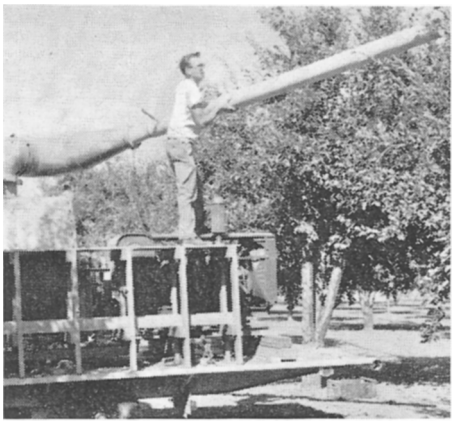


Experimental blower used in 1960 tests.

Field tests show feasibility of

Blower-Shaker

for mechanical harvesting of prunes

H. L. Brewer, R. B. Fridley, and P. A. Adrian

Pulsating air as a means of shaking the limbs of prune trees is a feasible method of harvesting with catching frames.

Prunes in the coastal areas of California have not been harvested extensively with catching frames because the fruit falls as it matures, necessitating more than one picking and involving the problem of windfall pick-up.

In 1959 and 1960, the blower method of harvest was tested in the field. The 1959 tests were limited, but indicated that air velocities under 100 mph—miles per hour—released 4′–8′ from the limbs would remove not more than about 10% of the fruit at any one harvest. In 1960, more extensive tests were conducted, with higher air velocities.

A centrifugal compressor with a capacity of 3,500 cfm—cubic feet per minute—at 2.5 psi—pounds per square inch—driven by a 50-hp—horsepower—engine supplied air at velocities up to 200 mph. Outlet pipes 10′ long conveyed the air from the blower to within 1′–3′ of the tree, minimizing velocity losses. Air volumes and velocities were varied by using pipe diameters of 5″ and 8″.

The trailer, with engine and blower, was positioned intermediate between trees. From this position a quarter of each of two trees in one row was blown with pulsating air blasts for about one minute. Pulsations were about 60 per minute. Two different blower speeds were combined with two outlet pipes to give four possible air volumes and velocities. The test blocks were blown once, and again one week later. The trees were gleaned at the end of the second week.

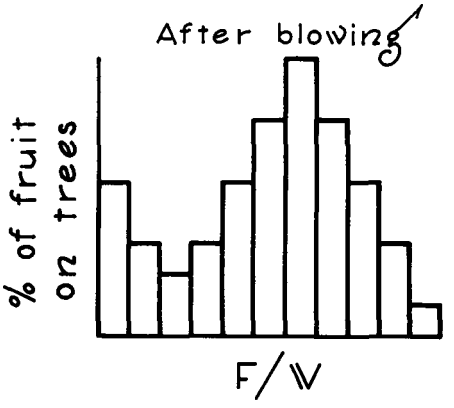
Field Tests

The 1960 results indicate that velocities of 95–185 mph removed 41% to 59% of the fruit on the tree at the time of each harvest. Thus, two pickings removed 68% to 76% of the fruit. The percentage of windfalls ranged from 1.2% to 9.0% during the week between harvests. In general, the more effective the treatment, the fewer the windfalls.

The results in the table can be used in estimating total removal in three or four pickings. An air velocity of 185 mph removes about half of the fruit on the tree at each harvest. About 3% of the fruit is lost to windfalls during each week between pickings. From these figures, three pickings would recover an estimated 84% and four pickings about 90%. This compares to 90%–98% recovered with a mechanical shaker where a single picking results in satisfactory quality.

The tests were insufficient to establish a quantitative relationship between percent removed and air volume or velocity, though higher air velocities were more effective. The primary problem associated with establishing such a relationship is the influence of the bonding force between each individual fruit and the tree.

Distribution of F/W—bonding force divided by fruit weight—of fruit on trees after blowing with air velocities less than 100 mph and end of outlet about 4′ from the limbs.



Ease of fruit removal decreases as the bonding force increases. During the 1960 tests, a significant percentage of the fruit had a low bonding force before harvest. The distribution after blowing indicates that most of the fruit with a low bonding force was removed. The distribution reassumed the initial form before the next harvest. Distribution after the 1959 harvest indicates that the air velocities used were relatively ineffective.

How practical this method of harvesting prunes is will depend on costs relative to existing methods of harvest. If a number of pickings are required, it would likely be practical. If the fruit can be harvested in one or two pickings, however, mechanical shakers would probably be less expensive.

Summary of 1960 Harvest Results

Air Velocity (mph)		150	185	95	95	185
Air Volume (cu ft/min)		1800	2220	2910	2910	2220
Fruit removal—% of total fruit on tree at the beginning of harvest	**First Pick**	42	41	47	52	51
	Second Pick	26	32	29	29	29
	Total	68	73	76	76	75
Fruit removal—% of fruit on tree at time of harvest	**First Pick**	42	41	47	52	51
	Second Pick	53	56	59	54	51
Windfalls—% of total fruit on tree at the beginning of harvest	**First Pick**	9.0	2.7	4.0	3.2	1.2
	Second Pick	8.0	3.7	4.0	6.2	—
	Total	17.0	6.4	8.0	9.4	1.2
Average F/W* of fruit on tree before blowing	**First Pick**	28	31	21	23	42
	Second Pick	38	35	29	23	39
Average F/W of fruit on tree after blowing	**First Pick**	33	37	32	34	

* F/W=bonding force divided by fruit weight

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