Bedside Heating Modification

By

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Previous research at Cornell has shown the merits of overhead heating for that portion of the pipe in the center of the house. (Gray, 1948.) At present, many greenhouses have the center piping along the side of the bed and conversion to overhead is not feasible in all cases at the present time. A study was made of soil temperatures and methods of modifying it when coils were beside the beds.

Coils along the side of the beds do not stop cold spots in the house because they do not give a protective layer of warm air above the plants. Bedside coils can give excessive warming of the soil near the coil and some studies have shown that better production of roses is obtained with soil temperatures below 70°F. (Kohl, 1948.)

Bedside Coils Heat the Soil

Regardless of placement of heating pipe the soil temperature is constantly changing. In a bed with no heat from pipes beside it, the soil temperature follows the air temperature but does not rise or fall the same amount. In a rose house kept at 70°F in the day and 60°F at night, the soil temperature might drop to as low as 61°F early in the morning just before the air temperature is raised to 70°F. The average minimum temperature was 63°F. During the day the soil temperature will rise dependent upon the air temperature and the amount of sunlight. About 4 o'clock in the afternoon the maximum will be reached and the soil temperature might be as high as 68°F. With a heating coil along the bed this daily fluctuation is changed for it is not often the heat is on in the center of the house during the daylight hours. A heating coil along the side of the bed not only changes the daily soil temperature cycle but imposes a temperature gradient across the bed, the soil is warmest near the pipe. With these ideas in mind a summary of modifications made and temperatures encountered is given. These tests were run on a bed having two coils, one to each side of the bed; on a bed with just one coil; and the check plot with no coils. This work was done at Cornell University in the rose house of the Floriculture range during the winter heating season when the need of heat was greatest.

Coils in Contact with the Bed

If the heating pipe were lying in contact with the concrete sidewall, the temperature of the soil was increased 14 to 17 degrees above the check bed having no side piping. This high temperature occurred only near the pipes. In the center of the two-coiled bed the temperature was only about 8 degrees higher than the check plot average temperature at that time. In the one-coiled bed, the temperature of the soil fartherest from the pipe averaged only 3 degrees above the check plot average. This is shown in the accompanying diagram.

Modifications Reduce Soil Heat

These high soil temperatures and large temperature gradients made modification advisable. Reduction in soil temperature was obtained when the pipe hangars held the pipe 3/4" to 1" from the side of the cement sidewall. In commercial practice some pipes are so arranged. This placement gave a 6 to 9 degree rise of the warmest spot over the average temperature in the unheated beds. The lowest temperatures within the heated beds was still above the beds with no coils. The difference was slight in the one-coiled bed and up to 4 degrees in the two-coiled bed.

A radiation shield was installed between the coil and the wall. Aluminum foil 6" wide was used. Sheet aluminum would have been longer lasting but was not available at the time. This shield reflects the heat from the coil and does not let it transfer to the bench. The coils were 3/4" to 1" away from the sidewall and the shield was placed in this gap. Under these conditions the warmest part of the two-coil bed averaged only 67 degrees when the check plot averaged 63°F. The one-coiled bed's highest temperature usually ran around 66°F and graded off to essentially check plot temperature. All these temperatures are shown in the diagram and the table.

Summary

It is believed that growers should seriously consider modification of those bedside coils where soil temperature is excessive. Certainly move the coil away from the side of the bed 3/4" and more, if possible. Place a shield between the wall and the coil if soil temperature is still too high.

References

(1) Gray, Harold E. A Study of the Problems of Heating, Ventilating, and Air Conditioning Greenhouses. Thesis, Cornell University, 1948.

(2) Kohl, Harry C. Growth and Flower Production of Better Times Roses with Three Soil Temperatures. Thesis, University of Illinois, 1948.