

WEED RESISTANCE

Weed resistance is defined by the Weed Science Society of America (WSSA) as the inherited ability of a plant to survive and reproduce after exposure to a dose of herbicide normally lethal to the wild type. In a plant, resistance may be naturally occurring or induced by such techniques as genetic engineering or selection of variants produced by tissue culture or mutagenesis (WSSA). Repeated applications of the same herbicide or a different herbicide with a similar mode of action on the same field in consecutive years has contributed to the widespread occurrence of resistance to herbicides in several weed species around the world, in the U.S. and in Louisiana (see list below). Weed management programs must not solely depend on herbicides to be economically sustainable in the long term. A combination of the following management strategies is recommended:

1. Use residual herbicides.
2. Rotate different crops.
3. Rotate herbicides with different modes of action.
4. Tank-mix herbicides with different modes of action at full recommended rates.
5. Avoid sequential applications of the same herbicide.
6. Utilize tillage, cultivation or other cultural practices whenever and wherever feasible.
7. Clean equipment thoroughly before and after each use.
8. Control weeds on fallow ground or set aside to prevent spreading of documented or suspected resistant weeds.

If you suspect resistance after a herbicide application, attempt to eradicate the escapes using mechanical methods (e.g., hand-removal, tillage). **DO NOT ALLOW WEEDS TO PRODUCE SEED.** If seeds are produced, collect a seed sample from suspect plants and take to your parish LSU AgCenter extension agent who will have them screened by an LSU AgCenter scientist and inform you if the population is resistant.

HERBICIDE-RESISTANT WEEDS IN LOUISIANA

Weed	Herbicide
Amazon sprangletop	cyhalofop-butyl, fenoxaprop-P-butyl
Barnyardgrass	propanil, quinclorac, imazethapyr
Common cocklebur	MSMA, DSMA
Italian ryegrass	glyphosate
Itchgrass	fluazifop-P-butyl
Johnsongrass	glyphosate, fluazifop-P-butyl, clethodim
Palmer amaranth	glyphosate
Rice flatsedge	halosulfuron
Waterhemp	glyphosate

HERBICIDE MODE OF ACTION

WSSA Group	HRAC Group	Site of Action	Chemical Family	Active Ingredient
1	A	Inhibition of acetyl CoA carboxylase (ACCase)	Aryloxyphenoxy-propionate 'FOPs'	clodinafop cyhalofop-butyl diclofop-methyl fenoxaprop-P-ethyl fluazifop-P-butyl quizalofop-P-ethyl
			Cyclohexanedione 'DIMs'	clethodim sethoxydim tralkoxydim
			Phenylpyrazoline 'DEN'	pinoxaden
2	B	Inhibition of acetolactate synthase ALS (acetohydroxyacid synthase AHAS)	Sulfonylurea	bensulfuron-methyl chlorimuron-ethyl chlorsulfuron flazasulfuron foramsulfuron halosulfuron-methyl iodosulfuron mesosulfuron metsulfuron-methyl nicosulfuron primisulfuron-methyl prosulfuron rimsulfuron sulfometuron-methyl sulfosulfuron thifensulfuron-methyl tribenuron-methyl trifloxysulfuron
			Imidazolinone	imazamox imazapic imazapyr imazaquin imazethapyr
		Inhibition of acetolactate synthase ALS (acetohydroxyacid synthase AHAS): continued	Triazolopyrimidine	cloransulam-methyl diclosulam flumetsulam penoxsulam

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			Pyrimidinyl(thio)benzoate	bispyribac-Na pyrithiobac-Na
5	CI	Inhibition of photosynthesis at photosystem II	Triazine	atrazine prometryn simazine
			Triazinone	hexazinone metribuzin
			Uracil	bromacil terbacil
7	C2	Inhibition of photosynthesis at photosystem II	Urea	diuron fluometuron (see F3) linuron siduron tebuthiuron
			Amide	propanil
6	C3	Inhibition of photosynthesis at photosystem II	Nitrile	bromoxynil
			Benzothiadiazinone	bentazon
22	D	Photosystem-I-electron diversion	Bipyridylium	diquat paraquat
14	E	Inhibition of protoporphyrinogen oxidase (PPO)	Diphenylether	acifluorfen-Na fomesafen lactofen oxyfluorfen
			Phenylpyrazole	pyraflufen-ethyl
			N-phenylphthalimide	flumioxazin flumiclorac-pentyl
		Inhibition of protoporphyrinogen oxidase (PPO): continued	Thiadiazole	fluthiacet-methyl
			Oxadiazole	oxadiazon
			Triazolinone	carfentrazone-ethyl sulfentrazone
12	FI	Inhibition of carotenoid biosynthesis at the phytoene desaturase step (Bleacher)	Pyridazinone	norflurazon
27	F2	Inhibition of 4-hydroxyphenyl-pyruvate-dioxygenase (4-HPPD) (Bleacher)	Triketone	mesotrione tembotrione
			Isoxazole	isoxaflutole
			Pyrazolone	topramezone
13		Inhibition of carotenoid biosynthesis (unknown target) (Bleacher)	Isoxazolidinone	clomazone
			Urea	fluometuron (see C2)

WSSA Group	HRAC Group	Site of Action	Chemical Family	Active Ingredient
9	G	Inhibition of EPSP synthase	Glycine	glyphosate
10	H	Inhibition of glutamine synthetase	Phosphinic acid	glufosinate-ammonium
18	I	Inhibition of DHP (dihydropteroate) synthase	Carbamate	asulam
3	KI	Microtubule assembly inhibition	Dinitroaniline	benefin = benfluralin ethalfuralin oryzalin pendimethalin trifluralin
			Pyridine	dithiopyr
			Benzamide	propyzamide = pronamide
			Benzoic acid	DCPA = chlorthal-dimethyl
15	K3	Inhibition of VLCFAs (Inhibition of cell division)	Chloroacetamide	acetochlor alachlor dimethenamid-P metolachlor
			Acetamide	napropamide
			Oxyacetamide	flufenacet
			Pyrazole	pyroxasulfone
20	L	Inhibition of cell wall (cellulose) synthesis	Nitrile	dichlobenil
21			Benzamide	isoxaben
8	N	Inhibition of lipid synthesis - not ACCase inhibition	Thiocarbamate	butylate EPTC molinate thiobencarb = benthicarb
			Phosphorodithioate	bensulide
			Benzofuran	ethofumesate
4	O	Action like indole acetic acid (synthetic auxins)	Phenoxy-carboxylic-acid	2,4-D 2,4-DB MCPA mecoprop = MCPP = CMPP
			Benzoic acid	dicamba
			Pyridine carboxylic acid	aminopyralid clopyralid florpyrauxifen fluroxypyr halauxifen picloram triclopyr
			Quinoline carboxylic acid	quinclorac
			Arylpicolinate	halauxifen

WSSA Group	HRAC Group	Site of Action	Chemical Family	Active Ingredient
19	P	Inhibition of auxin transport	Phthalamate Semicarbazone	naptalam diflufenzopyr-Na
25	Z	Unknown herbicide mode of action	Organoarsenical Unclassified	DSMA and MSMA aminocyclopyrachlor