Archival copy: for current recommendations see http://edis.ifas.ufl.edu or your local extension office.

UF IFAS Extension UNIVERSITY of FLORIDA

SS-AGR-244

Managing against the Development of Herbicide-Resistant Weeds: Sugarcane [1]

D. C. Odero, B. A. Sellers, J. A. Ferrell, and G. E. MacDonald[2]

Profitable sugarcane production in Florida requires effective weed management. Herbicides are a critical component of sugarcane weed management programs, because they provide an efficient and cost-effective means of weed control. However, excessive use of a single herbicide or group of herbicides with the same mechanism of action has resulted in the development of herbicide-resistant weeds. When herbicide-resistant weed populations appear, standard weed control treatments often become ineffective. As a result, alternative means of control must be used. In crops such as sugarcane where a limited number of herbicides are registered, the loss of a single effective herbicide can be very costly. Thus, it is critical to manage herbicides in order to prevent or delay the development of herbicide-resistant weed populations.

Growers and land managers must have a basic understanding of which herbicides have the same mechanism of action in order to successfully apply herbicides in a manner that reduces the likelihood of developing herbicide resistance. Table 1 lists herbicides by group number, mechanism of action, chemical family, common name, and trade name.

Figure 1. Sugarcane rows in the Everglades Agricultural Area (EAA) following herbicide application and cultivation.
Credits: C. Odero, UF/IFAS

When planning a herbicide program to manage against herbicide resistance, you should avoid whenever possible the use of a single herbicide or herbicide group in consecutive years. However, Group 4 (2,4-D, dicamba), Group 5 (atrazine, ametryn, metribuzin), and Group 18 (asulam) herbicides are typically used in every year of a sugarcane crop because of the limited number of herbicides available and the perennial crop cycle of sugarcane. Worldwide, over

1. This document is SS-AGR-244, one of a series of the Agronomy Department, UF/IFAS Extension. Original publication date December 2005. Revised October 2014. This publication is also part of the *Florida Sugarcane Handbook*, an electronic publication of the Agronomy Department. For more information, contact the editor of the Sugarcane Handbook, Hardev Sandhu (hsandhu@ufl.edu).Visit the EDIS website at http://edis.ifas.ufl.edu.

2. D. C. Odero, assistant professor, Agronomy Department, UF/IFAS Everglades Research and Education Center, Belle Glade, FL; B. A. Sellers, associate professor, Agronomy Department, UF/IFAS Range Cattle Research and Education Center, Ona, FL; J. A. Ferrell, professor, Agronomy Department; G. E. MacDonald, professor, Agronomy Department; UF/IFAS Extension, Gainesville, FL 32611.

The use of trade names in this publication is solely for the purpose of providing specific information. UF/IFAS does not guarantee or warranty the products named, and references to them in this publication do not signify our approval to the exclusion of other products of suitable composition. Use herbicides safely. Read and follow directions on the manufacturer's label.

The Institute of Food and Agricultural Sciences (IFAS) is an Equal Opportunity Institution authorized to provide research, educational information and other services only to individuals and institutions that function with non-discrimination with respect to race, creed, color, religion, age, disability, sex, sexual orientation, marital status, national origin, political opinions or affiliations. For more information on obtaining other UF/IFAS Extension publications, contact your county's UF/IFAS Extension office.

U.S. Department of Agriculture, UF/IFAS Extension Service, University of Florida, IFAS, Florida A & M University Cooperative Extension Program, and Boards of County Commissioners Cooperating. Nick T. Place, dean for UF/IFAS Extension.

Archival copy: for current recommendations see http://edis.ifas.ufl.edu or your local extension office.

70 weed species have developed resistance to the triazine herbicides. These biotypes include several members of the genera *Amaranthus, Ambrosia*, *Chenopodium, Eleusine, Panicum*, and *Solanum*, which are commonly found in Florida sugarcane fields. Consequently, it is critical that other herbicide groups be utilized as part of an integrated weed control program to prevent the development of triazine-resistant weed populations. Although there are no reported cases of resistance to asulam, there is always a chance that resistant populations could develop. Until recently, asulam (Group 18) was the only herbicide that could be used for postemergence control of grass weeds in sugarcane. However, the registration of Envoke (Group 2) provides an alternate mechanism of action for postemergence grass weed control. For most grassy weeds, tank mixtures of asulam and Envoke are an effective resistance management strategy. Herbicide resistance is more likely to be a problem in fields successively planted to sugarcane. Rotational crops and fallow periods provide a valuable opportunity to control weeds using tillage, flooding, or herbicides with mechanism of action.

Although it is likely that small populations of herbicide-resistant weeds are already present in the Everglades Agricultural Area (EAA), herbicide resistance is currently not a significant problem. The continued use of integrated and properly managed weed control programs should ensure that resistance does not become a major issue in the future.

Table 1. Group number and mechanism of action of herbicides commonly used in sugarcane and crops grown in rotation with sugarcane.

Group number and mechanism of action[1]	Chemical family	Common name	Trade name(s)	Crop used in…
Group 1 Acetyl CoA carboxylase (ACCase) inhibitors	aryloxyphenoxy-propionates	fenoxaprop	Acclaim Extra	sod
		fluazifop	Fusilade DX	fallow, canal banks
		cyhalofop	Clincher	rice
		quizalofop	Assure II	vegetables
	cyclohexanediones	clethodim	Select, Selex Max	vegetables
		sethoxydim	Poast, Poast plus	vegetables
Group 2 Acetolactate synthase (ALS) inhibitors	sulfonylureas	bensulfuron-methyl	Londax	rice
		chlorsulfuron	Corsair	sod
		halosulfuron-methyl	Sandea, Permit	sugarcane, rice
		nicosulfuron	Accent	sweet corn
		trifloxysulfuron-sodium	Envoke	sugarcane
	pyrimidinylthiobenzoate	bispyribac-sodium	Regiment	rice
	sulfonamide	penoxsulam	Grasp, Grasp Xtra[2]	rice
Group 3 Microtubule assembly inhibitors	dinitroanilines	oryzalin	Surflan	sod
		pendimethalin	Prowl 3.3, Prowl H2O, Pendimax 3.3	sugarcane
		prodiamine	Barricade	sod
Group 4 Synthetic auxins	phenoxy acetic acids	2,4-D	several	sugarcane, rice, sweet corn
	benzoic acid	dicamba	Banvel	sugarcane
	pyridinecarboxylic acid	triclopyr	Grasp Xtra[2]	rice
Group 5 Photosystem II inhibitors	triazines	ametryn	Evik	sugarcane
		atrazine	AAtrex, Atrazine (several), Bicep II Magnum[3]	sugarcane, sweet corn
		hexazinone	K4 [4]	sugarcane
		metribuzin	Sencor, Metribuzin 75	sugarcane
		simazine	Princep, Simazine (several)	sweet corn
Group 6 Photosystem II inhibitors (same mechanism as group 5, but different binding characteristics)	benzothiadiazinone	bentazon	Basagran	sweet corn, rice, vegetables
Group 7 Photosystem II inhibitors (same mechanism as group 5 and 6, but different binding characteristics)	Ureas	diuron	Diuron (several), Direx, Karmex, K4[4]	sugarcane
		linuron	Lorox	vegetables
	Amide	propanil	Stam M4	rice
		napropamide	Devrinol	vegetables

Archival copy: for current recommendations see http://edis.ifas.ufl.edu or your local extension office.

Group number and mechanism of action[1]	Chemical family	Common name	Trade name(s)	Crop used in…
Group 8 Lipid synthesis inhibition (not ACCase inhibition)	Thiocarbamates			
		EPTC	Eptam, Eradicane	sweet corn
		thiobencarb	Bolero	rice
	Phosphorodithioate	bensulide	Prefar	vegetables
Group 9 EPSP synthase inhibitors	glycine	glyphosate	Roundup, Touchdown, others	fallow
Group 14 Protoporphyrinogen oxidase (PPO) inhibitors	triazolinone	carfentrazone	Aim	sugarcane, rice, sweet corn
	Diphenylethers	acifluorfen	Ultra Blazer	rice
		oxyfluorfen	Goal	sweet corn
		fomesafen	Reflex	snap beans
	N-phenylphthalimides	flumioxazin	Valor SX	sugarcane
	Oxadiazole	oxadiazon	Ronstar	sod
Group 15 unknown mechanism of action	Chloroacetamides	metolachlor	Dual Magnum, Pennant Magnum	sweet corn, sod
		pronamide	Kerb	sod
Group 16 unknown mechanism of action	Benzofuran	ethofumesate	Prograss	sod
Group 18 DHP (dihydropteroate synthase step) inhibitors	Carbamate	asulam	Asulam, (several) Asulox	sugarcane
Group 21 Cell wall synthesis inhibitor (mechanism B)	Benzamide	isoxaben	Gallery	sod
Group 22 Photosystem I electron diversion	Bipyridyliums	paraquat	Gramoxone	fallow
Group 27 Hydroxyphenyl-pyruvate-dioxygenase inhibitors	Triketone	mesotrione	Callisto	sugarcane, sweet corn

[1]Group number and mechanism of action according to the Weed Science Society of America classification.
[2]Grasp Xtra is a commercial; blend of penoxsulam and triclopyr.
[3]Bicep II Magnum is a commercial blend of atrazine and metolachlor.
[4]K4 is a commercial blend of diuron and hexazinone.

Archival copy: for current recommendations see http://edis.ifas.ufl.edu or your local extension office.