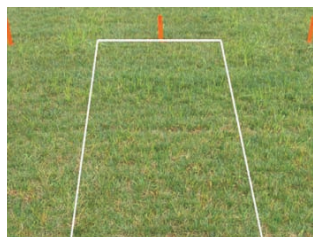




# New herbicides control yellow nutsedge in cool-season turf

Two new products show promise for yellow nutsedge control in cool-season turf, but sequential applications are critical.



Yellow nutsedge (*Cyperus esculentus* L.), a perennial weed that is often a problem in cool-season turf in summer (1), tolerates close mowing, establishes rapidly from tubers or seed and may compete with cool-season turfgrasses for water, light and mineral nutrients (1,7). Yellow nutsedge has undesirable qualities in turf including coarse leaf texture, light green color and shallow rooting (1), so superintendents often apply herbicides for selective control of yellow nutsedge in summer. Pre-emergence herbicides do not prevent yellow nutsedge establishment from tubers and are ineffective for controlling mature plants (7).

## Products for nutsedge control

Sulfonylureas, a major herbicide class in turf with activity on yellow nutsedge and other weed species (11,12), control susceptible weeds by inhibiting acetolactate synthase enzymes (ALS, EC 2.2.1.6) in branched-chain amino-acid synthesis (5,11,12). The sulfonylurea SedgeHammer (halosulfuron, Gowan Co.) is labeled for all major warm- and cool-season turfgrass species and effectively controls yellow nutsedge, purple nutsedge (*Cyperus rotundus* L.), and other sedge species (2). Recently, another sulfonylurea, Certainty (sulfosulfuron, Monsanto), and a protoporphyrinogen oxidase inhibitor, Dismiss (sulfentrazone, FMC Corp.), were registered for yellow nutsedge control in cool-season turfgrasses.

### Certainty

Certainty was registered in 2005 for use in

creeping bentgrass (*Agrostis stolonifera*), Kentucky bluegrass (*Poa pratensis*) and warm-season turfgrasses for control of roughstalk bluegrass (*Poa trivialis* L.), sedges, tall fescue (*Festuca arundinacea* L.) and broadleaf weeds. Creeping bentgrass and Kentucky bluegrass have shown acceptable tolerance levels to Certainty, and researchers have noted significant efficacy for tall fescue and roughstalk bluegrass control (6,8,9,10). However, research is limited on Certainty rates and regimens required for yellow nutsedge control in cool-season turfgrasses.

### Dismiss

Dismiss, which had been used previously in the southern U.S. for control of sedges, *Kyllinga* species and broadleaf weeds in warm-season turfgrasses (2,3), received registration in 2008 for use in six cool-season turfgrasses including creeping bentgrass, Kentucky bluegrass and perennial ryegrass (*Lolium perenne*). The mode of action of Dismiss may allow superintendents to rotate herbicide chemistries in weed-control programs rather than repeatedly applying ALS inhibitors for yellow nutsedge control in turf.

Resistance to ALS inhibitors has increased in sedges and other weeds from repeated use of herbicides such as SedgeHammer (4). New herbicide chemistries and alternative modes of action may be required for superintendents concerned with potential weed resistance, economics or application regimens needed for successful yellow nutsedge control. The objective of this research was

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## Yellow nutsedge control

Treatment/application*	Rate (a.i.)		% yellow nutsedge control <sup>†</sup>					
	ounces/acre	grams/hectare	2006			2007		
			1 WAIT <sup>‡</sup>	5 WAIT <sup>‡</sup>	10 WAIT <sup>‡</sup>	1 WAIT <sup>‡</sup>	5 WAIT <sup>‡</sup>	10 WAIT <sup>‡</sup>
Certainty 75DF								
single	0.19	13	0 d	62 d	60 f	0 d	51 b	84 d-g
	0.37	26	0 d	79 c	66 ef	0 d	66 b	90 b-e
	0.56	39	0 d	84 bc	74 de	0 d	84 a	84 d-g
sequential	0.19	13	---	---	85 b-d	---	---	96 a
	0.37	26	---	---	91 ab	---	---	97 a
	0.56	39	---	---	96 ab	---	---	97 a
Dismiss 4F								
single	2.0	140	30 c	68 d	70 ef	20 c	28 c	76 i
	4.0	280	38 b	80 c	76 c-e	31 b	56 b	83 e-h
	6.0	420	44 a	88 abc	90 ab	41 a	85 a	77 hi
sequential	2.0	140	---	---	74 de	---	---	86 c-f
	4.0	280	---	---	93 ab	---	---	91 a-c
	6.0	420	---	---	96 ab	---	---	93 ab
SedgeHammer 75DF								
single	0.5	35	0 d	92 ab	87 a-c	0 d	83 a	77 hi
	1.0	70	0 d	95 a	96 ab	0 d	89 a	84 d-g
sequential	0.5	35	---	---	96 ab	---	---	91 a-c
	1.0	70	---	---	98 a	---	---	94 ab

\*Initial and sequential application dates were June 20 and July 24, 2006, respectively, and July 2 and Aug. 13, respectively. A non-ionic surfactant, Activator 90, was added to Certainty and SedgeHammer at 0.25% v/v.

<sup>†</sup>Values in a column followed by the same letter are not significantly different from each other.

<sup>‡</sup>WAIT, weeks after initial treatment.

**Table 1.** Yellow nutsedge control with herbicides in a field experiment, 2006, Adelphia, N.J.

to investigate the efficacy of Dismiss and Certainty as potential alternatives to SedgeHammer for yellow nutsedge control in turfgrass.

### Materials and methods

Experiments were conducted from July to September 2006 and 2007 at the Rutgers Plant Science Research Center in Adelphia, N.J. Manhattan IV perennial ryegrass was established in September 2005 on a Holmdel sandy-loam with a pH of 6.4 and 2% organic matter content.

Turf was mowed at 2 inches (5 centimeters) with a rotary mower three days per week with clippings returned, fertilized with nitrogen at 0.13 pound/1,000 square feet/month (0.64 gram/square meter), and sufficiently irrigated to ensure optimal growth. From visual assessment, yellow nutsedge ground cover on the day of initial treatments was 19% ( $\pm 0.7$ ) in 2006 and 10% ( $\pm 0.5$ ) in 2007. Yellow nutsedge cover in untreated plots in 2006 was 11% ( $\pm 5$ ) and 8% ( $\pm 3$ ) at five and 10 weeks after initial treatments, respectively; in

2007, it was 15% ( $\pm 3$ ) and 6% ( $\pm 1$ ), respectively.

The experimental design was a randomized complete block with four replications of 3-foot  $\times$  10-foot (0.9-meter  $\times$  3-meter) plots. Treatments included single (one application) or sequential (two applications) treatments of SedgeHammer 75DF at 0.5 or 1 ounce a.i./acre (0.035 or 0.07 kilogram a.i./hectare), Dismiss 4L at 2, 4 or 6 ounces a.i./acre (0.14, 0.28 or 0.42 kilogram a.i./hectare), and Certainty 75DF at 0.19, 0.37 or 0.56 ounce a.i./acre (0.013, 0.026 or 0.039 kilogram a.i./hectare). Certainty and SedgeHammer were applied with a non-ionic surfactant at 0.25% v/v.

For treatments applied as sequential applications, the second application was applied five or six weeks after the first application. An untreated check was included with treatments. Initial and sequential treatments were applied on June 20 and July 24, 2006, respectively, and July 2 and Aug. 13, 2007, respectively.

Treatments were applied by making two passes per plot in opposite directions with a single-noz-



zle CO<sub>2</sub>-pressurized sprayer calibrated to deliver a total of 40 gallons/acre (374 liters/hectare). Nozzles were Tee Jet 9504E, and CO<sub>2</sub> regulators were set for 30 pounds/square inch (220 kilopascals).

Turf injury was visually rated five and 10 weeks after initial treatments on a percent scale, where 0 is no injury and 100 is completely dead turf. Yellow nutsedge control was visually rated one, five and 10 weeks after initial treatment on a percent scale, where 0 is no control and 100 is complete control.

Because year-by-treatment interaction was detected for weed control and turf injury, data from each year are presented separately.

## Results

### 2006 experiments

In 2006, at one week after initial treatment, only the three rates of Dismiss offered any control of yellow nutsedge (Table 1). By five weeks after initial treatment, SedgeHammer at 0.5 and 1.0 ounce a.i./acre provided 92% and 95% yellow nutsedge control, respectively; Dismiss at 2.0, 4.0 or 6.0 ounces a.i./acre provided 68%, 80% and 88% control, respectively; and Certainty at 0.19, 0.37 and 0.56 ounce a.i./acre provided 62%, 79% and 84% control, respectively. By five weeks after initial treatment, only Dismiss at 6 ounces a.i./acre and Certainty at 0.56 ounce a.i./acre provided yellow nutsedge control similar to that of SedgeHammer.

Sequential applications generally provided better yellow nutsedge control than single applications. By 10 weeks after initial treatment in 2006, single treatments of the two rates of SedgeHammer provided 87% and 96% yellow nutsedge control, and sequential treatments provided 96% and

98% control (Table 1). At 10 weeks after initial treatment, sequential treatments of Certainty at all three rates offered significantly greater control than the single applications (Table 1).

In 2006, Dismiss at 6.0 ounces a.i./acre was the only treatment for which a single application provided yellow nutsedge control similar to all single and sequential SedgeHammer applications by 10 weeks after initial treatment. All SedgeHammer applications provided significantly greater yellow nutsedge control than any single treatment of Certainty. However, by 10 weeks after initial treatment, sequential treatments of Certainty at 0.37 and 0.56 ounce a.i./acre, Dismiss at 4.0 and 6.0 ounces a.i./acre and SedgeHammer all provided similar yellow nutsedge control.

### 2007 experiments

Initial herbicide treatments were generally less efficacious in 2007 than in 2006. At one week after initial treatment in 2007, only the three rates of Dismiss controlled yellow nutsedge (Table 1). Only high rates of Dismiss and Certainty provided similar yellow nutsedge control from initial treatments to SedgeHammer by five weeks after initial treatment.

By 10 weeks after initial treatment in 2007, single treatments of SedgeHammer controlled yellow nutsedge 77% and 84%, and sequential applications provided 91% and 94% control (Table 1). Single treatments of Dismiss provided 76%-83% control, and sequential treatments provided 86%-93% control. Single applications of Certainty achieved 84%-90% control by 10 weeks after initial treatment, and sequential treatments averaged 97% control.

Single applications of Certainty at all three rates provided similar yellow nutsedge control to single applications of SedgeHammer by 10 weeks after initial treatment in 2007 (Table 1). Sequential SedgeHammer applications provided greater yellow nutsedge control than low rates of Dismiss.

### Turf injury

By five or 10 weeks after initial treatment in both years, perennial ryegrass had not been injured by SedgeHammer or Dismiss (data not shown). Initial treatments of Certainty did not injure perennial ryegrass by five weeks after initial treatment in 2006, but at 10 weeks after initial treatment, sequential treatments at the three rates tested caused 26%-50% turf injury (Table 2). Perennial ryegrass recovered to 4% or less injury by 15 weeks after initial treatment in 2006. By five or 10 weeks after initial treatment in 2007, turf did not show any injury from Certainty (data not shown).

## Turf injury from Certainty

Application date	Rate (a.i.)*		% turf injury†		
	ounces/acre	grams/hectare	5 WAIT‡	10 WAIT‡	15 WAIT‡
June 20	0.19	13	0 a	0 d	0 b
	0.37	26	0 a	0 d	0 b
	0.56	59	0 a	3 d	0 b
June 20 + July 24	0.19	13	0 a	26 c	3 a
	0.37	26	0 a	36 b	3 a
	0.56	59	0 a	50 a	4 a

\*Certainty was applied with a non-ionic surfactant, Activator 90, at 0.25% v/v.

†Values in a column followed by the same letter are not significantly different from each other.

‡WAIT, weeks after initial treatment. Injury after five weeks was rated before sequential treatments.

**Table 2.** Manhattan IV perennial ryegrass injury from Certainty 75DF in a field experiment, 2006, Adelphia, N.J.

## Discussion

Dismiss had quicker activity on yellow nutsedge than other herbicides, and efficacy from sequential applications at 4 and 6 ounces a.i./acre was comparable to SedgeHammer by 10 weeks after initial treatment. Yellow nutsedge control from single treatments of Dismiss varied over years, as has been reported in previous research (2).

Certainty appeared efficacious for yellow nutsedge control, but, like Dismiss, sequential treatments appear necessary for control comparable to that of SedgeHammer. When applied sequentially, Certainty provided more than 85% control of yellow nutsedge at all three rates in both years. Efficacy of Certainty for yellow nutsedge control has received limited investigation in turf, but the herbicide has been reported to safely control roughstalk bluegrass and tall fescue in cool-season turfgrasses (9,10).

Certainty was the only herbicide to injure perennial ryegrass in 2006. Injury was likely exacerbated by turf immaturity because the product was applied approximately nine months after seeding when the turf was still immature. No injury was detected in 2007. Currently, Certainty is not labeled for perennial ryegrass because of injury concerns, but it may be safely applied to creeping bentgrass, Kentucky bluegrass and bermudagrass for yellow nutsedge control (8,9).

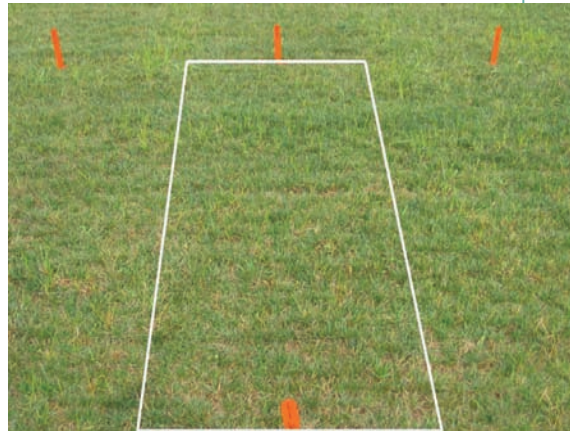
Overall, single applications of Dismiss and Certainty may provide moderate levels of yellow nutsedge control in turf depending on rate and year. However, sequential treatments of these herbicides at medium to high rates may provide levels of yellow nutsedge control comparable to that of single and sequential applications of SedgeHammer in perennial ryegrass. Further research is needed to investigate tolerance of other cool-season turfgrasses to these herbicides and to refine rates and regimens for yellow nutsedge control.

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Dismiss was applied to yellow nutsedge at 4 ounces a.i./acre in a single application (pictured). The photo was taken at five weeks after the initial application. Photo by Carrie Mansue

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### GCM

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## The research says

→ Dismiss had rapid activity after seven days compared to Certainty and SedgeHammer.

→ Sequential applications of Dismiss were required to achieve control comparable to single and sequential SedgeHammer applications.

→ Sequential Certainty treatments provided 85%–97% yellow nutsedge control in both years.

→ Certainty was the only herbicide to injure turf, but perennial ryegrass was only injured in one of two years.