

## What's New in Weed Management

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**Bottom line:** There was both good news and bad news on the weed management front during 2003. The bad news is that several weeds continue to spread and cause difficulties on golf courses. These include purple and yellow nutsedge, kyllinga, dallisgrass, smutgrass and moss. The good news is that there are now several new management tools that may help to control them. A brief review is presented below.

**Dallisgrass, *Paspalum dilatatum*.** Researchers around the country have been testing new products for years to try to find something better than MSMA for dallisgrass control. But at this point, nothing can replace post-emergent applications of MSMA for gradual removal of this weed. Repeat sprays (at least three weekly or biweekly applications) are required. To prevent further infestation, pre-emergent herbicides such as dithiopyr are effective if applied before seeds germinate (late winter/early spring, when average air temperatures are greater than 55F for several days).



dallisgrass

**Bottom line on dallisgrass:** This is a good example of the value of tried and true products such as MSMA. In university trials around the country, no other herbicide or combination of herbicides have been shown to more efficacious on dallisgrass to date.

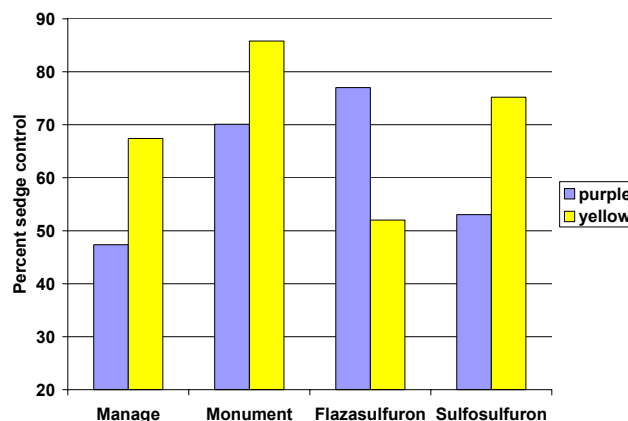
**Purple and yellow nutsedge, *Cyperus* spp.** Cultural practices, such as avoiding excessive soil moisture and decreasing mowing heights can help curtail populations. When using post-emergent herbicides, target small plants (5<sup>th</sup> leaf stage). For warm season turf, trifloxysulfuron, halosulfuron, imazaquin and MSMA are labeled and effective. However, only halosulfuron is safe for use on all cool-season turf (MSMA is safe for use on selected cool-season varieties).

In 2003, Syngenta received EPA approval for their new sulfonyleurea herbicide, Monument. This post-emergent herbicide has been tested in PACE trials and university trials around the country for the past several years, and has shown very good activity on yellow and purple nutsedge, green kyllinga, false green kyllinga and Poa

annua, as well as broadleaf weeds such as carpetweed, clover, dandelion, henbit, oxalis and spotted spurge. In addition, it can be used as a tool for removing perennial ryegrass and Poa trivialis from overseeded bermudagrass fairways. Monument is registered for use on bermudagrass and zoysiagrass.



**Figure 1. Purple and yellow nutsedge control with Monument (trifloxysulfuron), Manage (halosulfuron) and two experimental herbicides.** Each product was applied once in May, and control values shown below represent the average of several ratings taken over a period of three months after application. Data courtesy of Dr. Fred Yelverton, North Carolina State University.



In studies conducted at North Carolina State University (Dr. Fred Yelverton), Monument at 0.47 oz/acre consistently provided superior control of yellow and purple nutsedge (70% and 86% control respectively) when compared to Manage at 1.33 oz/acre (47 and 67% control, respectively), though both products performed at least adequately (see Figure 1). Two

experimental herbicide products – flazasulfuron and sulfosulfuron – showed good activity against yellow and purple nutsedge as well, but did not quite measure up to Monument. Similar results have been reported in Clemson University field trials as well (Dr. Bert McCarty). Comparable levels of activity against other sedge weeds such as green kyllinga and false green kyllinga have been observed in test plots with these four products.

**Bottom line:** Long term eradication of sedges is difficult, if not impossible, but new products such as Monument will make their management much easier. For cool season turf, Manage or MSMA (certain varieties only) are the safest options, and should be expected to provide 45% or more control. Repeat applications of these products will further enhance nutsedge control.

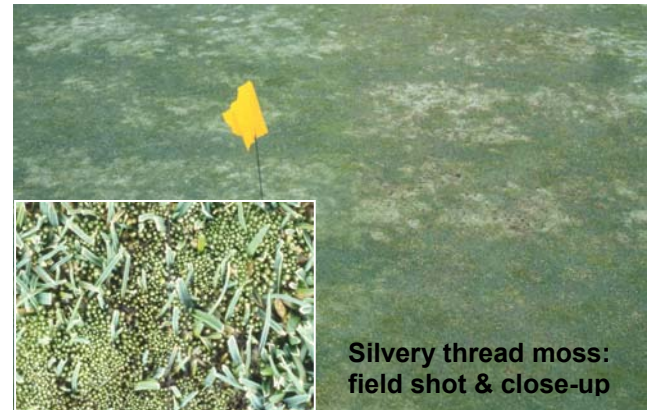
**White clover, *Trifolium repens*.** Prevent wet areas and maintain soil nitrogen levels at 10 – 20 ppm. Post-emergence herbicides such as clopyralid, quinclorac, dicamba, mecoprop or triclopyr, or mixtures of 2,4-D, dicamba and MCPP are effective. Apply when clover is actively growing, but before flowering.



Lontrel (clopyralid), one of the newer and more effective control products for white clover, went through a series of ups and downs during 2003, ending up in a relatively high spot, at least as far as golf turf uses were concerned. The story began when clippings from turf that had been treated with clopyralid were later used in the preparation of compost. Although the product label warned against the use of compost that contained treated material, some of this material made its way into commercial plant operations, where a few cases of plant damage were reported. As a result, in September of 2003, Dow discontinued the sale of clopyralid on **residential** turf. However, the use of clopyralid on non-residential turf (golf courses, parks, cemeteries, sports facilities) is still labeled. The label advises that grass clippings treated with clopyralid cannot be recycled if they are likely to be used for production of compost. In 2004, Dow will be introducing Spotlight (fluroxypyr), a product with activity similar to that of Lontrel against white clover.

## **Silvery thread moss, *Bryum argenteum*.**

Researchers are continuing to test new strategies for controlling this insidious pest of cool season greens. In most locations, chlorothalonil (Concorde, Daconil, Echo, Manicure, Thalonil) continues to be the best treatment for reducing moss populations, but only when used in repeat application (3 or more applications every 2 weeks) at the high labeled rate. Efficacy seems to improve with higher air temperatures (>80F is optimal). Unfortunately, there are some locations where chlorothalonil doesn't appear to perform well. A second concern with chlorothalonil are the recent limitations that EPA has placed on the amount used per year. For golf courses that use chlorothalonil for disease control and for moss control, it is relatively easy to exceed these EPA limitations (For example, Daconil Weatherstik use is restricted to 35.7 oz/1000 sq ft per year on greens; this amount will vary depending on the formulation of chlorothalonil that you use, so check labels carefully).



Finding alternatives that can be rotated with or substituted for chlorothalonil has been difficult – there are many chemicals that kill moss, but they unfortunately also damage or even kill the turf! Some promising new leads that do not appear to damage turf include:

- The herbicide **carfentrazone**, which is sold in the turf market as QuickSilver (FMC). Although not currently labeled for use on greens, research at North Carolina State (Dr. Fred Yelverton) shows that QuickSilver (2 applications at 0.67 – 3.4 oz/acre) provided moss control roughly equal to that of chlorothalonil (65 – 85% control)
- Studies conducted at Cornell University (Dr. Frank Rossi) and Oregon State University (Dr. Tom Cook) continue to show the value of **copper hydroxide** products (Kocide, Junction), at least in cooler locations. Four to seven applications of Junction applied at 5 oz/1000 sq ft at two-week intervals in 2 gallons of water per 1000 square feet provided roughly 45% moss control. Applications made October – December were the most effective. Keeping spray tank pH below 6.5 appears to improve control. However, the turf



yellowing that is sometimes observed with the use of copper products also increases as spray solution pH decreases. A follow-up application of iron sulfate appears to alleviate some of the yellowing.

- **Sodium carbonate peroxyhydrate** (Terracyte) has been tested in California (Mark Mahady) and New York (Cornell University, Dr. Frank Rossi), with up to 70% moss control observed at the 8 lb/1000 sq ft rate. Results have been variable however, with as little as 0 – 20% control observed in some locations. Some of this variability may arise because this granular product is difficult to apply evenly, and because turf thinning and phytotoxicity (especially on poa greens) can be an issue.

**Bottom line:** experiment with new products to avoid over-reliance on chlorothalonil. But be cautious, test on small areas, and look out for phytotoxicity.

**Goosegrass, *Eleusine indica*.** This summer weed begins to germinate when average air temperatures are above 60F for three days in a row. Decrease soil compaction via aeration and traffic management and reduce excessive soil moisture. Where this weed is a yearly problem, pre-emergent herbicide control with products such as dithiopyr, oryzalin, oxadiazon, pendimethalin and prodiamine is advisable. Always review herbicide labels to determine safety of each

product for your turf types. University trials conducted in the past several years indicate that foramsulfuron (Revolver) – a product recently registered for removal of perennial ryegrass on warm season fairways – has excellent post-emergent control of goosegrass. Post-emergent control with other products such as MSMA, diclofop or fenoxaprop are also effective.



Photos of goosegrass and white clover courtesy of WSSA and XID Services, Inc. Photo of nutsedge courtesy of Bruce Kidd, Dow Agro.

**Table 1. Using weed threat temperatures to time weed control procedures.** The average air temperatures below are rough guidelines that indicate when weed management practices should be triggered. Remember to use common sense in conjunction with this table – 3 days of unseasonably warm weather in January is still probably not sufficient to trigger goosegrass applications in most parts of the country, since cold weather will soon return. Weeds that are controlled post-emergence should not be treated until weekly monitoring indicates that weeds are present.

Common Name	Scientific name	Activity	Timing/Threat temperature*
Barnyardgrass	<i>Echinochloa</i>	Pre-emerge herbicides	When average air temperatures reach >60F (16C) for 3 days in a row
Crabgrass	<i>Digitaria</i>	Pre-emerge herbicide	When average air temperatures reach >50F (10C) for 3 days in a row
Foxtails	<i>Setaria</i>	Pre-emerge herbicide	When average air temperatures reach >65F (18C) for 3 days in a row
Goosegrass	<i>Eleusine</i>	Pre-emerge herbicide	When average air temperatures reach >60F (16C) for 3 days in a row
Annual bluegrass	<i>Poa annua</i>	Pre-emerge herbicide	Fall/winter, when average air temperatures drop to <75F (24C) (and >50F/10C) for 3 days in a row
Weeds controlled post-emergence		Begin weekly monitoring, mapping, record keeping	When average air temperatures reach >50F (10C)

\*average daily air temperatures

NOTE: Most pre-emerge products have 2-3 months of residual activity. Split applications, spaced 2-3 months apart, can be used to extend the period of control, but limitations on total product used per acre must be obeyed.

**Table 2.** Herbicide active ingredients and commonly available commercial products for use on turf.

Active ingredient	Trade Names
2,4-D amine	2, 4-D
asulam	Asulox, Asulam
atrazine	Drexel, Atrazine, AAtrex, Purge
benefin	Balan
bensulide	Betasan, Bensumec, Presan
bentazon	Basagran
bispyribac	Velocity
bromoxynil	Buctril, Brominal, Bromox
chlorsulfuron	Corsair
clethodim	Envoy
clopyralid	Stinger, Lontrel
dazomet	Basamid
DCPA	Dacthal W-75
dicamba	Banvel, Vanquish
dithiopyr	Dimension
DSMA	Methar, DSMA
diclofop	Illoxan
ethofumesate	Prograss
fenarimol	Rubigan, Patchwork
fenoxaprop	Acclaim
fluazifop	Fusilade 2000
foramsulfuron	Revolver
glufosinate	Finale

Active ingredient	Trade Names
glyphosate & glyphosate salts	Honcho, Mirage, Prosecutor, Rattler, Razor, Roundup, Silhouette, Touchdown
halosulfuron	Manage
imazaquin	Image
isoxaben	Gallery
mecoprop	MCPP, Triamine
metolachlor	Pennant
metribuzin	Sencor
metsulfuron	Manor, Escort
MSMA	MSMA
napropamide	Devrinol
oryzalin	Surflan
oxadiazon	Ronstar
pelargonic acid	Scythe
pendimethalin	Pre-M, Pendulum
prodiamine	Barricade, Regalkade
pronamide	Kerb
quinclorac	Drive
rimsulfuron	TranXit
siduron	Tupersan
simazine	Princep, Simazine
triclopyr	Turflon
trifloxysulfuron	Monument
trifluralin	Team 2G

**Table 3.** Cultural management practices for weeds. These practices should be regularly scheduled for improved turf health in general, but can be targeted in problem areas for management of the specific weeds listed below.

Goal	Practice	Target weeds
Decrease compaction	aerification, topdressing, traffic management	Goosegrass, knotweed and annual bluegrass thrive in compacted soils
Manage wet, waterlogged areas	Optimize irrigation uniformity, improve drainage, aerify and topdress	Kyllinga and sedges prefer wet areas
Manage dry soils	Optimize irrigation uniformity, remove trees whose roots compete for water	Spurge, knotweed, sorrel, plantain prefer dry areas
Reduce shade	Tree management program	All weeds: Turf that receives <3 hrs sun/day will be stressed and prone to weed invasion
Optimize soil fertility	Conduct soil tests 2X/yr; address deficiencies and excesses	All weeds
Avoid thinning turf	Avoid products that stress turf, avoid damage due to insects, diseases	All weeds