

7 Herbicide Injury Symptoms

Most observed herbicide damage is due to misapplication, but hybrid and environment interactions will sometimes cause injury symptoms to appear. Herbicides used to control weeds in the previous crop must be taken into consideration, as some herbicide carryover may affect the following corn crop.

Various tankmixes of herbicides are widely used. Be alert to plant injury that can be caused by individual tankmix components or by an interaction involving two or more components in the tankmix itself.

Corn plants frequently outgrow the effects of herbicide injury and their final yields may not be noticeably lowered.

ACCase Inhibitors

Aryloxyphenoxy Propionic Acids and Cyclohexanediones

(Including Assure® II, Fusion®, Poast® and Select Max®)



Symptoms of damage from acetyl coA carboxylase inhibitors include chlorosis (yellowing) of newly formed leaves with possible reddening or purpling of older leaves. Tissues at the growing point turn brown and eventually decompose, a symptom

called deadheart. Sublethal doses result in pale white to yellow streaks between leaf veins.

ALS Inhibitors

Imidazolinones, Sulfonylureas, and Triazolopyrimidines

(Including Accent Gold®, Beacor®, Classic®, FirstRate®, Lightning®, Pursuit®, and Scepter®)



These herbicides alter the function of the acetolactate synthase (ALS) enzyme and affect root and shoot growth and development. Corn injury typically shows up as reduced root systems, often described as “bottle-brush” roots.

Roots often grow flat or

parallel to the soil surface and may turn brown. Stems and midribs can purple, and the stem will be short and thick below the whorl. Mid- to late-season symptoms include short internodes, malformed leaves, poor root systems, and pinched ears.



Herbicides with sulfonylurea chemistry are labeled for use on both corn and soybeans. Products in this family may persist in the soil, particularly if soil pH is above 6.8 and post-application rainfall has been limited. Though they have the same general chemistry, different herbicides are used on corn and soybeans, and injury of corn may develop the

season following sulfonylurea herbicide application to soybean fields.

Synthetic Auxins

Benzoic Acids, Phenoxys, and Pyridine Carboxylic Acids

(Including Banvel[®], Butyrac[®], Clarity[®], and Crossbow[®])



These herbicides, also known as plant growth regulators, are translocated to meristematic tissue and interfere with cell formation resulting in abnormal root and shoot



growth. Symptoms include twisted whorls or buggy-whipping where the leaves do not unfurl, abnormal brace roots, root proliferation, brittle stalks, and poor pollination. Growing conditions are a factor in damage expression.

Auxin Transport Inhibitors

Semicarbazones

(Including Distinct[®] and Status[®])

These herbicides are primarily active against broadleaf plants, but injury symptoms may occur in corn under certain conditions. Injury is similar to growth regulator herbicides.

Carotenoid Synthesis Inhibitors

Isoxazolidinones

(Including Command[®])



Shallow planting or stress conditions that slow seedling metabolism can increase the potential for injury. Damage to corn seedlings the season following an application may occur, especially if soil pH is below 6.0. Affected plants are distinctly white

or bleached. Most corn plants recover and new leaves have normal color.

Cell Division Inhibitors

Amides

(Including Degree[®], Dual II Magnum[®], and Harness[®])



Amides (also known as acetanilides, acetamides, or chloroacetamides) are meristematic growth inhibitors that are translocated to the shoot and leaves. These products can cause seedlings to leaf underground or trap

seedling leaves so they cannot unfurl, giving a ladder effect. Damage is more likely to take place with cool, wet weather occurring immediately before emergence.

EPSP Synthase Inhibitors

Glycines

(Including Roundup[®] agricultural herbicides and generic formulations of glyphosate)



These non-selective foliar-applied herbicides are translocated and interfere with amino



acid synthesis. If spray drift reaches corn, leaves wilt, turn brown, and die. Sublethal rates can cause phenoxy-like symptoms. Glyphosate applications that occur too late to corn with Roundup Ready[®] 2 Technology can result in poor kernel set.

Glutamine Synthase Inhibitors

Phosphinic Acids

(Including Ignite[®] and Liberty[®])

Inhibitors of glutamine synthase are nonspecific and will kill plants that have not been modified to express





resistance to them. Symptomology will range from light speckling on leaves and yellowing to plant death, depending on the degree and intensity of drift or spray contamination.

4-HPPD Inhibitors Isoxazoles and Triketones

(Including Balance[®], Balance[®] Pro, Callisto[®], and Impact[®])



Injury symptoms range from minor yellowing, through completely bleached plants, to



significant stand loss. Shallow planting or stress conditions that slow seedling metabolism can increase the potential for injury. New tissue development should not be affected and the effect of injury on yield potential will vary from field to field.

Microtubule Inhibitors Dinitroanilines

(Including Prowl[®] and Treflan[®])



Dinitroanilines function by inhibiting root and shoot growth. Injury can occur due to carryover from an application made the previous season. Seedling roots are pruned and clubbed. Stunting and purplish discoloration may occur above ground.

Symptoms may be confused with nematode damage.

PPO Inhibitors

Diphenyl Ethers, Phenylphthalimides, Pyrimidines, and Triazolinones

(Including Aim[®], Authority[®], FlexStar[®], Reflex[®], and Resource[®])

Herbicide application during hot, humid conditions or before a long period of cool weather can result in crop

injury. Drift injury can occur if application takes place under windy conditions. Symptoms range from leaf speckling to browning and death of entire leaves. If enough plant tissue is affected, the plant may wilt and die.



The season following application in soybeans, non-degraded herbicide residue can cause interveinal bleaching and discoloration of corn seedlings if post-application rainfall was unusually low.

Photosystem I Electron Diversion Bipyridiliums

(Including Gramoxone Inteon[™])

Drift of these non-selective contact herbicides may cause leaf spotting. Symptoms can be confused with disease; however, the dead leaf areas will not spread.

Photosystem II Inhibitors—mobile within plant

Triazines and Ureas

(Including atrazine, AAtrex[®], Princep[®], Sencor[®] and Lorox[®])

These chemical families inhibit photosynthesis, which leads to leaf yellowing, browning, and death, usually starting at the leaf margins and tip. New leaves may be symptom-free. Symptoms are more common on sandy soil where an excessive rate was applied. Unfavorable growing conditions may accentuate plant injury.

Photosystem II Inhibitors—nonmobile within plant

Benzothiadiazoles and Nitriles

(Including Basagran[®] and Buctril[®])

These are contact herbicides that are absorbed through the foliage. Leaf speckling after foliar application is a common injury symptom.

Herbicides that may be used or trigger symptomology in corn, grouped by mode of action and class of chemistry.

HERBICIDE	MODES OF ACTION	CLASS OF CHEMISTRY	TRADEMARK OWNER
Acetyl CoA Carboxylase Inhibitors		Aryloxyphenoxypropionates	
Assure® II	ACCCase Inhibitor	Aryloxyphenoxypropionate	E.I. du Pont de Nemours & Co.
Fusilade® DX	ACCCase Inhibitor	Aryloxyphenoxypropionate	Syngenta
Fusion®	ACCCase Inhibitor + ACCCase Inhibitor	Aryloxyphenoxypropionate + Aryloxyphenoxypropionate	Syngenta
Hoelon®	ACCCase Inhibitor	Aryloxyphenoxypropionate	Bayer
Acetyl CoA Carboxylase Inhibitors		Cyclohexanediones	
Poast®	ACCCase Inhibitor	Cyclohexanedione	BASF
Poast Plus®	ACCCase Inhibitor	Cyclohexanedione	BASF
Select®	ACCCase Inhibitor	Cyclohexanedione	Valent USA Corporation
Select MAX®	ACCCase Inhibitor	Cyclohexanedione	Valent USA Corporation
Acetolactate Synthase Inhibitors		Imidazolinones	
Authority®	ALS Inhibitor + PPO Inhibitor	Imidazolinone + Triazolinone	FMC Corporation
Assist			
Optill™	ALS Inhibitor + PPO Inhibitor	Imidazolinone + Pyrimidinedione	BASF
Lightning®	ALS Inhibitor + ALS Inhibitor	Imidazolinone + Imidazolinone	BASF
Pursuit®	ALS Inhibitor	Imidazolinone	BASF
Pursuit® Plus	ALS Inhibitor + Microtubule Inhibitor	Imidazolinone + Dinitroaniline	BASF
Raptor®	ALS Inhibitor	Imidazolinone	BASF
Scepter®	ALS Inhibitor	Imidazolinone	BASF
Squadron®	ALS Inhibitor + Microtubule Inhibitor	Imidazolinone + Dinitroaniline	BASF
Steel®	ALS Inhibitor + ALS Inhibitor + Microtubule Inhibitor	Imidazolinone + Imidazolinone + Dinitroaniline	BASF
Acetolactate Synthase Inhibitors		Sulfonylureas	
Accent®	ALS Inhibitor	Sulfonylurea	E.I. du Pont de Nemours & Co.
Accent Gold®	ALS Inhibitor + ALS Inhibitor +	Sulfonylurea + Sulfonylurea + Triazolopyrimidine + Pyridine	E.I. du Pont de Nemours & Co.
Authority® XL	ALS Inhibitor + PPO Inhibitor	Sulfonylurea + Triazolinone	FMC Corporation
Beacon®	ALS Inhibitor + Auxin	Sulfonylurea	Syngenta
Canopy®	ALS Inhibitor	Sulfonylurea + Triazine	E.I. du Pont de Nemours & Co.
Celebrity® Plus	ALS Inhibitor + PPO Inhibitor	Sulfonylurea + Benzoic Acid + Semicarbazone	BASF
	ALS Inhibitor + Auxin + Auxin		
Classic®	Transport Inhibitor	Sulfonylurea	E.I. du Pont de Nemours & Co.
Exceed®	ALS Inhibitor	Sulfonylurea + Sulfonylurea	Syngenta
NorthStar®	ALS Inhibitor + ALS Inhibitor	Sulfonylurea + Benzoic Acid	Syngenta
Option®	ALS Inhibitor	Sulfonylurea	Bayer
Peak®	ALS Inhibitor + Auxin	Sulfonylurea	Syngenta
Permit®	ALS Inhibitor	Sulfonylurea	Nissan Chemical Industries, Ltd
Realm™ Q	ALS Inhibitor + 4-HPPD Inhibitor	Sulfonylurea + Triketone	E.I. du Pont de Nemours & Co.
Resolve® Q	ALS Inhibitor + ALS Inhibitor	Sulfonylurea + Sulfonylurea	E.I. du Pont de Nemours & Co.
Spirit®	ALS Inhibitor + ALS Inhibitor	Sulfonylurea + Sulfonylurea	Syngenta
Steadfast®	ALS Inhibitor + ALS Inhibitor	Sulfonylurea + Sulfonylurea	E.I. du Pont de Nemours & Co.
Steadfast® ATZ	ALS Inhibitor + ALS Inhibitor + PS II Inhibitor	Sulfonylurea + Sulfonylurea + Triazine	E.I. du Pont de Nemours & Co.
Synchrony® XP	ALS Inhibitor + ALS Inhibitor	Sulfonylurea + Sulfonylurea	E.I. du Pont de Nemours & Co.
Valor® XLT	PPO Inhibitor + ALS Inhibitor	Phenylphthalimide + Sulfonylurea	Valent USA Corporation
Yukon®	ALS Inhibitor + Auxin	Benzoic Acid + Sulfonylurea	Nissan Chemical Industries, Ltd.

Herbicides shown in bold type contain two or more active ingredients, so they may appear in more than one section of the table.



HERBICIDE	MODES OF ACTION	CLASS OF CHEMISTRY	TRADEMARK OWNER
Acetolactate Synthase Inhibitors		Triazolopyrimidines	
Accent Gold®	ALS Inhibitor + ALS Inhibitor + ALS Inhibitor + Auxin	Pyridine + Sulfonylurea + Sulfonylurea + Triazolopyrimidine	E.I. du Pont de Nemours & Co.
Authority™ First Broadstrike™	ALS Inhibitor + PPO Inhibitor	Triazolopyrimidine + Triazolinone	FMC Corporation
FirstRate®	ALS Inhibitor	Triazolopyrimidine	Dow AgroSciences LLC
Gangster®	ALS Inhibitor + PPO Inhibitor	Triazolopyrimidine	Dow AgroSciences LLC
Gauntlet®	ALS Inhibitor + PPO Inhibitor	Triazolopyrimidine + Phenylphthalimide	Valent USA Corporation
Hornet®	ALS Inhibitor + Auxin	Triazolopyrimidine	FMC Corporation
Python®	ALS Inhibitor	Triazolopyrimidine + Triazolinone	Dow AgroSciences LLC
SureStart™	ALS Inhibitor + Auxin + Cell Division Inhibitor	Triazolopyrimidine + Pyridine	Dow AgroSciences LLC
TripleFLEX™ Herbicide	Cell Division Inhibitor + Auxin + ALS Inhibitor	Triazolopyrimidine + Pyridine + Amide + Pyridine + Triazolopyrimidine	Monsanto Technology LLC
Synthetic Auxins		Benzoic Acids	
Banvel®	Auxin	Benzoic Acid	BASF
Celebrity® Plus	ALS Inhibitor + Auxin + Auxin Transport Inhibitor	Sulfonylurea + Benzoic Acid + Semicarbazone	BASF
Clarity®	Auxin	Benzoic Acid	BASF
Distinct®	Auxin + Auxin Transport Inhibitor	Benzoic Acid + Semicarbazone	BASF
Marksman®	Auxin + PS II Inhibitor	Benzoic Acid + Triazine	BASF
NorthStar®	ALS Inhibitor + Auxin	Sulfonylurea + Benzoic Acid	Syngenta
Status®	Auxin + Auxin + Transport Inhibitor	Benzoic Acid + Semicarbazone	BASF
Yukon®	ALS Inhibitor + Auxin	Benzoic Acid + Sulfonylurea	Nissan Chemical Industries, Ltd.
Synthetic Auxins		Phenoxy Carboxylic Acids	
<i>2,4-D</i>	<i>Auxin</i>	<i>Phenoxy</i>	<i>Generic chemical name</i>
Butyrac®	Auxin	Phenoxy	Allbaugh, Inc.
Crossbow®	Auxin + Auxin	Phenoxy + Pyridine	Dow AgroSciences LLC
Synthetic Auxins		Pyridine Carboxylic Acids	
Accent Gold®	ALS Inhibitor + ALS Inhibitor + ALS Inhibitor + Auxin	Pyridine + Sulfonylurea + Sulfonylurea + Triazolopyrimidine	E.I. du Pont de Nemours & Co.
Crossbow®	Auxin + Auxin	Phenoxy + Pyridine	Dow AgroSciences LLC
Hornet®	ALS Inhibitor + Auxin	Triazolopyrimidine + Pyridine	Dow AgroSciences LLC
Stinger®	Auxin	Pyridine	Dow AgroSciences LLC
SureStart™	ALS Inhibitor + Auxin + Cell Division Inhibitor	Triazolopyrimidine + Pyridine + Amide	Dow AgroSciences LLC
Tordon®	Auxin	Pyridine	Dow AgroSciences LLC
Transline®	Auxin	Pyridine	Dow AgroSciences LLC
TripleFLEX™ Herbicide	Cell Division Inhibitor + Auxin + ALS Inhibitor	Amide + Pyridine + Triazolopyrimidine	Monsanto Technology LLC
WideMatch®	Auxin + Auxin	Pyridine + Pyridine	Dow AgroSciences LLC
Auxin Transport Inhibitors		Semicarbazones	
Celebrity® Plus	ALS Inhibitor + Auxin + Auxin Transport Inhibitor	Sulfonylurea + Benzoic Acid + Semicarbazone	BASF
Distinct®	Auxin + Auxin Transport Inhibitor	Benzoic Acid + Semicarbazone	BASF
Status®	Auxin + Auxin + Transport Inhibitor	Benzoic Acid + Semicarbazone	BASF

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HERBICIDE	MODES OF ACTION	CLASS OF CHEMISTRY	TRADEMARK OWNER
Carotenoid Synthesis Inhibitors		Isoxazolidinones	
Command®	Carotenoid Synthesis Inhibitor	Isoxazolidinone	FMC Corporation
Command® Xtra	Carotenoid Synthesis Inhibitor + PPO Inhibitor	Isoxazolidinone + Triazolinone	FMC Corporation
Commence®	Carotenoid Synthesis Inhibitor + Microtubule Inhibitor	Isoxazolidinone + Triazolinone	FMC Corporation
Cell Division Inhibitors		Amides	
Axiom®	Cell Division Inhibitor + PS II Inhibitor	Amide + Triazine	Bayer
Define™	Cell Division Inhibitor	Amide	Bayer
Degree®	Cell Division Inhibitor	Amide	Monsanto Technology LLC
Degree Xtra®	Cell Division Inhibitor + PS II Inhibitor	Amide + Triazine	Monsanto Technology LLC
Domain™	Cell Division Inhibitor + PS II Inhibitor	Amide + Triazine	Bayer
Dual II Magnum®	Cell Division Inhibitor	Amide	Syngenta
Guardman Max®	Cell Division Inhibitor + PS II Inhibitor	Amide + Triazine	BASF
Expert®	Cell Division Inhibitor + PS II Inhibitor + EPSPS Inhibitor	Amide + Triazine + Glycine	Syngenta
Halex™ GT	Cell Division Inhibitor + 4-HPPD Inhibitor + EPSPS Inhibitor	Amide + Triketone + Glycine	Syngenta
Harness®	Cell Division Inhibitor	Amide	Monsanto Technology LLC
Harness® Xtra	Cell Division Inhibitor + PS II Inhibitor	Amide + Triazine	Monsanto Technology LLC
Lexar®	Cell Division Inhibitor + 4-HPPD Inhibitor + PS II Inhibitor	Amide + Triketone + Triazine	Syngenta
Lumax®	Cell Division Inhibitor + 4-HPPD Inhibitor + PS II Inhibitor	Amide + Triketone + Triazine	Syngenta
Micro-Tech®	Cell Division Inhibitor	Amide	Monsanto Technology LLC
Outlook®	Cell Division Inhibitor	Amide	BASF
Radius™	Cell Division Inhibitor + 4-HPPD Inhibitor	Amide + Isoxazole	Bayer
SureStart™	ALS Inhibitor + Auxin + Cell Division Inhibitor	Triazolopyrimidine + Pyridine + Amide	Dow AgroSciences LLC
TripleFLEX™ Herbicide	Cell Division Inhibitor + Auxin + ALS Inhibitor	Amide + Pyridine + Triazolopyrimidine	Monsanto Technology LLC
Verdict™	PPO Inhibitor + Cell Division Inhibitor	Pyrimidinedione + Chloroacetamide	BASF
Warrant™ Herbicide	Cell Division Inhibitor	Amide	Monsanto Technology LLC
EPSP Synthase Inhibitors		Glycines	
Expert®	Cell Division Inhibitor + PS II Inhibitor + EPSPS Inhibitor	Glycine + Triazine	Syngenta
Flexstar® GT	PPO Inhibitor + EPSPS Inhibitor	Diphenyl Ether + Glycine	Syngenta
Glyphomax®	EPSPS Inhibitor	Glycine	Dow AgroSciences LLC
Halex™ GT	Cell Division Inhibitor + 4-HPPD Inhibitor + EPSPS Inhibitor	Amide + Isoxazole + Glycine	Syngenta
Roundup	EPSPS Inhibitor	Glycine	Monsanto Technology LLC
PowerMAX®	EPSPS Inhibitor	Glycine	Monsanto Technology LLC
Roundup	EPSPS Inhibitor	Glycine	Monsanto Technology LLC
WeatherMAX®	EPSPS Inhibitor	Glycine	Syngenta
Touchdown®	EPSPS Inhibitor	Glycine	Syngenta
Glutamine Synthase Inhibitors		Phosphinic Acids	
Ignite®	GS Inhibitor	Phosphinic Acid	Bayer
Liberty®	GS Inhibitor	Phosphinic Acid	Bayer
Liberty® ATZ	GS Inhibitor + PS II Inhibitor	Phosphinic Acid + Triazine	Bayer

Herbicides shown in bold type contain two or more active ingredients, so they may appear in more than one section of the table.



HERBICIDE	MODES OF ACTION	CLASS OF CHEMISTRY	TRADEMARK OWNER
4-Hydroxyphenyl-Pyruvate-Dioxygenase Inhibitor		Isoxazole	
Balance®	4-HPPD Inhibitor	Isoxazole	Bayer
Balance® Flex	4-HPPD Inhibitor	Isoxazole	Bayer
Balance® Pro	4-HPPD Inhibitor	Isoxazole	Bayer
Corvus™	4-HPPD Inhibitor	Isoxazole	Syngenta
Laudis™	4-HPPD Inhibitor	Isoxazole	Bayer
Radius™	Cell Division Inhibitor + 4-HPPD Inhibitor	Amide + Isoxazole	Bayer
4-Hydroxyphenyl-Pyruvate-Dioxygenase Inhibitor		Triketones	
Callisto®	4-HPPD Inhibitor	Triketone	Syngenta
Halex™ GT	Cell Division Inhibitor + 4-HPPD Inhibitor + EPSPS Inhibitor	Amide + Triketone + Glycine	Syngenta.
Impact®	4-HPPD Inhibitor	Triketone	Amvac Chemical Corporation
Lexar®	Cell Division Inhibitor + 4-HPPD Inhibitor + PS II Inhibitor	Triketone	Syngenta
Lumax®	Cell Division Inhibitor + 4-HPPD Inhibitor + PS II Inhibitor	Amide + Triketone + Triazine	Syngenta
Realm™ Q	ALS Inhibitor + 4-HPPD Inhibitor	Sulfonylurea + Triketone	E.I. du Pont de Nemours & Co.
Microtubule Inhibitors		Dinitroanilines	
Commence®	Carotenoid Synthesis Inhibitor + Microtubule Inhibitor	Isoxazolidinone + Dinitroaniline	FMC Corporation
Pendimax®	Microtubule Inhibitor	Dinitroaniline	Dow AgroSciences LLC
Prowl®	Microtubule Inhibitor	Dinitroaniline	BASF
Prowl® H2O	Microtubule Inhibitor	Dinitroaniline	BASF
Pursuit® Plus	ALS Inhibitor + Microtubule Inhibitor	Imidazolinone + Dinitroaniline	BASF
Sonalan®	Microtubule Inhibitor	Dinitroaniline	Dow AgroSciences LLC
Squadron®	ALS Inhibitor + Microtubule Inhibitor	Imidazolinone + Dinitroaniline	BASF
Steel®	ALS Inhibitor + ALS Inhibitor + Microtubule Inhibitor	Imidazolinone + Imidazolinone + Dinitroaniline	BASF
Treflan®	Microtubule Inhibitor	Dinitroaniline	Dow AgroSciences LLC
<i>trifluralin</i>	<i>Microtubule Inhibitor</i>	<i>Dinitroaniline</i>	<i>Generic chemical name</i>
Protoporphyrinogen Oxidase Inhibitors		Diphenyl Ethers	
Blazer®	PPO Inhibitor	Diphenyl Ether	United Phosphorus, Inc.
Cobra®	PPO Inhibitor	Diphenyl Ether	Valent USA Corporation
FlexStar®	PPO Inhibitor	Diphenyl Ether	Syngenta
Flexstar® GT	PPO Inhibitor + EPSPS Inhibitor	Diphenyl Ether + Glycine	Syngenta
Goal®	PPO Inhibitor	Diphenyl Ether	Dow AgroSciences LLC
Phoenix™	PPO Inhibitor	Diphenyl Ether	Valent USA Corporation
Reflex®	PPO Inhibitor	Diphenyl Ether	Syngenta
Storm®	PPO Inhibitor + PS II Inhibitor	Diphenyl Ether + Benzothiadiazole	United Phosphorus, Inc.
Ultra Blazer®	PPO Inhibitor	Diphenyl Ether	United Phosphorus, Inc.
Protoporphyrinogen Oxidase Inhibitors		Phenylphthalimides	
Gangster®	ALS Inhibitor + PPO Inhibitor	Triazolopyrimidine + Phenylphthalimide	Valent USA Corporation
Resource®	PPO Inhibitor	Phenylphthalimide	Valent USA Corporation
Valor® SX	PPO Inhibitor	Phenylphthalimide	Valent USA Corporation
Valor® XLT	ALS Inhibitor + PPO Inhibitor	Phenylphthalimide + Sulfonylurea	Valent USA Corporation

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HERBICIDE	MODES OF ACTION	CLASS OF CHEMISTRY	TRADEMARK OWNER
Protoporphyrinogen Oxidase Inhibitors		Pyrimidinediones	
Optill™	ALS Inhibitor + PPO Inhibitor	Imidazolinone + Pyrimidinedione	BASF
Sharpen™	PPO Inhibitor	Pyrimidinedione	BASF
Verdict™	PPO Inhibitor + Cell Division Inhibitor	Pyrimidinedione + Chloroacetamide	BASF
Protoporphyrinogen Oxidase Inhibitors		Triazolinones	
Aim®	PPO Inhibitor	Triazolinone	FMC Corporation
Authority®	PPO Inhibitor	Triazolinone	FMC Corporation
Authority® Assist	ALS Inhibitor + PPO Inhibitor	Imidazolinone + Triazolinone	FMC Corporation
Authority™ First	ALS Inhibitor + PPO Inhibitor	Triazolopyrimidine + Triazolinone	FMC Corporation
Authority® XL	ALS Inhibitor + PPO Inhibitor	Sulfonylurea + Triazolinone	FMC Corporation
Command® Xtra	Carotenoid Synthesis Inhibitor + PPO Inhibitor	Isoxazolidinone + Triazolinone	FMC Corporation
Gauntlet®	ALS Inhibitor + PPO Inhibitor + PPO Inhibitor	Triazolopyrimidine + Triazolinone + Triazolinone	FMC Corporation
Photosystem I Electron Diversion		Bipyridiliums	
<i>diquat®</i>	<i>PS I Inhibitor</i>	<i>Bipyridilium</i>	<i>Generic chemical name</i>
Reward®	PS I Inhibitor	Bipyridilium	Syngenta
Gramoxone	PS I Inhibitor	Bipyridilium	Syngenta
Inteon™			
Photosystem II Inhibitors		Benzothiadiazoles	
Basagran®	PS II Inhibitor	Benzothiadiazole	BASF
Laddok®	PS II Inhibitor + PS II Inhibitor	Benzothiadiazole + Triazine	BASF
Storm®	PPO Inhibitor + PS II Inhibitor	Diphenyl Ether + Benzothiadiazole	United Phosphorus, Inc.
Photosystem II Inhibitors		Nitriles	
Bison®	PS II Inhibitor	Nitrile	Winfield Solutions, LLC
Buctril®	PS II Inhibitor	Nitrile	Bayer
Moxy®	PS II Inhibitor	Nitrile	Winfield Solutions, LLC
Photosystem II Inhibitors		Triazines	
Aatrex®	PS II Inhibitor	Triazine	Syngenta
<i>atrazine</i>	<i>PS II Inhibitor</i>	<i>Triazine</i>	<i>Generic chemical name</i>
Axiom®	Cell Division Inhibitor + PS II Inhibitor	Amide + Triazinone	Bayer
Canopy®	ALS Inhibitor + PS II Inhibitor	Sulfonylurea + Triazine	E.I. du Pont de Nemours & Co.
Degree Xtra®	Cell Division Inhibitor + PS II Inhibitor	Amide + Triazine	Monsanto Technology LLC
Domain™	Cell Division Inhibitor + PS II Inhibitor	Amide + Triazine	Bayer
Guardsman Max®	Cell Division Inhibitor + PS II Inhibitor	Amide + Triazine	BASF
Harness® Xtra	Cell Division Inhibitor + PS II Inhibitor	Amide + Triazine	Monsanto Technology LLC
Laddok®	PS II Inhibitor + PS II Inhibitor	Benzothiadiazole + Triazine	BASF
Lexar®	Cell Division Inhibitor + 4-HPPD Inhibitor + PS II Inhibitor	Amide + Isoxazole + Triazine	Syngenta
Liberty® ATZ	GS Inhibitor + PS II Inhibitor	Phosphonic Acid + Triazine	Bayer
Lumax®	Cell Division Inhibitor + 4-HPPD Inhibitor + PS II Inhibitor	Amide + Isoxazole + Triazine	Syngenta
Marksman®	Auxin + PS II Inhibitor	Benzoic Acid + Triazine	BASF
Princep®	PS II Inhibitor	Triazine	Syngenta
Sencor®	PS II Inhibitor	Triazine	Bayer
Steadfast® ATZ	ALS Inhibitor + ALS Inhibitor + PS II Inhibitor	Sulfonylurea + Sulfonylurea + Triazine	E.I. du Pont de Nemours & Co.
Photosystem II Inhibitors		Ureas	
Lorox®	PS II Inhibitor	Urea	E.I. du Pont de Nemours & Co.

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Herbicides by Active Ingredient and Mode of Action

HERBICIDE	ACTIVE INGREDIENT	MODE OF ACTION
2,4-D	2,4-D	Auxin
AAtrex®	Atrazine	PS II Inhibitor
Accent®	Nicosulfuron	ALS Inhibitor
Accent Gold®	Clopyralid + Flumetsulam + Nicosulfuron + Rimsulfuron	ALS Inhibitor + ALS Inhibitor + ALS Inhibitor + Auxin
Aim®	Carfentrazone	PPO Inhibitor
Assure® II	Quizalofop	ACCCase Inhibitor
atrazine	Atrazine	PS II Inhibitor
Authority®	Sulfentrazone	PPO Inhibitor
Authority® Assist	Imazethapyr + Sulfentrazone	ALS Inhibitor + PPO Inhibitor
Authority™ First	Cloransulam + Sulfentrazone	ALS Inhibitor + PPO Inhibitor
Authority® XL	Chlorimuron + Sulfentrazone	ALS Inhibitor + PPO Inhibitor
Axiom®	Flufenacet + Metribuzin	Cell Division Inhibitor + PS II Inhibitor
Balance®	Isoxaflutole	4-HPPD Inhibitor
Balance® Flexx	Isoxaflutole	4-HPPD Inhibitor
Balance® Pro	Isoxaflutole	4-HPPD Inhibitor
Banvel®	Dicamba	Auxin
Basagran®	Bentazon	PS II Inhibitor
Beacon®	Primisulfuron	ALS Inhibitor
Bison®	Bromoxynil	PS II Inhibitor
Blazer®	Aciflourfen	PPO Inhibitor
Broadstrike™	Flumetsulam	ALS Inhibitor
Buctril®	Bromoxynil	PS II Inhibitor
Butyrac®	2,4-DB	Auxin
Callisto®	Mesotrione	4-HPPD Inhibitor
Canopy®	Chlorimuron + Metribuzin	ALS Inhibitor + PS II Inhibitor
Celebrity® Plus	Dicamba + Diflufenzopyr + Nicosulfuron	ALS Inhibitor + Auxin + Auxin Transport Inhibitor
Clarity®	Dicamba	Auxin
Classic®	Chlorimuron	ALS Inhibitor
Cobra®	Lactofen	PPO Inhibitor
Command®	Clomazone	Carotenoid Synthesis Inhibitor
Command® Xtra	Clomazone + Sulfentrazone	Carotenoid Synthesis Inhibitor + PPO Inhibitor
Commence®	Clomazone + Trifluralin	Carotenoid Synthesis Inhibitor + Microtubule Inhibitor
Corvus™	Isoxaflutole	4-HPPD Inhibitor
Crossbow®	2,4-D + Triclopyr	Auxin + Auxin

Herbicides by Active Ingredient and Mode of Action *(cont.)*

HERBICIDE	ACTIVE INGREDIENT	MODE OF ACTION
Define™	Flufenacet	Cell Division Inhibitor
Degree®	Acetochlor	Cell Division Inhibitor
Degree Xtra®	Acetochlor + Atrazine	Cell Division Inhibitor + PS II Inhibitor
<i>diquat</i>	Diquat	PS I Inhibitor
Distinct®	Dicamba + Diflufenzopyr	Auxin + Auxin Transport Inhibitor
Domain®	Flufenacet + Metribuzin	Cell Division Inhibitor + PS II Inhibitor
Dual II Magnum®	Metolachlor	Cell Division Inhibitor
Exceed®	Primisulfuron + Prosulfuron	ALS Inhibitor + ALS Inhibitor
Expert®	Atrazine + Glyphosate + Metolachlor	Cell Division Inhibitor + PS II Inhibitor + EPSPS Inhibitor
FirstRate®	Cloransulam	ALS Inhibitor
Flexstar®	Fomesafen	PPO Inhibitor
Fusilade® DX	Fluazifop	ACCCase Inhibitor
Flexstar® GT	Fomesafen + Glyphosate	PPO Inhibitor + EPSPS Inhibitor
Fusion®	Fenoxaprop + Fluazifop	ACCCase Inhibitor + ACCCase Inhibitor
Gangster®	Cloransulam + Flumioxazin	ALS Inhibitor + PPO Inhibitor
Gauntlet®	Cloransulam + Sulfentrazone	ALS Inhibitor + PPO Inhibitor
Glyphomax®	Glyphosate	EPSPS Inhibitor
Goal®	Oxyfluorfen	PPO Inhibitor
Gramoxone Inteon™	Paraquat	PS I Inhibitor
Guardman Max®	Atrazine + Dimethenamid	Cell Division Inhibitor + PS II Inhibitor
Halex™ GT	Glyphosate + Mesotrione + Metolachlor	Cell Division Inhibitor + 4-HPPD Inhibitor + EPSPS Inhibitor
Harness®	Acetochlor	Cell Division Inhibitor
Harness® Xtra	Acetochlor + Atrazine	Cell Division Inhibitor + PS II Inhibitor
Hoelon®	Diclofop	ACCCase Inhibitor
Hornet®	Clopyralid + Flumetsulam	ALS Inhibitor + Auxin
Ignite®	Glufosinate	GS Inhibitor
Impact®	Topramezone	4-HPPD Inhibitor
Laddok	Atrazine + Bentazon	PS II Inhibitor + PS II Inhibitor
Laudis™	Tembotrione	4-HPPD Inhibitor
Lexar®	Atrazine + Mesotrione + Metolachlor	Cell Division Inhibitor + 4-HPPD Inhibitor + PS II Inhibitor
Liberty®	Glufosinate	GS Inhibitor
Liberty® ATZ	Atrazine + Glufosinate	GS Inhibitor + PS II Inhibitor
Lightning®	Imazapyr + Imazethapyr	ALS Inhibitor + ALS Inhibitor
Lorox®	Linuron	PS II Inhibitor

Herbicides by Active Ingredient and Mode of Action *(cont.)*

HERBICIDE	ACTIVE INGREDIENT	MODE OF ACTION
Lumax®	Atrazine + Mesotrione + Metolachlor	Cell Division Inhibitor + 4-HPPD Inhibitor + PS II Inhibitor
Marksman®	Atrazine + Dicamba	Auxin + PS II Inhibitor
Micro-Tech®	Alochlor	Cell Division Inhibitor
Moxy™	Bromoxynil	PS II Inhibitor
NorthStar®	Dicamba + Primisulfuron	ALS Inhibitor + Auxin
Optill™	Imazethapyr + Saflufenacil	ALS Inhibitor + PPO Inhibitor
Option®	Foramsulfuron	ALS Inhibitor
Outlook®	Dimethenamid	Cell Division Inhibitor
Peak®	Prosulfuron	ALS Inhibitor
Pendimax®	Pendimethalin	Microtubule Inhibitor
Permit®	Halosulfuron	ALS Inhibitor
Phoenix™	Lactofen	PPO Inhibitor
Poast Plus®	Sethoxydim	ACCCase Inhibitor
Poast®	Sethoxydim	ACCCase Inhibitor
Princep®	Simazine	PS II Inhibitor
Prowl®	Pendimethalin	Microtubule Inhibitor
Prowl® H2O	Pendimethalin	Microtubule Inhibitor
Pursuit®	Imazethapyr	ALS Inhibitor
Pursuit® Plus	Imazethapyr + Pendimethalin	ALS Inhibitor + Microtubule Inhibitor
Python®	Flumetsulam	ALS Inhibitor
Radius™	Flufenacet + Isoxaflutole	Cell Division Inhibitor + 4-HPPD Inhibitor
Raptor®	Imazamox	ALS Inhibitor
Realm™ Q	Rimsulfuron + Mesotrione	ALS Inhibitor + 4-HPPD Inhibitor
Reflex®	Fomesafen	PPO Inhibitor
Resolve® Q	Rimsulfuron + Thifensulfuron	ALS Inhibitor + ALS Inhibitor
Resource®	Flumiclorac	PPO Inhibitor
Reward®	Diquat	PS I Inhibitor
Roundup PowerMAX®	Glyphosate	EPSPS Inhibitor
Roundup WeatherMAX®	Glyphosate	EPSPS Inhibitor
Scepter®	Imazaquin	ALS Inhibitor
Select®	Clethodim	ACCCase Inhibitor
Select MAX®	Clethodim	ACCCase Inhibitor
Sencor®	Metribuzin	PS II Inhibitor
Sharpen™	Saflufenacil	PPO Inhibitor

Herbicides by Active Ingredient and Mode of Action *(cont.)*

HERBICIDE	ACTIVE INGREDIENT	MODE OF ACTION
Sonalan®	Ethalfluralin	Microtubule Inhibitor
Spirit®	Primisulfuron + Prosulfuron	ALS Inhibitor + ALS Inhibitor
Squadron®	Imazaquin + Pendimethalin	ALS Inhibitor + Microtubule Inhibitor
Status®	Dicamba + Diflufenzopyr	Auxin + Auxin Transport Inhibitor
Steadfast®	Nicosulfuron + Rimsulfuron	ALS Inhibitor + ALS Inhibitor
Steadfast® ATZ	Atrazine + Nicosulfuron + Rimsulfuron	ALS Inhibitor + ALS Inhibitor + PS II Inhibitor
Steel®	Imazaquin + Imazethapyr + Pendimethalin	ALS Inhibitor + ALS Inhibitor + Microtubule Inhibitor
Stinger®	Clopyralid	Auxin
Storm®	Bentazon	PPO Inhibitor + PS II Inhibitor
SureStart™	Acetochlor + Clopyralid + Flumetsulam	ALS Inhibitor + Auxin + Cell Division Inhibitor
SureStart™	Acetochlor + Clopyralid + Flumetsulam	ALS Inhibitor + Auxin + Cell Division Inhibitor
Synchrony® XP	Chlorimuron + Thifensulfuron	ALS Inhibitor + ALS Inhibitor
Tordon®	Picloram	Auxin
Touchdown®	Glyphosate	EPSPS Inhibitor
Transline®	Clopyralid	Auxin
Treflan®	Trifluralin	Microtubule Inhibitor
<i>trifluralin</i>	Trifluralin	Microtubule Inhibitor
TripleFLEX™ Herbicide	Acetochlor + Clopyralid + Flumetsulam	Cell Division Inhibitor + Auxin + ALS Inhibitor
Ultra Blazer®	Acifluorfen	PPO Inhibitor
Valor® SX	Flumioxazin	PPO Inhibitor
Valor® XLT	Flumioxazin + Chlorimuron	PPO Inhibitor + ALS Inhibitor
Verdict™	Dimethenamid + Saflufenacil	PPO Inhibitor + Cell Division Inhibitor
Warrant™ Herbicide	Acetochlor	Cell Division Inhibitor
WideMatch®	Clorpyralid + Fluroxypyr	Auxin + Auxin
Yukon®	Dicamba + Halosulfuron	ALS Inhibitor + Auxin

