TURF HERBICIDE RESISTANCE CHART

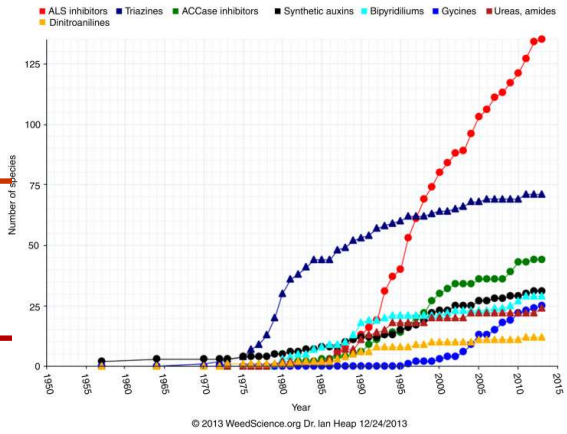
Repeated use of herbicides with the same
site of action can result in the development of herbicide-resistant weed populations.

This chart groups herbicides by their sites of action 1) to maintain greater diversity in herbicide use and 2) to rotate among herbicides with different sites of action to delay the development of herbicide resistance. The Site of Action (SOA) Group is a classification system developed by the Weed Society of America.

	Group	Site of Action	Chemical Family	Active Ingredient	Product Examples
Lipid Synthesis Inhibitors	1	ACCase Inhibitors	Aryloxyphenoxy propionate	Diclofop-methyl Fluazifop	Destro Fusilade
Amino Acid Synthesis Inhibitors	2	ALS Inhibitors	Sulfonylureas	Foramsulfuron Halosulfuron Iodosulfuron Prosulfuron Rimsulfuron Trifloxysulfuron	Tribute HaloForce Duke Casper Coliseum Recondo
			Pyrimidinyl-thio-benzoate Triazoloyrimidine	Bispyribac Florasulam	Nominee Crest
	9	EPSP Synthase Inhibitor	Glycine	Glyphosate	Rapid Fire 800
Growth Regulators	4	Specific Site Unknown	Phenoxy	2,4-D MCPA	2,4-D Contra M
			Benzoate Pyridine	Dicamba Clopyralid Picloram Fluroxypyr	Dicamba Slinger Victory Crest
			Quinoline carboxylate	Quinclorac	Quinstar
Photosyntheis Inhibitors	5	Photosystem II Inhibitor	Triazine Triazinone	Simazine Metribuzin	Sim-Force Metric
	6	Photosystem II Inhibitor	Nitrile Benzothiadiazinone	Bromoxynil Bentazone	Buctril Nutmeg
Carotenoid Inhibitors	12	Inhibitors of carotenoid biosynthesis	Phenyl ether	Diflufenican	Warhead Trio
Nitrogen metabolism	10	Glutamine synthesis Inhibitor	Phosphinic acid	Glufosinate	Exonerate
Auxin Inhibitor	18	DHP Inhibitors	Carbamates	Asulam	Asulox
Cellulose Inhibitors	29	Inhibitors of cellulose biosynthesis	Alkylazines	Indaziflam	Specticle
Cell Membrane Disruptors	14	PPO Inhibitors	N-phenyl-oxadiazolones N-Phenyl triazolinone	Oxadiazon Carfentrazone	Echelon Duo Smackdown
	22	Photosystem I Diverters	Pyridinium	Paraquat	Paraquat
Seedling Root Growth Inhibitors	3	Microtubule Inhibitors	Dinitroaniline	Pendimethalin Prodiamine	Battalia Onset 10GR
			Benzamide Pyridines	Propyzamide Dithiopyr	Checkpoint Dimension
Seedling Shoot Growth Inhibitors	15	Long Chain Fatty Acid Inhibitor	Chloroacetamide	Metolachlor Dimethenamid	Pennmag Freehand
			Benzofuran	Ethofumesate	Tramat
HPPD Inhibitor	27	HPPD inhibitor	Pyrazoles	Topramezone	Pylex
Inhibition of fatty acid thioesterase	30	Inhibits plant cell wall biosynthesis.	Benzyl ether	Methiozolin	Poacure

The chart below lists turf registered premix herbicides by their trade names so you can identify the component herbicides and their respective site of action groups. Refer to the Site of Action Chart on the Left for more information.

Premix Trade Name	Active Ingredients	Site of Action Group
3-D	Bentazone Dicamba MCPA	6 4 4
Weed Blast MA	Bromoxynil MCPA	6 4
Casper	Dicamba Prosulfuron	4 2
Crest	Florasulam Fluroxypyr	2 4
Freehand	Dimethenamid Pendimethalin	15 3
Silverado	Carfentrazone MCPA	14 4
Warhead Trio	Diflufenican Clopyralid MCPA	12 4 4



There are several means of delaying and perhaps preventing resistance developing.

The most practical and effective strategy is to rotate herbicides with different sites of action (SOA). The Table opposite provides a complete list of herbicides that are registered in Australia for turf grass and their respective SOA and Group number.

If two herbicides have the same SOA number or code, they affect weeds in the same way. Consequently repeated and frequent use of chemicals with the same SOA increases the risk of weeds becoming resistant.

In contrast rotating or combining herbicides with different SO As delays the development of resistant weeds.

Pre-emergent herbicides
In turf most pre-emergent herbicides are in Group 3 or 15 but in reality most Australian turf managers base their programs on Groups 3 and use Group 2 for post emergent control.

This has increasingly lead to many turf managers increasingly getting poor results from using Group 2. To ensure that turf managers can continue to use these for a long time, herbicides with different SOAs should be incorporated into weed management programs even if they are not as effective or require repeat applications to provide the desired level of control. You can then return to using Groups 3 and 2.

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