From Forest Nursery Notes, Winter 2009

151. Keep pests out of your greenhouse. Robb, K. Greenhouse Management and Production 28(9):32-34, 36, 38, 40. 2008.

By Karen Robb

Insect-exclusion techniques can reduce pest damage and lower control costs.

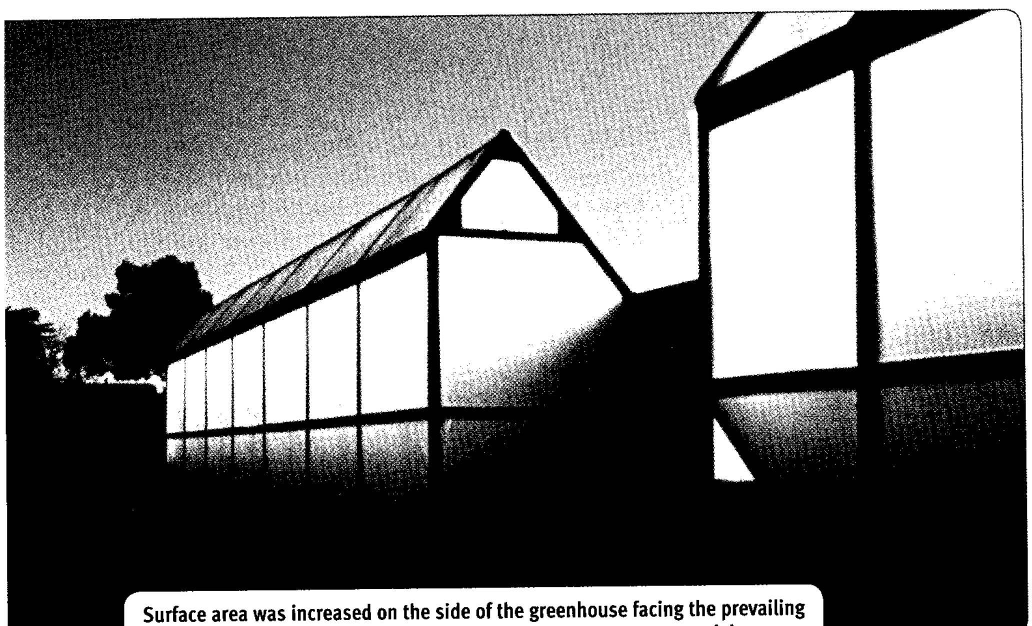
Keep pests out of your greenhouse

THE MOST EFFECTIVE strategy for insect control is prevention. One integrated pest management strategy particularly suited to greenhouses is the use of physical barriers to exclude insect pests.

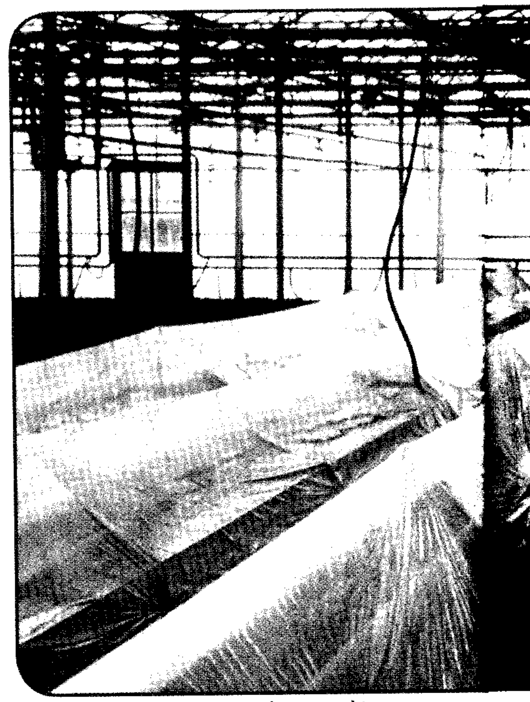
Many greenhouse structures have open sides or vents to increase ventilation. They don't offer any impediment to the movement of insects into these greenhouses. Screening vents and doorways can greatly decrease insect movement into greenhouses, reducing or eliminating the need for insecticides.

Certain situations make screening greenhouses especially attractive. For instance, certain adult thrips can transmit tospoviruses to sensitive crops within 30 minutes of feeding. There is no cure for tospoviruses. The control recommendation is to rogue infected plants and to control thrips. There are no pesticides available that give continual protection from one pesticide application to the next. Thus, exclusion is a more effective virus control strategy than chemical control for thrips. A similar case can be made for other insect-transmitted diseases.

Insect exclusion is not simply a matter of placing screen over greenhouse openings. There are several things to consider when incorporating screening into an IPM program.



Surface area was increased on the side of the greenhouse facing the prevailing wind to compensate for reduced airflow across screen material.



Row covers are sometimes used to protect propagation material, highly valuable or susceptible crops.

How much exclusion is required? Will partial exclusion be adequate or is complete exclusion the goal? What cooling system is used? What are the target pests? What are the host crops? Is disease transmission a factor? How are pests being introduced to the crops?

Selective screening

For certain operations, partial exclusion provides adequate insect suppression. Some growers have successfully screened only the side of the greenhouse facing the prevailing wind. Other growers have found that only screening very sensitive or highly valuable crops, using row covers, for example, is justified.

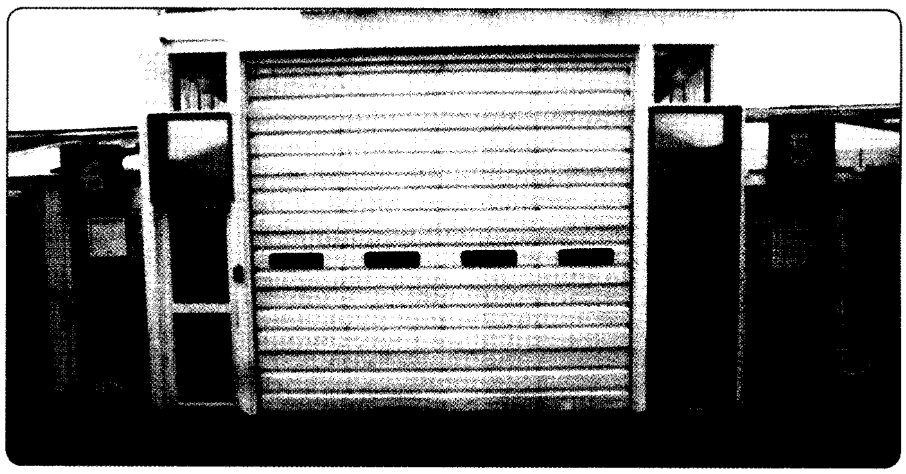
The size of screen mesh used for exclusion screening depends on the individual grower's target pest species and ability to compensate for reduced airflow.

Start with clean plants

One of the most important factors in managing insect populations is to start with clean plant material. This

28(9): 32-34, 36, 38, 40.

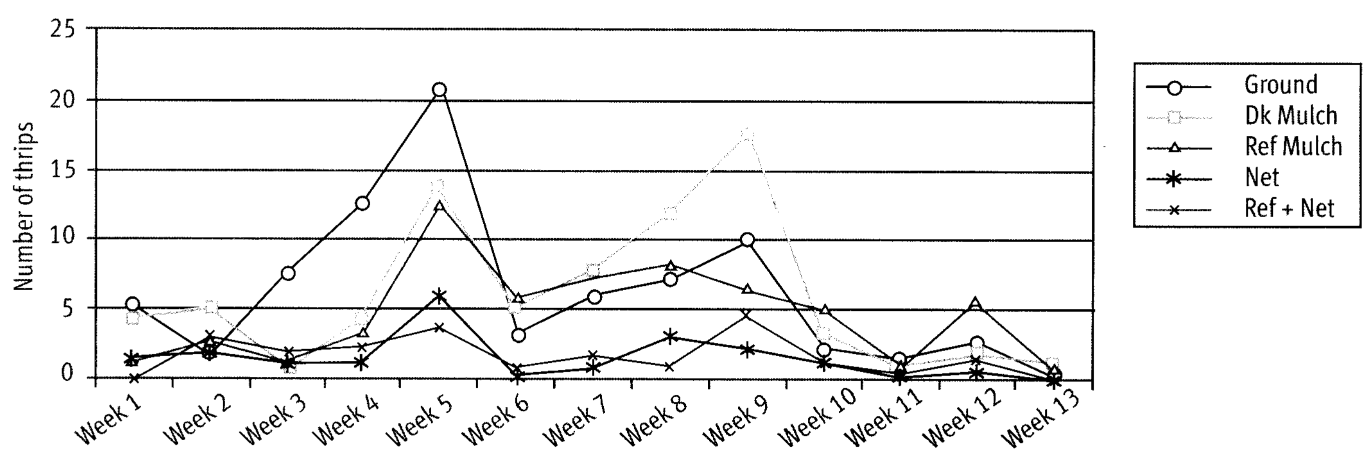
The sidewalls of this greenhouse were replaced with screen. Plastic can be rolled over the sides during cold weather.



A screened double-door entry between two greenhouses permits vehicles access to the greenhouse.

is virtually impossible, however, if insects move from production areas to stock and rooting areas. Every grower can't adapt to the stringent requirements for effective screening of entire greenhouses, so many growers isolate these crucial propagation areas with physical barriers. Producers of tospovirus-sensitive

Table 1



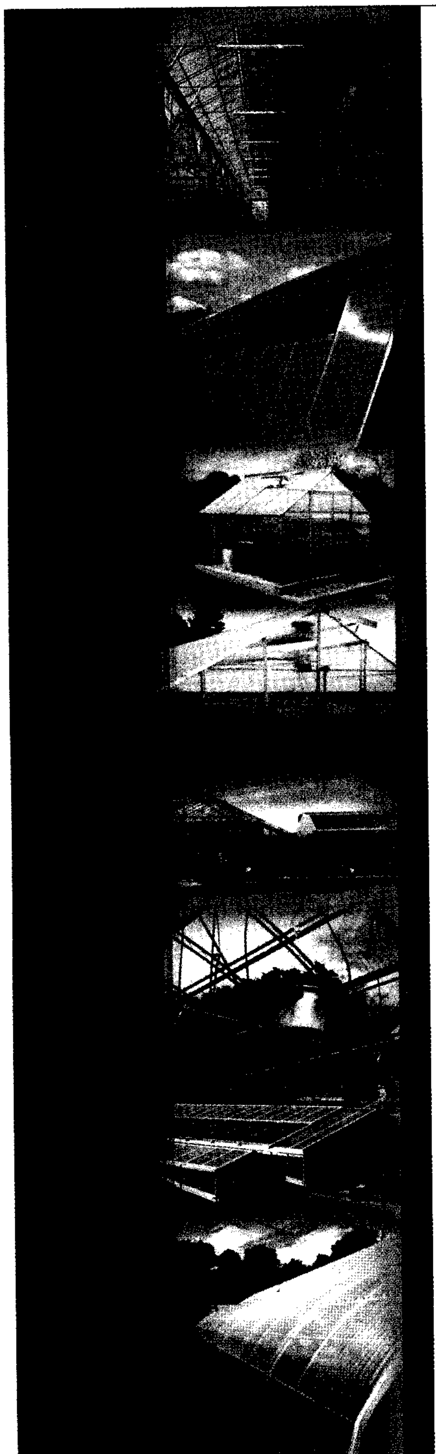
Mean number of adult thrips caught on a 1-inch vertical strip on a yellow sticky trap.

crops or propagation material find that complete exclusion is required.

Type of cooling system matters

The type of cooling system impacts what modifications will be required to exclude insects. With positive-pressure cooling systems, air is cooled outside the greenhouse and then blown in at high speeds. These systems provide more even cooling than other systems and help in the exclusion of insects. The high cost of positive-pressure cooling systems is a drawback for some growers.

In greenhouses with negative-



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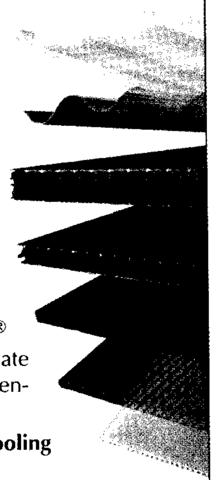

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Exclusion in outdoor production

Trials in Southern California have been conducted at cooperating nurseries with reflective mulches and reflective crop covers. These trials were conducted in replicated block designs on several crops, including container roses, chrysanthemums, lisianthus and solidago.

In the mum trial, treatments consisted of a reflective groundcover, reflective plant cover, a combination of the reflective ground mulch with the reflective plant cover, non-reflective ground mulch and control of uncovered ground. The treatments were replicated three times. Light levels were measured regularly at canopy height, as well as air and soil temperatures. Sticky traps were counted weekly.

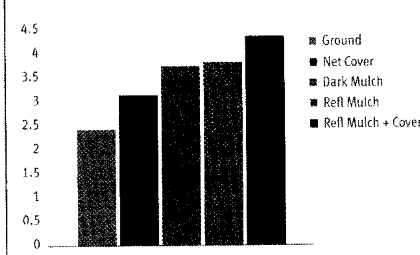
Monthly measurements of light, air and soil temperature and plant quality (on a 1-5 scale) were also recorded for each plot. At the end of the trial, 10 plants were randomly selected from each plot and evaluated for quality, number of flowers, caliper of terminal flowers, plant height, fresh weight and dry weight.

Treatment differences

There was no significant difference between treatments in the numbers of leaf miners captured on sticky cards. In thrips catches, however, there were significant differences, with reflective mulch treatments having significantly fewer thrips than the ground treatment, and the two treatments with the plant cover had significantly fewer thrips captured than the reflective mulch treatment (See Table 1 on Page 33).

No significant differences between treatments were observed in fresh weight, dry weight, number of flowers or flower caliper. Significant differences were observed in plant height with all mulch and/or cover treatments superior to the bare ground treatment. Significant differences were also observed in the plant quality index analysis (See Table 2).

Table 2



Plant quality index, based on a 1-5 scale.

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Having workers wear disposable suits further reduces risk that insects will hitch a ride into a screened greenhouse.

pressure cooling systems, air is pulled through a wet pad, through the greenhouse and then out through exhaust fans. Passively cooled greenhouses rely on vents and side openings for cooling.

Airflow reduction

The use of exclusion screening results in a concomitant reduction in airflow. Smaller screen openings result in greater airflow reductions. This can be compensated for by increasing the surface area through which air flows. For example, instead of screening ceiling vents, screening can be stretched from gutter to gutter, greatly increasing the surface area.

An exterior frame can also be built and covered with screening to increase surface area. Some growers use a bafflelike frame, similar to a car's air filter. Other growers have opted to replace greenhouse sidewalls with screening, adding roll-down plastic curtains for use in cold weather.

At least one grower has connected two separate greenhouses with a screened frame and removed the sidewalls between the greenhouses. This not only allows work crews to drive between greenhouses as the crop is harvested, but also increases airflow.

Screen maintenance

Screening can't be installed and then forgotten. It is critical to

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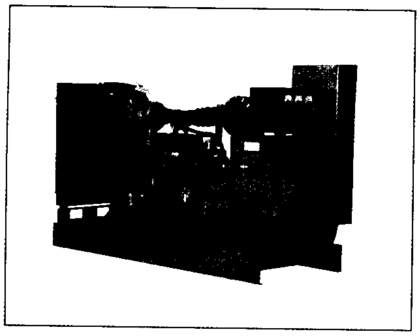

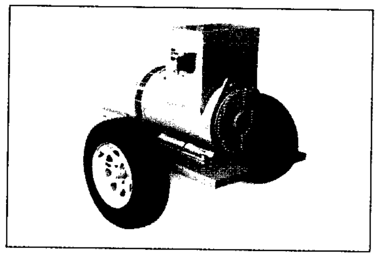

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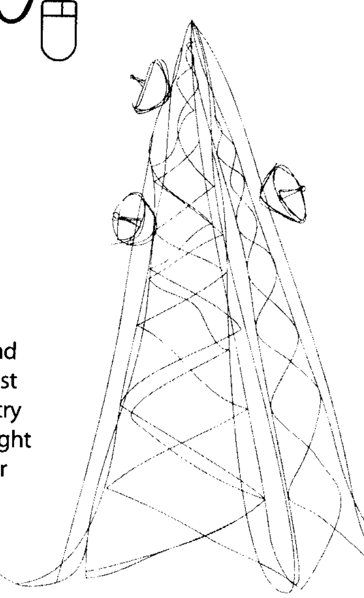

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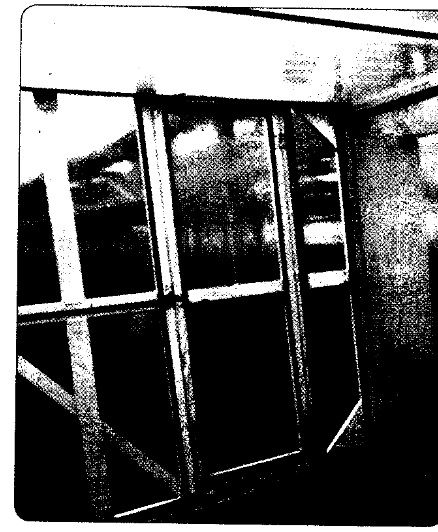
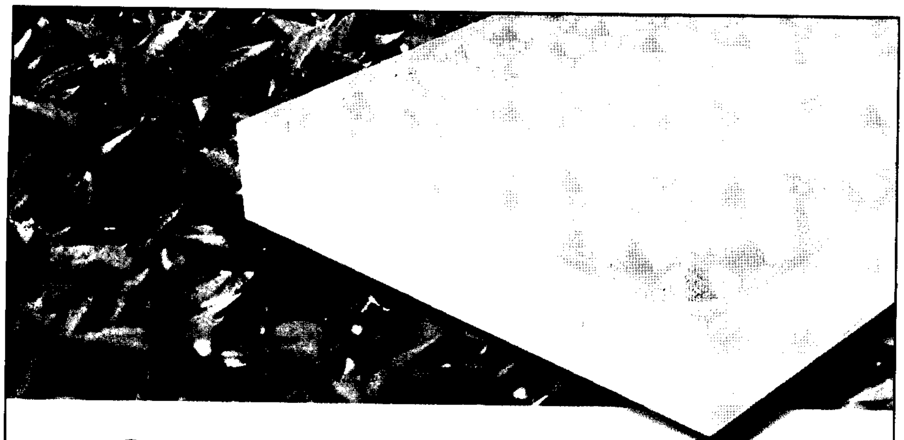


A double-door entry greatly reduces insect entry into screened greenhouses.

In greenhouses with a screened double-door entry, workers can prop the doors open to load crops onto trucks without allowing insects into greenhouses.

maintain the calculated airflow for the greenhouse to maintain proper cooling. The cooling system will experience a drop in performance if the calculated airflow (cubic feet per minute) is not maintained, resulting in increased greenhouse temperatures, increased electrical use and reduced motor life.

Use a manometer to monitor the static pressure of the greenhouse. Plan to clean screens regularly, but don't clean the screen material while fans are running. Don't forget to



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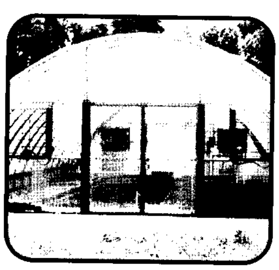
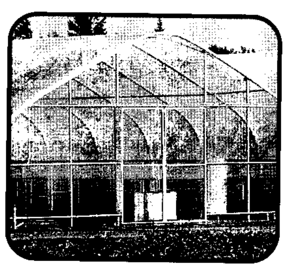
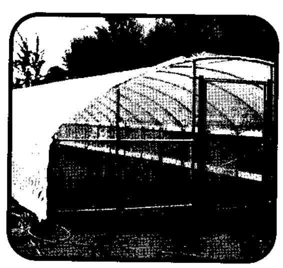


30' Quonset
3' side walls
2 3/8" Bows .095 ga
14' high @ center



30' Semi Gable
1 7/8" Bows .095 ga
4' side walls
13' high @ center



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4' side walls 1 7/8"
8 1/2' high @ center

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Other growers have reported dramatic reductions in insecticide use after screening greenhouses.

maintain fan blades and motors.

Good sanitation and maintenance practices should be closely followed. Any holes in screens should be identified and repaired in a timely fashion.

Limited access to screened areas is suggested, since insects are small, easily overlooked and may hitch a ride on clothing or wind when doors are opened. Some growers have circumvented this situation by building a screened foyer around the door to create a double-door entry and by requiring everyone to don a disposable suit before entering the greenhouse.

Monitoring pest populations

As in all IPM programs, monitoring is critical. Use yellow sticky traps to monitor insect pest populations on a weekly basis. Monitoring provides a rapid assessment of the efficacy of this pest-management strategy, allowing time for remedial action, if necessary.

Physical barriers have been used to successfully eliminate thrips from stock plant production greenhouses under stringent maintenance conditions for years. Other growers have reported dramatic reductions in insecticide use after screening greenhouses. Although exclusion of insects from greenhouses may not be viable for all ornamental growers, it is a powerful tool to be considered for inclusion in greenhouse IPM programs.

Karen Robb is former county director/farm adviser, University of California Cooperative Extension, dosbugdocs@yahoo.com.