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Identification and Control of Problematic Sedges in Arkansas Rice

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Background

Sedges, including yellow nutsedge (*Cyperus esculentus*), rice flatsedge (also known as annual flatsedge) (*Cyperus iria*) and smallflower umbrella sedge (*Cyperus difformis*), are increasingly becoming problematic and difficult to control in Arkansas rice fields due to emerging resistance issues. This fact sheet is a resource for growers, consultants and extension personnel on the identification of predominant sedges present in Arkansas rice fields. Alternative management options are also suggested for controlling ALS-resistant sedges.

For over a decade, one class of herbicide chemistry has been used almost exclusively for sedge control. This group of herbicides, referred to as ALS inhibitors, belongs to Group 2, according to the HRAC system for grouping herbicides based on their mode of action. Permit® (halosulfuron) has been the predominant ALS-inhibitor herbicide used for sedge control, especially for the control of nutsedges. Since the introduction of Clearfield® rice in 2002, Newpath® (imazethapyr), also an ALS-inhibitor, has provided an additional option for sedge control.

Over-reliance on ALS-inhibiting herbicides, as with any herbicide, has resulted in selection for resistance to this chemistry. Rice flatsedge populations with resistance to Beyond® (imazamox) have been confirmed in Arkansas. These flatsedge populations were also found to be resistant to Regiment® (bispyribacsodium) and Grasp® (penoxsulam), meaning that when resistance evolves to one ALS-inhibiting herbicide, it is likely that the entire ALS chemistry class will become ineffective on that population.

Most of the smallflower umbrella sedge populations in Arkansas have preexisting resistance to ALS herbicides, as they were spread from California through seed contamination. ALS-resistant umbrella sedge has been widespread in California rice production.

Rice flatsedge and umbrella sedge reproduce by seed, but yellow nutsedge primarily reproduces through underground tubers (Figure 1). It is commonly thought that resistance is less likely to evolve in predominantly vegetative-reproducing species such as yellow nutsedge, but evidence indicates it is possible for this to happen. At least one such population has been

FIGURE 1. Yellow nutsedge tuber

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documented in Arkansas (resistance to Permit®), and this population is also showing cross-resistance to other ALS herbicides.

Identification

The presence of solid triangular stems differentiates sedges from round hollow-stemmed grasses or solid round-stemmed rushes. Many sedge species have long, narrow and triplet leaves that are usually shiny and ridged with no ligules or auricles present. It can be difficult to differentiate yellow nutsedge plants from rice flatsedge plants prior to flowering, but at seedling stage, yellow nutsedge produces relatively thicker stems and broader leaves (Figure 2a) compared to rice flatsedge (Figure 2b). Leaves of yellow nutsedge plants taper gradually from the base and form a sharp point. When crushed, the rice flatsedge leaves produce a strong cedar-like aroma, which would be absent in yellow nutsedge. Moreover, the presence of tubers (Figure 1) in yellow nutsedge will help differentiate between these two species. Smallflower umbrella sedge seedlings also lack a tuber. The seedlings have much narrower (needle-like) leaves, and the first few leaves spread out forming a V-shaped early growth (Figure 2c).

Sedge species can be easily identified and distinguished at the flowering stage. Yellow nutsedge flower heads are loose, long, branched and yellow to golden brown in color (the name originates from the strikingly yellowish flower heads) (Figure 3a). Flower heads of rice flatsedge are much narrower and shorter (Figure 3b) compared to yellow nutsedge and can also be greenish-yellow in color. Smallflower umbrella sedge produces dense, round and often stalkless flower heads that are brown to purplish in color (Figure 3c).

FIGURE 2a. Seedlings of yellow nutsedge

FIGURE 2b. Seedlings of rice flatsedge

FIGURE 2c. Seedlings of smallflower umbrella sedge

FIGURE 3a. Flowering plant of yellow nutsedge

FIGURE 3b. Flowering plant of rice flatsedge

FIGURE 3c. Flowering plant of smallflower umbrella sedge

In addition, bog bulrush or "swamp sedge" also has been found in Arkansas rice fields, especially zero grade or reduced tillage fields. Although common in California and Louisiana, it was only recently confirmed in Arkansas (Rouse et al., 2016). The scientific name of swamp sedge is *Schoenoplectus mucronatus*. It is also resistant to most ALS herbicides and is similar in stature to umbrella sedge (Figures 4a and 4b). Swamp sedge reproduces by seed (Figures 4c and 4d) and has a culm or reduced rhizome root structure (Figure 4e).

FIGURE 4a. Swamp sedge seedling

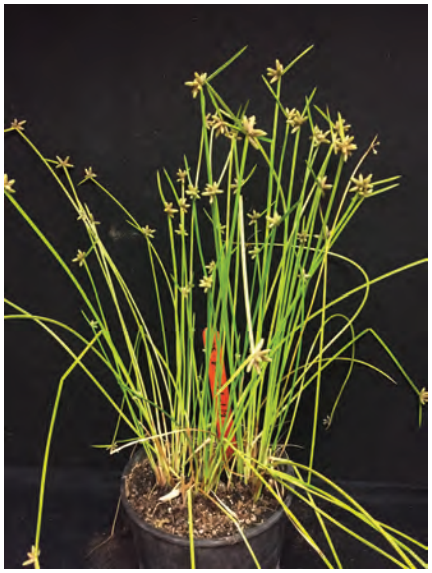


FIGURE 4b. Swamp sedge mature plant

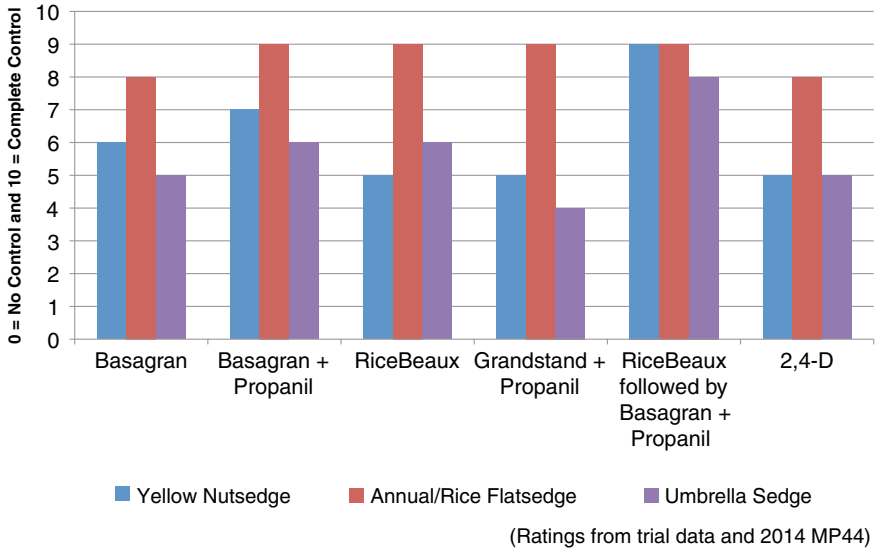
FIGURE 4c. Swamp sedge seedhead

FIGURE 4d. Swamp sedge seed

FIGURE 4e. Swamp sedge root

Control

It currently takes a system approach to control ALS-resistant sedges in rice. An early postemergence application (1-2 leaf rice) of Riceshot® (propanil) plus Bolero® (thiobencarb) or RiceBeaux® (propanil + thiobencarb) followed by Basagran® (bentazon) plus Riceshot® or crop oil concentrate applied pre-flood or early post-flood is the best option available. At least one new herbicide, benzobicyclon, is currently being developed that has activity on ALS-resistant sedges when applied early post-flood and, in the future, may provide growers with more options. Figure 5 shows control options for ALS-resistant sedges in rice.



(Ratings from trial data and 2014 MP44)

FIGURE 5. ALS-Resistant Sedge Control Options for Rice

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