

Herbicide Sites of Action

Herbicides kill plants by binding to a specific protein and inhibiting that protein's function. This protein is referred to as the herbicides site of action. Utilizing herbicide programs that include several different sites of action is a key step in managing herbicide resistant weeds.

A numbering system has been developed that makes it easier for farmers to evaluate their herbicide program in terms of site of action diversity. Each herbicide site of action is assigned a Group Number (Table 1), and this Group Number is found on the first page of most herbicide labels. Simply including multiple sites of action is not sufficient in fighting herbicide resistance, but rather the different sites of action must be effective against problem weeds such as waterhemp and giant ragweed.

Table 1. Herbicide classification by Group Number and site of action of products commonly used in corn and soybean.

Group No.	Site of Action (mode of action)	Group No.	Site of Action (mode of action)
1	ACC-ase (lipid synthesis)	10	Glutamine synthetase (photosynthesis inhibition)
2	ALS (amino acid synthesis)	13	DPX synthase (carotene synthesis)
3	Tubulin (cell division)	14	PPO (chlorophyll synthesis)
4	Auxin binding site (synthetic auxin)	15	Unknown (LC fatty acid synthesis)
5	D1 protein (Photosystem II inhibition)	19	Unknown (Auxin transport)
6 and 7	D1 protein (Photosystem II inhibition)	22	Unknown (Photosystem I inhibition)
9	EPSPS (shikimic acid pathway inhibition)	27	HPPD (carotene synthesis)

Table 2. Active ingredients and Group Numbers of single ingredient products.

Tradename	Group No.	Active Ingredient	Tradename	Group No.	Active Ingredient
2,4-D	4	2,4-D	Lorox	7	linuron
Accent	2	nicosulfuron	Option	2	foramsulfuron
Aim	14	carfentrazone	Outlook	15	dimethenamid
Assure II	1	quizalofop	Peak	2	prosulfuron
atrazine	5	atrazine	Permit	2	halosulfuron
Autumn	2	iodosulfuron	Poast	1	sethoxydim
Balance Flexx	27	isoxaflutole	Prowl	3	pendimethalin
Banvel/Clarity	4	dicamba	Pursuit	2	imazethapyr
Basagran	6	bentazon	Python	2	flumetsulam
Beacon	2	primisulfuron	Raptor	2	imazamox
Buctril	6	bromoxynil	Resolve	2	rimsulfuron
Cadet	14	fluthiacet-ethyl	Resource	14	flumiclorac
Callisto	27	mesotrione	Roundup	9	glyphosate
Classic	2	chorimuron	Scepter	2	imazaquin
Cobra	14	lactofen	Select	1	clethodim
Command	13	clomazone	Sencor	5	metribuzin
Dual	15	metolachlor	Sharpen	14	saflufenacil
Express	2	tribenuron	Sonalan	3	ethalfuralin
FirstRate	2	cloransulam	Spartan/Authority	14	sulfentrazone
FlexStar/Reflex	14	fomasafen	Stinger	4	clopyralid
Fusilade DX	1	fluazifop	Treflan	3	trifluralin
Gramoxone	22	paraquat	UltraBlazer	14	acifluorfen
Harmony	2	thifensulfuron	Valor	14	flumioxazin
Harness/Surpass	15	acetochlor	Warrant	15	acetochlor
Impact/Armezon	27	topramezone	Zidua	15	pyroxasulfone
IntRRo	15	alachlor	<i>Only sold in premix</i>	2	thiencarbazone
Laudis	27	tembotrione	<i>Only sold in premix</i>	19	diflufenzopyr
Liberty/Ignite	10	glufosinate	<i>Only sold in premix</i>	1	fenoxaprop

Table 3. Active ingredients and group numbers of herbicide premixes.

Tradename	Group No.	Active Ingredients	Tradename	Group No.	Active Ingredients
Anthem	14, 15	fluthiacet, pyroxasulfone	Instigate	2, 27	rimsulfuron, mesotrione
Authority Assist	2, 14	imazethapyr, sulfentrazone	Keystone	5, 15	atrazine, acetochlor
Authority First	2, 14	cloransulam, sulfentrazone	Lexar	5, 15, 27	atrazine, metolachlor, mesotrione
Authority MTZ	5, 14	metribuzin, sulfentrazone	Lumax	5, 15, 27	atrazine, metolachlor, mesotrione
Authority XL	2, 14	chlorimuron, sulfentrazone	Marksman	4, 5	dicamba, atrazine
Autumn Super	2, 2	iodosulfuron, thien carbazole	Northstar	2, 4	primisulfuron, dicamba
Basis Blend	2, 2	rimsulfuron, thifensulfuron	Optill	2, 14	imazethapyr, saflufenacil
Bicep	5, 15	atrazine, metolachlor	Permit Plus	2, 2	halosulfuron, thifensulfuron
Callisto Xtra	5, 27	atrazine, mesotrione	Priority	2, 14	halosulfuron, carfentrazone
Canopy	2, 5	chloriuron, metribuzin	Prefix	14, 15	fomesafen, metolachlor
Canopy EX	2, 5	chlorimuron, tribenuron	Prequel	2, 27	rimsulfuron, isoxaflutole
Capreno	2, 27	thien carbazole, tembotrione	Pursuit Plus	2, 3	imazethapyr, pendimethalin
Corvus	2, 27	thien carbazole, isoxaflutole	Realm Q	2, 27	rimsulfuron, mesotrione
Degree Xtra	5, 15	atrazine, acetochlor	Resolve Q	2, 2	rimsulfuron, thifensulfuron
Enlite	2, 2, 14	chlorimuron, thifensulfuron, flumioxazin	Require Q	2, 4	rimsulfuron, dicamba
Envive	2, 2, 14	chloriuron, thifensulfuron, flumioxazin	Sequence	9, 15	glyphosate, metolachlor
Expert	5, 9, 15	atrazine, glyphosate, metolachlor	Sonic	2, 14	cloransulam, sulfentrazone
Extreme	2, 9	imazethapyr, glyphosate	Spirit	2, 2	primisulfuron, prosulfuron
Fierce	14, 15	flumioxazin, pyroxasulfone	Status	4, 19	dicamba, diflufenopyr
Fierce XLT	2, 14, 15	chlorimuron, flumioxazin, pyroxasulfone	Steadfast Q	2, 2	nicosulfuron, rimsulfuron
Flexstar GT	9, 14	glyphosate, fomesafen	Surestart	2, 4, 15	flumetsulam, clopyralid, acetochlor
FulTime	5, 15	atrazine, acetochlor	Synchrony	2, 2	chlorimuron, thifensulfuron
Fusion	1, 1	fenoxaprop, fluazifop	Triple Flex	2, 4, 15	flumetsulam, clopyralid, acetochlor
Gangster	2, 14	cloransulam, flumioxazin	Valor XLT	2, 14	chlorimuron, flumioxazin
Guardman Max	5, 15	atrazine, dimethenamid	Verdict	14, 15	saflufenacil, dimethenamid
Halex GT	9, 15, 27	glyphosate, metolachlor, mesotrione	Yukon	2, 4	halosulfuron, dicamba
Harness Xtra	5, 15	atrazine, acetochlor	Zemax	15, 27	metolachlor, mesotrione

Common chemical and trade names are used in this publication. The use of tradenames is for clarity by the reader. Inclusion of a tradename does not imply endorsement of that particular brand of herbicide nor does exclusion imply nonapproval.