Integrated Nursery Pest Management

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Integrated nursery pest management (INPM) is the most practical and ecologically sound approach for control of nursery pests because it is integrated with all other nursery management procedures. As a result, nursery managers are not limited to fighting damaging pest "fires" that should not have been ignited in the first place. INPM is accomplished through coordinated tactics that prevent pest damage from reaching economically damaging proportions while protecting the environment from potential hazards. The tactics may be classed as preventive, cultural, chemical, and biological. They are selected to achieve pest management goals in the most practical manner.

Preventive

The best kind of pest control is that which prevents pests from becoming a problem in the first place. Preventing problems, however, requires a great deal of knowledge and effort. For nurserymen, the key preventive activities are training; a combination of detection, diagnosis, and evaluation; and exclusion.

Training—Perhaps the most important part of a successful INPM program is the recurrent training of nursery personnel. Technology in applicable pest management techniques changes rapidly, and the nursery that does not keep abreast of the changes stands to lose a great deal.

Detection, Diagnosis, and Evaluation—Early pest detection, rapid diagnosis, and evaluation of either existing or potential pest problems are prerequisites to a successful INPM program. All nursery personnel should be aware of and alert to early indications of pest occurrence. Observations of abnormal seedling appearance should be reported immediately to appropriate pest specialists to facilitate rapid diagnosis and evaluation. Only in this way can the most effective, practical, and environmentally safe INPM practices be selected and applied before the pest problem becomes unmanageable.

Exclusion—Nurseries should strive to exclude pests that may be transported and spread in contaminated seedlings, soil, mulches, water, and equipment (fig. I-1). Nursery sites with pest problems should be identified and recorded, and steps should be taken to minimize expansion. Pest exclusion procedures are probably the most effective, practical, economical, and safe INPM practices readily available for nursery application. The standardized systematic plant quarantine regulations established and administered by State agencies should also be followed. These practices are often the only effective way to prevent a nursery pest problem.

Figure I-1—Nursery equipment should be thoroughly cleaned to prevent movement of pests from one part of the nursery to another.

Cultural

Site Selection—When selecting sites for new nursery locations or for expansion, managers must give careful consideration to the type, texture, pH, and drainage of the soil; past cropping history and present indications of pest occurrence; and an adequate supply of uncontaminated water with low salinity and proper pH. The soil type for most tree species should be of coarse texture (primarily sand and silt, with a low clay content). The subsoil should be free of impermeable layers, particularly at shallow depths. Soil-borne pathogenic fungi, such as those causing damping-off and root rots, are generally least severe in coarse-textured soils with good drainage. Fine-textured clay soils with poor internal drainage are difficult to till and fumigate. The pH values of soil and irrigation water also influence the occurrence of several soil-borne pests. Soils recently in field crops often contain pathogenic fungi that attack nursery seedlings. Water can be contaminated with pathogenic fungi, nematodes, insects, weed seeds, salts, and herbicides detrimental to quality seedling production.

Species Requirements—The requirements of tree species vary, and the needs of the crop species should be identified and recorded. Pest problems are most severe when these requirements are not fully met in nursery beds. For example, site requirements, soil microbiological associations, mycorrhizal fungi, and cultural procedures differ between conifers and hardwoods. When they are produced in the same nursery, managers must adjust cultural practices and site conditions for the needs of each species.

Crop Rotation, Cover Crops, and Organic Matter Amendments—Crop rotation can often reduce pest problems. Continuous cropping of seedlings of a given species promotes the buildup of a variety of pests (pathogenic fungi, insects, nematodes, and weeds). Rotating susceptible and nonsusceptible seedling crops in the proper sequence will usually avoid significant damage.

Cover crops are alternated with seedlings as a standard practice in most nurseries (fig. I-2). These crops reduce wind and water erosion and provide soil organic matter. The various cover crop species

Figure I-2—Cover crops, alternated with seedlings, can improve soil chemical and physical properties and reduce losses from diseases and insects.

differ in susceptibility to nursery pests. Corn, peas, soybeans, and sorghum are susceptible to and promote the development of charcoal root rot and black root rot, while millet, sudan grass, and sudex are relatively resistant. After the cover crop is plowed under, it must be permitted to decompose before the soil is fumigated. When it is green, it may absorb or otherwise deactivate large quantities of methyl bromide and make fumigation ineffective.

Organic matter improves tilth, nutrient and water retention, and aeration of nursery soils. It must be added to produce good-quality seedlings consistently. Organic matter amendments may reduce nursery soil pest problems in various ways, such as promoting populations of beneficial soil fungus saprophytes and competitors and increasing biodegradation of residual toxic chemicals. However, the type and condition of the organic amendments must be carefully controlled. For example, fresh sawdust may reduce seedling growth because, as it decomposes, the microorganisms responsible for this process tie up available nitrogen. In addition, organic amendments such as pine needles, straw, and sewage sludge may harbor harmful pathogenic fungi, insects, nematodes, weed seeds, and chemicals.

Soil Acidity / Alkalinity—The degree of acidity (low pH) or alkalinity (high pH) in soil strongly influences the development of soil-borne pathogenic fungi. In general, damping-off and root rots are most severe in nursery soils with a pH above 5.5. In nursery beds and containers, soil pH levels above 6.0 have also significantly reduced the development of ectomycorrhizae on conifers. The pH can be lowered by applying elemental sulfur or ammonium sulfate. Lime is routinely used to increase pH in nursery soils. The pH of irrigation water can be lowered by metering prescribed amounts of sulfuric or phosphoric acid into the irrigation system.

Seedbed Sowing Date—In early spring, the cold, moist soil is conducive to the development and spread of certain damping-off fungi (*Pythium* and *Phytophthora*). Therefore, spring seeding should be delayed until the soil temperature approaches the optimum for seed germination and early seedling development. In the Deep South, excessively warm surface soil in late spring frequently causes "sun scald" and mortality on young, recently germinated seedlings. Consequently, either early spring or fall sowing is required for satisfactory seed germination and survival of young seedlings.

Seedling Density—Control of seedling density reduces the potential hazard for certain pests. At high densities, seedlings must compete for available nutrients and water, and growth and vigor are reduced. Higher seedling densities also promote denser foliage coverage, which reduces air movement and provides a more favorable microclimate for foliage disease fungi.

High demands for tree seedlings for accelerated forestation programs have caused many nurseries to increase seedbed densities. This practice promises to be self-defeating. Pest problems will increase, and the quality of seedlings will decline. As a result, huge investments in preparation of planting sites and in planting itself may be jeopardized to save a few dollars per thousand seedlings in the nursery. Nursery practices must be designed to produce the highest quality seedlings for successful forestation.

Mulches—Precautions are needed in the selection and utilization of mulch materials to avoid the introduction and development of pest problems. As previously pointed out, pine needles, sawdust, and grain straw may contain pests such as pathogenic fungi and weed seeds (fig. I-3). Such materials should be fumigated with a mixture of methyl bromide and chloropicrin—either 98 percent and 2 percent or 67 percent and 33 percent—at a

Figure I-3—Mulching, a necessary cultural practice in forest nurseries, can also be a source of weed and pest problems.

dosage rate of 1.0 lb/yd^3 of material. Mulch fumigation procedures, temperature, and moisture requirements are similar to those that will be described for soil fumigation in a later section.

In most cases, mulch materials are relatively dry and require additional water to provide adequate moisture for effective fumigation. In addition, a minimum 72-hour, and preferably longer, aeration period is required before fumigated mulches are used. These materials absorb large amounts of the fumigant, and long aeration periods are required to release these toxic chemicals.

Fertilization—Fertilizer rates, composition, timing, and application methods can significantly affect pest populations, as well as those of associated beneficial soil organisms. Inadequate rates, incorrect formulations, and improper applications of fertilizers can stunt seedlings, burn foliage, and cause summer chlorosis and poor development of roots and mycorrhizae. Seedlings that are stressed in these ways are considerably more susceptible to a variety of soil and aboveground pests. Excessive applications of nitrogen and phosphorus may increase damping-off in early spring and increase fusiform rust on slash and loblolly pines in the South. In addition, excessive applications of phosphorus (above 150 lb available P205-Bray II analysis-per acre) inhibit formation of ectomycorrhizae on conifers and endomycorrhizae on hardwoods (see introductory chapter on mycorrhizae).

Irrigation—Inadequate, excessive, or improper irrigation may create nursery pest problems. As with inadequate fertilization, inadequate water may cause seedling yellowing, stunting, and mortality -particularly during hot, dry weather. In addition, both conifer and hardwood seedlings growing with inadequate soil moisture and high temperatures (above 90 °F) are considerably more susceptible to charcoal or black root rots. Excessive water may inhibit soil aeration, cause root mortality, and thereby increase seedling susceptibility to certain water-loving soil pests, such as *Pythium, Phytophthora,* and nematodes. Repeated excessive irrigation (particularly during late afternoon and evening) may increase the incidence of foliage disease *(Botrytis* in container nurseries) and decrease the development of mycorrhizae on both conifer and hardwood seedlings.

Temperature Controls—Temperature is one of the most difficult environmental factors to manipulate in bareroot nursery seedbeds. In greenhouse container nurseries, desired temperatures are most commonly obtained through combinations of heating, air-conditioning, restricting sunlight (lathing), and irrigation. Both high and low soil and air temperatures significantly affect a number of pest problems, as well as seed germination and subsequent seedling growth. Temperatures in bareroot nurseries can be reduced with irrigation. In addition, some species that are highly intolerant of high temperatures such as fir, spruce, and white pine, may require lath shading. The adverse effects of low soil temperatures in bareroot nursery seedbeds in early spring can be avoided by delaying the seedbed sowing date until the soil temperature is suitable for rapid seed germination and early seedling growth. However, as previously pointed out, this practice may have limited application in southern nurseries, where excessively high soil and air temperatures may frequently occur early in the growing season.

Soil Drainage and Subsoiling—Poor soil drainage invites problems with a variety of soil pests. Solutions include seedbed elevation, crowning, subsoiling, and the installation of drainage tiles. Sometimes surface water collects and stagnates in low spots in seedbeds. This problem can be eliminated by leveling and reshaping the seedbeds. Orienting seedbeds to promote maximum water runoff away from the beds will also decrease drainage problems and subsequent pest occurrence.

Subsoiling, a standard practice in most nurseries, is utilized primarily to break up underlying hardpans and to decrease the soil bulk density. Subsoiling increases soil drainage and aeration and permits deeper root penetration, particularly for hardwoods. Decreases in soil bulk density promote a more fibrous seedling root system with increased mycorrhizae development.

Eradicating Alternate Hosts—Southern fusiform rust and white pine blister rust are caused by obligate parasites that require specific alternate hosts (oaks and *Ribes* spp., respectively) to complete their life cycles. Where feasible and practical, the alternate hosts of these and other rusts should be eliminated within and around the nursery to minimize disease problems. Spores of these fungus pests can travel long distances, and complete eradication for extended distances from the nursery is frequently impractical. Nevertheless, alternate host eradication within and near the nursery seems well advised.

Windbreak Species—Tree windbreaks are quite useful, but tree species for windbreaks should be neither alternate hosts nor species susceptible to potential seedling pests. The use of similar windbreak and seedling crop species may supply fungus inoculum and insect pests that can readily spread to adjoining nursery seedlings. Existing windbreaks of susceptible species may require sanitation pruning or elimination.

Sanitation—Sanitation should be routinely employed to prevent the spread of pest problems within the nursery and to subsequent field plantings. Diseased or insect-infested seedlings should be rogued. Weeds and pest host-plants in and around the nursery should also be eliminated to reduce fungus inoculum, insects, and weed seed sources.

Seedling Grading and Culling—This practice may be required to minimize the transport of pest-infested seedlings to field planting sites. Seedling examinations during packing are highly beneficial in detecting inconspicuous root rots and other diseases, such as stem rusts and certain foliage diseases, that frequently are not detectable until late in the growing season. Also, diseases that are erratically distributed in nursery seedbeds are considerably more difficult to eliminate in bed culling than in seedling culling during packing.

Managers should carefully evaluate the present trend to de-emphasize seedling grading and culling during the packing operation. The benefits of this practice include improved seedling quality and reduced pest damage potential in field plantings.

Chemical

Chemical treatments are integral components of INPM, and a variety of chemicals are needed for use before and after seed sowing. However, chemicals should be used only (1) in combination with other INPM practices, where they have failed to produce satisfactory results; or (2) in situations where other INPM practices are not available.

Soil Fumigation—Soil fumigation before seed sowing is the most effective means of reducing soil-borne pathogenic fungi, insects, nematodes, and seeds of some weed species (fig. I-4). Although several soil fumigants are registered for use in forest tree nurseries, the most effective are the methyl bromide-chloropicrin formulations. The formulation of 67 percent methyl bromide and 33 percent chloropicrin is most effective in reducing soil-borne fungi that have resistant spore stages, such as those that cause charcoal, black, and Cylindrocladium root rots on conifers

Figure I-4—Soil fumigation to control soilborne pathogens, insects, and weeds has become a routine nursery practice.

and hardwoods. The formulation of 98 percent methyl bromide and 2 percent chloropicrin is widely used where a broader spectrum soil fumigant is needed for a variety of soil pests.

Soil fumigation is relatively expensive, and there is no excuse for doing it poorly. Nursery managers must carefully adhere to the recommendations in table 1 on proper fumigation procedures and soil moisture and temperature requirements.

Soil fumigants are nonselective in activity. Thus, non-target beneficial organisms, such as the mycorrhizal fungi, are reduced. The ectomycorrhizal fungi associated with most conifer species and other beneficial microorganisms necessary in a suitable soil environment usually re-infest fumigated soil fairly rapidly by airborne spores blown in from adjacent soils. Re-infestation may be delayed where adjacent soils do not provide sufficient inoculum.

A much more drastic negative effect of soil fumigation may be observed on certain hardwood species, such as sweetgum, yellow-poplar, and black walnut, which have endomycorrhizae. The endomycorrhizal fungi produce fewer spores, and they produce them below ground. These spores are not transported by air currents. Consequently, re-infestation of fumigated soil takes a much longer time. It is possible that an effective soil fumigation may minimize one problem (a soil-borne pathogen) and create another (reduced mycorrhizal fungi and other beneficial microorganisms) of equal or greater importance.

Soil Pesticide Applications—Pesticides occasionally must be applied to the soil to control certain diseases, nematodes, insects, and weeds. Fungicides that are registered for use in forest tree nurseries are limited in number. They range from broad-spectrum compounds, such as captan, to those with very specific range of activity, such as metalaxyl (which affects only species of *Phytophthora* and *Pythium).* Generally, these compounds are applied after tree seeds germinate and a specific problem has been identified. They are applied either as soil drenches or as low-volume foliar sprays, followed by sufficient irrigation to move the compound down into the root zone. Since a fungicide is usually applied to soil in response to an existing disease problem, multiple applications are often required to maintain control of the problem.

Nematodes rarely cause problems in forest tree nurseries, but where they do, a nematicide should be applied before sowing. Granular formulations must be incorporated into the soil; liquid formulations can be injected into the soil at a prescribed depth by using chisel plows.

Soil insects also rarely cause problems in forest tree nurseries. When an insect problem is identified, an appropriate insecticide should be applied in a water solution of sufficient volume to move the insecticide to the target site. Special precautions are warranted when prescribing "protective" insecticide treatments involving both target pest and non-target biocontrol organisms (e.g., spider mites and associated insect predators) on the same host seedling species. Indiscriminate or improper use of insecticides in such cases could be more detrimental than beneficial.

Significant advances in nursery weed control have been made in recent years. Most nursery managers routinely apply one or more herbicides to the soil surface at planting time. These preemergence herbicides prevent germination of various weed species. Other post emergence herbicides are registered for controlling weed species that do germinate. Conscientious and safe use of registered herbicides in forest tree nurseries has virtually eliminated hand-weeding.

Foliage Pesticide Applications—Pesticides often must be applied with hydraulic spray equipment (fig. 1-5) to foliage in forest tree nurseries. Fungicides and insecticides may be either contact or systemic. Contact fungicides must be present on the susceptible plant part to be effective; these compounds have little or no effect against established infections. Since contact fungicides do not move on the plant surface or inside the plant, they must be applied frequently to protect newly formed tissues.

Systemic fungicides enter a plant's vascular system and are translocated throughout the plant. Because of this unique characteristic, systemic fungicides require fewer applications to protect all tissues. In addition, many systemic

Figure 1-5—Many diseases, insects, and weeds can be controlled by proper timing and application of foliar and/or soil pesticides using hydraulic spray equipment.

fungicides exhibit therapeutic (curative) activity against infections already established within the plant. One notable example is triadimefon (Bayleton®), a compound used to control fusiform rust in southern nurseries. Triadimefon applied as a foliar spray controls fusiform-rust infections that occur within 7 days prior to treatment, and it provides protection for at least 21 days after application. Thus, three equally spaced applications of triadimefon between mid-April and mid-June are as effective in controlling fusiform rust as 30 to 40 applications of the contact fungicide ferbam.

Foliar herbicides used in forest tree nurseries must be toxic to target pests (weeds and grasses) but nontoxic to the tree seedling crop species. Appropriate herbicides for specific weed problems and conditions in forest tree nurseries are available.

Seed Treatment Chemicals—Chemicals are applied to forest tree seeds to protect them against birds, animals, and seed-borne pathogenic fungi. They also help to prevent soil-borne damping-off organisms from attacking emerging seedlings. A seed treatment has recently been developed to protect emerging southern pine seedlings from fusiform rust.

The most commonly used seed treatment chemical is thiram. This chemical is both a bird or bird and animal repellent, and a fungicide that has activity against certain seed-borne and soil-borne pathogens. There are presently no systemic seed treatment compounds registered for use against seed--borne pathogens.

The one systemic fungicide registered for use as a preplant seed treatment is triadimefon. Treating loblolly and slash pine seeds either in a solution of triadimefon (10 oz. a.i. per 100 gal of water) for 24 hr or a dry product mixture at the same dosage rate and exposure period protects newly emerged seedlings from fusiform rust for at least 14 days. As a result, foliar sprays with this fungicide can be delayed until seed germination and seedling emergence are fairly complete.

Biological

Although biological techniques are the most desirable for pest management, effective and practical applications in nurseries have been rather limited. One of the most successful examples has been the recent application of selected ectomycorrhizal and endomycorrhizal fungi in conifer and hardwood nurseries, respectively. The mycorrhizae are discussed in considerable detail in a separate chapter. Other biological controls include resistance, parasites and predators, and competitive and saprophytic fungi and bacteria.

One of the most significant improvements in management of forest tree nurseries involves seed-source selection. In the early days, nursery personnel were required to collect their own seeds. They often did so with little regard for tree form, growth rate, or disease resistance. In many cases, inferior seedlings were the result. Most forest tree nurseries now use seeds from carefully managed seed orchards. These orchards are comprised of clones selected for desirable tree growth and pest resistance. Seed orchard clones are meticulously selected from field sources, and their subsequent progeny are carefully evaluated on a variety of field planting sites. The clones with poorly performing progeny are quickly rogued from the orchard.

An effective, efficient, and rapid technique for testing selected seed orchard pine clones for fusiform-rust resistance is presently provided by the Resistance Screening Center (USDA Forest Service, Region 8, Forest Pest Management), Asheville, NC 28806. These tests are conducted under highly controlled conditions, and the results are available considerably sooner than those from routine field progeny tests.

At present, a large number of forestry agencies are establishing third-generation seed orchards. Some seed orchards producing disease-resistant material have also been recently established (fig. I-6). Consequently, seed sources for future use in forest tree nurseries will be even more resistant to pests.

Biological agents can significantly reduce pest populations (particularly insects) in the nursery. These agents are present in nature, and their development usually coincides with the development of pest populations. Unfortunately, the introduction of parasites and predators as biological control agents has had only limited success in nurseries.

The majority of the fungi and bacteria in the nursery are beneficial rather than harmful. In fact, certain types of fungi and bacteria are required for successful production of tree seedlings and cover crops. Most soil fungi and bacteria are saprophytic on soil organic matter. Some fix nitrogen; some are antagonistic to or compete with soil-borne pathogenic fungi. Insufficient populations of these beneficial soil organisms greatly impede the processes of organic-matter decomposition and nutrient fixation. Most of these fungi and bacteria are the initial colonizers of recently fumigated soil. Certain fungi such as the *Trichoderma* species are highly antagonistic to, and competitive with, pathogenic fungi.

Figure I-6—Today's seed orchards produce progeny with superior growth characteristics and resistance to some diseases.

Conclusions

INPM is far easier to read about than it is to apply. First, managers must thoroughly understand each technique. Then they must exercise judgment in deciding where and when to apply the available techniques. Some practices, such as soil fumigation, have negative as well as positive effects. Furthermore, the effects may vary between and even within nurseries and from year to year. As a result, INPM must be regarded as an art. It is an art that improves with experience and the emergence of new technology. It is a difficult art, but the nursery managers who utilize it are the most likely to be successful.

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Table 1—Recommended guidelines and precautions for effective soil fumigation with mixtures of methyl bromide and chloropicrin

Soil fumigation factors	Guidelines and precautions
Soil preparation	Work into fine, loose, friable condition to minimum depth of 8 to 10 inches.
	Soil should be as free of clods as possible.
Organic matter	Do not use nondecayed organic matter. Organic matter can render fumigant ineffective and harbor fungi and nematodes.
	Cut or chop green organic matter into the soil a minimum of 3 to 4 weeks prior to fumigation.
Soil moisture	Coarse-textured sandy soils—75 percent field capacity.
	Fine-textured clay soils—25 to 50 percent field capacity.
Soil temperature	Soil temperature above 50 °F at 6-inch depth.
	Air and soil temperatures not usually correlated.
Soil fumigants and target pests	Mixtures of 98% methyl bromide/2% chloropicrin fumigant; broad spectrum for nematodes, weeds, insects, and most soilborne fungi.
	Mixtures of 67% methyl bromide/33% chloropicrin fumigant; particularly effective against soilborne fungi with tough resistant stages.
Calibrating and monitoring soil fumigation equipment	Fumigant dosage = concentration × time. Dosage determined by injector nozzle size, fumigant pressure, and tractor speed.
	Inject fumigant at minimum 8-inch soil depth.
	Inject deeper for deeper-rooted species.
	Maintain constant pressure, tractor speed, and fumigant flow through all nozzles for uniform, effective coverage.
Soil tarping	Apply clear polyethylene tarp with adequate strength and thickness immediately after fumigation for maximum effectiveness.
	Alternate strips require longer fumigation and time intervals and afford opportunity for contamination from adjacent nonfumigated soil strips.
	Solid tarping requires shorter fumigation time interval and minimizes opportunity for soil contamination.
	Repair and seal any holes or opened glue joints immediately.

Table 1—Recommended guidelines and precautions for effective soil fumigation with methyl bromide—*Continued*

Soil fumigation factors	Guidelines and precautions
Fumigation exposure period	Consult fumigant label for recommendations.
	Minimum of 48 hours at soil temperature above 60 °F at 6-inch depth. At lower temperatures and during wet weather (following fumigation), double the exposure period.
Fumigation aeration period	Consult fumigant label for recommendation.
	Minimum of 48-72 hours; varies with fumigant, soil, temperature, moisture, and crop to be planted.
	Double aeration period in wet weather or at temperatures below 60 °F.
Extended aeration for seedbeds receiving artificial inoculations of ectomycorrhizal fungi	Aerate soil at least 3 weeks following fumigation with mixture of 67% methyl bromide/33% chloropicrin. This strong fumigant has extended residual toxicity to all soil fungi, including those which form mycorrhizae.
Contamination of fumigated soils	Avoid possible contamination by movement of soil, plants, mulches, etc., into fumigated areas. Clean, by steam or equivalent, all equipment: plows, bed shapers, tractor tires, etc.
	Avoid transplanting from nomfumigated soils.
Fumigation of mulch materials	Prefumigate mulch materials such as pine needles, straw, and bark with mixture of 67% methyl bromide/33% chloropicrin or mixture of 98% methyl bromide/2% chloropicrin formulations at a dosage rate of 1.0 lb/yd^3.
	Tightly compacted or baled materials should be a maximum of 18 inches deep. Loose pine needles, straw, etc., may be 36 to 48 inches deep.
	Fumigation procedures and precautions (tarping, temperature, moisture, exposure, aeration periods, etc.) are same as for soil fumigation.
Soil nutrient alterations	Level of soluble salts and ammonia nitrogen may be increased due to decreased populations of nitrifying bacteria.
	Do not use ammonia fertilizers on plants requiring nitrates or those sensitive to ammonia. Apply only nitrate fertilizers until seedlings are established and soil temperature is above 68 °F.
	Base your fertilizer applications on soil tests made after fumigation.
Water requirements	Water requirements per unit of plant production are generally less.
	Water requirements per acre are increased due to generally larger plants and increased production.
Safety	The methyl bromide/chloropicrin formulations are highly toxic to animals (including humans) and plants. Fumigants must be handled with care and applied only by trained, certified personnel.
	Always read fumigant label prior to use and follow all directions and precautions closely.