

KEEP HORIZONTAL AIR FLOW RUNNING¹

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Horizontal air flow (HAF) improves growing conditions in greenhouses in many ways. The expense of running the fans is small but it is still an expense. When can the fans be turned off?

The simplest greenhouse climate control system consists of 1) a heating phase, 2) a static phase and 3) a cooling phase (more sophisticated systems are described in CT GNL #87, 7/78). HAF is important at all times in phase 1 to increase heating efficiency and uniformity. It is never used in phase 3 during cooling since it operates counter to either ventilator or fan ventilation.

During phase 2, when neither heat nor ventilation is required, HAF is generally desirable. It is in this phase that diseases often become serious if the humidity is high and the air stagnant. Let us consider this for a moment.

Picture a Connecticut greenhouse in October when the day has been drizzly and the temperature is 60°F outside. The dew point is 60°. As night falls, the greenhouse temperature slowly falls to 60°. Conditions are ideal for the growth of disease organisms such as mildew or Botrytis. Leaves and petals are surrounded by a "halo" of moisture laden air. This is the result of the water in their tissues (closed stomata may have a narrow slit that never closes) and from the radiation that they produce. Glass or plastic roofs do not radiate as much heat to plants as the plants radiate. The plants may be a fraction of a degree cooler. They are moist enough for disease to develop.

But what happens when HAF is operating? At a design air speed of 60 ft./min., the plants are "scrubbed" of the boundary layer of moist air. At the same time the air is transferring heat to the leaf or petal surface and warming it to the air temperature. This slight change in the environment of the plant surface inhibits fungal growth. Less

spraying is required and less residue improves crop quality. HAF is essential.

Now picture the same greenhouse the next day. A front has passed through. The dew point has dropped from 60° to 40° but the air is still 60° (this almost never happens). Is HAF necessary? NO!

Whenever the dew point is more than ten degrees below the greenhouse night temperature, HAF is not essential in phase 2, the static phase. It might be argued that the dew point should be 15 or 20° below the greenhouse temperature before HAF is turned off. No research has been conducted to determine this.

How does one turn the HAF off under the above conditions? The simplest way is to listen to the weather forecast and pull the plug or throw the switch in the evening. A more sophisticated system would place a humidistat in series with the HAF circuit.

But this does not take into account nights when heat is required. When heating, HAF increases efficiency. This poses a problem in circuitry. HAF should be turned back on and remain on for a while after the heat is turned off. An automatic reset timer can be installed in parallel with the humidistat. A third signal is necessary to turn HAF on during the day to increase CO² utilization.

HAF costs about ½¢/ft²/month if running continuously. For instance, power for a 3000 ft² house will cost about \$120 per year (8 months). If the fans can be turned off 10% of the time, the saving is \$12 per year. The controls necessary will cost \$75-100 plus installation. At 12% interest on \$100, the interest only balances the power saved. The investment will never be recovered.

In New England, electrical power saved by turning off HAF cannot be justified as a good investment. Allow HAF to operate at all times when not venting.

¹Connecticut Greenhouse Newsletter #102, Nov. 1980.