



By Erik Runkle



Fanning Uniformity in the Greenhouse

Horizontal airflow fans, which help create a more uniform greenhouse environment, can be a boon if used properly.

Horizontal airflow (HAF) fans, also called mixing fans or circulation fans, are used to mix the air mass inside greenhouses to provide a more uniform environment. There are many benefits to using HAF fans, but they're often misused or poorly maintained. This article reviews the benefits of using HAF fans and provides brief guidelines for how best to use them.

Temperature and Gas Uniformity

Horizontal temperature variations can be observed in greenhouses in colder climates when crop flowering is delayed near outside edge walls. Vertical temperature gradients also exist but aren't as readily apparent. Recently, my graduate student Matthew Blanchard and research technician Mike Olrich quantified the vertical temperature variability in our research greenhouses, ranging from floor height to 9 feet above the floor, where baskets might be hung. Measurements were made with HAF fans off and on. With the HAF fans turned off, the average air temperature at night near the floor was 1.2° F cooler than the temperature at bench height, and 3.3° F cooler than 9 feet above the floor. When the HAF fans were operating during the night, the air temperature near the floor was similar to bench height and only 1.9° F cooler than overhead. HAF fans had less of an impact during the day.

As a result, problems with pathogens are less likely with proper air mixing. Therefore, proper installation and use of HAF fans can create a more uniform environment, can slightly raise the temperature where plants are growing and can help prevent pathogen outbreaks.

HAF Fan Guidelines

- To conserve energy, use fans that have highly efficient (low horsepower) motors and are made specifically to achieve HAF.
- Operate fans continuously during crop production but, when possible, have them automatically turn off during venting. Operation at night is especially important.
- Check fans weekly to ensure that all are operational.
- Mount fans on a solid post; fans hanging on two chains often move horizontally, which can prevent uniform air movement.
- Position fans:
 - between 4 feet above the crop and the gutter, below retractable shade curtains and all at the same height.
 - so they blow straight and parallel to the ground, not pointing downward or upward.
 - above or below hanging baskets so that air flow is not impeded.
- Routinely clean blades and guards to improve efficiency.
- HAF fans should be turned off in propagation houses, where calm air is desirable.

Fans that are not maintained or positioned correctly do not serve their purpose and can actually produce a less uniform environment compared to no HAF fans at all. For example, fans pointed downward toward the crop can cause plants to become dry at variable rates, which can make water management difficult.

For more information about installing HAF fans, read John Bartok's September 2005 article in *GPN* magazine, available online at www.gpnmag.com/Grower-101-Horizontal-Air-Flow-article6329. 

Erik Runkle is associate professor and floriculture extension specialist in the Department of Horticulture at Michigan State University. He can be reached at runkleer@msu.edu or (517) 355-5191, ext. 1350.

HAF fans mix warm air (above) with cooler air (below) to create a more uniform temperature environment.

HAF fans mix warm air (above) with cooler air (below) to create a more uniform temperature environment. Fans also mix water vapor and carbon dioxide to prevent localized conditions. The air movement also causes plants — particularly foliage — to dry more quickly than in a still environment. Fans can also prevent condensation of water on plants, which can occur when plant temperature reaches the dew point on a cold night.