Weed Resistance And Herbicide Classification

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. 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 integrated weed management (IWM) strategies is recommended:

1. Use residual herbicides with multiple sites of action. A layered soil residual program (PRE followed by POST residual) is recommended.
2. Rotate different crops.
3. Crop rotation allows rotating herbicides with different sites of action.
4. Tank-mix herbicides with multiple effective sites of action at full recommended rates in a cropping season.
5. Avoid sequential applications of the same herbicide group.
6. Utilize tillage, cultivation or other cultural practices such as narrow row spacing and cover crops (e.g. cereal rye) 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). Use harvest weed seed control (HWSC) methods to mitigate and prevent the spread of herbicide-resistant weed seeds when infestations are high, and you have weed biotypes resistant to multiple herbicide sites of action.

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 weed scientist and inform you if the population is resistant.

Herbicide-Resistant Weeds in Louisiana

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

Herbicide Classification According to Site of Action

WSSA/HRAC Code (Group No.)	Site of Action	Chemical Family	Herbicide
1	Inhibition of Acetyl CoA Carboxylase	Aryloxyphenoxy-propionates (FOPs)	Clodinafop-propargyl Cyhalofop-butyl Fenoxaprop-ethyl Fluazifop-butyl Quizalofop-ethyl
1	Inhibition of Acetyl CoA Carboxylase	Cyclohexanediones (DIMs)	Clethodim Sethoxydim
1	Inhibition of Acetyl CoA Carboxylase	Phenylpyrazoline	Pinoxaden
2	Inhibition of Acetolactate Synthase	Imidazolinones	Imazamox Imazapic Imazapyr Imazaquin Imazethapyr
2	Inhibition of Acetolactate Synthase	Pyrimidinyl benzoates	Bispyribac-sodium Pyrithiobac-sodium
2	Inhibition of Acetolactate Synthase	Sulfonanilides	Pyrimisulfan
2	Inhibition of Acetolactate Synthase	Sulfonylureas	Bensulfuron-methyl Chlorimuron-ethyl Chlorsulfuron Flazasulfuron Foramsulfuron Halosulfuron-methyl Imazosulfuron Mesosulfuron-methyl Metsulfuron-methyl Nicosulfuron Orthosulfamuron Primisulfuron-methyl Prosulfuron Rimsulfuron Sulfosulfuron Thifensulfuron-methyl Tribenuron-methyl Trifloxysulfuron-Na
2	Inhibition of Acetolactate Synthase	Triazolinones	Flucarbazone-Na Propoxycarbazone-Na Thiencarbazone-methyl

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2	Inhibition of Acetolactate Synthase	Triazolopyrimidine - Type 1	Cloransulam-methyl Diclosulam Flumetsulam
2	Inhibition of Acetolactate Synthase	Triazolopyrimidine - Type 2	Penoxsulam Pyroxsulam
3	Inhibition of Microtubule Assembly	Benzamides	Propyzamide=pronamide
3	Inhibition of Microtubule Assembly	Benzoic acid	Chlorthal-dimethyl=DCPA
3	Inhibition of Microtubule Assembly	Dinitroanilines	Benefin=benfluralin Ethalfluralin Oryzalin Pendimethalin Prodiamine Trifluralin
3	Inhibition of Microtubule Assembly	Phosphoroamidates	Butamifos
3	Inhibition of Microtubule Assembly	Pyridines	Dithiopyr
4	Auxin Mimics	Benzoates	Dicamba
4	Auxin Mimics	Other	Benazolin-ethyl
4	Auxin Mimics	Phenoxy-carboxylates	2,4-D 2,4-DB MCPA Mecoprop
4	Auxin Mimics	Pyridine-carboxylates	Aminopyralid Clopyralid Florpyrauxifen Picloram Halauxifen
4	Auxin Mimics	Pyridyloxy-carboxylates	Fluroxypyr Triclopyr
4	Auxin Mimics	Pyrimidine-carboxylates	Aminocyclopyrachlor
4	Auxin Mimics	Quinoline-carboxylates	Quinclorac
5	Inhbition of Photosynthesis at PSII - Serine 264 Binders	Amides	Propanil
5	Inhbition of Photosynthesis at PSII - Serine 264 Binders	Phenlcarbamates	Desmedipham Phenmedipham
5	Inhbition of Photosynthesis at PSII - Serine 264 Binders	Pyridazinone	Chloridazon (=pyrazon)

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5	Inhbition of Photosynthesis at PSII - Serine 264 Binders	Triazines	Atrazine Prometryne Propazine Simazine Simetryne Terbumeton Terbuthylazine Trietazine
5	Inhbition of Photosynthesis at PSII - Serine 264 Binders	Triazinones	Hexazinone Metribuzin
5	Inhbition of Photosynthesis at PSII - Serine 264 Binders	Triazolinone	Amicarbazone
5	Inhbition of Photosynthesis at PSII - Serine 264 Binders	Uracils	Bromacil Terbacil
5	Inhbition of Photosynthesis at PSII - Serine 264 Binders	Ureas	Diuron Fluometuron Linuron Siduron Tebuthiuron
6	Inhbition of Photosynthesis at PSII - Histidine 215 Binders	Benzothiadiazinone	Bentazon
6	Inhbition of Photosynthesis at PSII - Histidine 215 Binders	Nitriles	Bromoxynil
6	Inhbition of Photosynthesis at PSII - Histidine 215 Binders	Phenyl-pyridazines	Pyridate
9	Inhibition of Enolpyruvyl Shikimate Phosphate Synthase	Glycine	Glyphosate
10	Inhibition of Glutamine Synthetase	Phosphinic acids	Glufosinate-ammonium
12	Inhibition of Phytoene Desaturase	Diphenyl heterocycles	Fluridone
12	Inhibition of Phytoene Desaturase	N-Phenyl heterocycles	Norflurazon
13	Inhibition of Deoxy-D-Xyulose Phosphate Synthase	Isoxazolidinone	Clomazone
14	Inhibition of Protoporphyrinogen Oxidase	Diphenyl ethers	Acifluorfen Fomesafen Lactofen Oxyfluorfen

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14	Inhibition of Protoporphyrinogen Oxidase	N-Phenyl-imides	Trifludimoxazin Flumiclorac-pentyl Flumioxazin Saflufenacil Tiafenacil
14	Inhibition of Protoporphyrinogen Oxidase	N-Phenyl-imides (procide acitive form)	Fluthiacet-methyl
14	Inhibition of Protoporphyrinogen Oxidase	N-Phenyl-oxadiazolones	Oxadiazon
14	Inhibition of Protoporphyrinogen Oxidase	N-Phenyl-triazolinones	Carfentrazone-ethyl
14	Inhibition of Protoporphyrinogen Oxidase	N-Phenyl-triazolinones (continued)	Sulfentrazone
14	Inhibition of Protoporphyrinogen Oxidase	Phenylpyrazoles	Pyraflufen-ethyl
15	Inhibition of Very Long-Chain Fatty Acid Synthesis	Benzofurans	Ethofumesate
15	Inhibition of Very Long-Chain Fatty Acid Synthesis	Isoxazolines	Pyroxasulfone
15	Inhibition of Very Long-Chain Fatty Acid Synthesis	Oxiranes	Indanofan
15	Inhibition of Very Long-Chain Fatty Acid Synthesis	Thiocarbamates	Butylate EPTC Molinate Thiobencarb (=Benthiocarb) Vernolate
15	Inhibition of Very Long-Chain Fatty Acid Synthesis	α-Chloroacetamides	Acetochlor Alachlor Dimethenamid Propachlor Metolachlor
18	Inhibition of Dihydropteroate Synthase	Carbamate	Asulam
19	Auxin Transport Inhibitor	Aryl-carboxylates	Diflufenzopyr-sodium Naptalam
22	PS I Electron Diversion	Pyridiniums	Diquat Paraquat
23	Inhibition of Microtubule Organization	Carbamates	Chlorpropham
24	Uncouplers	Dinitrophenols	Dinosam Dinoseb
27	Inhibition of Hydroxyphenyl Pyruvate Dioxygenase	Isoxazoles	Isoxaflutole

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27	Inhibition of Hydroxyphenyl Pyruvate Dioxygenase	Pyrazoles	Pyrasulfotole Tolpyralate Topramezone
27	Inhibition of Hydroxyphenyl Pyruvate Dioxygenase	Triketones	Benzobicyclon Bicyclopyrone Mesotrione Tembotrione
28	Inhibition of Dihydroorotate Dehydrogenase	Aryl pyrrolidinone anilide	Tetflupyrolimet
29	Inhibition of Cellulose Synthesis	Alkylazines	Indaziflam
29	Inhibition of Cellulose Synthesis	Benzamides	Isoxaben
29	Inhibition of Cellulose Synthesis	Nitriles	Dichlobenil Chlorthiamid
30	Inhibition of Fatty Acid Thioesterase	Benzyl ether	Cinmethylin Methiozolin
31	Inhibition of Serine-Threonine Protein Phosphatase	Other	Endothal
32	Inhibition of Solanesyl Diphosphate Synthase	Diphenyl ether	Aclonifen
33	Inhibition of Homogentisate Solanesyltransferase	Phenoxypyridazine	Cyclopyrimorate
34	Inhibition of Lycopene Cyclase	Triazole	Amitrole
0	Unknown	Acetamides	Napropamide
0	Unknown	Phosphorodithioate	Bensulide