

Tank Mixing Iron with Herbicides May Reduce Crabgrass Control

By Brian Tucker and Bert McCarty

Smooth crabgrass (*Digitaria ischaemum* [Schreber], Schreber) is a common invasive weed throughout the United States. It is a summer annual capable of prostrate growth and reproduces primarily by seed. Crabgrass occurs in most crops, turfgrasses and landscapes. It can grow in most soil types while also tolerating low fertility and dry conditions (Uva et. al., 1997).

A variety of chemical agents target postemergent control of crabgrass. Traditionally, organic arsenicals such as MSMA and DSMA, have been used for postemergent crabgrass control.

Presently, additional control options exist with each having varying levels of effectiveness (Street and Sherratt, 2002). However, these herbicides often cause unacceptable discoloration to the desired turfgrass. A common practice to mask this damage is applying micronutrients

with the herbicide. The most commonly used nutrient for masking purposes is iron, which is involved in several plant processes including production of chlorophyll, heme and cytochromes. It's also a major component of reducing com-

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plexes associated with photosynthesis.

Iron typically increases color and is often used for color enhancement without excessive shoot growth in most turfgrass species (McCarty, 2001). Additionally, iron has also been shown to help certain species tolerate heat and drought stress (Glinski, 1992).

A potential negative side effect of using iron as a masking agent is the possible antagonistic effect it may have on the efficacy of some herbicides. Previous research demonstrates postemergent crabgrass control with MSMA and Drive was slowed and decreased when iron was added to these (Dernoeden, 2003; Coats et. al., 2001). To ascertain the severity of this antagonism, a study was conducted at Clemson University to evaluate tank-mixing iron on the efficacy of several herbicides on postemergent smooth crabgrass control.

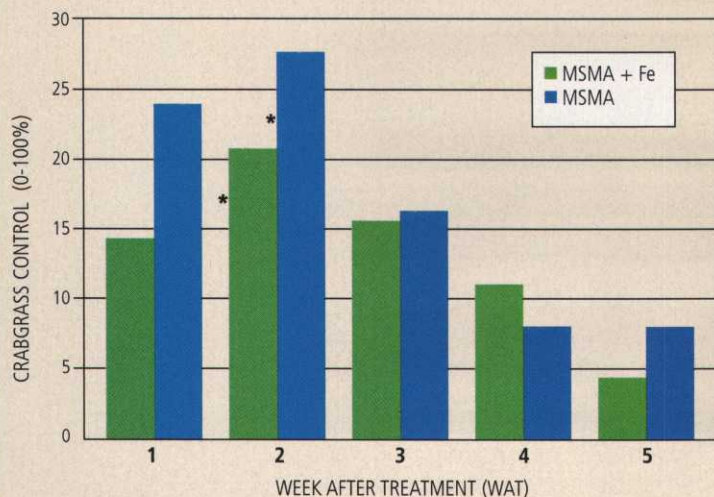
Materials and methods

Two studies were conducted in the Clemson greenhouses in Clemson, S.C., with the first study conducted from February–March 2002 and repeated from April–May 2002. Smooth crabgrass was grown from seed in 6-inch diameter pots. The study was a completely randomized design with three replications of each treatment.

Table 1 describes the treatments applied in this study. Each treatment was applied with a carbon

FIGURE 1

Iron effect on postemergent crabgrass control with MSMA. Visual injury ratings were taken weekly for five weeks after treatment (WAT).



* indicates a difference between treatments according to Fisher's Lowest Statistical Difference (.05).

dioxide (CO₂) backpack sprayer at 20 gallons per acre (gpa). The iron source for this study was a dissolved granular containing 20 percent soluble iron derived from ferrous sulfate (FeSO₄), applied at a rate of .5 pounds of iron (Fe) per 1,000 square feet. All herbicide treatments were sprayed immediately after iron application.

Crabgrass control was visually rated on a 0-percent to 100-percent scale, with 100 percent equal to complete control and 0 percent equal to no control. Visual ratings began one week after treatments were applied and continued weekly for five weeks. Data were analyzed using PROC GLM in SAS and means were separated using Fisher's LSD=.05.

Results

In the first study, the only treatments exhibiting an antagonistic effect from iron were MSMA and Acclaim Extra. Crabgrass control one week after treatment with MSMA was reduced 40 percent when added with iron, but unaffected thereafter (Figure 1).

Acclaim Extra and Acclaim Extra plus iron had little influence on crabgrass control two weeks after treatment, but by the third week and thereafter significant reductions occurred (Figure 2). Crabgrass control with Acclaim Extra plus iron was reduced 34 percent, 44 percent and 62 percent at three, four and five weeks after treatment, respectively. The addition of iron to all other herbicides examined in the first study had no antagonistic effect on weed control.

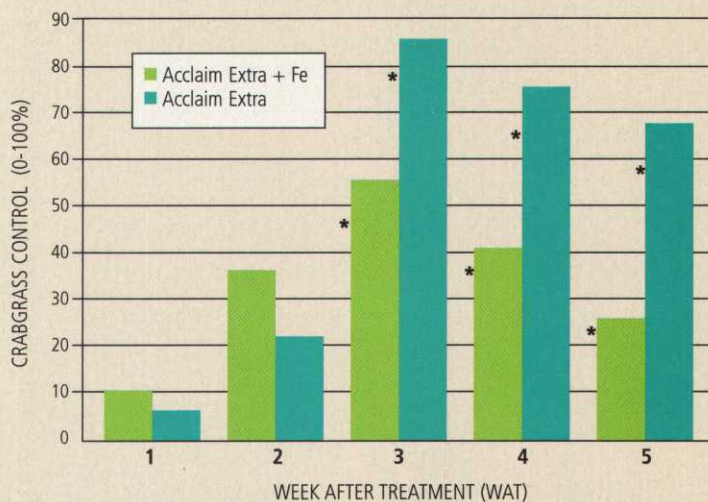
Acclaim Extra was most affected by tank mixing with iron.

In the second study, the only antagonistic effect observed was with the herbicide Drive. Iron did not have a negative effect on MSMA or Acclaim Extra in this study, as in the first. At two weeks through four weeks after treatment, Drive with iron was significantly lower than Drive without iron. During weeks two through four, crabgrass control with Drive plus iron was reduced by 20 percent when compared to Drive applied alone. By five weeks after treatment, both Drive plus iron and without iron had similar control (Figure 3).

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FIGURE 2

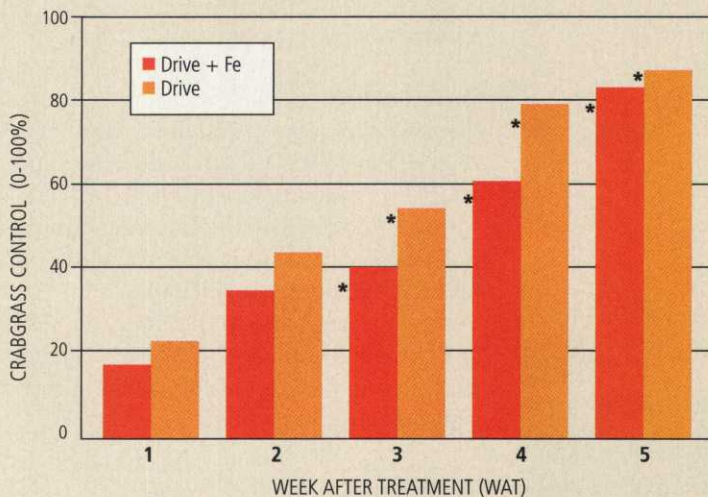
Iron effect on postemergent crabgrass control with fenoxaprop-ethyl (Acclaim Extra). Visual injury ratings were taken weekly for five weeks after treatment (WAT).



* indicates a difference between treatments according to Fisher's Lowest Statistical Difference (.05).

FIGURE 3

Iron effect on postemergent crabgrass control with quinclorac (Drive). Visual injury ratings were taken weekly for five weeks after treatment (WAT).



* indicates a difference between treatments according to Fisher's Lowest Statistical Difference (.05).

TABLE 1

Treatments used in determining potential antagonism of adding iron with postemergent herbicides for smooth crabgrass control.

TREATMENT	RATE
Iron 20 WP (FeSO ₄)	.5 lbs Fe/1,000 square feet
MSMA 6.6 L	1.5 pounds of active ingredient per acre (ai/A)
MSMA 6.6 L + Iron 20 WP	1.5 lbs ai/A + .5 lbs Fe/1,000 square feet
Asulox (asulam) 3.34 L	2 lbs ai/A
Asulox (asulam) 3.34 L + Iron 20 WP	2 lbs ai/A + 0.5 lbs Fe/1,000 square feet
Vantage (sethoxydim) 1.0 L	.25 lbs ai/A
Vantage (sethoxydim) 1.0 L + Iron 20 WP	.25 lbs ai/A + .5 lbs Fe/1,000 square feet
Acclaim Extra (fenoxaprop) 0.57 L	.17 lbs ai/A
Acclaim Extra (fenoxaprop) 0.57 L + Iron 20 WP	.17 lbs ai/A + .5 lbs Fe/1,000 square feet
Fusilade T&O (fluazifop) 2.0 EC	.10 lbs ai/A
Fusilade T&O (fluazifop) 2.0 EC + Iron 20 WP	.10 lbs ai/A + .5 lbs Fe/1,000 square feet
Drive (Quinclorac) 75 DF	.75 lbs ai/A
Drive (Quinclorac) 75 DF + Iron 20 WP	.75 lbs ai/A + .5 lbs Fe/1,000 square feet
Envoy (clethodim) 1 EC	.25 lbs ai/A
Envoy (clethodim) 1 EC + Iron 20 WP	.25 lbs ai/A + .5 lbs Fe/1,000 square feet

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Conclusion

These studies suggest iron in the form of ferrous sulfate (FeSO₄) has little antagonistic effect on Asulox, Vantage, Fusilade T&O, or Envoy. Although inconsistent, an antagonistic response occurred when iron was added with MSMA, Acclaim Extra and Drive.

Iron appeared to slow the effects of MSMA and Drive, but ultimately — by five weeks after treatment — these herbicides had similar control with and without iron.


Acclaim Extra was most affected by tank mixing with iron. Five weeks after treatments, crabgrass control was reduced by more than 60 percent on plants treated with Acclaim Extra plus iron, compared to Acclaim Extra without iron.

Future research is needed to fully evaluate various iron sources on postemergent crabgrass control, including further examination of timing and rates of iron and herbicides application.

Tucker is a master's student at Clemson University in turfgrass management studying under McCarty and holds a bachelor's degree from Clemson University in microbiology.

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