Weed Sanitation Program at the Vallonia Nursery

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A weed control program, which significantly reduced weed control cost and improved the degree of weed control, has been developed. The basic idea is to destroy weed seeds by fumigation and then prevent them from reinfesting the seedbed.

Weed control is an important part of the process of growing high-quality nursery stock. Weeds compete with seedlings for soil moisture, nutrients, and light. This competition is a particularly severe problem in the forest nursery because many tree seedlings grow very slowly for the first few months after germination, whereas weeds grow very rapidly under the ideal soil and moisture conditions of the nurserybed. Weeds also interfere with tree lifting and may harbor insect and disease pests.

The Vallonia Nursery has developed a weed sanitation program, which has significantly reuced weed control cost, greatly imroved the degree of weed control, and avoided the problems posed by herbicides. In 1974, standard weed control practices were followed with handweeding as the primary method. Nursery production was about *4* million seedlings per year. The weeding required approximately 6,464 hours of wage-rate labor. The weed sanitation program was initiated in 1975 and refined over several years. In 1981, after the program had been in full operation for a complete rotation, weed control required only 1,542 hours of wage-rate labor. This is a work-hour reduction of *76* percent and a savings of about $18,000 during the year. At the same time, nearly 100-percent control of weeds was obtained in the seedbeds. To achieve these results, management must first understand the principles behind the program and be committed to carrying out the details. Second, approximately $100 per year in herbicide cost must be allocated to control weeds in areas adjacent to seedbeds. Herbicides are an integral part of the program, but they are applied to areas adjacent to seedbeds rather than directly to the seedbeds.

The following is a description of the essential parts of the Vallonia Nursery weed sanitation program. The basic idea is to destroy weed seeds in the soil by fumigation and then prevent them from reinfesting the seedbed.

1. The first step is a thorough soil fumigation program to kill weed seeds in the soil. Soil fumigation is standard practice in most nurseries for insect, disease, and weed control. The bed ends should also be fumigated so that subsequent nursery operations do not mix unfumigated soil into the seedbed. For example, a bedformer can spread unfumigated soil from the bed ends over the entire seedbed. If soil erosion is a problem on the bed ends, a cover crop such as rye should be sown.
2. The second step is to prevent weed seeds from reinfesting the fumigated soil. Weed seeds can get back into the fumigated seedbed from several sources.
   a. Windblown seeds from plants such as dandelion (*Taraxacum* spp.), fleabane (*Erigeron* spp.), and willow (*Salix* spp.). This source can be greatly reduced by spraying adjacent fields and lawns with a phenoxy-type herbicide such as 2,4-D (2,4 dichlorophenoxyacetic acid). The best time to spray is based on the prevention of weed seed production. Fall spraying is ideal for controlling dandelion, whereas fleabane seeds mature in late summer. When willow or other tree species with windborne seeds are a problem, consideration should be given to removing trees adjacent to the seedbeds. One must determine the source of the weed problem and then attempt to control or eliminate the source.
   b. Waterborne seeds from plants growing adjacent to the seedbed or seeds carried with soil eroding from adjacent areas. This seed source is controlled by fumigating the bed ends and by diverting floodwater away from seedbed areas.
   c. Weed seeds that are carried into the fumigated seedbed

on nursery equipment. A tractor that has been used for mowing or one that has accumulated soil from unfumigated areas can carry thousands of weed seeds, as well as disease organisms. The solution is to keep tractors and other equipment clean. This should be standard practice for disease control.

d. Weed seeds that are not killed by fumigation. Certain weed species such as wild geranium (*Geranium* spp.) and clover (*Trifolium* spp.) have seeds that are resistant to fumigation. The only solution is to remove these weeds before they produce more seeds. Over a period of years, this problem can be greatly reduced.
e. Weed seeds from uncommon sources that may be unique to a specific situation. Examples might be seeds carried in irrigation water or with windblown soil. Irrigation water should be screened and cover crops and windbreaks should be used to reduce windblown soil.

3. The third step is to prevent seed production by weeds that escape prevention efforts. One weed, if allowed to mature seed, can produce hundreds or thousands of new weeds within a few weeks. The solution is to remove these weeds before they can produce seed. At the Vallonia Nursery, the seedbeds are handweeded once a week in early summer and once every 2 to 4 weeks in late summer. The weeds are collected in buckets and removed from the seedbeds. At this nursery, it requires an average of 64 work hours per week to remove essentially all of the weeds in the seedbeds. This could be reduced if safe and effective herbicides can be used in the seedbeds. However, some handweeding will be necessary, because most herbicides are selective in that certain weeds are controlled much better than others.
4. The fourth step is to minimize weed seed production when the area is rotated to cover crops. At the Vallonia Nursery, we use a 3-or 4-year rotation of seedling production (1 or 2 years), cover crop, and a fallow year to decompose the cover crop and prepare the area for fall fumigation and sowing. In the spring, after the seedlings are harvested, the seedbed area is heavily fertilized and sown to a crop of sorghum-Sudan. This crop germinates and grows very rapidly, thereby crowding out most weeds. Weed control in irrigation lines and bed ends is continued by using contact herbicides. The sorghum-sudan is allowed to grow all summer and is plowed under the following spring. The area is then disked as often as necessary to prevent weed seed production (about once a month) and to hasten decomposition of the cover crop. It is not necessary to follow this type of rotation as long as weed seed production is minimized during the rotation. At the Vallonia Nursery the weed population has decreased with each rotation.