



GROWER 101

Structure Basics, Part II:

Using Insect Screening

With the latest whitefly infestation fresh in your mind, now might be the perfect time to add another layer of protection to your greenhouse — insect screening. This, the second in our three-part series with the NGMA, will start you in the right direction.

By National Greenhouse Manufacturer's Association



Photo courtesy of Ludvig Svensson, Inc.

What are the advantages of insect screening?

Properly installed insect screening restricts the entry of insects and pests and reduces pesticide use.

What are the disadvantages of insect screening?

The disadvantages of insect screening include increasing sizing and fastening problems, decreased ventilation, reduced access to the greenhouse and added maintenance. In addition, screens can keep insects in as well as out.

What negative effects do screens have on airflow?

Screens with small holes are more effective in excluding pests but are more resistant to airflow. A screen with too much restriction of airflow can cause higher static pressure drops, inadequate air exchange, increased energy consumption by the fans, excessive wear on the fan motors and higher greenhouse temperatures.

Can airflow problems be avoided?

Yes, correctly installing screens, which have been properly chosen for

new construction or retrofitted to existing greenhouses, can exclude insects and pests while still allowing for adequate airflow.

How many screen varieties are there?

There are many different screens for reduction of almost any type of insect or pest. The challenge lies in matching the type of screen to the insect or pest you wish to control. For crops that suffer from pests during a limited part of the growing season, lighter-duty, less expensive screens will work. For handling multiple pests at different points in the growing season (e.g., aphids in spring, thrips in summer and whiteflies in fall) select a more restrictive screen.

Lighter screens can also be used for short-term, interior zones and for periodic use when pests appear in larger numbers. Heavier, more rigid screens can provide protection against sun, wind, rain, hail, snow and wear and tear from equipment and workers brushing against it.

What about thrips; are they too small for screening?

Even though thrips are small enough to fit through most screens with good airflow, it has been shown in many cases that they can be dramatically reduced with the white screens designed for whiteflies. It is theorized that these screens are effective due to the color of the screens and the thrips' inability to recognize the material as something to feed on.

What is the basic range of insect sizes?

Insects range in size from 215 micrometers (western flower thrips), which is barely visible to the naked eye, to 608 micrometers (serpentine leaf miner), which is easily diverted by screens.

What are insect screens made of and how do they hold up?

The most common screen, most often seen in homes, is made of stainless steel and brass. While being the longest-lasting, it is the most expensive.

There are two types of polyethylene screens. One is monofilament, woven with solid strands similar in appearance to fishing line, which is very rigid and strong. The other type is made of film that is punched full

of “micro holes” and used as a crude, but low-priced, insect barrier. Drawbacks include weak construction and low UV protection as well as very restricted airflow.

A third type is polyethylene/acrylic. This material is made of many fibers, “multi-filament,” which causes resistance to smooth yarns sliding together and thereby maintains the integrity of the holes.

A fourth type is nylon. This type is good for shorter-term, low-cost and light-duty applications; it is more restrictive to air flow.

Does the manner in which it is constructed affect the screen?

There are three manners in which screens are constructed. Weave, the most common, provides a trade-off between hole size and airflow. Be sure to always check the tightness of the weave and apply lateral tension to see if the hole distorts. Knit means that each thread is tied around the next, creating a durable network resistant to tearing and raveling. Extra loops and knots may cause greater air restriction. Film can be punched full of micro holes creating an insect barrier that is very restrictive to airflow and must be applied with the correct side out.

What is considered adequate ventilation?

Willits (1993) recommends an air exchange of 11-17 cubic feet per minute per square foot. These low rates are based on a study conducted using no alternate cooling devices, e.g., cooling pads, shade cloth, white wash, etc.

How can I maintain adequate ventilation while retrofitting?

The first step in retrofitting with insect screen is to check the current ventilation system. Measure the difference in static pressure in the structure with all the fans off and then with all the fans running. Use that pressure drop when consulting the manufacturer’s specification chart to estimate the total amount of air moving through the greenhouse. Interpolate between 0.0-inch, 0.05-inch and 0.01-inch volumes given for the various fans and motors. (For example, a 0.025-inch pressure drop is halfway between the 0-inch and the 0.05-inch. Thus, the volume of air moved would be halfway between the volumes given for 0 and 0.05.) Then add up all the volumes of the fans together. Divide this total by the number of square feet of the greenhouse; the quotient should equal an air exchange of 11-17 cubic feet per minute per square foot. Certainly if the volume of air exchanged is below 8 cubic feet per minute, the structure is likely to overheat during hot, bright weather. If the total volume of air exchange is well above 17 cubic feet per

square foot, the selection of screening fabric may be limited and transpiration and evaporation will be excessive.

What if my greenhouse is naturally ventilated?

In a naturally ventilated greenhouse, the speed of the air is neither as rapid nor as constant as that of greenhouses ventilated with fans. Therefore, there is no formula for determining how the greenhouse will function when screened. Naturally ventilated greenhouses can be successfully screened if the following guidelines are considered.

When does the crop suffer from insect damage? Is it at a time when heat loads are critically high for the crop? You may consider not screening all vents, monitoring temperatures closely and removing the screen when the pest threat is past and the weather grows warmer.

If the greenhouse is already at its upper limit for temperature, you have three options. One, increase the open area of your vents and replace solid poly walls with walls made of insect screen and covered by roll-up poly film.

What is considered adequate ventilation?

If you are unsure of heat gain, experiment with one section at a time until you are comfortable with the application. Second, you could screen only the side that faces the wind, since most insects are carried by wind; this method has been shown to reduce insect populations. Three, consider the color of shade cloth used to shade the greenhouse. Black shade cloths, although they have a long UV life, tend to create excessive heat transfer, radiating heat into the house. By using an aluminized shade cloth, you can negate the additional heat gain associated with the insect screen.

Are there specific things I need to do in to maintain insect screens?

Yes, the screens need to be cleaned or dirt and dust will alter the static pressure in the greenhouse. Although you should check with the manufacturer for proper cleaning guidelines, the following suggestions may be used for most screens. Clean the screens from the inside out with a hose and nozzle pressure. Never use high-pressure cleaners or brushes as they will alter the holes’ size and make the screening useless. Screening should not be cleaned during ventilation, as the water can fill the openings and completely stop airflow. The best time to clean is in the evening when ventilation is usually over.

How do I attach insect screens to my greenhouse?

There are three options when fastening your screen: poly fastener, spring lock or lath. Remember that keeping the screen snug and avoiding abrasion are your main goals when attaching the screen. Contact your NGMA greenhouse manufacturer for recommendations, as they may have ready-made solutions available.


What kind of results should I expect when screening my greenhouse?

Average grower: The average grower, one that grows and sells to market or end users, usually wants good control of insects and will be content with a 70-90-percent decrease in pests. These results can be achieved by screening the air inlet only.

Primary propagator and research facilities: Propagators have a high demand from their customers to provide insect-free plants, and research greenhouses need full control of the

environment. In these two instances, the following things need to be screened: the air inlets, vents and fans. In addition to screening, the doors need to be air-locked and all leaks or gaps in the house need to be sealed.

How advanced are screening applications?

The need for insect screens will continue to increase due to reduced availability of insecticides and the demand for high-quality, insect-free plants. With this increase, we will see more applications for insect screens. As the NGMA members would like to encourage their successful use, they have written a considerations document specific to insect screens. Contact the NGMA office for a free copy or download it off the web at www.ngma.com 

For additional information on insect screening, greenhouse structures or equipment, call the National Greenhouse Manufacturer’s Association at (800) 7892-6462.



LearnMore!

For more information related to this article, go to www.onhort.com/gp010202