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Managing Smutgrass in Irrigated Pastures

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Small smutgrass (*Sporobolus indicus*, also called smutgrass) is a tufted perennial grass native to tropical America (fig. 1). Although it occurs as a weed in many different areas, it is most problematic in pastures in the southern and western United States. Because smutgrass is unpalatable to livestock, animals avoid grazing it, and it quickly dominates irrigated pastures, causing significant reductions in livestock grazing capacity. Smutgrass is well adapted to the warm summer temperatures of the Sacramento Valley, particularly in irrigated areas. Its name is derived from a black fungus that often develops in its seed head in humid areas (fig. 2). This fungus has not been found in samples from the Sacramento Valley.

Figure 1. Mature smutgrass plant.

Figure 2. Smutgrass inflorescence, one green and one mature and drying as seen from mid to late summer.

Smutgrass Biology

- Smutgrass is a warm-season perennial: it remains dormant in the winter, begins growing in spring, and produces seed from July to September, depending on elevation.
- Individual plants can produce up to 45,000 seeds per year.

- Seed production takes place continually throughout the growing season, with flowering, immature seed, mature seed, and seed shattering occurring simultaneously on individual seed heads of the same plant (Mislevy et al. 1999).
- One study determined that germination with the seed husks attached was 1 to 9% (Currey et al. 1972). However, when the husks were removed, germination was 88% (Wilder 2009).
- Seeds buried during experiments did not germinate (Wilder 2009).
- Seeds can survive in soil for more than 2 years (Currey et al. 1972).
- Seeds require bare ground to germinate.
- Germination occurs at temperatures between 68°F and 95°F (Wilder 2009).
- Because seeds are very small, they are easily distributed by animals, wind, and water. The outside of the seeds are covered with a gelatinous mucilage that becomes sticky when moistened. This allows seeds to cling to bird feathers or animal hair.

Smutgrass can resemble tall fescue from a distance. However, smutgrass has a very distinct spikelike inflorescence (fig. 2) that is not obviously branched. This characteristic makes it easy to distinguish smutgrass from other grasses in irrigated pasture. Initial infestations generally occur when the soil has been disturbed and moisture is available; seeds can be transported through irrigation district canals, in hay, by livestock, and on equipment. In addition, isolated fields have become infested, leading to the conclusion that birds or other animals can spread the seeds.

Smutgrass requires bare ground and sunlight for germination and establishment. A well-established pasture with ample canopy cover can reduce smutgrass establishment. Overgrazing pastures or overwintering cattle on pasture can open bare soil that may allow smutgrass to germinate. Addressing initial infestations quickly is crucial given the high number of seeds produced per plant.

Smutgrass Management

Herbicides

GLYPHOSATE (ROUNDUP)

Rotary wiper application of glyphosate. Rotary weed wipers have been used successfully in the southern United States and many other countries in pasture weed control (fig. 3). This equipment allows the operator to set the height of the rotating wiper above the desirable pasture plants and "wipe" the herbicide on the target weed. The wiper rotates on a drum that is driven by a belt connected to the tires. As the drum rotates it presses a herbicide-saturated carpet material against the leaves it contacts. The wiper can be pulled by a moderate-sized ATV or UTV with a 12-volt auxiliary connection or a direct connection to the battery.

For this technique to work effectively, it is critical that the desirable plants be shorter than the target weeds. Grazing animals can be used to reduce the height of the desirable plants, which will increase the selectivity of the herbicide to smutgrass. Timing of application is critical.

Figure 3. Rotary wiper.

Annual weeds can be controlled with glyphosate throughout most of their life cycle, but control is particularly effective when plants are young. Perennial weeds generally have significant root systems. To kill perennials, glyphosate should be applied after flowering when the plants are translocating sugars back to the roots or belowground reproductive structures (generally late summer and early fall).

Using a rotary wiper is significantly different from traditional broadcast spraying:

- Pesticide drift is reduced because the product is applied directly to the target plant.
- The application solution is much more concentrated than broadcast mixes.
- Desirable plants in the pasture should be grazed as close (short) as practical so that only ungrazed target weeds are exposed to the wiper. Make sure the wiper is set above the height of the desirable plants to avoid herbicide injury.
- The wipers tested for this publication had a push button that activated the pump that sprayed herbicide on the rotating carpet. Depending on the ground speed, the button had to be depressed for 1 to 5 seconds to spray the complete surface of the carpet as it rotated. The amount of time between pushing the button depended on the density of weeds being wiped. While the tendency is to continually press the button, this overfills the carpet, causing the herbicide to drip onto desirable vegetation.
- The greater the density of the weeds, the greater the volume of herbicide mix that must be applied.
- The Roundup WeatherMax label notes that application speed should not exceed 5 mph.

Table 1. Amount of Roundup WeatherMax (4.5 lb/gal) to mix for rotary wiper application

Desired volume	Concentration		
	33%	50%	75%
1 gal	0.33 gal (42 oz)	0.5 gal (64 oz)	0.75 gal (96 oz)
10 gal	3.3 gal	5 gal	7.5 gal
15 gal	5 gal	7.5 gal	11.25 gal

Read and follow all label instructions when applying herbicides. Two sections of the label are absolutely critical to applying glyphosate safely and effectively: the sections on application equipment and techniques (section 8.0 on the Roundup WeatherMax label) and the section on pastures (section 11.4 on the Roundup WeatherMax label). Glyphosate is not a restricted material; however, it does require that a use report be submitted to the local agriculture commissioner. For more information, call your local county agriculture commissioner's office.

Glyphosate concentrations. The labeled concentration for Roundup WeatherMax (used in the UC wiper applications discussed in this publication) is 4.5 pounds per gallon. Other brands of glyphosate have different concentrations of active ingredient. If a product has 3 pounds per gallon of active ingredient, use 1.5 times as much (4.5 ÷ 3) to match the rates given in this publication. Thus, to reproduce the successful July treatment of 33% WeatherMax (4.5 lb/gal) discussed below, a 50% mixture using a glyphosate product (3.0 lb/gal) would need to be applied. Read the label to make sure you know the active ingredient concentration of the glyphosate product purchased.

The Roundup WeatherMax label notes that "solutions ranging from 33 to 100% of this product in water may be used in panel wiper applicators." A 33% mixture would equal 42 ounces in 1 gallon of water. Table 1 gives the amount of Roundup WeatherMax to mix for rotary wiper applications.

When using a wiper in a pasture, the Roundup WeatherMax label notes the following

grazing restriction: "For spot treatments or wiper application methods using rates of 2 quarts per acre or less, the entire field or any portion of it may be treated. When spot treatments or wiper applications above 2 quarts per acre, no more than 10 percent of the total pasture may be treated at any one time. To achieve maximum performance, remove domestic livestock before application and wait 7 days after application before grazing livestock or harvesting for feed."

The two areas of consideration for the effectiveness of glyphosate are the concentration of the applied material and the timing of application. Smutgrass is a perennial plant, and perennial plants translocate sugars to the roots after flowering. If applied during flowering, glyphosate is carried with the sugars to the roots, where it kills the plant. An unpublished study in 2010 by Kyser and Nader with wiper-applied Roundup WeatherMax (4.5 lb/gal concentration) at two rates (16% and 33%) with 3 timings (July 12, August 18, and September 15) demonstrated that the July 33% treatment was the most effective. The late-summer applications (August and September) injured the smutgrass but did not provide effective control.

Figure 4. Green shoot of smutgrass emerging 56 days after July 12 glyphosate wiper application. Most of these shoots later died.

Figure 4 shows smutgrass-treated plants 56 days after the July 12 application of 33% glyphosate. After the crown turned brown and appeared dead, the plant initiated yellowish-green shoots, most of which later died. Reemerging shoots in an adjacent section treated with 10% glyphosate were darker green in color. In an October evaluation, control was estimated at 95% in the 33% glyphosate and 90% in the 10% glyphosate plots. Figure 5 shows the progression of smutgrass death compared with an untreated

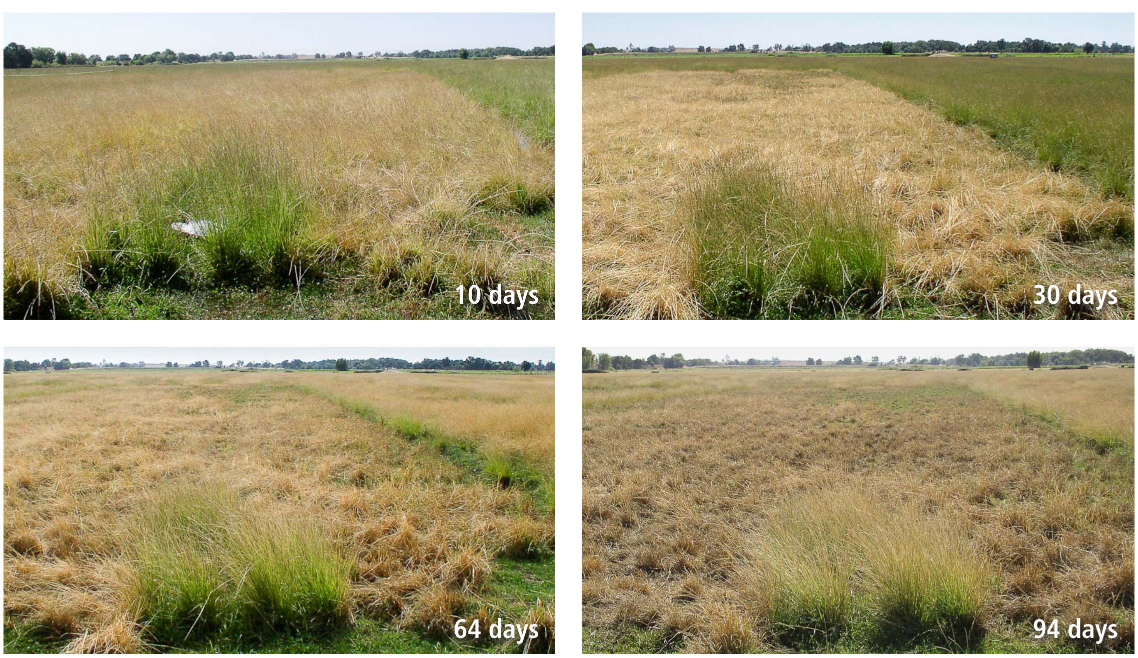


Figure 5. Control of smutgrass at 10, 30, 64 and 94 days after a 33% glyphosate treatment in July.

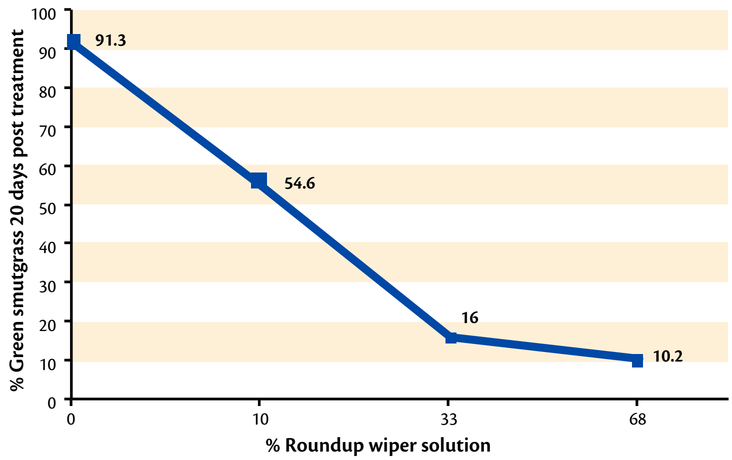


Figure 6. Roundup concentration and effectiveness on smutgrass, September 13, 2010.

Figure 7. Late-September glyphosate spot treatment of new smutgrass infestation.

green area around an irrigation valve in the front of the field. It is estimated that 2 additional years of control would be required to reduce the seed bank.

In a similar unpublished study by Davy and Betsy Karle, Roundup PowerMax (4.5 lb/gal) applied on September 13, 2010, at 33% percent provided far better control than did 10%, but gave nearly the same control as 68% (fig. 6). Lower-stature smutgrass often survived even high-concentration treatments because the plants were not in contact with the wiper applicator.

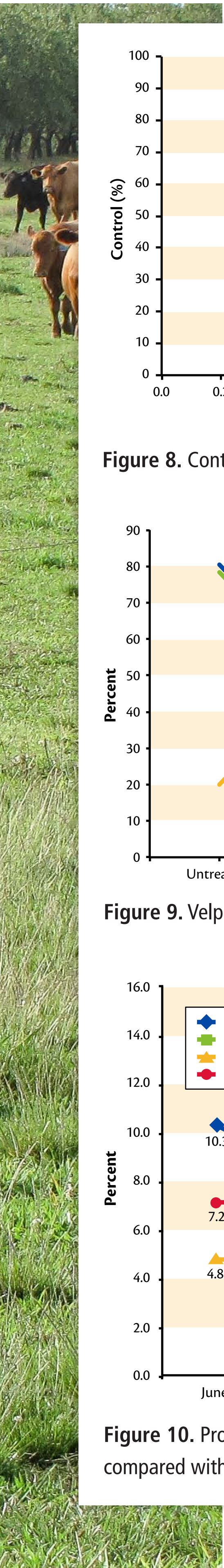
Spot treatment with glyphosate. Spot-spraying glyphosate onto isolated plants during the start of infestation is an effective practice. Applications of solutions of 1.5 to 2% Roundup in late September effectively controlled smutgrass (fig. 7). The spikelike seed head makes isolated plants easy to recognize in the pasture. Table 2 gives the amount of Roundup WeatherMax to mix for hand-held sprayers (from the Roundup WeatherMax label).

HEXAZINONE (VELPAR)

Hexazinone is a soil-based herbicide that is taken up by plant roots and foliage. Velpar L contains the "Danger" signal word and is a restricted-use pesticide; it is potentially damaging to oaks and other tree and shrub species. As such, applicators must leave a buffer zone between treated areas and trees. It should not be applied in areas where it could leach into groundwater or in situations where treated soil could wash away. Based on research conducted in Florida (fig. 8), some

Table 2. Mixing WeatherMax (4.5 lb/gal) for hand-held sprayers

Desired volume	Concentration					
	0.5%	0.75%	1%	1.5%	2%	4%
1 gal	0.6 oz	1 oz	1.3 oz	2 oz	2.5 oz	5 oz
25 gal	1 pt	1.5 qt	1 qt	1.5 qt	2 qt	4 qt
100 gal	2 qt	3 gal	1 gal	1.5 gal	2 gal	4 gal



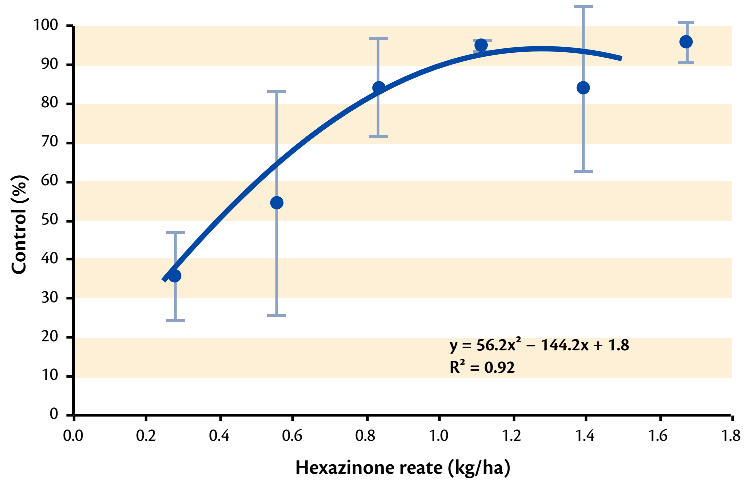


Figure 8. Control of smutgrass in Florida by different rates of Velpar L.

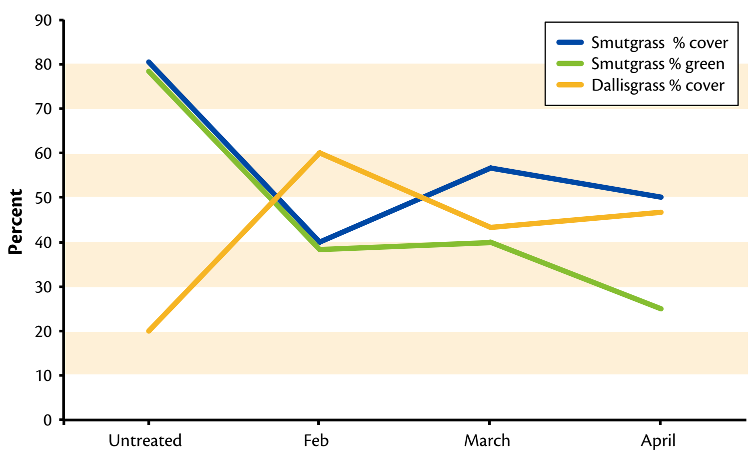


Figure 9. Velpar control of smutgrass at three application times.

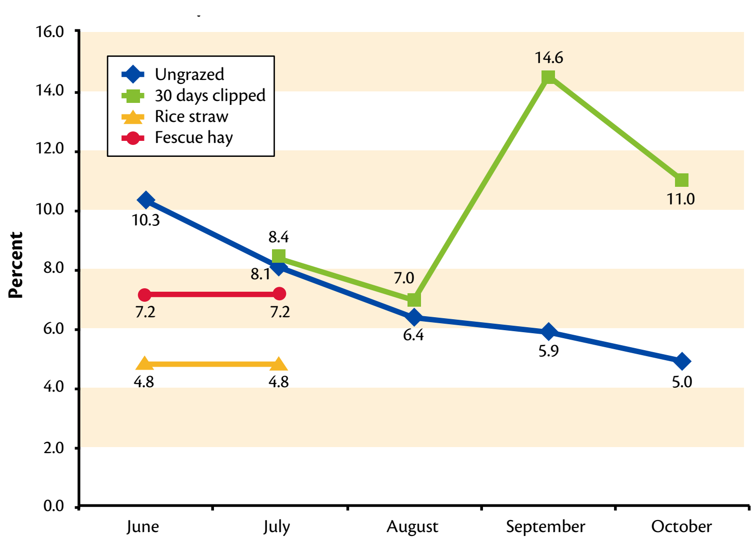


Figure 10. Protein percentage of ungrazed and clipped smutgrass compared with rice straw and fescue hay

agencies are recommending Velpar L at 4.5 pints per acre for control of smutgrass.

In a trial conducted in 2010 on an irrigated pasture in Marysville, California, Velpar L was applied at 4.5 pints per acre at three timings, February, March, and April (fig. 9). Smutgrass control was only 30 to 50%, with little difference among timings. The difference in results between Florida and Marysville may be due to soil texture. In fine-textured or high-organic-matter soils, hexazinone binds tightly to soil particles and is not as available for root uptake as in coarse soils. The Florida experiments were conducted on sandy soils with low organic matter; the Marysville study was on a silty clay loam with 1.5% organic matter.

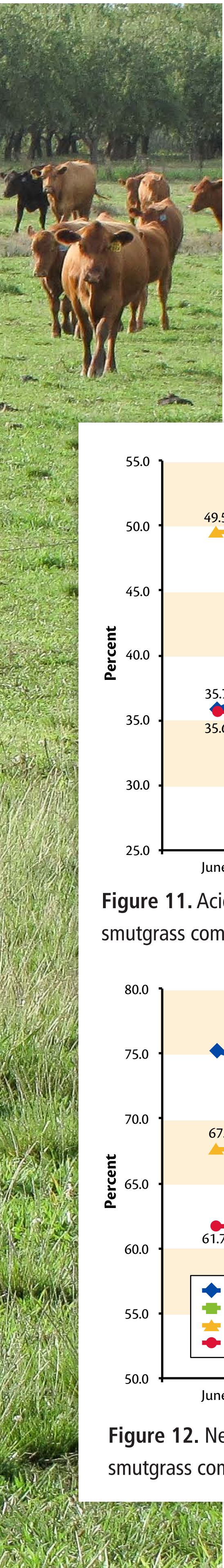
Grazing

It is not understood why livestock avoid grazing smutgrass. Grazing may be limited by the plant's low nutritional content, the very coarse leaves, or perhaps a secondary compound such as alkaloids.

The protein concentration of smutgrass in June starts out at acceptable levels, but in the absence of grazing it declines to levels near the value of rice straw (fig. 10), which would not support even dry (nonlactating) cows. Clipping smutgrass every 30 days can increase protein levels, but the levels ultimately drop back down in October, likely due to the onset of dormancy.

Acid detergent fiber (ADF) is a chemical test that can be used to estimate the energy levels of feeds. The higher the level of ADF, the lower the energy available to the animal. Ungrazed smutgrass has much less ADF than rice straw and is about the same as fescue hay (fig. 11). Clipping it every 30 days further reduced fiber content and increased its available energy content.

Neutral detergent fiber (NDF), which includes the entire fiber fraction captured in ADF and also hemicellulose, is used to estimate intake



by animals. In September, ungrazed smutgrass has a higher NDF than rice straw and fescue hay, whereas clipped smutgrass has a much lower fiber fraction and a marked reduction (fig. 12). The lower in NDF value, the higher the available energy and estimated intake of forage by grazing animals.

Some producers have used intensive grazing to reduce the animals' grazing selectivity. One producer uses a stocking rate of 42 cows per acre on 2.5-acre pastures with an average 21-day rotation. The results can be seen in figures 13 and 14. If the infested field is hayed in the spring and kept grazed down and more vegetative, the nutritional value of smutgrass increases. This method does not eliminate or reduce the weed, but it does diminish its negative effects on pasture intake.

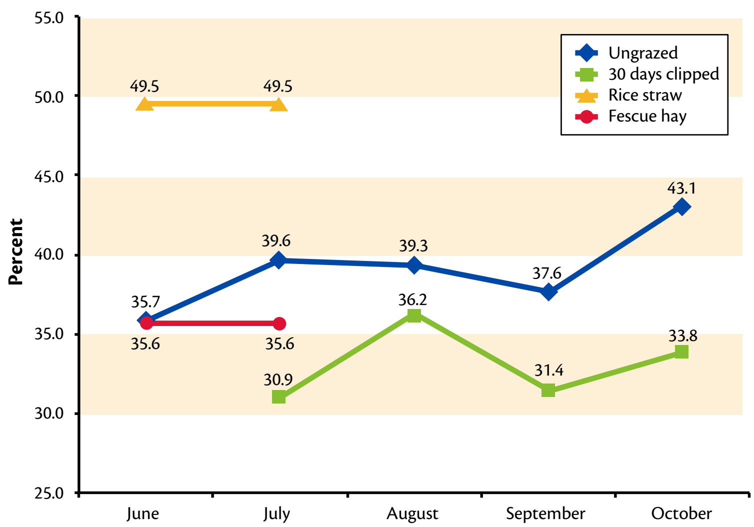


Figure 11. Acid detergent fiber percentage of ungrazed and clipped smutgrass compared with straw and fescue hay

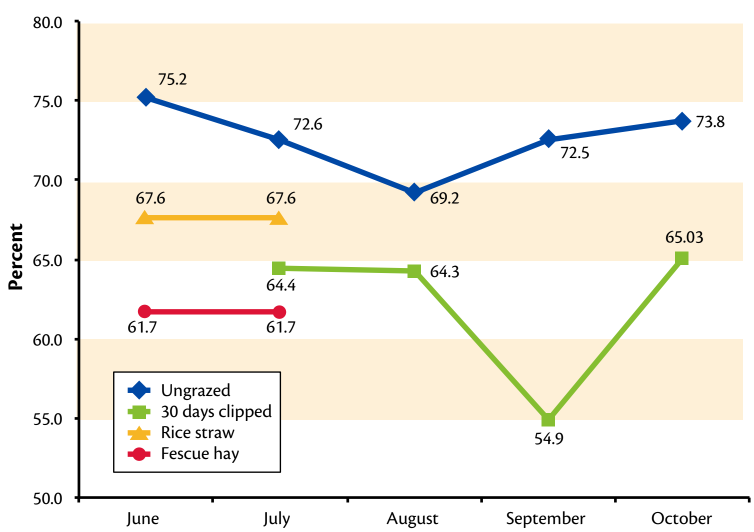


Figure 12. Neutral detergent fiber percentage of ungrazed and clipped smutgrass compared with straw and fescue hay.

Irrigation

Research conducted by Davy and Karle in Glenn County, California, studied the impact of optimizing irrigation intervals on a smutgrass population in a very well-drained soil. They found

Figure 13. Intensively grazed smutgrass pasture. An electric fence in the middle divides grazed from ungrazed areas.

Figure 14. Smutgrass in the vegetative state being grazed.

that treatments normally irrigated on a 14-day schedule had higher smutgrass composition than pasture treatments more optimally irrigated on a 7-day schedule (fig. 15). Desirable forage grasses showed a corresponding increase in cover. The production response was also very favorable.

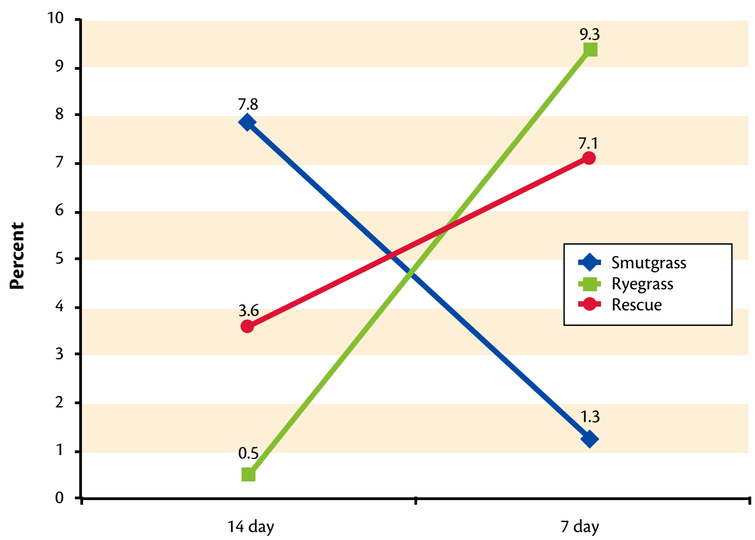


Figure 15. Effect of irrigation interval on smutgrass.

Burning

Burning can reduce the old leaf and stem biomass of smutgrass and can clean up a pasture if a rancher plans to graze the smutgrass the following spring. However, researchers at the University of Florida found that burning alone was not effective in controlling this weed.

Mechanical Control

Research has shown that while repeated mowing decreases the diameter of individual smutgrass plants, the density of plants increases. When mowing is discontinued, smutgrass eventually returns to its previous density. Mowing has also been cited as a cause of further spread of seed in the pasture.

Mechanical attempts to remove the plant, such as plowing, can lead to soil disturbance, which can increase the infestation. Some managers have plowed pastures and reseeded them. However, the smutgrass seedbank in the soil leads to rapid reinfestation. Given that seed survive for 2 years or more, pastures must be left fallow for an extended period or rotated to another crop to eliminate smutgrass.

Drying

In California, it is possible to stop irrigation for the summer and allow the pasture to dry. In some locations, this has killed smutgrass. This practice can be followed by seeding a new pasture in the fall with a no-till drill. However, smutgrass seeds in the soil may reinfest the site.

Biological Control

There have been no biological control efforts for this weed in the United States.

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Measurement Conversion Table

U.S. Customary	Conversion factor for U.S. Customary to Metric	Conversion factor for Metric to U.S. Customary	Metric
acre (ac)	0.4047	2.47	hectare (ha)
miles per hour (mph)	1.61	0.62	kilometers per hour (k/h)
ounce, fluid (oz)	29.57	0.034	milliliter (ml)
quart, liquid (qt)	0.946	1.056	liter (l)
pint, liquid (pt)	0.473	2.11	liter (l)
gallon (gal)	3.785	0.26	liter (l)
gallon per acre	9.36	0.106	liter per hectare (l/ha)
Fahrenheit (°F)	°C = (°F – 32) ÷ 1.8	°F = (°C ´ 1.8) + 32	Celsius (°C)

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