SUMMER COOLING OF GREENHOUSES

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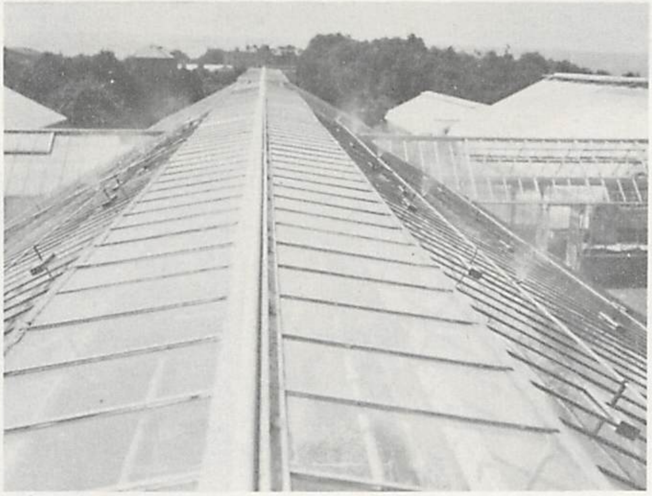
During the past two summers, studies have been made in the Cornell Experimental Greenhouses to determine means of controlling excessive temperatures encountered in the greenhouse during the summer.

SHADING

Early in the summer of 1946 shading compound was applied to the roof of one of the experimental greenhouses. The rate of application was sufficient to reduce the total light intensity in the house by 50 per cent. During July of that year records were kept of the maximum daily temperatures attained in this house as compared to an adjacent house with no shading. The average of these maximum daily temperatures showed a reduction of 6.4° during the hottest part of the day by shading.

In a greenhouse with no shade, a plot of geraniums was covered with a window sash to which shading had been applied to reduce the light intensity by 50 per cent. Leaf temperatures of these plants were compared to leaf temperatures of adjacent plants not shaded. The average leaf temperature of the shaded plants was 9.5 degrees below the plants not shaded when the air temperature was the same in both cases.

Shade paint is undesirable because the shade further reduces the light intensity on cloudy days when light intensity is below that required for optimum growth.



WATER SPRAY ON THE GREENHOUSE ROOF

WATER ON THE ROOF

To avoid this light reduction a fine spray of water was applied to the roof of one greenhouse and inside another house water was atomized into the air.

A special nozzle was used for the roof spray which required low water pressure. It throws the water upward in a fine cone-shaped spray. Several such nozzles were spaced over the roof to obtain complete coverage.

The air temperature in the greenhouse was recorded. The roof spray produced a mean temperature 4.7° lower than no roof spray. The maximum temperature difference during the hottest part of the day averaged 6.4 degrees. The greatest temperature difference noted at any time was 10 degrees.

The roof spray reduced the light intensity by only 10%. The comparison showed a mean air temperature in the house with the roof spray 1.75 degrees lower than that in a house shaded to reduce light 35 per cent.

No attempt was made to catch the water running off the roof of the sprayed house, but the quantity of water supplied was determined by a water meter in the main line. An average of approximately 500 gallons per hour was supplied when the system was operated. Calculations showed that approximately 3 per cent of this water was actually lost by evaporation, yet evaporation accounted for nearly 80 per cent of the cooling. This run-off water could easily be collected at the eaves, and pumped back over the roof.

ATOMIZED WATER IN THE HOUSE

The atomizing nozzles inside the house required compressed air. Several nozzles were located in one greenhouse so as to atomize water directly into the stream of air coming in the side ventilators. Water was evaporated at the rate of 45 pounds per hour in a house 75 x 36 feet. Results with the atomized water inside the greenhouse showed that this method gave no significant reduction in temperature when the greenhouse was run with all the ventilators open. The air change by natural ventilation was so rapid that it overshadowed any possible benefit derived from the atomization of the water. Slowing the rate of air movement by closing the side vents increased the effectiveness of the method in reducing temperature but not sufficiently to compensate for the lack of ventilation.

SUMMARY

Of the three methods studied the water spray on the roof showed the greatest temperature reduction. A further advantage of this system is that it can be controlled and regulated to meet changing outdoor weather conditions. It also has little effect on light intensity within the house.

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Your editor,

Kenneth Post