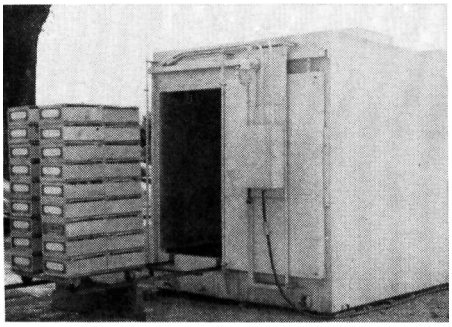
Fruit Cooling by Forced Air

portable unit designed to cool fruit in orchard at harvest reduces usually required 12-hour cooling period to 1½ hours

Rene Guillou and Ralph R. Parks



Packed fruit entering cooler. A partition, open at top and bottom, keeps ice on right side of cooler and permits forced circulation of cold air around fruit.

Refrigeration is necessary to extend the shelf-life of market fruits, and the sooner after harvest the better. Under current practice, it may take 12 to 36 hours for even the field heat to be removed from such table fruits as plums, apricots, peaches and grapes. However, orderly harvest and movement of the fruit to adequate refrigeration facilities will shorten the cooling time. Beyond the initial cooling, the shipper should supply adequate cold storage to insure the fruit being marketed in a fresh-appearing condition.

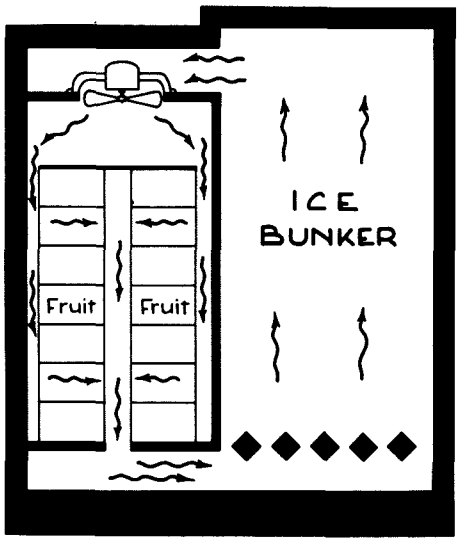
Natural movement of refrigerated air is quite slow. Even where fans are used in storage rooms to circulate the air, warm air in the boxes of fruit seems to defy replacement with cold air. Actually, the weight difference between the warm air in a box of fruit and the cold air outside is too small to create even a fair exchange rate.

Rapid Cooling

Air, at best, is a slow heat transfer medium. To make it work properly in a cold room, it must be forced through and around the fruit to be cooled. A university-designed forced-air system for orchard cooling of fruit does just that. With air being forced to flow through a box of fruit, cooling can be accomplished in 1½ hours that would ordinarily require 12 hours in the conventional cold storage room—a time ratio of 1:8.

While this principle can be demonstrated in any refrigerated room or trailer, a special unit, holding three tons of fruit and nine tons of ice, was constructed for use on apricots, peaches and grapes in the 1956 season. Approximately one ton of ice is needed for cooling three tons of fruit to below 40°F from field heat in three hours. This time may be doubled if the pack is particularly difficult to penetrate with forced air. Peaches in cups and grapes in consumer packs slow the cooling process in relation to the size and restrictions of air flow.

The portable test fruit cooler for three tons of fruit uses four ⅓hp fans for blowing down on canvas-covered stacks. The air must pass horizontally through the individual lugs of fruit to the slot in the car below where the air returns to the ice bunker for recooling. There is a partition wall between the ice bunker and the cold room. The wall is open above the fan and below the tracks for circulation of air through the fruit and the ice which is dropped in from above in 50-pound cakes.



Floor plan of portable fruit cooler for orchard use.

Cooled fruit can be stacked outside and covered on a temporary, insulated platform if shipping trucks are not immediately available for removing the fruit from the ranch. One ice bunker could be used between two tunnels in a permanent building. The cooler could be built most any length desired.

Field tests and demonstrations were made on the Davis campus and in Glenn, Tehama, Tulare, and San Joaquin counties during July, August and September, 1955.

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Cooled fruit on temporary insulated platform awaiting shipping truck.