What Works on Cogongrass and What Does Not: A Summary of nearly 10 years of cogongrass research in Mississippi

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Effective Herbicides for cogongrass control

Imazapyr (Arsenal, Chopper, and generics) and glyphosate (Roundup, Accord, and generics) have been found to be the most effective herbicides for cogongrass control. Other herbicides that we have tested that were determined not to be as effective as these two active ingredients are shown in Tables 1 and 2.

In older studies and recommendations, two soil sterilants, Hyvar X (bromacil) at 18 or 24 lb ai/acre (see 1972 Mississippi State University Cogongrass Control Guideline) and a high-rate mixture of Karmex (diuron) plus imazapyr at 10.3 plus 1.3 lb ai/acre controlled cogongrass better than glyphosate or imazapyr applied alone.

Timing and sequence of glyphosate and imazapyr applications

Both glyphosate as a 2% mixture of Roundup Pro 4L and imazapyr at 24 fl oz/acre of Arsenal 2L (0.375 lb ai/acre) consistently controlled cogongrass using:

- Fall applications (last week of September) and
- Spring applications followed by fall applications (last week of April or first week of May and last week of September)

Control levels of 80% or above have been achieved with these products applied in fall or spring followed by a fall treatment repeated over three growing seasons (Wright 2004-present).

Glyphosate applied in spring provides up to 90% control over summer months, but control typically drops below 40% prior to the next spring application. Cogongrass control with imazapyr applied only in spring requires a longer interval to reach an acceptable level compared to glyphosate applied at the same time. However, when repeated, spring applications of imazapyr reach 80 to 90% control and it remains consistent until the next spring.

Frequency of herbicide applications

Reduced rates of imazapyr (0.0625 or 0.125 lb ai/acre or about 1%) and glyphosate (0.25 or 0.5 lb ai/acre or about 1%) were evaluated as chemical mowing treatments for cogongrass with the goal to maintain 50% growth suppression. The first year of this study, cogongrass required only one application of the high rates of imazapyr per growing season, while all other treatments required two applications. However, in the second year of the study, 2 applications of all treatments were needed to maintain 50% control levels.

Wiper mower and ropewick trials on cogongrass

Cogongrass control was evaluated with herbicides applied through conventional flat fan nozzles at 20 gallons per acre (gpa) and the WetBlade mower at 1 gpa that wicks the herbicide on to the mown grass. Treatments evaluated were imazapyr at 0.125 and 0.25 lb ai/acre, clethodim at 0.125 lb ai/acre (Select), or glyphosate. Roundup Pro and Touchdown IQ formulations of glyphosate with surfactants were applied through nozzles at 4 lb ai/acre or 2%, while the no-surfactant Accord was applied at the same rates through the WetBlade. No herbicide treatment applied with the WetBlade controlled cogongrass as well as conventional hydraulic nozzles.

A 33 or 50% solution of glyphosate or imazapyr was applied with a ropewick applicator to cogongrass in juvenile longleaf pines. Cogongrass was wiped one or two directions to apply single or double rates.

The concentration of glyphosate or imazapyr was not significant nor was the number of applications. While the level of cogongrass control was not as high as normally observed with imazapyr or glyphosate, this method did allow selective application of both herbicides in longleaf pine which are susceptible to injury from either herbicide at normally recommended application rates for cogongrass control.

Surfactant additives to herbicide mixtures

The surfactant, Dyne A Pak, added at 1% of the spray volume, enhanced control of cogongrass with imazapyr applied at rates of 0.125, 0.25, 0.375, 0.5, 0.625 lb ai/acre compared to a nonionic surfactant. As imazapyr rates increased, cogongrass control increased. A significant increase in visual control was only observed at imazapyr rates of 0.375 lb/acre or less after 1 year after treatment, while no significant differences were measured in rhizome biomass for any treatments (Chesser's research 2005 to 2007)

Seedhead suppression with herbicides

Applications of glyphosate at 0.5 or 1.0 lb ai/acre, clethodim (Select) at 0.25 lb ai/acre, imazapic (Plateau) at 0.25 lb ai/acre, sulfometuron (Oust) at 0.09 lb ai/acre, or imazapyr at 0.25 lb ai/acre to cogongrass in dormant or 'boot head' growth stage reduced the number of viable cogongrass seed produced. Trinexapac-ethyl at 0.08 lb ai/acre did not impact the number of seedheads or live seed.

Herbicide and cropping systems for cogongrass suppression

Cogongrass was controlled 60% by no-till drill planted soybean. Control improved to 95% with applications of either 1 lb ai glyphosate or 0.125 lb ai clethodim (Select or Intensity herbicides). However, soybean emergence has been successful at only one location each year (Ivy's research 2004-present).

After two consecutive years of treatment, cogongrass control in a cropping system of Clearfield corn planted as no-till and treated with imazapyr at 0.38 lb ai/acre Arsenal preemergence was statistically similar to cogongrass treated with 0.75 lb ai/acre Arsenal without the Clearfield corn. Wildlife activity as observed by tracks, scat, feeding signs, such as ears broken on stalk and fed upon, empty cobs on ground, etc. and actual animals disturbed indicated wildlife activity (dove, turkey, squirrel, deer, raccoon, rabbit) was much more prevalent in the Clearfield corn than in cogongrass alone (Burns' research 2004-2005).

Mechanical, burning, and herbicide combinations

Cogongrass foliage removal by mowing or burning prior to application of glyphosate at 2.25 lb ai/acre or 0.63 lb ai/acre imazapyr improved visual control one year after treatment. Rhizome biomass was also reduced by all treatments except glyphosate applied after foliage was burned (Myers' research 2004-2006).

Mechanical control trials on cogongrass

Imazapyr at 0.63 lb ai/acre glyphosate at 2.25 lb ai/acre, or a mix of these two was applied to cogongrass regrowth foliage after tillage with a rotary tiller, disk, or moldboard plow. Tillage prior to herbicide application improved cogongrass control 21 months after treatment regardless of herbicide applied as evaluated by stem and rhizome weights. Without herbicide application, the rotary tiller provided the best cogongrass control. There was no significant difference among herbicides following a tillage treatment.

Rotary tillage reduced cogongrass stem weights 74 to 92% and rhizome biomass between 88 to 98% after two years tillage. By comparison, disking reduced stem weights 61 to 80% and rhizome biomass 47 to 80% and the moldboard plow reduced these parameters 56 to 80% and rhizome weights 47 to 85%.

Cogongrass was mowed from March through October every other month, every month, every other week, or every week with a string trimmer. After two years, cogongrass stem density was reduced 21, 27, 52, and 85%, respectively, at the end of the growing season, but stem density was not different than

the unmowed plots at the start of the next season. At the start of the fourth year, cogongrass stem density failed to recover. Plots were mowed at the same frequency years four and five. By the end of the fifth year, cogongrass stem density was reduced 22, 39, 66, and 86% in plots mowed bimonthly, monthly, biweekly, and weekly, respectively, compared to the untreated. Rhizome biomass was reduced 17, 33, 60, and 70% in those respective plots. Stem height and density in 2007 were still much lower than the unmowed cogongrass (Burnell's research 2001 to 2004). Exceedingly frequent mowing over five years is impractical but has shown positive rhizome control.

Ineffective herbicides tested

Flumioxazin (Valor or Broadstar) at 0.06, 0.125, or 0.25 lb ai/acre with 0.46 lb/acre ammonium sulfate was mixed with 0.75 lb ai imazapyr or 1.5 lb ai/acre glyphosate and applied to cogongrass. No improvement in cogongrass control was observed with any treatment compared to imazapyr or glyphosate applied without flumioxazin.

Table 1. Herbicides evaluated in 1999 and 2000 that did not provide cogongrass control equal to glyphosate or imazapyr.

Herbicide(s) Trade Name	Herbicide(s) Common Name	Rate(s) lb ai/A
Asulox	asulam	3.3, 5.0
Velocity SP	bispyribac-sodium	0.03
NA	V10029	0.63 oz
Accent Herbicide	nicosulfuron	0.03, 0.06
Beacon Herbicide	primisulfuron	0.04, 0.07
Finale, Ignite, Liberty, Rely	glufosinate	0.34, 0.67
Escort XP	metsulfuron	0.02, 0.04
Oust XP	sulfometuron	0.12, 0.23
Drive 75 DF Herbicide	quinclorac	0.5, 1.0
Maverick, Outrider	sulfosulfuron	0.06
Bladex and CyPro	cyanazine	2.0, 4.0
Karmex	diuron	1.0, 2.0
Bicep	atrazine + metolachlor	1.7 + 2.1, 3.4 + 4.1
Sencor + MSMA	metribuzin + msma	0.375 + 1.8
Hyvar X and X-L	bromacil + diuron	1.6 + 1.6
Glean	chlorsulfuron	0.5, 1.0
Velpar L	hexazinone	1.5, 3.0
Cadre, Plateau	imazapic	0.2

Table 2. Herbicides that did not control cogongrass as well as glyphosate or imazapyr.

Herbicide(s) Trade Name	Herbicide(s) Common Name	Rate(s) lb ai/A
Achieve	tralkoxydim	0.52
Shark	carfentrazone	0.40
Raptor	Iiazamox	0.06
Callisto	mesotrione	0.65
Clincher	cyhalofop	0.55
Define	flufenacet	0.44
Envoke	trifloxysulfuron	0.04
Harmony	thifensulfuron + tribenuron	0.06 + 0.035
Katana	flazasulfuron	0.10
Lightning	imazethapyr + imazapyr	0.09 + 0.02 lb ae/A
Milestone	azafenadin	1.6
Option	foramsulfuron	0.035
Monitor	sulfosulfuron	0.125
Premit	halosulfuron	0.125
Velocity SP	bispyribac-sodium	0.10
Staple	pyrithiobac-sodium	0.11
Steadfast	nicosulfuron + rimsulfuron	0.06 + 0.035
Valor	flumioxazin	0.18

Remote sensing of cogongrass with hyperspectral reflectance

Cogongrass can be differentiated from other warm season grasses with hyperspectral reflectance data. Separation of cogongrass from other warm season grasses, such as bermudagrass, johnsongrass, centipedegrass, dallisgrass, and vaseygrass was more accurate when reflectance data were collected in summer compared to reflectance data taken of these species in winter (plants dormant), spring (cogongrass bloom), or fall (started to senesce).

High resolution aerial images of Interstate 59 median and right of way and two-lane MS highway 528 right of way were used for broadscale cogongrass population detection. Near infrared (NIR), red, green, and blue spectral reflectance values for each known class area within the images, along with spatial patterns and expert knowledge, were analyzed and used to train and recode the classified image. Areas of the images suspected to be cogongrass, other roadside vegetation, road/bare soil, forest, and shadow/water were used to train the system for supervised classification and used to recode the unsupervised classification. A database of GPS points of known locations for each class within each image were used to test the accuracy of each classification. Overall accuracies for supervised classification of the images ranged from 85 to 95%, while unsupervised classification were 75 to 90% accurate. Producers' accuracies for the cogongrass class ranged from 54 to 71% with unsupervised techniques; however, supervised classification techniques resulted in 54-100% accuracy to depict cogongrass. The results from this study show good results for cogongrass detection with basic knowledge classification techniques.