Here are a few questions we've been asked on the new products:

Q: When will Gly-Rye™ be available?

A: Commercial quantities of **'JS501'** and **'Replay'** are available for sale right now, even blue-tag certified.

Q: What does Gly-Rye™ look like as turf?

A: Golf courses that have planted **Gly-Rye™** have been impressed by the color, appearance, seedling vigor, and pest resistance. Quality has been similar to other premium perennial ryegrasses. It looks good enough to grow even if you never spray it with glyphosate.

Q: Is Gly-Rye™ "biotech," or "transgenic," or "GMO" ?

A: No. It originated from a natural mutation that occurred in one plant in 1999. That plant was bred and hybridized to produce varieties with a higher degree of herbicide tolerance and better turf quality. Being non-transgenic means that these varieties have a finite limit in herbicide tolerance and that it is important to stay within our recommended application rates.

Q: How do these grasses differ from crops that are Roundup Ready®?

A: Roundup Ready® crops contain a gene and promoter that were inserted in the laboratory. The gene is from a bacteria and the promoter (which switches on the gene) is from a virus. The virus promoter turns on the gene "full blast 24/7," giving it high levels of glyphosate tolerance. Because **Gly-Rye™** is a natural product, these grasses tolerate a reduced level of glyphosate. And because the promoter is all natural, precautions are necessary under certain weather and growth stage conditions.

Q: What are the precautions?

A: Mature **Gly-Rye™** is safe for glyphosate application at our recommended rates as long as temperatures are above 50° F. Do not apply glyphosate when cold temperatures are in the long-range forecast. **Gly-Rye™** seedlings are safe for glyphosate application, as long as the application is made within 2 weeks of emergence or after 6 week from emergence. Avoid glyphosate application from 3 to 5 weeks after emergence as the seedlings go through a sensitive transition period.

Q: Is this rate of glyphosate high enough to kill *Poa*?

A: Yes, and in most cases with one application. As a matter of fact you should be careful about treating areas with high quantities of *Poa* because you'll end up with open turf.

Q Any other recommendations?

A: Do not blend other (intolerant) varieties with **Gly-Rye™**. Plant **Gly-Rye™** to your whole property but spray only the areas where you need *Poa* control.

Science Behind Gly-Rye™ , continued

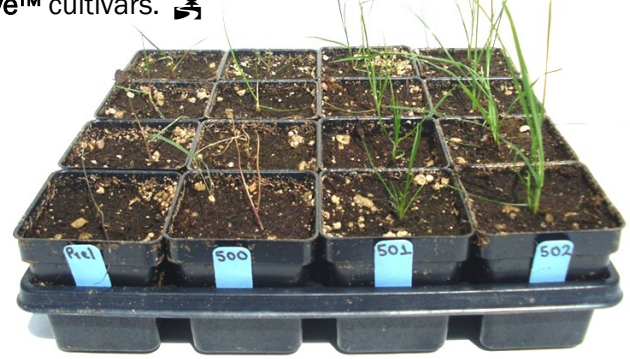
accumulation.

To test the accumulation of shikimate in leaves, perennial ryegrass seedlings were sprayed at the 3 to 4-leaf stage with glyphosate at a rate of 12 fl. oz./A (PowerMax® brand). Leaves were sampled at 0, 24, 48, 72, 96, and 120 hours after the application, and shikimate was measured using a spectrophotometer.

Two glyphosate-sensitive cultivars, Prelude and LPS, were used as controls. Both accumulated around three times more shikimate than **JS501** and **Replay** at 72, 96 and 120 hours after treatment (see graph). Shikimate started to build up 24 hours after treatment in Prelude and LPS, reaching a maximum 72 hours after treatment. **JS501** and **Replay** showed minimal change in shikimate compared with their untreated controls. Replay had the highest level of glyphosate tolerance with virtually no shikimate accumulation after 120 hours.

So what does all this mean? **The data confirm that JS501 and Replay are tolerant to the rate of glyphosate used in this experiment.**

In future issues of the ***Research NewsFlash*** we will include tips on how to manage **Gly-Rye™,** including important safety issues, rates for *Poa annua* control, temperature effects on application rate, tank mixing with other products, maturity tolerance, frequency of application, and how to renovate your existing stand to **Gly-Rye™** cultivars.



Perennial ryegrass injury 14 days following an application of glyphosate at 12 fl oz/A. From left to right: Prelude (glyphosate sensitive), 500 (glyphosate sensitive), 501 (now JS501) and 502 (now Replay). Image courtesy of Dr. Carol Mallory-Smith, Oregon State University.