WHY PESTICIDES SOMETIMES FAIL

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There is still a wide range of chemicals for pest control in nurseries and greenhouses, even though good sense and legal restrictions have reduced the number in recent years. The chemical companies have usually tested a product extensively before it is marketed. They want to sell as much as possible and be sure that satisfied users come back for more. This makes it a little surprising that there are so many reports of poor results in pest, disease, and weed control. It should suggest that users consider their own practices before being sure that the chemical is at fault.

This paper presents a checklist of some things that can go wrong in pesticide use. Proper pest control is not easy; it requires attention to detail before, during, and after the application both for effectiveness and, of course, for safety.

APPLYING THE WRONG MATERIAL

Incorrect diagnosis of the problem. In recent years many chemicals have been developed to present as small a danger as possible to the environment. Therefore, they are very specific in their action. This means that correct diagnosis, at least to the *class* of the problem involved, becomes important. Think, for example, of how similar to a disease some of the results of micronutrient imbalance can be. And, of course, fungicides would be ineffective in combating fluoride toxicity.

A more subtle case of using the wrong product occurs when an organism has developed resistance to a particular chemical and is no longer controlled by it. This can occur with a local population or can have spread through all individuals of the species. Published information is not always available on this phenomenon, which can be extremely frustrating.

Using the product incorrectly. "Read the instructions when all else fails", has become a stock joke. However, the consequences of not being familiar with the label on pesticides can be dangerous as well as illegal. The chance of failure is increased. In addition to the gross errors from guessing what the product can do, there are the well-intentioned mistakes, "if one is good, two must be better." Sometimes very exact conditions for application must be met. Some materials are light-sensitive and must be watered into the soil. Others may work only with a spreader-sticker, or may be phytotoxic if applied under certain environmental conditions. What a pity to put the time and labor into an application that will be a near miss

because not even the large print was read!

Using an outdated or improperly stored chemical. Complex organic molecules are often far from stable. Storage in warm humid conditions in open bags or with other chemicals as contaminants will change the activity of most materials, usually in the wrong direction. The manufacturers are not just trying to sell more chemical by putting an expiration date on their bags. Take notice of these, and dispose of any outdated materials in whatever manner is legal in your state.

Problems with a tank mix. The thought of saving a pass or two with a sprayer by mixing everything in one tank is very tempting. With the complex molecules involved there may be reactions that leave no activity in the mix, or, worse still, a phytotoxic material that will destroy the crop. Many problems are documented, and there are also ways of testing compatibility and possible phytotoxicity on a small scale. And the time to do this is *before* the expensive materials are mixed, the spray time invested, and the crop put at risk.

Problems from careless cleanup. Some materials will affect others even when present as only the trace left from a poor cleaning job of the sprayer. Both phytotoxicity and inactivation can occur with unintended tank mixes.

Using the wrong formulation. Some spray systems are only effective with particular formulations of a chemical. The manufacturer knows best in this case and will give the information in the instruction booklet. Trust him!

MAKING THE APPLICATION INCORRECTLY

Applying the wrong rate. Once again the label information usually represents extensive testing by the manufacturer. It should be followed unless another rate has been shown to be better for a particular circumstance by further testing. Not only the concentration of the spray but the amount reaching the plant or a unit area is important.

Poor coverage. Most chemicals must reach the pest or the weed in order to be able to be effective. Poor coverage means that the pesticide might as well have been left in the bag in the storehouse. At least that way the cost of the application would have been saved.

Problems due to the weather. Spraying is even more effective than washing a car in bringing on rain that is not wanted. Sprinklers, too, can wash off spray before it has had time to act. Light inactivation can be a problem, and high or rising temperatures can cause trouble by drying the spray before it can penetrate or by causing phytotoxicity.

Initial application too late. Small problems are almost always easier to cure than large ones. Controlling pest infestation before the rate of increase of the organism has reached its maximum rate always means that the job will be easier and more sure of success. Often knowing the biology of a pest will allow control at a susceptible stage in its life history, when all other stages are resistant to the chemicals available for use. Applying an herbicide before a weed has set and released seed is an obvious step that is often ignored by overextended nurserymen. And the word "preemergence" on a herbicide label means what it says. If the target weed has already grown up into the light, it is too late for preemergence control.

Lack of follow-up. Follow-up application of the same or a complementary spray will often control organisms missed the first time. Some pesticides act exclusively on one stage of the pest, and follow-up applications may be needed to control a susceptible stage that hatches or germinates from resistant eggs, spores, or seeds. Rain or irrigation coming too soon after a spray application also make a follow-up essential.

Poor records of treatment. No matter how extensive the manufacturer's testing has been, the conditions on each nursery are different enough to make it essential to keep full records of what, where, when, how, and why a treatment was done. A record of how effective it turned out to be is essential. All growing operations are "systems" in the technical sense of the word. Each part relates to all the others, and each nursery operates at full efficiency only when all activities are tailored to fit its particular conditions.

Relying on chemicals alone. Even the most effective chemicals need a helping hand. All aspects of your cultural practices should be aimed at getting the healthiest and most resistant plant possible. Scouting pest levels and knowing the biology of the pest will allow treatment at the time when it will do most good. Following the program that has come to be called, "integrated pest management" will ensure that every weapon possible is being brought to bear on each problem. Properly used pesticides will rarely fail. A careful check of nursery operations will often show some small correction that will make a spray successful when it is next applied.