Department of Horticultural Science

Horticulture Information Leaflet 449

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WEED MANAGEMENT IN CONIFER SEEDBEDS AND TRANSPLANT BEDS

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Weeds compete with conifer seedlings for light, water, nutrients and space. Of these, light competition is probably the most detrimental to conifer seedlings. Shading will reduce growth, and generally weaken seedlings making them more susceptible to insects, mites and diseases. Weed competition has also been known to reduce winter hardiness. Consequently, an intensive weed control program is required to produce quality seedlings and transplants.

Although we have relatively few herbicides labeled for use in seedbeds and transplant beds, the available products are generally very effective and most weeds can be selectively controlled with minimal hand weeding or injury to conifer seedlings. The keys to a successful weed management program are to:

- eradicate perennial weeds before planting
- apply the appropriate herbicides at the right times
- remove emerged weeds when they are young

Some weed management options differ between seedbeds and transplant beds; consequently, these sites will be discussed separately.

Weed Control in Conifer Seedbeds

Site Preparation. The first step is to eliminate as many weeds as possible. In particular, perennial broadleaves and sedges should be eradicated before planting, because there are no selective means of controlling these weeds in conifer seedbeds. Two options for site preparation are:

- repeated applications of postemergent herbicides
- fumigation

Postemergence herbicides such as Roundup or Roundup-Pro (glyphosate), 2,4-D, Garlon (triclopyr) and others will control perennial weeds. However, to eradicate these weeds from the area, repeat applications as needed throughout the growing season. At least 1 to 2 years of intensive effort coupled with the use of cover crops to smother weeds can eliminate most weeds. However, many weeds have persistent underground storage organs which will survive these treatments. In particular, nutsedge tubers can remain viable in the soil for up to 10 years. For these reasons, and because nurseries rarely have the time for 2 years of site preparation, fumigation is typically the method of choice for weed control during site preparation.

Three fumigants are available; however, regardless of the fumigant used, soil preparation is the key to successful sterilization. Soil should be cultivated to a depth of 6 to 8 inches seven to 10 days before and again immediately before fumigation. Tillers are excellent for this purpose. At treatment time, the soil should

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be free of clods and fresh organic debris, moist enough for seed germination, and have a temperature greater than 55 ^{0}F at the 6-inch depth. Fall is an excellent time to fumigate since soils are warm and proper moisture levels are easier to attain. Since most fumigants are inactivated by high levels of undecomposed organic material (such as leaves or grass), organic debris should be removed or allowed to decompose before fumigation. If the soil is not moist, properly prepared and free of fresh organic matter, there may be weeds that the fumigant will not kill. While the soil should be moist, wet soils prevent free movement of the fumigant within the soil, resulting in poor control.

Three commonly used fumigants are metham, dazomet, and methyl bromide. Metham (Vapam) is a liquid while dazomet (Basamid) is a granule; however, the active ingredient in both Vapam and Basamid is methyisothiocyanate (commonly referred to as MIT) which is released as a gas after the material is applied to the soil. Since Vapam is a liquid, it may be easiest to use on small areas as a liquid drench. For best results, cultivate the soil thoroughly and irrigate before applying metham at a rate of 1 pint in enough water to uniformly cover 50 square feet of surface area. After application, irrigate the soil with sufficient water to saturate the surface. To increase effectiveness, cover the area with plastic sheeting. Cultivate the treated area 7 days after application to a depth of 2 inches. Do not plant until 14 to 20 days after treatment. If the soil is cold and wet, you will have to wait longer. Always refer to the product label for details and precautions.

Since dazomet (Basamid) is a granular material, it is easy to apply with a spreader. After application it should be rototilled into the soil then irrigated thoroughly. For maximum effectiveness, cover with a plastic sheet or tarp. However, plastic sheeting is not mandatory, irrigation or rolling to seal the surface can be used in place of plastic sheeting. If plastic sheeting is not used the soil surface should be kept moist for several days to slow the loss of methylisothiocyanate from the soil. Seven days after fumigation, cultivate the treated area to a depth of 2 inches. Do not till any deeper than 2 to 3 inches to prevent weed seeds and other pests from being moved into the previously treated soil. Do not plant until 14 to 20 days after treatment. If the soil is cold and wet, you will have to wait longer. Refer to the product label for details and precautions.

Methyl bromide is a pressurized liquid and becomes a gas when released. Since methyl bromide is highly volatile, the treated area must be covered with plastic and seal all edges with soil *before* treatment. For treating large areas, I advise contracting with a professional fumigator to do the job. For treating small areas, methyl bromide comes in 1.5-lb canisters. To release the gas from these canisters, use only approved puncturing devices. Two types of puncturing devices are available. One type is to be sealed under the plastic with the methyl bromide canister in a holder; once the plastic tarp is in place, you just press or step on the canister and it is punctured by a spike at the base of the device. The other type of puncturing device has a puncturing clamp and hose attached, and is for use outside the plastic. The hose goes from this device, under the plastic; place the canister in the clamp and squeeze. Caution: the puncturing clamps are notorious for leaking. If the unit has any corrosion or loose fittings, discard and replace. Remove the plastic tarp 24 hours after fumigation. Cultivate the treated area to a depth of 2 inches (*no deeper*) to accelerate the aeration of the soil. Do not plant until seven to 10 days after the tarp has been removed. If the soil is cold and wet, you will have to wait longer. This product is *very toxic* and should be used only by professional applicators. Refer to the product label for details and precautions. Methyl bromide will not be available after the year 2005.

REMINDER: Fumigants are highly toxic chemicals that must be handled properly to be both safe and effective. If you have never fumigated soil before, have an experienced pesticide applicator (who has fumigated before) help the first time you fumigate. After fumigation, don't reintroduce weeds. Clean equipment such as tillers or tractors before using them in the area. Do not add top soil, mulch or saw dust (unless they too have been fumigated). Use only "clean" composts. Control creeping perennial and flowering weeds in the surrounding beds and fields.

Tips for Successful Fumigation

- The soil should be:
  - Moist but not wet
  - Free of un-decomposed organic matter
  - 60 ^{0}F at 6 inches
  - Recently rototilled

- Shape & amend beds before fumigation.

- Tarping is required with methyl bromide and recommended with Vapam and Basamid.

- Hard-seeded weeds such as clover and Carolina geranium may not be controlled.

- Once fumigated, be diligent about keeping the beds clean. Don't reintroduce weeds or pathogens.

- **Be careful**! Fumigants are toxic to you, too!

At Seeding

Seed-propagated weeds will rapidly find a way back into seedbeds if nothing is done to prevent re-infestation. Mulch, preemergence and postemergence herbicides, and hand weeding before weeds go to seed will reduce weed re-infestations. Mulching beds at seeding will help retain moisture and reduce weed seed germination. Goal 2E (oxyfluorfen) is the only preemergence herbicide labeled for use in seedbeds (See Tables 1 & 2). Apply Goal 2E at a rate of 0.5 lb ai/A (1 qt per acre or 0.9 oz per 1000 sq ft) immediately after seeding and mulching, then irrigate. Goal will injure young seedlings during the first 6 to 8 weeks of growth. After the new growth has matured (fully expanded, and at least 6 weeks after bud break), reapply Goal 2E at the same rate. Goal can postemergently control many young broadleaf weeds which may have emerged. Add 0.25% (0.3 oz per gal) of a non-ionic surfactant if postemergence weed control is needed. No surfactant is necessary for preemergence applications. Reapply Goal 2E in late summer or early fall to control winter annual weeds. Hand weed escaped weeds before they go to seed.

Grasses can be controlled postemergently at any time during the growing season with Envoy (clethodim) or Vantage (sethoxydim) (Table 3). Envoy is applied at 0.125 to 0.25 lb ai/A (17 to 34 oz per acre or 0.4 to 0.8 oz per 1000 sq ft). Always add a nonionic surfactant at a rate of 0.25% (by volume) when applying Envoy. Apply Vantage at a rate of 0.3 to 0.5 lb ai/A (= 36 to 60 oz per acre or 0.8 to 1.4 oz per 1000 sq ft). No surfactant is required with Vantage. Envoy and Vantage may be applied directly over the top of conifer seedlings; however, it is advisable to avoid applications when very young, tender foliage is present as some leaf spotting may occur. Optimum weed control is achieved when weedy grasses are young and growing vigorously. Creeping perennial grasses will require repeat applications to obtain complete control; treat when re-growth is observed. Envoy will control annual bluegrass (*Poa annua*); Vantage will not. Neither Envoy nor Vantage will control sedges or rushes.

In 1-0 & 2-0 seedlings. Use the same strategies as described for *at-seeding* treatments. Be sure the initial application of Goal is made before the seedlings break bud and that follow-up treatments are not applied to tender new growth; else, injury will occur. Ronstar (oxadiazon) may be used preemergently for annual grasses and some broadleaf weeds. Ronstar has a longer soil residual and is more effective for controlling annual grasses than Goal. However, Ronstar does not control chickweed. Thus, it is often used in combination with Goal to control a broader spectrum of weeds and to reduce the number of treatments required. The wettable powder formulation of Ronstar can severely burn young growth on many conifer species. The granular formulation is less injurious. There are no selective means of controlling nutsedge. Consequently, eradicating nutsedge at site preparation (i.e., fumigation) is essential. Emerged annual and perennial grasses can be controlled with Envoy or Vantage as previously described.

Weed Control in Conifer Transplant Beds

New transplant beds should be free of perennial weeds, particularly perennial broadleaves and sedges. Most perennial broadleaf weeds may be managed with applications of non-selective herbicides (such as Roundup-Pro) and cultivation; however, such efforts require at least one full growing season and are not effective on sedges. Fumigation may be necessary. Follow the fumigation guidelines described in the seedbeds section above. And remember, that non-fumigated mulches, top soil or composts can introduce many weed seeds.

All herbicides labeled for use in seedbeds may be used in transplant beds. In addition, Devrinol (napropamide), Fusilade II (fluazifop-p) and Pennant (metolachlor) are registered for use in transplant beds. Devrinol and Pennant are labeled for preemergence control of annual grasses and some broadleaf weeds from seed. Devrinol applied at 3 to 4 lb ai/A (6 to 8 lb of the 50DF formulation per acre) has a longer soil residual but is more expensive than Pennant. Pennant's most important attribute is preemergence yellow nutsedge control. Apply Devrinol or Pennant in combination with Goal in the spring before weeds emerge and conifers break bud. If Pennant is used, reapply about 8 weeks later for season-long control of yellow nutsedge. If Devrinol is used, about 16 weeks of weed control can be expected. The activity of both Devrinol and Pennant will be reduced in soils with high organic matter contents. Fusilade II is used for postemergence control of annual or perennial grasses in the same manner as Envoy or Vantage (each discussed previously in the seedbeds section).

Controlling Escaped Weeds in Conifer Seedbeds and Transplant Beds

The treatments described above will control most weeds in conifer seedbeds. Escaped weeds may be hand weeded. Tall weeds (at least 4 inches taller than the conifer seedlings) can be controlled with wiper-applied Roundup or Roundup-Pro. For wiper-applications, use a 33% (by volume) solution; wipe the weeds in two directions, avoiding contact with conifer seedlings.

Table 1. Preemergence herbicides labeled for use in conifer seedbeds or transplant beds.

Herbicide	At-Seeding	Seedbeds	Transplant Beds
Goal	0.5 lb ai/A (1 qt/A)	0.5 lb ai/A (1 qt/A)	1 to 2 lb ai/A (2 to 4 qt/A)
Devrinol 50WP	No	2 to 4 lb ai/A (4 to 8 lb/A)	3 to 4 lb ai/A (4 to 8 lb/A)
Pennant 7.8 EC	No	4 lb ai/A (4 pints/A)	4 lb ai/A (4 pints/A)
Ronstar 2G	No	2 to 3 lb ai/A (100 to 150 lb/A)	3 to 4 lb ai/A (150 to 200 lb/A) (pines only)

Table 2. Preemergence herbicide registrations for conifer seedbeds (S) and transplant beds (T).

Herbicide	Balsam Fir	Fraser Fir	Hemlock	Blue Spruce	White Spruce	Virginia Pine	White Pine
Devrinol	T	T	T	T	T	T	T
Goal		S + T	S + T	S + T	S + T	S + T	S + T
Pennant	T	T		T	T	T	T
Ronstar 2G*			T	T	T	T	S** + T
Ronstar WP		T	T				T

* Certain selected cultivars of hemlock and spruce have been injured by Ronstar applications.
**Ronstar G may be applied when white pine seedlings are at least 4 weeks old.

Table 3. Postemergence herbicides labeled for use in conifer seedbeds or transplant beds.

Herbicide	At-Seeding	Seedbeds	Transplant Beds
Goal*	0.25 lb ai/A (2 pints/A)	0.25 lb ai/A (2 pints/A)	0.25 lb ai/A (2 pints/A)
Envoy*	0.125 to 0.25 lb ai/A (12 to 34 oz/A)	0.125 to 0.25 lb ai/A (12 to 34 oz/A)	0.125 to 0.25 lb ai/A (12 to 34 oz/A)
Fusilade II*	No	No	0.125 to 0.25 lb ai/A (0.5 to 1 pint / A)
Vantage	0.3 to 0.5 lb ai/A (2.3 to 3.8 pints/A)	0.3 to 0.5 lb ai/A (2.3 to 3.8 pints/A)	0.3 to 0.5 lb ai/A (2.3 to 3.8 pints/A)

* Add 0.25% (by volume) nonionic surfactant