Greenhouse Chambers for Small Seed Increases

J. S. McFarlane and I. O. Skoyen[1] [2]

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The sugar beet breeder must frequently make small seed increases of breeding lines and hybrid combinations. These increases can be made in field isolations, but costs are high and great care is required to avoid contamination from outside pollen. Greenhouse chambers ventilated with filtered air are widely used in Europe for producing small quantities of seed. Wood et al. (1)[3] developed a compartmented greenhouse at Longmont, Colorado, which uses the principle of negative pressure for ventilating and cooling. After a study of these facilities a group of 12 compartments were constructed at the U. S. Agricultural Research Station, Salinas, California, in 1961.

A prefabricated, aluminum-framed greenhouse without door or roof vents was used as the basic unit (Figure 1). The greenhouse measured 32 × 9 feet and was divided into 6 sections by using standard commercial partitions. Each section was subdivided into 2 equal-sized chambers by cross partitions constructed of vinyl plastic film. The planting area within the chambers measured 57 × 50 inches. All seams and joints between chambers were sealed with a caulking compound or plastic cement. Each compartment was entered through modified, commercial ventilating sash hinged at the eave line (Figure 1).

Figure 1.—Compartmented greenhouse used for production of sugar-beet seed at Salinas, California. Filtered air from fan house (top, right) is supplied to each chamber through underground ducts.

[1] Geneticist and research agronomist, Crop Research Division, Agricultural Research Service, U. S. Department of Agriculture, Salinas, California.

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[3] Number in parentheses refers to reference.

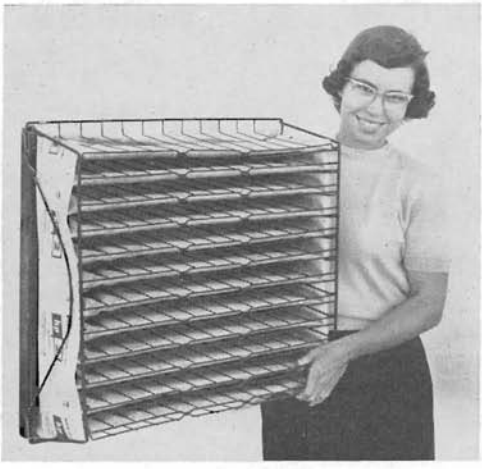

Figure 2.—Filter unit consisting of a replaceable, pleated-cotton, filter cartridge and a metal retainer.

Filtered air was provided from a fan house constructed at the head of the greenhouse. The fan was located in a pollen-tight room and air was drawn through filters fitted with a cotton medium capable of removing air contaminants below the size of sugar beet pollen (Figure 2). The filtered air was directed through an underground duct constructed of concrete pipe and parallel to the greenhouse. Junction boxes were placed at 15-foot intervals in the concrete pipe and 4-inch transite pipe was used to carry the filtered air from the junction boxes to the individual chambers. The air flow was adjusted to provide a change of air at least every 2 minutes. Air escaped through flutter valves located in the outside wall of each chamber.

Thermally induced beet roots were planted in beds formed by placing soil to a depth of 1 foot inside the chamber foundations. The plants were furrow-irrigated, and the flow of water was controlled by valves located just outside the chambers. Supplementary light was furnished from a 150-watt incandescent bulb in each chamber and controlled by a time clock. Fumigants for insect control were introduced through the air outlets.

The plants grew vigorously and flowered normally in the chambers. Because some difficulty was experienced with pollen distribution, provisions for shaking the plants during pollination would be desirable. Seed yields as high as 2¾ pounds per chamber were obtained. Very little contamination occurred from pollen introduced from the outside. This was determined by planting one chamber entirely to male-sterile plants and count-

ing the seeds formed at the end of the pollinating season. Only 17 seeds were identified as having arisen from fertilization with outside pollen.

Two crops of seed were grown in each chamber in 1961. Three seed crops per year should be possible by carefully coordinating the supply of thermally induced roots with the dates the chambers are available for planting.

Reference

(1) WOOD, R. R., D. E. CONWELL, C. WALTER IMPEY and P. B. SMITH. 1960. Development of air conditioned, compartmented greenhouse. J. Am. Soc. Sugar Beet Technol. XI (1): 44-88.