Disease Control in the Propagating House

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To understand strategies for disease control in propagating houses, it is necessary to understand some basic concepts of how diseases develop. Three components must be present before a disease will occur: (1) a pathogen (micro-organism that is capable of causing disease), (2) a susceptible host plant, and (3) favorable environmental conditions for the disease to develop. In addition, all three must be present for a sufficient length of time to allow infection to take place. If any of these components is lacking, no disease will develop. If these components are present at a less than an optimum level, disease will develop at a slower rate.

Because of the environmental conditions in a propagating house, the potential for disease is very high. Free moisture, high humidity, and mild temperatures favor the development of many fungal and bacterial diseases. Propagation houses could almost be considered by a pathologist to be an ideal inoculation chamber to study diseases. The vast majority of fungal spores require free moisture to germinate, a prerequisite to infection. Bacteria also require free moisture to be present before they can actively move into plant tissues. High humidity favors spore production and disease development.

Wounds (cuttings, leaf removal, bruises, epidermal abrasions, etc.) break the natural plant barriers potentially allowing easier access to the pathogens. Because of the humid environment, stomates tend to be open predisposing these tissues to infection. In general, stressed plants are often more susceptible to disease. Thus, it is likely that cuttings will be more susceptible than under normal growing conditions. Pathogens attacking seedlings may not be serious problems when the plants have matured. Thus, the favorable environment for disease and the vulnerability of the plant material make disease control in a propagating house an extremely challenging situation.

Disease control strategies are based on three general methods: cultural, chemical, and genetic resistance. Successful control programs will often utilize or integrate all three of these methods.

Good sanitation practices are the first line of defense. Preventing the introduction of the pathogen is very important. It has to be remembered that no disease will develop if no pathogens are present.

There are numerous avenues by which the pathogens can gain entry into a propagating house. The propagation medium may be contaminated, for instance from a previous crop. Various steam, chemical, and heat treatments are commonly used prior to planting the crop in an effort to eliminate pathogens from the propagation medium. The planting material itself (seeds or cuttings) may be contaminated. Acceptable planting material can often be obtained from disease-free areas, isolated stock plants, or certified commercial sources. These plantings should be isolated from production fields to minimize their exposure to pathogen contamination. Chemical treatments are also available which will remove surface contaminates from both seeds and cuttings. Knives and containers used in

processing cuttings should periodically be sterilized to prevent inoculation of the wounded tissues.

Irrigation water derived from ponds or outdoor irrigation ditches can become contaminated with plant pathogens. Only uncontaminated water should be used in a propagation situation. Chlorination, bromitization, ozonation, and possibly filtration can be used to de-contaminate water. Weeds and sometimes "decorative plants" can also act as host plants for various diseases and when left in or nearby greenhouses can function as inoculum sources.

Infected crops growing adjacent to greenhouses can also produce inoculum which can be transferred by air currents, equipment, or personnel to the propagating area. Propagation houses or areas should be separated from production areas and ideally serviced by their own equipment and personnel. These houses should have a minimum of foot traffic in and out and only key personnel should be allowed access to the area. Dirt from outdoors and greenhouse floors can be readily tracked in by foot traffic. Cull piles, contaminated pots and containers, and "ignored plants" can all be sources of disease inoculum. Eliminating or minimizing these sources of inoculum is a must in any disease control program.

Regarding chemical control, a question consistently arises, should fungicides be used on a routine preventative basis in propagating houses? There seems to be no easy straightforward answer to this question. Since fungicides basically function in a preventive or protective way, routine use prior to disease development is a logical practice. On the other hand, spraying when it is not necessary does not make economical or environmental sense. In addition, fungicides have been known to inhibit growth, in particular, germination and root growth of some plants. Finally, routine spraying can encourage poor cultural and management practices. There is a natural tendency to let some cultural practices slide thinking a spray program will protect the crop. If previous crops have been healthy and the crop can be closely observed, routine use of preventative sprays would in most cases not be necessary. But if diseases have been a problem in the past and there is evidence that no phytotoxicity would be expected, preventative use would be encouraged.

Some of the newer and more active fungicides are prone to the development of resistant strains of fungi which are no longer sensitive to the fungicide. Once resistance has developed, that fungicide is no longer effective as a disease control agent. These shifts in fungal populations from sensitive to resistant are aggravated by continual and overuse of these at-risk fungicides. Since they give superior control, the temptation is to overuse them. To minimize the potential for the development of resistance, the total number of applications should be limited. They should be applied only as protective sprays to avoid treating large populations of the pathogen, less susceptible cultivars should be used when possible and cultural controls should be fully utilized to minimize disease pressure. It is also suggested that these at-risk fungicides be alternated or used with tank mixtures of other registered fungicides having different modes of activity. There are other advantages to tank mixing fungicides including broadening the potential number of diseases controlled and possibly taking advantage of synergistic activity. Recent work from Pennsylvania State University has demonstrated the synergistic effects of tank mixtures of Ornalin, Fore, and Daconil 2787. These fungicide mixtures not only provided longer-term control but did so at below normal rates.

Because of the extremely favorable environment for disease development in a propagating house, taking special preventative measures to avoid the introduction of pathogens is the key to a successful control program. Continual close surveillance and immediate response to disease detection is also important in minimizing losses.