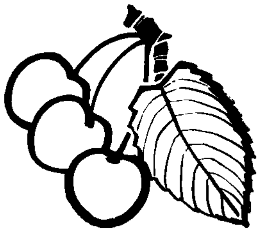
Catching frame used in mechanical harvesting trials on Royal Ann cherry trees at the Joe S. Solari ranch, Stockton.



MECHANICAL HARVESTING OF SWEET CHERRIES

1961 Tests Show Promise and Problems

R. A. NORTON · L. L. CLAYPOOL · S. J. LEONARD

P. A. ADRIAN · R. B. FRIDLEY · F. M. CHARLES

Tests indicate that, under good conditions, 80 to 90 per cent removal of sweet cherries is possible by mechanical shaking. However, overcoming tree injury is essential to successful commercial use of tree shaking equipment. Improved clamping devices must be developed that will eliminate or minimize tree injury. Pruning and training adjustments will be required to facilitate use of mechanical harvesting equipment in the orchard and aid in fruit removal. Results of brining tests indicate that much of the bruising observed in the fresh fruit was not visible after brining, particularly when the fruit was placed in brine immediately after harvest. Shipping any of the mechanically harvested sweet cherry crop appears impractical today.

Sweet cherries in the air as they are removed by boom shaker.

THE POSSIBILITY of mechanical harvesting of sweet cherries was suggested by promising results in other soft fruits and also from work done with the Montmorency sour cherry in other parts of the country. The advantages are obvious—more than half of the production cost in sweet cherries goes to harvest labor which is rapidly becoming more expensive and increasingly difficult to obtain. Brining had formerly been considered a secondary outlet for fruit not suitable for fresh shipment or canning. This outlet has been extremely important, however. It now accounts for almost half of all the cherries produced in San Joaquin county, the state's largest production district.

The feasibility of harvesting sweet cherries mechanically was investigated in 1961 both at Davis and under commercial orchard conditions near Stockton. Two types of harvesting equipment, three varieties, three dates of harvest, and two methods of handling fruit subsequent to removal were compared in replicated tests at Stockton. Samples of fruit from each treatment were analyzed in the fresh state for injury and adherence of stems to the fruit. The remainder of the fruit was brined and analyzed similarly. The work at Davis included tests on the mechanics of cherry removal with various types of shakers and ages of trees. In addition, exploratory tests were run with a chemical, 4-thianaphtheneacetic acid, reported to be effective in loosening the fruit from the tree.

Solari Trial

At the Solari ranch near Stockton, two types of fruit removal devices were used: the Best Shaker, a hydraulically operated shaker with a two-inch stroke and a frequency of about 600 to 800 cycles per minute; and a Goodwin "Redhead" knocker with a four-inch stroke at about 185 psi compressor pressure. Goodwin's catching frame was used for all tests.

The Best shaker, having two clamping surfaces resulted in greater injury in the early phases of the trials but modifications of the shaker clamp prior to the final harvest period greatly reduced the injury. No serious disease infection in the shaker wounds was detected within six months after harvest. However, cherry trees are extremely susceptible to disease infection from numerous organisms and commercial adoption of mechanical harvesting for this crop will be delayed until bark injury can be reduced to a minimum. The tests at Davis indicated that the C-clamp type of hookup mechanism, when carefully placed, caused little visible damage. Exploratory work with a trunk shaker showed promise for harvesting young trees, but was ineffective on older trees and caused excessive bark injury.

No distinct differences in amount of fruit removed by the Best or Goodwin shakers was noted. Considerable variation was noted in the per cent of fruit removed whether the estimation was obtained by counting the fruit on branches located throughout the tree or by a visual estimate of the entire tree before and after being shaken. As Bing and Royal Ann cherries advanced in maturity, they were more readily removed by shaking with an increasing percentage removed without stems. Under good conditions 80 to 90 per cent of the fruit can be removed mechanically.

Fruit injury

Mechanical harvesting, regardless of the equipment used, resulted in considerable bruising and injury to the fruit. This occurred as the fruit hit branches, twigs and leaves before being removed, also as it fell through the tree and finally upon hitting the catching frame. Much of the fruit left on the tree was severely injured and could not be used unless picked and placed in brine immediately. Under the conditions of this test it is doubtful that shipping of any portion of this fruit would be practical.

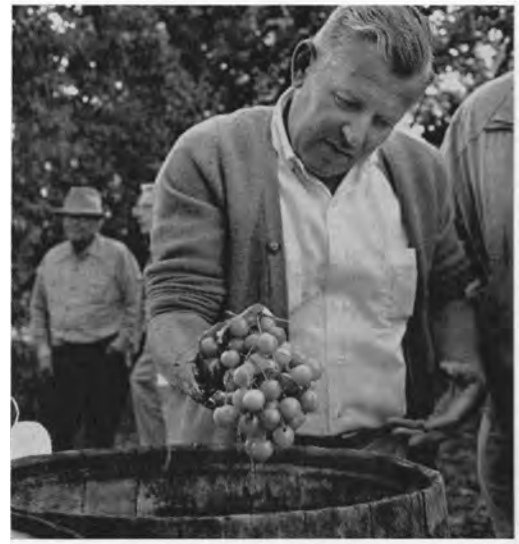
Royal Ann cherries were more subject to bruising, or at least the injury was more noticeable with this variety. Susceptibility to bruising of Royal Ann increased as the season progressed, whereas the reverse appeared to be true with the Bing variety.

Lambert cherries were readily harvested mechanically in a limited test. The brining quality was comparable to Royal Ann and superior to most lots of Bing.

Brining tests

A total of forty experimental barrels of cherries were prepared in SO_2 (sulfur dioxide) brine at harvest and analyzed for injury during November, 1961. As shown in the table, two methods of handling the cherries after harvest were compared. One-half of the fruit was placed immediately into barrels of brine in the orchard and the remainder was allowed to stand in boxes for 4 to 6 hours before brining. The lots which were brined in the field were spoken of as the "wet" treatments, and those which were allowed to stand in boxes were spoken of as the "dry" lots.

The freshly-picked cherries were analyzed for injury and removal of stems as a basis for comparing brined fruit lots. Results of the brining tests indicated that much of the bruising observed in the fresh fruit was not apparent in the brined cherries, particularly when the fruit was placed in brine immediately after harvest. Highest quality mechanically-harvested Bing cherries (combination No. 1 and No. 2 grade) were obtained at the earliest harvest period. Royal Ann cherries mechanically harvested during the second harvest were equal to hand-picked fruit



Royal Ann Cherries brined in the orchard show good quality.

Some leaves and twigs are removed with fruit.

and superior to machine-harvested fruit from the first harvest, May 22.

Some internal damage to the fruit as a result of mechanical harvesting was observed after removal of the SO_2. Placing the cherries in brine immediately after harvest reduced this damage considerably. It seems feasible to expect that the fruit could be conveyed directly from the catching frame to bins placed in the orchard. Brine could be added to the bins immediately before or after harvest. The bins could be transported to the brining facility at the convenience of the grower or processor and either stored in these containers or transferred to larger holding tanks.

EVALUATION OF MECHANICALLY HARVESTED ROYAL ANN CHERRIES HELD IN BRINE

Equipment	Handling method[1]	With stems %	Combination #1 & #2 grade[2]	Culls
		Harvested May 22		
Best	Dry	73.3	77.7	1.1
	Wet	78.0	73.5	1.3
Hand	Dry	96.8	93.0	0.5
	Wet	99.0	91.3	0.3
		Harvested May 29		
Best	Wet	59.2	86.7	0.8
Goodwin	Dry	77.6	87.6	0.3
	Wet	73.8	89.3	0.1
Hand	Dry	97.1	80.6	0.7
	Wet	98.8	83.8	0.7
		Harvested June 5		
Best	Dry	28.5	68.1	0.9
	Wet	21.4	74.1	0.8
Hand	Wet	71.8	74.4	0.9

[1] Dry—left in field boxes 4–6 hours after harvest, then placed in brine. Wet—placed in brine immediately after harvest.

[2] Oregon standards for Sulfured Cherries, Oregon State Dept. of Agriculture, Salem, Oregon, May 20, 1954.

Davis tests

The results of the tests conducted at Davis showed that there was no advantage in the use of 4-thianaphtheneacetic acid in loosening cherries on the tree.

High frequencies (2,000 cpm) and a short stroke (3/8 inch) were effective for removal on young trees—or erect branches on older trees similar in structure to that prevalent in younger trees. This combination was not effective on long or drooping branches. To obtain removal on this type structure, lower frequency (700 cpm or less) and a longer stroke (1½ inch) were required. Possibly even a longer stroke would increase removal further.

R. A. Norton is Associate Agriculturist, Extension Service, Davis; L. L. Claypool is Professor of Pomology, U. C., Davis; S. J. Leonard is Food Technologist, U. C., Davis; P. A. Adrian is Agricultural Engineer, U. S. Department of Agriculture and Associate in Agricultural Engineering, U. C. Davis; R. B. Fridley is Assistant Professor and Assistant Agricultural Engineer, U. C. Davis; and F. M. Charles is Farm Advisor, San Joaquin County.

This project was supported in part by a grant from the San Joaquin Cherry Growers and Industries Foundation. The Best Welding Works, Modesto, and A. D. Goodwin Co., Manteca, supplied harvesting equipment and assistance with the testing program. Ray Rugani and the Stockton Cherry Briners Inc. assisted and furnished facilities for the brining tests. Joe S. Solari's cherry orchards were used for the tests.

D. C. SUMNER · J. R. GOSS

Sideoats Grama and

SEED PRODUCTION

Trials conducted by the Department of Agronomy at Davis indicate the possibility of producing successful seed crops of several perennial grasses adapted to the Great Plains areas. Species showing the most promise include sideoats grama, weeping lovegrass, sand lovegrass, Boer lovegrass, and Lehmann lovegrass.

SIDEOATS GRAMA is a native of the Great Plains from Canada to Mexico and the lovegrasses, with the exception of sand lovegrass, are introductions from Africa. All have been found useful in certain parts of the Great Plains for reseeding range lands but the markets are not large and it would be easy to produce more than could be used. Therefore, growers interested in producing seed are urged to work through local marketing establishments or make prior arrangements with retail outlets in the area of use.

Some of the more prominent varieties of sideoats grama and areas of adaptation are as follows: Butte and Trailway, for Nebraska; El Reno, for Kansas; Coronado and Tucson, for Oklahoma and the Southwest. Sand lovegrass varieties include: A-11527 for New Mexico and Neb. 27, for Nebraska. The Boer lovegrass is A-84, for Arizona. The Lehmann lovegrass is A-68, for Arizona. The weeping lovegrass has no named improved varieties, to date. Sources of seed, potential market demands, and retail prices may be obtained by writing to Agricultural Experiment Stations of Land Grant Colleges in the states indicated.

Moisture needed

Though these grasses are drought resistant they are adapted to areas receiving summer rain, and when grown for seed must have adequate moisture to produce good seed crops. The effective root distribution is relatively shallow, especially with sideoats grama, and frequent irrigations are necessary.

Coronado and Tucson strains of sideoats grama can produce two seed crops each year—the first maturing in June or July, the second in September or October. When grown in California for seed, experience indicates that the first crop is usually light and may not be economical to harvest. The first crop seed yield is dependent largely upon climate in the area where it is grown. Uneconomical first