Evaluation of Nursery Losses Due to Pests

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All nurseries experience some pest losses, despite the best efforts at control. But the question arises, do the losses in a particular nursery justify additional expenditures for prevention or control? To answer that question, managers must carefully analyze the losses and the costs of preventing them. The first step in this analysis is determining the pest losses that are occurring.

We believe that the nursery must be viewed as an integral part of a forest regeneration program. Some pests cause losses in the nursery itself. Others weaken seedlings and cause them to die after outplanting in the field. Field losses are often due to improper nursery practices neither detected nor reported, but they should be. A nursery's purpose is to contribute to successful forest regeneration. Its concerns do not end at the nursery gate, and analysis of pest losses cannot end there either.

Nursery Losses

Pest-caused losses in the forest nursery may occur in several forms. The most obvious are the dead and dying seedlings observed in nursery beds. The economic loss represented by this seedling mortality may vary with the age of the affected seedlings. Seedlings that die early in the growing season usually represent less economic loss than seedlings that die later in the season, when greater investments have been made in them.

Pests also damage seedlings, making them unsuitable for planting. These seedlings are thrown away (culled) during lifting and packing.

A third type of economic loss may occur when large numbers of seedlings are stunted or damaged during the growing season and require an additional growing season in the nursery. The expense of maintaining these seedlings in the nursery for the extra growing season is considered an additional economic loss attributable to the causal pest(s).

Field Losses

Nursery pests and their damage also cause economic losses in field planting. When seedlings are not available for planting during a particular season, investments in site preparation may be either partially or completely lost. The site may have to be prepared again when seedlings become available in subsequent years.

Nursery pests originating in the nursery are frequently transported to field plantings on infected or infested seedlings. In the field, these pests may continue causing economic losses by killing, stunting, or deforming seedlings.

The most serious damage in field plantings involves the introduction of a new pest on infected or infested nursery stock and its subsequent spread to adjacent planted or natural stands. White pine blister rust and phytophthora root disease of Port-Orford cedar are examples of diseases that have been introduced into new localities on diseased nursery stock. That is why the transport of nursery stock between nurseries, States, regions, and countries should be carefully monitored. When such transport is necessary, seedlings should be carefully examined for pests. Most State plant quarantine agencies require seedlings to be examined and certified pest-free prior to interstate transport.

Evaluation

A pest loss evaluation program should be an integral part of any nursery operation. The program should include biological, economic, and environmental evaluations of pest-caused losses, along with pest management alternatives and post-control appraisals. A first prerequisite in any nursery pest evaluation is identifying the pest problem and associated causal agent(s). Causal agents may include biological organisms such as insects and fungi, or abiotic factors such as the nursery environment and management's cultural practices. Additional background information that is helpful in planning nursery pest evaluations include:

1. Seedling species.
2. Seedling age when affected.
3. Portion of seedling affected.
4. Seedbed location.
5. Size and distribution of affected area.
6. Soil type and drainage.
7. Cultural practices.
8. Pesticide use.

Nursery pest evaluations may be designed either for general pest occurrence or for specific pest problems. The evaluation intensity may range from informal seedbed scouting to intensive randomized or systematic sampling procedures that permit statistical analyses. Preliminary sampling data may also be needed to determine the distribution and variation of the pest problem in order to select the most effective and efficient evaluation type and intensity. It is important to evaluate when the symptoms are readily visible. Root diseases, stem rusts, and foliage blights, for example, are easiest to see late in the growing season. Proper timing of evaluation requires a knowledge and understanding of localized nursery pest problems.

After pest damage is identified and quantified, cost-benefit and environmental impact analyses of pest management alternatives are

needed to select the pest management strategy most economical and safest to the environment. Nursery pest management strategies include routine preventive practices as well as curative treatments after pest problems are detected, identified, and evaluated. High product values and high pest hazards in nurseries frequently make preventive practices such as soil fumigation and chemical sprays desirable. However, the most effective and efficient pest management procedures involve an integrated nursery pest management strategy (see chapter 62). The primary objectives of this strategy are to minimize potential pest losses and maximize production of high-quality, pest-free seedlings for improved survival and growth in field plantings.

Pest evaluation of field plantings also is very important. Frequently, such evaluations are omitted or de-emphasized, or the results are not reported. Background information that is helpful in evaluating field planting problems includes:

1. Seedling storage (length, type, and container).
2. Site conditions (site index, soil type, and competition).
3. Planting conditions (moist or dry).
4. Planting method (hand or machine).
5. Seedling size (too small or too large).
6. Seedling root system (adequate, substandard, or needing additional root pruning).
7. Incidence of mycorrhizae on seedling feeder roots.

Field planting evaluations promote cooperative relationships with field foresters and relate the nursery manager's concern for successful forestation, which is everyone's primary goal.

Selected References

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