CULTURAL PRACTICES AND IPM FOR POINSETTIAS

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An Introduction to IPM

Growers are becoming more aware of integrated pest management (IPM) each day, and the use of IPM is increasing throughout the country. Very simply, IPM is a way of optimizing pest control in an economically and ecologically sound manner. As a management system, it has four main goals:

Protect the Quality of the Crop. The first goal of IPM is to allow producers to grow premium plants without sacrificing crop quality. One preconceived notion that is a misconception about IPM is that crop quality will suffer, that plants will attain pest damage. This is simply not true.

Safeguard the Environment and the Health of Greenhouse Workers and the Public.

Environmental stewardship is everyone's responsibility and is a major focus of any IPM program.

Reduce Pest Management Costs. Pesticides are increasing in cost and growers cannot afford to waste chemicals either from an environmental standpoint or an economic one. Through a continuous, integrated program, pest management can be more efficiently implemented.

Use Pesticides Effectively. IPM is often perceived erroneously as advocating the elimination of pesticides; this is very far from the intent of the program. Chemical control is usually an essential part of an IPM program. The intent is to make sure pesticides are used properly and as effectively as possible.

Why IPM?

As evident in the latest issue (August 1990) of *GrowerTalks*, IPM has been gaining more interest and recognition over the past few years. There are three reasons for this trend:

Laws and Regulations. New legislation is restricting pesticide application, forcing companies to show a needfor a pesticide prior to label approval. This trend will continue, and with increased costs of developing new chemicals, growers must rely on chemicals to a lesser degree in the future.

Pesticide Phobia. Media coverage has bombarded the public with negative, exaggerated and sometimes misleading information. The public has responded with the predictable response of demanding a reduction in pesticide usage.

Single Strategy Approach. Since World War II, pesticide use has increased dramatically, and many growers have relied almost solely on chemical control methods. Concomitantly, research in the private sector has concentrated around the development of a better pesticide rather than an overall control strategy. This has not only left a technological void with respect to alternatives to chemicals, it has led to pest resistance to pesticides leaving us with fewer defenses against devastating insects and diseases.

Integrated pest management will continue to be refined and implemented at an increasing rate. Prior to effective use of IPM tools, growers should be aware of the basic principles behind IPM.

Basic Principles of IPM

When initiating a control program, it is essential to establish procedures for determining when control is needed. Once the problem has been determined or anticipated, then strategies can be planned that integrate chemical, biological, cultural, and mechanical techniques for control or prevention of pest problems. There are four basic principles of an IPM program:

Crop Monitoring or Pest Scouting. Be aware of the status of the crop as well as the pest status; insect populations and incidence of disease counts are important to determining population trends and in planning control strategies. Effective monitoring can also indicate when pests are not present, preventing unnecessary applications of pesticide.

Proper Pest Identification. Know what the problem is prior to trying to control it. Most pesticides are species specific and correct identification is important for efficient control.

Correct Timing. Pesticide applications made at the wrong stage of a pest's development or when pests are not even present is a waste of time and money. Timing of chemical applications is crucial in an IPM program.

Precise Records. Crop records form the basis for future pest management. With accurate records, pest control should become easier with every crop. Documentation of plant cultural practices, environmental conditions as well as pesticide applications should be made for future reference.

Growers using IPM can make more efficient and economical use of pesticides than growers relying solely on chemical controls. They are practicing environmental stewardship while effectively protecting the value and quality of their crop.

Cultural Practices and IPM

Pathologists use an excellent diagram to explain the interrelationship of the host plant, the pathogen or infecting organism, and the environment surrounding both when describing plant diseases. This "disease triangle" can be broadened conceptually to encompass all plant pest problems (Figure 1). In an integrated pest

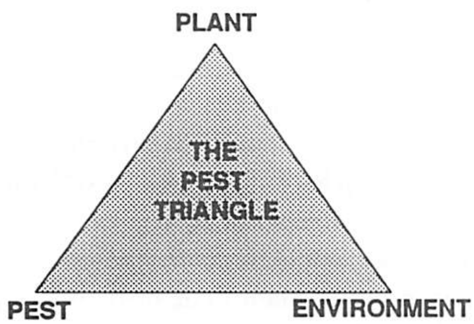

Figure 1. The pest triangle.

management program, growers move beyond confronting pest problems with only pesticides (Figure 2) and address the plant and environmental aspects of control (Figures 3–5).

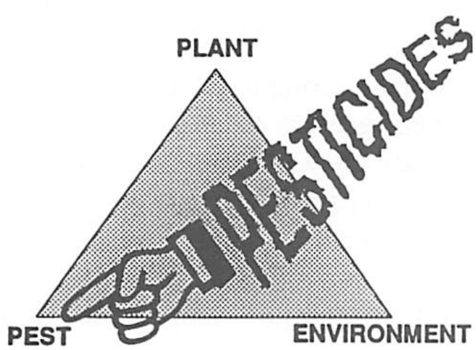

Figure 2. The single strategy approach.

Pest approaches (Figure 3) do include pesticides, but also include pest monitoring, use of predators and pest parasites, and antagonistic microbes that may compete with/help exclude

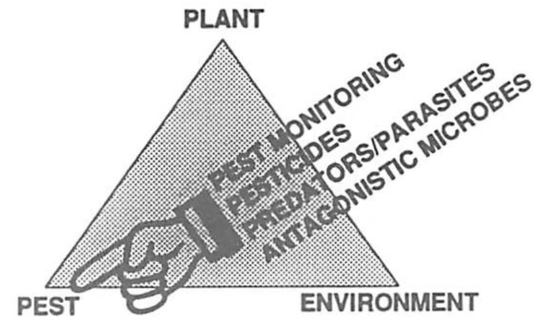

Figure 3. Pest approaches to IPM.

pest organisms. The importance of monitoring has already been addressed. Predator and parasite alternatives for use on poinsettia pests would include Australian lady beetle for mealybug control and *Bacillus thuringiensis israelensis* for fungus gnat control. Growth media companies have begun to incorporate beneficial microbes into their substrates that are antagonistic to disease pathogens. Feasible alternatives are available that warrant grower investigation prior to sole reliance on chemical pesticides.

Plant approaches (Figure 4) are just as important as pest approaches. Poinsettia resistance to diseases and insects exists to varying degrees among cultivars. For example, whiteflies have been shown to have a preference among cultivars. Growers should be able to document

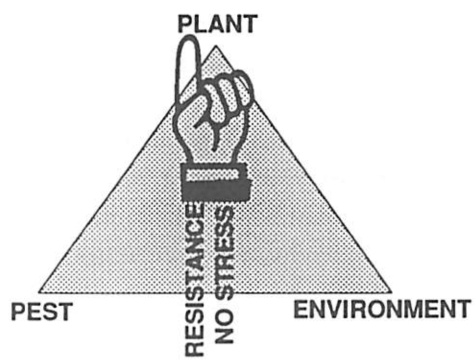

Figure 4. Plant approaches to IPM.

cultivar preferences of pests through their records. This information can be used to isolate particularly susceptible (highly preferred) cultivars from the rest of the crop for more effective control.

The concept of preventing plant stress cannot be over-emphasized. For example, salt damage of roots offers an opening for root rot organisms such as pythium. Spray damage from incorrect pesticide application provides an entry point for botrytis. Every attempt should be made to prevent nutrient, moisture (excess as well as deficient), or any other type of stress during poinsettia production.

Environmental approaches (Figure 5) are perhaps the least emphasized or advertised control methods available. However, their effectiveness can be equal to chemical controls.

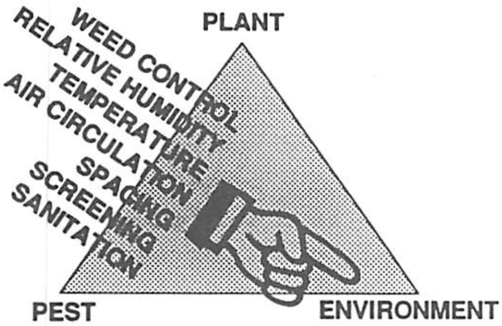

Figure 5. Environmental approaches to IPM.

Weed Control. Growers should have zero tolerance for weeds inside a greenhouse. Weeds under benches serve as a breeding ground for pests and a haven for pathogens. They can serve as a sanctuary when pesticides are applied to crops; after the pesticide threat is gone, pests simply return from unsprayed weeds to their original home on the crop. Empty houses can be fumigated with a fumigant such as methyl bromide for weed prevention. Empty houses can be shut down, allowing temperatures to elevate and desiccate weeds. Finally, herbicide control is possible, if necessary. Only diquat (**Ortho Diquat**), glyphosate (**Roundup**) and oryzalin (**Surflan**) are registered for use in greenhouses. Plants SHOULD NOT BE PRESENT in the greenhouse when herbicides are applied. Reintroduction of plant material is not advised for at least 24 hours after treatment with diquat or glyphosate, and only after 14 days if oryzalin is used. Oryzalin WILL VOLATILIZE IF TEMPERATURES RISE ABOVE 80°F; this is the reason for the 14 day waiting period prior to moving in plant material. Do not use herbicides in a greenhouse without first consulting the North Carolina weed extension specialist for ornamentals.

Relative Humidity. Control of relative humidity in a greenhouse can be a frustrating battle. The physics of a greenhouse and physiology of plant growth lead to increased moisture content in the air; evaporation of soil moisture is trapped by the greenhouse glazing and plant transpiration increases ambient water vapor.

During most of the poinsettia season, relative humidity can be reduced if growers will vent each evening just after sunset, exchanging cooler outside air for air within the greenhouse. As the cooler air is warmed, the relative humidity (RH) will be decreased. For example, assume it is 40°F outside and rainy. There is 100% RH outside of the greenhouse and the moisture content of the exterior air is 37 grains of water/lb of air. Inside, the temperature is 65°F and the RH is 90%; interior air moisture content is 83 grains of water/lb of air. The example greenhouse has a volume of 39,348 ft^3 (an 86' × 36' quonset house). For reduction of relative humidity, exhaust fans should be turned on long enough to exchange 1/2 of the air in the greenhouse (the time required to vent the needed 19,674 ft^3 of air can be calculated by knowing the CFM capacity of the exhaust fan). After exchanging 1/2 of the air, the greenhouse is heated to the set 65°F. The end result in the greenhouse is 65°F air that contains 60 grains of water/lb of air and has a relative humidity of 65%.

The cost of the air exchange can be easily calculated. Given an acceptable margin of error, growers can assume that one BTU can raise ~52 ft^3 of air 1°F. In the given example, 19,674 ft^3 of air must be raised 25°F. The total BTU output required of the heating system to heat the air is: $[19{,}674\ ft^3 \div 52\ ft^3/BTU/°F] \times 25°F = 9459$ BTU's of heater output. The cost of 9459 BTU output, assuming a 70% efficient natural gas heating system would be ~6¢. If you exchange air every evening during September 1–December 15, you have increased your heating bill for the entire greenhouse by only $6.36. The cost of one fungicide application (material + labor + equipment depreciation) for botrytis control in the same greenhouse would be greater than the increase in the heating cost.

Temperature. Temperature manipulation for control of pests is more difficult than control of relative humidity. The greenhouse should be keep close to temperatures optimum for plant production. However, growers should be aware of temperature and how it affects pesticides and pests. For example, pesticide applications made in the middle of the day when greenhouse temperatures are highest can lead to phytotoxicity and damage plants. If greenhouses are maintained too cool, much below 60°F, the incidence of *Pythium* and *Thielaviopsis* can increase. On the other hand, pathogens such as *Phytophthora* and *Rhizoctonia* prefer warmer temperatures and can increase in importance if houses are maintained too warm. Growers can reduce the possibility of bacterial soft rot during propagation by maintaining moderate temperatures; evaporative cooling can prevent excessive temperatures that bacterial soft rot prefers.

Air Circulation. Adequate air movement around and within the plant canopy is necessary to prevent condensation on foliage that could lead to botrytis blight. Also, as plants transpire, the air immediately surrounding leaves becomes saturated with water vapor and RH approaches 100%, increasing the chances of botrytis infection. Proper air circulation can increase foliar transpiration and increase evaporation of soil moisture from the soil surface, thus removing excess soil moisture. Unfortunately, all the additional water vapor increases the ambient RH of the greenhouse, so air exchanges become even more important.

Spacing. Crowding plants results in leggy growth and stretching of shoots. Inadequate spacing also reduces air circulation, can increase disease potential, and decreases pesticide coverage. It is recognized that a 15" × 15" is not as economical as 12" × 12" if the only economic factor considered is $/ft^2, but crop quality and cost of pest controls must also be considered as economic factors when deciding on spacing.

In summary, effective and efficient pest management addresses pest control from the pest, plant, and environmental angles in order to integrate control techniques into a economical program that protects crop quality and the environment.