

WEED CONTROL IN FIELD NURSERIES: something old, Something New

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Herbicides are very effective tools for controlling weeds while reducing costs associated with physical weed removal. Herbicide selection depends on the weeds you are trying to control, the stage of the planting, the plant material in the planting and the stage of the weed growth. Other factors influencing herbicide selection include timing of the herbicide application, classification and persistence in the soil, the chemical mode-of-action, soil type, temperature, soil pH, organic matter content, available soil moisture, whether the weeds or crop plants are under stress, spray pattern, equipment calibration, chemical retention on leaf or soil surface, uptake in the weed, and spray water quality.

Table 1. Some herbicides registered for use in outdoor ornamentals and non-crop areas. Mode of action, herbicide family, trade and common name, and application timing are indicated. PSI and PSII indicate photosystem I and II. Chemical families marked with the same herbicide resistance activity code (HRAC) have been shown to result in cross-resistance among weed species. (Sources: Prather et al. 2000; Altland, 2003, Weed Science Society of America, 2002).

HRAC	Mode of action	Herbicide Family	Common Name Active Ingredient	Trade Name(s)	Application timing	Strengths
B	Amino acid synthesis Inhibitor (ALS inhibitor)	Imidazolinone	Imazaquin	Image	Pre, post	Grasses, broadleaves
			Imazapic	Plateau	Pre, post	Grasses
		Sulfonylurea	halosulfuron	Manage	Post	Broadleaves, Sedges
G	Amino acid synthesis inhibitor (EPSP synthase inhibitor)	Glycine	glyphosate	Rattler, Roundup(various), Mirage, Silhouette, Prosecutor, Touchdown Pro	Post	Grasses, Broadleaves
L	Cell Wall Synthesis inhibitor	Benzamide	Isoxaben	Gallery	Pre	Broadleaves
			Isoxaben + trifluralin + fertilizer	Snapshot	Pre	Grasses, broadleaves
		Nitrile	dichlobenil	Casoron	Pre	Grasses, broadleaves
D	Cell Membrane Disrupter	Bipyridylum	diquat	Reward L&A	Post	Grasses, broadleaves

	(inhibits PS I)					
			paraquat	Starfire, Boa, Gramoxone	Post	Grasses, broadleaves
E	Cell Membrane Disruptor (inhibits PPO enzyme)	Diphenyl ether	oxyfluorfen	Goal	Pre	Broadleaves
			oxyfluorfen + pendimethalin	OH II	Pre	Grasses, broadleaves
			oxyfluorfen + oryzalin	Rout	Pre	Grasses, broadleaves
			oxyfluorfen + oxadiazon	Regal	Pre	Grasses, broadleaves
		Oxadiazole	oxadiazon	Ronstar	Pre	Grasses
			oxadiazon + prodiamine	Regal Star	Pre	Grasses, broadleaves
			oxadiazon + pendimethalin	Kansel Plus	Pre	Grasses, broadleaves
E	Cell Membrane Disruptor (inhibits PPO enzyme)	N-phenylphthalamide	flumioxazin	Sureguard, BroadStar	Pre, Post	Broadleaves
A	Fatty acid synthesis inhibitor	Cyclohexanediones	sethoxydim	Vantage	Post	Grasses
			clethodim	Envoy	Post	Grasses
		Aryloxyphenoxy-propionate	Fluazifop-p-butyl	Fusilade II	Post	Grasses
			fenoxaprop	Acclaim Extra	Post	Grasses
O	Growth regulator	Phenoxy	2,4-D ester	Salvo	Post	Broadleaves
			2,4-D amine	Weedar 64	Post	Broadleaves
		Benzoic acid	dicamba	Banvel	Post	Broadleaves
		Picolinic acid	triclopyr	Garlon	Post	Broadleaves
			clopyralid	Lontrel T & O, Stinger	Post	Broadleaves
H	Glutamine synthesis inhibitor	Phosphonic acid	glufosinate	Finale	Post	Grasses, broadleaves
C3	Non-mobile photosynthetic inhibitor (inhibit PS II)	Benzothiadazole	bentazon	Basagran	Post	Broadleaves
C1	Mobile PS II inhibitor	Triazine	atrazine	Atrazine (4L, 90 DF)	Pre, post	Grasses, Broadleaves
			simazine	Princep (4L, 90 DF), Caliber	Pre	Grasses

C2	Mobile PS II inhibitor (different binding site than triazines)	Urea	diruon	Diuron (4L, 80 DF, 80 WDG)	Pre	Broadleaves
K1	Mitotic disruptors; microtubule assembly inhibitors (root meristem inhibitors)	Pyridine	dithiopyr	Dimension (EC, Ultra 2SC, Ultra WSP)	Post	Grasses, Broadleaves
		Dinitroaniline	prodiamine	Barricade (65 WG, 4 FL)	Pre	Grasses
			pendimethalin	Hurdle, AquaCap	Pre	Grasses
M	Mitotic disruptors; microtubule assembly inhibitors (root meristem inhibitors)	Dinitroaniline	pendimethalin	Pendulum (2G, 3.3 EC, 3.8 CS), Pre-M, Corral	Pre	Grasses
			oryzalin	Surflan	Pre	Grasses
			trifluralin	Treflan	Pre	Grasses
			isoxaben + trifluralin + fertilizer	Snapshot	Pre	Grasses, Broadleaves
			oxyfluorfen + pendimethalin	OH II	Pre	Grasses, Broadleaves
			trifluralin + benefin	Team Pro	Pre	Grasses, Broadleaves
K3	Cell division inhibitor (seedling shoot inhibitor)	Acetamide	napropamide	Pre-Pair, Devrinol (2G, 50 DF)	Pre	Grasses, Broadleaves
		Choroacetamide	metolachlor	Pennan Magnum	Pre	Sedges, grasses
		Benzamide	Kerb	pronamide	Pre	Winter annuals

Table 2. Common container nursery weeds listed by family and life cycle. (Source: Gilliam et al. 1990, Altland 2003, Norcini and Stamps, 1994)

Scientific name	Common name	Division or Family	Life Cycle
<i>Amaranthus hybridus</i>	Smooth pigweed	Amaranthaceae	Summer annual

<i>Amaranthus retroflexus</i>	Redroot pigweed	Amaranthaceae	Summer annual
<i>Bryum argenteum</i>	Silver thread mosses	Bryophyta	Perennial
<i>Cardamine hirsuta</i>	Hairy bittercress	Brassicaceae	Winter annual
<i>Cardamine pennsylvanica</i>	Pennsylvania bittercress	Brassicaceae	Winter annual
<i>Chamaesyce maculata</i> or <i>Eurphobia maculata</i>	Prostrate spurge	Eurphorbiaceae	Summer annual
<i>Conyza canadensis</i>	Horseweed or mare's tail	Asteraceae	Summer or winter annual
<i>Cyperus esculentus</i>	Yellow nutsedge	Cyperaceae	Perennial
<i>Digitaria sanguinalis</i>	Large crabgrass	Poaceae	Summer annual
<i>Eclipta alba</i>	Eclipta	Asteraceae	Summer annual
<i>Epilobium ciliatum</i>	Northern willowherb	Onagraceae	Summer annual
<i>Glechoma hederacea</i>	Ground ivy	Lamiaceae	Perennial
<i>Lactuca serriola</i>	Prickly lettuce	Asteraceae	Winter or summer or biennial
<i>Lamium amplexicaule</i>	Henbit	Labiatae	Summer or winter annual
<i>Marchantia polymorpha</i>	Liverwort	Hepatophyta	Perennial
<i>Oxalis corniculata</i>	Creeping red woodsorrel	Oxalidaceae	Perennial – (spreads by stolons)
<i>Oxalis stricta</i>	Yellow woodsorrel	Oxalidaceae	Perennial – (spreads by stolons)

			rhizomes)
<i>Poa annua</i>	Annual bluegrass	Poaceae	Winter annual
<i>Portulaca oleracea</i>	Common purslane	Portulacaceae	Summer annual
<i>Sagina procumbens</i>	Birdseye pearlwort	Caryophyllaceae	Perennial
<i>Senecio vulgaris</i>	Common groundsel	Asteraceae	Winter annual
<i>Sonchus oleraceus</i>	Annual sowthistle	Asteraceae	Summer annual
<i>Stellaria media</i>	Common chickweed	Caryophyllaceae	Summer or winter annual
<i>Taraxacum officinale</i>	Dandelion	Asteraceae	Perennial

New Herbicide Formulations in 2005

DuPont Weststar™ Herbicide

A new water-dispersible, granular blend consisting of 6.5% sulfometuron-methyl (Oust®) and 68.6% hexazinone (Velpar®) was labeled in 2004 in Oregon and Washington for conifers grown for Christmas trees. Application rate range is 1.25 - 1.5 lb/A. Labeled rates for grass and broadleaf weed control in non-crop sites and in conifers grown for forestry are 1.5 -4 lb/A. Application method is ground and aerial (helicopter only) and application timing is after planting, while trees are dormant. In 2004, DuPont initiated field tests of Weststar™ to assess its utility in Eastern Christmas trees. Test sites were set up in the following states: Connecticut, Michigan, New York, Pennsylvania and Wisconsin. In tests at these sites 90% control or better was observed at 56-59 days after treatment (DAT) for the following weeds: Quackgrass, Canada thistle, large crabgrass, fleabane sp., common cinquefoil, white clover and field violet. Excellent crop safety was seen on Black spruce and Eastern white pine with Weststar™ at 12-40 oz/A. Acceptable crop safety was seen on Douglas fir and Fraser fir at 12-20 oz/acre. Good - excellent grass and broadleaf weed control was seen on a variety of weed species. Past testing with sulfometuron-methyl and hexazinone separately have shown the following three results: 1) hexazinone generally causes no injury to commonly grown Christmas tree species; 2) sulfometuron-methyl at rates 0.75-1 oz ai/A may, under certain conditions, cause injury to Christmas trees, especially transitory leader length shortening; and, 3) hexazinone is the key ingredient for excellent marehail and common ragweed control. A supplemental label was issued late November 2004 for states including: CT, MI, NC, OH, PA and WI. Testing of Weststar™ herbicide will continue in large plots only in 2005.

There will be no sales for fall 2004 or spring 2005. A supplemental use label for 12 oz/acre Weststar for Eastern Christmas trees is under consideration.

Dow Agro Sciences - Dimension EW

Dow Agro Science is testing a new formulation of dithiopyr called Dimension EW with expected registration in two years. Currently the active ingredient (a.i.) dithiopyr is available only as an EC formulation. Dow hopes that the new water emulsion (EW) formulation will reduce the odor associated with the a.i.; provide higher a.i. loading, provide early postemergent crabgrass control and provide lower phytotoxicity with over-the-top applications.

Dow Agro Sciences - Showcase™

Dow also has a new preemergent for broadleaf and grass control in container and field ornamentals, non-bearing fruit and nut crops and non-crop areas at 100lb or 200 lb/A. It will be registered as an over-the-top 3-way granular-formulation. Showcase™ contains trifluralin (2%) + isoxaben (0.25%) (which is the current Snapshot label) + oxyfluorfen (0.25%). Showcase will have a limited release at the end 2005 and a full release in 2006. At Ohio State University we will be engaged in trials this spring and summer testing efficacy and phytotoxicity of Showcase™. Showcase is not recommended on new seedlings or cuttings or other newly propagated materials. For more information on this product and our testing, plan to attend the OSU/ONLA Research Field Day September 22, 2005 at OSU, Columbus, OH. Call me at 614-247-6195 or email: mathers.7@osu.edu to register.

BASF – Pendulum Aqua Cap™

BASF is discontinuing its Pendulum 60 WDG (pendimethalin) label in 2005. The Pendulum EC label will stay in the market but the patented formulation, Pendulum Aqua Cap™ will be replacing the WDG label. The Aqua Cap is a microencapsulated formulation, which should provide superior spray-ability. BASF also reports the product has no odor, no solvent is required; it is easier to clean up than the old WDG formulation. Hurdle, which was labeled for landscape, has also been discontinued.

Harrell's Weed Free 63™

A new granular Goal formulation distributed by Harrell's provides better control than comparable granular products in trials conducted by Harrell's. It out performed OHII, Rout and Regal O.O (other combination herbicides, containing Goal).