Controlling Greenhouse Insects During Hot Weather

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The control of insect pests is always a major concern in the floriculture greenhouse. When the days get long, the sun's intensity increases, the temperatures soar and insect populations can explode. Under these conditions, it is essential for growers to have a good "game plan" to manage pest populations within tolerable limits. Here are some things to consider when developing your insect control game plan for the spring and summer months.

The rate of insect development is related to temperature. As temperatures increase, the time required for the insect to complete its life cycle will decrease and, as a result, insect populations will increase rapidly. For example, the sweet potato whitefly's life cycle will vary from 18 up to 57 days depending on temperature and food source. The implication of this fact is that the applicator must be that much more vigilant under hot weather conditions.

In a 65-75°F environment it takes the greenhouse whitefly about 32 days to complete one life cycle, sweetpotato whitefly complete a life cycle in 39 days, and thrips require about 25 days. Under hot summer conditions the time required to complete one life-cycle will be reduced to 14 and 18 days for thrips and whitefly, respectively.

Increase spray frequency during hot weather: When insect populations become a problem under moderate temperature conditions spray at four- to five-day intervals for thrips and five- to seven-day intervals for whitefly. Reduce the period between spray applications to three days under hot weather conditions.

The number of consecutive spray applications to schedule in a series and the frequency of the applications will depend on the pest involved, the environment and the severity of the problem. If the infestation is high, continue the spray schedule for one complete life cycle once the program begins. Evaluate the effectiveness at the end of this period.

Early detection is important. Use scouting and monitoring techniques to detect insect populations before they explode. Monitor insect populations by routinely inspecting plants for pests. Move around the house and inspect plants in different parts of the house, checking under leaves, the soil etc. for signs of a problem.

Looking in the right spot for a pest is the key to early detection. Whitefly tend to congregate on the underside of leaves, thrips feed in the growing tips and flowers of most crops, green peach aphids can usually be found clustered on the tender shoot tips of a crop but the melon aphid shows no special preference for this site.

Monitor the right plants. Plant sensitivity to an insect pest will vary with the species as well as between cultivars. Growers can use this to their advantage in two ways. One way is to use resistant cultivars when they are available. The second way is to monitor susceptible species for early signs of infestation. Check the plants which usually show problems first and take immediate action when problems do occur. In this way, the grower can spot treat the problem, checking the infestation before it becomes epidemic.

Use insect traps and monitor them. Use sticky traps, yellow for whitefly and blue for thrips. Check the traps routinely—on a regular schedule! Identify the insects captured and make notes as to the location, the type and number of insects found, the action taken to combat the problem and the result of that action.

Identify the pest involved. To control an insect pest, it is important to know what pest you are dealing with. It is also important to know something about the insect's life cycle and feeding habits. Monitor and correctly identify pests as they appear. If you cannot identify the pest, seek help.

Once insects are detected, act quickly. Rogue infested plants and spot treat if only a few plants are involved. Spot treat if a small area is involved. If a larger area is involved, schedule an application of the appropriate pesticide for the crop. A sequence of two, three or more applications many be warranted. If so, do it.

Match control to the insect involved and the insect's life cycle. Many insects pass through several stages of development. The physical appearance of the insect will change with each stage of development. An insect's susceptibility to a chemical agent will also change with the stage of development. For example, the whitefly can be controlled with pesticides during three stages of development; the crawler stage (immediately following egg hatch), the early nymphal stages and the adult stage.

Guard against resistance. Constant use of a single pesticide or a single class of a chemical pesticide often results in a resistant insect population. As insects build resistance to a pesticide, they will usually become resistant to an entire class of pesticides. At this point it becomes necessary to control the pests with materials from a different chemical class, one to which they are not resistant.

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To avoid resistance, rotation or the alternating use of pesticides from several different chemical classes is recommended. There are two schools of thought on chemical rotation: (1) alternate every spray application and (2) alternate once every insect life cycle. If one chemical is applied for one complete insect life cycle only the offspring of resistant individuals should survive. The class of pesticide is then switched to one which most of the insects should not be resistant. In this manner the insect population can be controlled.

Mites represent a special case. Mite populations are usually very heterogenous, that is, there will be some individuals in the population that will be resistant to any particular chemical. The strategy with mites is to use one chemical until only resistant insects remain and the population begins to increase again. At that point switch chemical agents until resistance is again detected in the population.

Commonly used greenhouse pesticides and the chemical classification of these compounds are listed in the following table.

Pesticide Name	Chemical Class
Orthene	Organophosphate
Talstar	Pyrethroid
Dursban	Organophosphate
Tempo	Pyrethroid
Knox Out	Organophosphate
Sumithrin	Pyrethroid
Vapona	Organophosphate
Pounce	Pyrethroid
Mavrik	Pyrethroid
Dibrom	Organophosphate
Oxamyl	Carbamate
Sulfotepp (Dithio,Dithione)	Organophosphate
Avid	Botanical
Malathion	Organophosphate
Dycarb	Carbamate
Kelthane	Chlorinated Hydrocarbon
Pentac	Chlorinated Hydrocarbon
Vendex	OrganoTin
Thiodan	Chlorinated Hydrocarbon

Good coverage is important. When insect populations reach epidemic proportions or the pest is hard to control because they tend to hide (i.e. thrips), high volume sprays are desirable, since they produce a heavier, more persistent pesticide residue on the plant surface. Under these circumstances combining two or more pesticides in a tank mix may be needed to gain the upper hand on the problem.

Air movement, both inside and outside the greenhouse, has an effect on pesticide application. For example, it is recommended that applicators not use smoke formulations when it is windy outside as the effectiveness of the application will be diminished. However, plant canopy penetration and coverage with fog applications may increase with the use of horizontal air movement in the house.

Try new materials. Recent additions to the pesticide arsenal may be effective tools in your program. Here are some to consider. ***Tame*** is a cyano-pyrethroid recently put on the market. ***Enstar*** is a hormone, an old material just recently reintroduced. Growers have reported good success with Enstar controlling both whitefly and aphid. ***Horticultural oils*** have been effective on a broad range of insects. These materials are extremely refined to limit plant damage. The oils work by smothering the insects. Some toxicity to the insects also occurs. ***Piperonyl butoxide*** (PBO) is a synergistic agent which lowers insect resistance to certain classes of pesticides. Alone PBO has no toxic effect on insect pests. However, when PBO is combined with pesticides such as Avid, Pentac, Talstar, or some other pyrethroids, the effectiveness of the pesticide is increased over and above its normal toxicity range.

Finally, ***biologicals*** such as predatory insects, mites, nematodes and disease organisms may represent sensible alternatives to pesticides for growers under certain circumstances. Many growers already use biological agents such as *Bacillus thuringiensis* (BT) in formulations such as Gnatrol or Vectobac for fungus gnat control.

Be aware of the potential for phytotoxicity. In general, it is best to apply pesticides either early or late in the day when light levels are low. High light levels usually result in high temperatures which can reduce the effectiveness of some pesticides and also increase the likelihood of plant damage.

A wilted plant will be more susceptible to pesticide damage than a turgid plant. This same rule applies to other forms of plant stress. As the plant stress level increases, the likelihood of phytotoxicity increases and the plant's resistance to insects and diseases decreases. Before applying a pesticide, make sure the plants have been well watered and are in a turgid state.

Plants in flower are more sensitive to phytotoxic effects than those not in flower. Once in flower, aerosol and smoke formulations may represent the only safe recourse for the applicator.

Prevention helps. Mow the grass and weeds around the greenhouse to reduce insect populations and to prevent their movement into the greenhouse. Thrips multiply rapidly on grass flowers. If the grass outside the house is allowed to flower, thrips populations will become epidemic and the insects will be carried into the house on the ventilation air stream.

Growers who follow these recommendations will achieve better pest control during hot weather.