Strategies for Control of Ornamental Diseases

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The methods employed by producers of ornamental crops to control plant pathogens are varied and numerous. Since no single approach to disease control can give complete results on its own, the best approaches encompass a variety of physical, chemical and biological methods.

Physical methods

The first concern in any disease control program is to provide the best possible environment for the crop you are producing. This includes sanitation, using physical barriers and other steps to exclude pathogens from the growing environment. Strict sanitation is important for a variety of reasons since pathogens can be harbored on weeds and move easily into the crop you are producing. This is especially important for some fungal diseases such as powdery and downy mildews and certain viral diseases. In addition, control of algae can be very important on the greenhouse floor, the surface of the growing medium or soil and the leaves of the plants themselves. When algae is not controlled, it can pose a safety hazard and reduce productivity by using the fertilizer and water meant for the crop.

Physical barriers such as greenhouse walls and producing potted plants on raised benches can also greatly decrease the spread of plant pathogens from the native soils into the crop or from one part of the crop to another. In addition, it is critical to start with pathogen-free pots and potting media or soil. Most growers use a variety of prepared potting media as well as using steam sterilization for soil in the field or in ground bed. The key to physical methods for disease control is to keep the crop from becoming infected at all. Once infected, other, less effective controls must be relied on.

Biological methods

The most important biological method is use of pathogen-free stock, whether it is seeds, plugs or cuttings. When you use propagative material that is infected with a plant pathogen you only insure that you will have disease problems throughout production of the crop. No matter how good a job you do in preparing the growing area with clean pots, soil or potting media if you use infected stock plants you will negate the benefit of all of your work.

Sometimes growers use dips for their propagative material. Unfortunately, many times the chemical chosen for the dip treatment is a fungicide with a narrow range of activity that does not control the target pathogen. Fungicide use under these conditions simply makes the disease more severe. I have worked in two different locations in Florida where this problem existed. In these nurseries, disease spread from a few cuttings to the entire crop and caused an epidemic. If you insist on using a pre-plant dip to treat your cuttings, then you must use a broad spectrum material which can control many different plant pathogens.

Another valuable biological control method is using cultivars that are resistant to the disease that is the most destructive in your production system. This method has not been widely used in the past since we have very limited information available on resistance of ornamentals to the multitude of

diseases that affect them. It is critical for ornamental producers to request seed producers and other plant breeders to develop resistance in these ornamentals to their most serious plant diseases. I assure you that the same people who are breeding ornamentals also breed vegetables that are resistant to plant pathogens. Tomato growers do not consider a new cultivar of tomato unless it is resistant to nematodes and fungi that cause losses. Start asking for these resistant cultivars today and although they are not available now they will be in ten years. Unless you start asking now you will definitely not have any available later. Breeding resistance it not just a possibility it is the responsibility of the plant producer and the plant breeder since this is one of the most important methods for reducing the use of pesticides while maintaining a high quality product in the future.

Environmental methods

There are many ways the environment can be altered or managed to reduce plant diseases. Some of them include temperature, irrigation, humidity and host nutrition (fertilizer). All diseases have a specific range of temperatures under which they are the worst. If you grow plants in a greenhouse you can alter the temperature of that structure to levels that are not optimal for the pathogen. This can greatly reduce disease severity. Sometimes the range of temperatures that is best for the disease is different than that required for crop production. At other times the temperatures are identical and they cannot be changed without causing damage to the crop or perhaps lengthening production time. Other problems that exist are the added expense of changing the greenhouse temperature and the fact that many ornamentals are produced in the field where temperatures cannot be changed.

Other elements, which greatly affect disease severity, are the irrigation method and the humidity of the growing environment. Many diseases are less severe under lower humidities. Unless you are producing the crop in an enclosed structure such as a greenhouse you are limited in your ability to change the humidity. One of the best ways to alter the humidity around the plants is to space them farther apart. This can increase air movement between plants and thus reduce relative humidity and disease severity. It also reduces the chance of spread from infected plants to adjacent healthy plants simply because they are touching. Other methods, which reduce relative humidity in a greenhouse, are venting and heating which remove the moisture-laden air from the greenhouse just prior to sunset.

Elimination of overhead irrigation and exposure to rainfall also reduces the chance for disease development and spread since many of the most common plant pathogens require free water on the leaf surface to allow germination and infection. In addition, splashing irrigation water can easily spread spores from one infected plant or leaf throughout the entire planting.

Chemical methods

The final area in which disease control methods are concentrated is that of chemical control. Use of disease control pesticides should be minimal if other control measures are used. Pesticide usage, however, remains the backbone of control for many severe ornamental diseases. Due to the need for very high quality ornamental products, many nurseries must employ preventative measures. Pesticides are routinely employed by ornamental plant producers and they are generally efficacious and nonphytotoxic.

The first and most important step to pesticide use is diagnosis of the problem. In some cases, the problem is not caused by a plant pathogen and could be worsened if pesticides are applied. Similarly, diseases with similar symptoms can be caused by widely differing organisms. Root rot of seedlings may be caused by *Rhizoctonia, Fusarium, Pythium*, or *Phytophthora* spp. or any combination of these as well as other pathogens. Thiophanate methyl controls *Rhizoctonia* and *Fusarium* spp. but has no discernible effect on the other two fungi. Similarly, fosetyl aluminum aids in control of *Pythium* and *Phytophthora* spp. but shows no activity against *Rhizoctonia* spp. If an accurate diagnosis is not made, disease control may not be achieved simply due to selection of the wrong chemical.

Availability of legal fungicides or bactericides for use on specific plants for a given disease with a proven record of efficacy and crop safety is the major concern. The 1981 Amendment Section 2(ee) of FIFRA, states that pesticide users can elect to use a product to control nonlabeled pest species as long as the product is legal for use on that plant.

The second step toward controlling a particular disease involves selection of the most efficacious chemical application. This is accomplished by using pesticide label and the recommendations published through state extension services for pest control. It is critical to know whether or not the pesticide should be applied to the foliage of the plant or to the growing medium. Diseases such as Cylindrocladium root rot of *Spathiphyllum* spp. cannot be controlled through foliar sprays. Only application of a drench will result in enough pesticide to affect development of most root diseases. In general, root diseases must be treated through drenching the growing medium and leaf diseases through foliar sprays. In cases in which the pathogen lives in the growing medium but infects stems or leaves, a combination of the two methods may be necessary. An example of this type of disease is Rhizoctonia stem rot and aerial blight.

Some nurseries utilize a preventative disease control program based on mediaincorporated fungicides. Recurrent problems with sanitation in the propagation area may justify use of fungicides as a component of growing media. The effectiveness of these fungicides is primarily determined by the accuracy in predicting soilborne pathogens and choice of the best product for each pathogen or combination of pathogens.

Phytotoxicity

Under the normal conditions in which pesticides are routinely applied, phytotoxicity occasionally occurs. The wrong choice of pesticide, whether due to active ingredient, carrier chemical, or rate applied, can result in plant injury. Phytotoxicity can result in a variety of symptoms and may be more severe under certain production situations. Use on pesticidesensitive plant species can result in plant injury more often than not. The desire to save time and money may lead to the common practice of tank mixing several fungicides, or a fungicide with other pesticides such as miticides, insecticides, or nematicides. The practice of tank mixing pesticides and fertilizers can be as injurious to plants as the application of pesticides under adverse environmental or cultural conditions. Some fungicides are formulated with special adjuvants that can contribute to plant injury if indiscriminate tank mixing occurs.

Many symptoms of phytotoxicity are difficult to verify unless some plants of the same age cultivar remain untreated and can serve as controls. This is the only way to assess such symptoms as stunting, reduced leaf size or slight chlorosis. It should be remembered that once phytotoxicity develops, most symptoms will not disappear. The plants may outgrow the problem, but leaves with burns or distortion will not become normal. A phytotoxicity test should be performed whenever new plants or varieties are added a new pesticide product becomes available, or when a new tank mix is needed.

Avoiding phytotoxicity is not an impossible task and can be accomplished if several key practices are followed closely. Spray plants only with pesticides known to be safe for the plant. Do not tank mix unless the combination of products is known to be safe. Do not spray stressed plants if this can be avoided. If the pesticide label instructs application to the growing medium then apply it only to the growing medium. The same holds true for foliar applications. When certain pesticides are applied to the wrong portion of a plant, they may cause phytotoxicity, which does not occur when applied to the correct site. Likewise, if the label instructs rinsing foliage after application, this must be done to avoid damage to the plant.