

# 11. Pest Control Products for Outdoor Herbaceous Ornamentals

## **Integrated Pest Management (IPM) in Outdoor Ornamentals including Field-Grown Cut Flowers, Perennials and Potted Plants**

IPM in outdoor ornamental and flower crops involves the same principles used in greenhouse production. However, there are some differences.

Monitoring is still the cornerstone of an IPM program, but there may be less reliance on the use of yellow sticky cards as an insect-monitoring tool due to wind-blown dust and debris collecting on them and limiting their usefulness. Regularly inspect crops to detect problems early. As with greenhouse-grown crops, there are large variations in the susceptibility of crops and varieties to diseases and insects. Knowing this can greatly increase the efficiency of crop inspections, by targeting first those crops that are most likely to have pests or diseases.

In outdoor production, there is no control over the weather. Cool, damp conditions will increase the likelihood of disease outbreaks. Strong winds may result in sudden and unexpected outbreaks of insect pests that have been blown in from elsewhere. However, the outside environment will never be as perfect for pest development as it is in a greenhouse. Variability in weather such as cool or cold nights and rain can slow the development of pests compared to a similar situation in the greenhouse.

Biological control may not offer the same options for control as it does in the enclosed environment of greenhouses. For example, flying insects such as parasitic wasps are not constrained to stay in the crop. Predatory mites (which do not fly) may be useful, but there has been little experience with them in outdoor situations, although their use is increasing.

The use of pesticides outdoors also requires different thinking. Products registered for greenhouse use are not necessarily registered for outdoor ornamentals. For more information, see Table 11-1. *Insecticides and Miticides* on page 146, Table 11-2. *Fungicides Registered for Use on Outdoor Ornamental Crops in Canada* on page 147, and Table 11-3. *Other Pesticides Registered for Use on Outdoor Ornamental Crops in Canada* on page 148. Be aware of the potential for drift into non-target areas, proximity to watercourses and ponds, and the impact on non-target organisms such as honeybees.

**Table 11-1.** Insecticides and Miticides Registered for Use on Outdoor Ornamental Crops in Canada (refer to label for rates)

Insecticides	Pests	Crops
Cygon 480, Lagon 480 (dimethoate)	Various insect pests including aphids, mealybugs, mites, scale, thrips, whitefly (see label)	Outdoor ornamentals (see label)
Dibrom (naled)	Aphids, leafhoppers, spider mites, other listed pests (see label)	Outdoor ornamentals (see label)
Dipel WP, Dipel 2X DF ( <i>Bacillus thuringiensis</i> kurstaki)	Listed caterpillars	Ornamental and shade trees
Dursban WSP, Dursban T, Pyrate 480 EC, Pro Dursban Turf, Lorsban 4E (chlorpyrifos)	Various insect pests, including Japanese beetle (see label)	Outdoor ornamental plants
Dyno-Mite (pyridaben)	Various mite pests (see label)	Outdoor ornamental plants
Endeavor 50 WG (pymetrozine)	Aphids	Outdoor ornamental plants
Floramite SC	Two-spotted spider mite	Outdoor ornamentals
Forbid 240 EC (spiromesifen)	Two-spotted spider mites, broad mites, whitefly	Outdoor ornamental plants
Imidan 50 WP (phosmet)	Elm spanworm, gypsy moth, Japanese beetle	Outdoor herbaceous plants (see label)
Insecticidal soap (potassium salts of fatty acids)	Various insect and mite pests (see label)	Outdoor flowers, ornamentals (see label)
Intercept 60 WP (imidacloprid)	European chafer, Japanese beetle	Outdoor ornamental crops
Kanemite 15 SC (acequinocyl)	Spider mites	Outdoor ornamentals
Kontos (spirotetramat)	Whitefly, western flower thrips, green peach aphid, citrus mealybug, Euonymus scale, spider mites	Outdoor ornamental crops (except conifers)
Landscape oil (mineral oil)	Spider mites, scale, mealybug, whitefly	Labelled ornamental crops
Malathion 500E, Malathion 25W, Malathion 85 E (malathion)	Various insect and mite pests (see label)	Ornamental plants; trees, shrubs and flowers
Met52 ( <i>Metarhizium anisopliae</i> , Strain F52)	Black vine weevil, strawberry root weevil, thrips	Container-grown ornamentals
Orthene (acephate)	Various insect and mite pests (see label)	Outdoor flowers, ornamentals, shrubs, trees, rose
Scimitar CS (lambda-cyhalothrin)	Black vine weevil	Outdoor ornamentals
Sevin SL, Chipco Sevin T&O, Chipco Sevin RP2 (carbaryl)	Various insect pests (see label)	Various outdoor ornamentals (see label)
Success 480 SC (spinosad)	Thrips and other pests (see label)	Outdoor ornamentals
*Thiodan 50 WP, Thiodan 4 EC, Thionex 50 W, Thionex EC (endosulfan)	Various insect and mite pests (see label)	Outdoor ornamentals
Tristar 70 WSP (acetamiprid)	Various insect pests (see label)	Ornamental and flowering plants
Vendex 50W	Spider mites	Outdoor ornamentals

\* Endosulfan registration is being phased out. Registrants must cease production and sale of endosulfan pesticide products by Dec 31, 2014. Sale of endosulfan products by others is not permitted after Dec 31, 2015, and use by growers is not permitted after Dec 31, 2016.

**Table 11-2.** Fungicides Registered for Use on Outdoor Ornamental Crops in Canada (refer to label for rates)

Fungicides	Diseases	Crops
Acrobat 50 WP	Downy mildew (control), <i>Phytophthora ramorum</i> ( <b>suppression</b> )	Outdoor-grown ornamental crops
Actinovate SP ( <i>Streptomyces lydicus</i> Strain WYEC 108)	Powdery mildew ( <i>Sphaerotheca macularis</i> )	For disease <b>suppression</b> on field-grown gerbera daisy
Aliette (fosetyl-AI)	Sudden Oak Death ( <i>Phytophthora ramorum</i> )	For disease <b>suppression</b>
Banner Maxx (propiconazole)	Various diseases (see label)	Outdoor ornamental crops (see label)
Botran 75 W (dicloran)	Botrytis	Rose, hydrangea (outdoors)
Captan 50 WP, Captan 80 WDG, Maestro 80 DF, Supra Captan 80 WDG (captan)	Foliar diseases, damping-off, bulb rot (see label)	Various outdoor ornamentals (see label)
Compass 50 WG (trifloxystrobin)	For control/ <b>suppression</b> (see label) of powdery mildew, scab, <i>Rhizoctonia</i> , rust, <i>Botrytis</i>	Various outdoor ornamentals (see label)
Confine (mono- and di-potassium salts of phosphorous acid)	Phytophthora root rot and foliar blight Downy mildew ( <i>Peronospora lamii</i> )	For disease <b>suppression</b> on outdoor bedding plants
Contans WG ( <i>Coniothyrium minitans</i> )	For control/ <b>suppression</b> of <i>Sclerotinia</i> (see label)	Outdoor cut flowers
Daconil 2787, Daconil Ultrex (chlorothalonil)	Various diseases (see label)	Various outdoor ornamental crops (see label)
Decree 50 WDG (fenhexamid)	Botrytis	Outdoor ornamentals
Dithane DG, Dithane M-45 (mancozeb)	Various foliar diseases (see label)	Woody ornamentals (see label)
Folpan 50 WP, Folpan 80 WDG (folpet)	Various foliar diseases, root and stem rot (see label)	Various outdoor ornamentals (see label)
Funginex 190 EC (triforine)	Black spot of roses, powdery mildew	Outdoor ornamentals
Heritage (azoxystrobin)	Daylily rust	Daylilies
*Meltatox	Powdery mildew	Roses (not for cut flowers)
Millstop (potassium bicarbonate)	Powdery mildew	Provides disease <b>suppression</b> on outdoor ornamental crops.
Nova 40 W (myclobutanil)	Rusts, powdery mildew, leaf spots (see label)	Various outdoor ornamentals (see label)
Phostrol (mono- and dibasic sodium, potassium and ammonium phosphites)	Phytophthora	For disease <b>suppression</b> on outdoor bedding plants, potted plants and cut flowers
Presidio (fluopicolide)	Downy mildew, Phytophthora crown and root rot	Outdoor ornamentals (field and container grown), bedding plants, cut flowers
Previcur N (propamocarb hydrochloride)	Pythium, Phytophthora	Various outdoor ornamentals (see label)
Regalia Maxx (extract of <i>Reynoutria sachalinensis</i> )	Powdery mildew	For disease <b>suppression</b> on outdoor ornamental plants
Rhapsody ASO, Cease Biological Fungicide ( <i>Bacillus subtilis</i> )	Powdery mildew, Botrytis, leaf spots, Rhizoctonia, Pythium, Phytophthora	For disease <b>suppression</b> on various outdoor ornamentals (see label)
RootShield ( <i>Trichoderma harzianum</i> )	Botrytis and root diseases	For disease <b>suppression</b> on outdoor ornamental crops
Rovral, Rovral WDG (iprodione)	Botrytis, Rhizoctonia	Outdoor ornamentals (see label)
Senator 70 WP (thiophanate-methyl)	Black spot of roses, powdery mildew	Outdoor ornamentals
Subdue Maxx (metalaxyl)	Pythium, Phytophthora <b>Suppression</b> of <i>Phytophthora ramorum</i>	Outdoor ornamentals
Switch 62.5 WG	Powdery mildew	For disease <b>suppression</b> on outdoor ornamentals (except roses)
Tivano (citric acid/lactic acid, as fermentation products of <i>Lactobacillus casei</i> Strain LPT-111)	Powdery mildew and black spot	For disease <b>suppression</b> on outdoor grown roses
Torrent 400SC (cyazofamid)	Pythium, Phytophthora, downy mildew ( <i>Peronospora</i> spp.)	Outdoor ornamentals
ZeroTol (hydrogen peroxide)	For control/ <b>suppression</b> of various fungal and bacterial diseases (see label)	Outdoor ornamentals

\* Meltatox registration has been voluntarily withdrawn by the registrant. Sale of Meltatox by retailers is not permitted after Dec 31, 2015, and use by growers is not permitted after Dec 31, 2016.

**Table 11-3.** Other Pesticides Registered for Use on Outdoor Ornamental Crops in Canada

Pesticide	Pest	Crops
Deadline M-Ps (metaldehyde)	Slugs	Ornamentals
Sluggo (ferric phosphate)	Slugs	Outdoor ornamentals, nurseries

## Integrated Weed Management in Outdoor Flower Production

The other major difference between greenhouse and outdoor production of flowers and other ornamental crops is in the need for weed management. Herbicides have a much more important role in outdoor flower production than in greenhouse production.

A successful weed management program must integrate cultural and chemical weed control practices. Growers cannot depend entirely on chemical weed control in outdoor flower crops, since there is a limited spectrum of herbicides registered for these crops. There are many ways of reducing weed problems:

### **Choose a low weed-pressure site**

**Select fields with lower weed pressure.** Problem weeds, for example annuals such as pigweed, ragweed and lamb's quarters, as well as perennials, make weed control programs more difficult. See OMAFRA Publication 75, *Guide to Weed Control* for management strategies for problem weeds.

**Grow rotational crops that reduce weeds.** For example, winter wheat in the previous year breaks the life cycle of annual weeds and allows the use of hormone herbicides (e.g., 2,4-D) to control broadleaf weeds.

**Grow crops with a wider choice in herbicides.** For example, corn reduces weed populations before planting flowers. Avoid persistent herbicides that may harm flower crops in future plantings.

### **Prepare the site**

**Identify weeds.** Watch for these weeds common in outdoor flower production: perennial weeds like quackgrass, bindweed, vetch, wild grape, perennial nightshade, thistles, ground-ivy (creeping charlie), willowherb and burdock, and biennials like

dandelions, wild carrot and biennial wormwood. Winter annuals like sow thistles, fleabanes, mustards, peppergrass, shepherd's purse and flixweed can also be a challenge because they establish through the fall.

**Eradicate perennial and biennial weeds.** It is important to identify and control these tough weeds in the preplanting year, because they are very difficult to control after planting. Apply systemic herbicides such as glyphosate (e.g., Roundup) to perennial weeds in the preplanting year. Use the appropriate rate for each weed (note the higher rates on labels for perennial weeds), and apply it when the weed reaches the sensitive stage of growth. Use a sprayer designated solely for applying glyphosate to reduce the risk of damaging crops. Repeated cultivations of some perennial weeds (e.g., bindweed) will also provide control, but avoid dragging weeds to clean areas of the field.

**Grow a green manure crop.** Cover crops like cereals, perennial ryegrass, pearl millet or Sudan-sorghum grown in the preplanting year will both compete with weeds and improve soil structure. There are several key times to use herbicides in these crops to reduce weeds: before planting (non-selective herbicides, e.g., glyphosate or paraquat); shortly after establishment of the green manure crop (short residual herbicides, e.g., 2,4-D, bromoxynil, dicamba); and before plowdown. Avoid using herbicides that leave a soil residue to carry over into the planting year (e.g., atrazine, simazine, diuron).

### **Avoid weeds in production years**

**Set up a stale seedbed.** This technique is useful for crops seeded or planted later in the spring. Cultivate the area as early as possible (April or early May) to encourage germination of weeds. Just before planting time, kill emerged weeds with herbicides (e.g., glyphosate, paraquat), flammers or steam. Plant directly into undisturbed soil to avoid bringing new weed seeds to the surface. For seeded crops, the burndown can be repeated if necessary (very carefully) just before the crop emerges. A plate of glass set on freshly

worked ground will encourage weed seed germination and will signal when to apply this second burndown safely before the crop emerges.

**Manage weeds in row middles.** Cultivation can control weeds between the rows but will decrease soil organic matter. Alternatively, planting grass strips between the rows will prevent weeds from becoming established. Choose a grass mixture of low-maintenance grasses that tolerate drought, like creeping red fescue or perennial ryegrass. Timely mowing can prevent weeds from seeding into crops. Use of sod row middles increases the need for irrigation and/or nitrogen fertilizer.

**Prevent weeds from setting seeds.** Control weeds in field edges and adjacent areas before they set seed. Try to control weed escapes in crops before they set seed by cultural removal or chemical mowing. Mowing at regular intervals will prevent many weeds from flowering. Watch for weeds that sprout low branches that may flower lower than mower blades and manually remove them.

### **Use many weed-control tools**

**Cultivation.** Generally, cultivating when weeds are small and soils are drying is most effective. Different cultivation tools work at different timings for different weeds. Rotary hoes, tine cultivators, rolling baskets, rotating disks, brushes and interplant cultivators may be effective in flower crops. Frequent hand hoeing when weeds are tiny can be quick and effective.

**Hilling.** Row crops like gladiolus benefit from regular hilling, which provides support for the plant and weed control. Equipment is available that can move soil toward the plants on one pass and pull it away on the next if a mound is not desirable.

**Mowing.** Small mowers can manoeuvre around many plants to mow weeds. This can be very effective to prevent weed flowers and seeds, but mowing does not eliminate weed competition for moisture. Weed whips are very useful for selective cutting, both with a blade and a string attachment. Removal of flower heads from the area may be needed to avoid seed shed after mowing.

**Flamers.** Equipment that directs a hot propane flame to kill weeds can be very effective. Driving speeds of 5–10 km/h are required to avoid damage

to the crop, so fields need to be designed with straight rows and large turning areas. Hand-held flamers are also available, but quick movement of the flame is still important.

**Mulching.** A thick layer of mulch can prevent weed germination and conserve soil moisture. Apply weed-free mulch (know your source) after planting but before weeds emerge. Use plastic mulch under short-term crops, and planters to plant through the plastic. Dark plastic gives the best weed control, although other colours may have other uses. Biodegradable plastics avoid the problem of disposal after use. Organic mulch materials, e.g., straw or fine wood chips, can work well but be sure to provide enough nitrogen for the plants as they decompose. In the late fall, pull the mulch away from the base of the plants to discourage rodents over winter. Nursery ground-cover fabric can be especially useful for weed control in outdoor potted plant production and for perennial flowers that grow in clumps. This fabric is long lasting, provides drainage and is not as slippery as plastic. It provides a weed-free area, is durable and easy to keep clean. Weeds will establish on the edges of all mulches, so regular edge weeding is necessary.

**Herbicides.** Table 11-4. *Herbicides Registered for Use on Outdoor Ornamental Crops in Canada* on page 150 lists a selection of herbicides registered for use on outdoor ornamental crops in Canada. Select a herbicide registered for use on the crop and apply it as directed on the label. Keep a separate, clearly marked sprayer for herbicides and wash it out properly between uses with a tank cleaner like Agral 90. Sprayers with shrouds can prevent herbicides from contacting the crop, and other drift-reducing technologies like air-induction nozzles may be useful. Wick wiper applicators (either hand-held, tractor or ATV-mounted) can control weeds by wiping concentrated herbicides such as glyphosate directly on weeds. Selective drip applicators are also available for very finely targeted applications next to flowers. Spot treatments can be very effective at controlling small patches of new weeds. For best results with glyphosate, wait until the flowering stage of perennial weeds like thistle, milkweed or bindweed. Check equipment for drips and leaks before treating weeds to avoid dripping herbicide on the crop.

**Note:** Rotation of herbicide families (see Herbicide Groups in Table 11-4. *Herbicides Registered for Use on Outdoor Ornamental Crops in Canada* on this page) is important to minimize the building up of seed from weed escapes, including triazine-tolerant weeds. Do not use herbicides from the same group year after year but switch between different group numbers. Rotation will also help avoid an accumulation of herbicide residues in the soil that may result in crop injury over a period of years and may harm subsequent crops.

**Table 11-4.** Herbicides Registered for Use on Outdoor Ornamental Crops in Canada

Herbicides	Timing and Weeds	Crops	Herbicide Group	Comments
Basamid Granular (fumigant) (dazomet)	PRE Germinating weed seeds	Outdoor flowers, ornamentals	Z	Apply to weed-free soil. Do not use below 6°C. Open soil 5–7 days after treatment.
Bonanza 400 Treflan EC Rival 500 EC (trifluralin)	PPI Annual grasses and broadleaf weeds (see label)	Perennials and woody ornamentals (see label)	3	Incorporate shallowly in two directions within 24 hours of application. Place roots of transplants below treated layer.
Dacthal W75 (chlorthal dimethyl)	PRE Various including lamb's quarters, crabgrass, lovegrass, carpetweed, witchgrass, purslane, foxtail, common chickweed (see label)	Outdoor ornamentals (see label)	3	Apply to weed-free soil Irrigate or shallowly incorporate within 3–5 days if no rain falls.
Devrinol 50 DF Devrinol 2 G Devrinol 10 G (napropamide)	PRE Weed control (see label)	Outdoor flowers, ornamentals (see label)	15	Apply to weed-free soil. Requires 1 cm of rainfall or irrigation within 7 days (spring or fall) or 2 days (summer) to prevent breakdown by sunlight. This product is very safe on plants.
Dual Magnum Dual II Magnum (s-metolachlor)	PRE or early POST Nightshade, annual grasses and redroot pigweed	Outdoor ornamentals. (see label)	15	Apply only once per year. Use a minimum of 150–200 L water/ha.
Frontier Max (dimethenamid-P)	PRE Barnyard grass, crabgrass, eastern black nightshade, fall panicum, foxtail, old witchgrass, redroot pigweed	Outdoor ornamentals (see label)	15	Apply in and around field, liner and container grown ornamentals.
Gallery 75 DF (isoxaben)	PRE Broadleaf weeds	Containerized ornamentals. Not for use on cut flowers (see label)	21	Apply late summer to early fall, early spring, any time prior to germination or immediately after cultivation. Do not apply more than once per season.
Kerb 50 WSP (propyzamide)	PRE Quackgrass, annual grasses, chickweed (see label)	Iris, peony, ground covers (see label)	15	Apply to weed-free soil. Works best in cool, moist soil.
Princep Nine-T Simadex, Simazine 480 (simazine)	PRE Various broadleaf weeds and annual grasses	Woody ornamentals and nursery stock (see label)	5	Apply to weed-free soil. Repeated applications may leave soil residues that damage subsequent crops. Use lower rate on low organic matter soils.
Prowl H <sub>2</sub> O (pendimethalin)	PRE Barnyard grass, crabgrass, fall panicum, green foxtail, lamb's-quarters, redroot pigweed ( <b>suppression</b> )	Outdoor ornamentals (see label)	3	Apply in and around field, liner and container-grown ornamentals.
Roundup (glyphosate)	POST Broad spectrum weed control (see label)	Prior to planting on all crops	9	Systemic, avoid valuable plants. Apply to actively growing plants at susceptible stages.

Herbicides	Timing and Weeds	Crops	Herbicide Group	Comments
Vapam (metam)	PRE Germinating weed seeds	Outdoor ornamentals	Z	Cultivate soil well a week before application. Soil temperature at application must be between 16–32°C at a depth of 7.5 cm.
Venture L (fluazifop)	POST Grass weeds (see label)	Outdoor ornamentals (see label)	1	Apply to actively growing grasses. Do not cultivate for 5 days. Test on a few plants for tolerance.

PPI — preplant incorporated; PRE — preemergent; POST— postemergent (to the weeds)

