Above: Portable evaporative coolers are easy to install; Inset: Dust, weed seeds and algae reduce the effectiveness of evaporative cooling systems. (Photos courtesy of John Bartok)

Grower 101:

Using Evaporative Cooling, Part II

Find out more about how to keep your greenhouse ventilated and cool in the heat of summer.

By John W. Bartok, Jr.

The heat of the summer is right around the corner, and that means more energy is being used to keep your greenhouse cool. As you learned in Part I in the March issue of *GPN*, fan and pad systems are great for cooling, but there are more options: swamp coolers, mist and fog systems, and fan-generated fog units.

SWAMP COOLERS

Typically known as "swamp coolers," self-contained evaporative cooling units are mounted on a concrete pad adjacent to the greenhouse. A unit consists of a metal enclosure that contains a blower or fan and either cellulose pads and a water pump or a polyester belt that rotates in a pan of water. The dry outside air drawn in through the pads or belt picks up moisture before it enters the greenhouse. After the cool air is heated inside the greenhouse, it is exhausted through the louvers or vents, taking the heat with it. These units work well in naturally vented greenhouses.

Portable swamp coolers are also available. They are usually placed inside the door of a greenhouse on the end opposite where the fans are located. Air that enters through the door is conditioned and picks up heat as it travels toward the fans. A hose connection and electric supply are needed. One unit will cool up to 1,200 sq.ft. Measurements taken last summer in a Connecticut greenhouse showed that air temperature in a shaded greenhouse with swamp coolers was several degrees below outside ambient.

MIST AND FOG SYSTEMS

Research has shown that fine mist or fog is more effective than cooling pads or swamp coolers. Most mist and fog systems utilize high-pressure nozzles to form fine water droplets. Mist contains droplets in the 50- to 100-micron size (thickness of a human hair = 0.004 inches = 100 microns). Fog contains droplets of 0.05-50 microns. The smaller the droplet size, the quicker it absorbs heat and changes to the vapor state. Larger droplets take longer to change and can end up wetting the surface they fall on. Therefore fog is more desirable for evaporative cooling whereas mist is usually better for plant propagation.

A high-pressure pump is necessary to develop the force needed to form mist or fog. Depending on the nozzle style, it takes 60-500 psi to form mist droplets and 500-1,200 psi to form fog. High-pressure piping is also necessary. Particular care has to be given to filtration to prevent nozzle clogging. Because so little water is needed, (typical nozzle output is 0.5–1.0 gal. per hour) some growers use demineralized, bottle water or rain water. Anti-drip nozzles are also installed to prevent draining the system after the water is shut off.

Most fan systems are set up with many of the nozzles over the intake louvers and vents, with a small percentage distributed throughout the crop area. Building shelters over the intake end of the greenhouse and

Fog cooling is more effective than a pad and fan system, as the micro droplets evaporate faster and are more dispersed throughout the greenhouse.

mounted nozzles within this will restrict any dripping to outside the greenhouse. In natural ventilation systems, the nozzles are uniformly distributed throughout the greenhouse.

FAN-GENERATED FOG UNITS

An alternative system utilizes a fan with a special hub and blade assembly. Water is fed into the hub and channeled to the four blades. As the water exits the end of the blade, it encounters a shearing speed and atomizes into fine fog droplets. The fan distributes the fog in the greenhouse. Sizes are available that will cool up to several thousand square feet of growing area.

With all systems, adding excessive moisture to the greenhouse can increase the incidence of disease.

Usually, evaporative cooling is the last stage of cooling in the greenhouse. If the fan system or natural ventilation cannot satisfy the environmental needs, the evaporative cooling system activates. Control can be from a thermostat, controller or computer. If you need to keep the temperature down for crop production this summer, try evaporative cooling. GPN

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