HOW MUCH BEATING WILL YOUR TART CHERRIES TAKE AND WHERE DO THEY GET IT?

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R. T. WHITTENBERGER

Eastern Regional Research Laboratory
U. S. Department of Agriculture

Philadelphia, Pa.

J. H. LEVIN and R. J. WOLTHUIS

Agricultural Engineering Research Division
U. S. Department of Agriculture, MSU

East Lansing, Michigan

H. P. GASTON

Department of Horticulture, MSU

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No single event has brought cherry bruising into sharper focus than has the introduction of the mechanical harvester. In fact, the harvester has monopolized studies on bruising for the past several years. Much information has been obtained. We are reminded, however, that cherries must indeed be handled, and therefore bruised, at many stages after harvest. What are the effects of post-harvest bruising on cherry quality and processed yield? Should efforts be made to control post-harvest as well as harvest bruising?

In 1964 our research group set out to evaluate the total bruising of tart cherries as they move from the tree to the consumer's container. We obtained excellent cooperation from growers and processors and carried out detailed studies in 12 orchards and 10 processing plants in Michigan. Our findings are presented now in the hope that they will be helpful to the cherry industry.

HARVEST BRUISING

Soft Cherries. In some years cherries can take a moderate amount of rought treatment during harvesting and handling operations, but in 1964 they could not. Most cherries were abnormally soft and easily bruised. As a result, harvest bruising increased about 3-fold in 1964 over previous years (Table 1).

This applied to both hand and machine picked fruit in southern and northern Michigan. On the average, the hand picked lots were slightly less bruised.

Mechanical Harvesters. Experience has shown repeatedly that mechanical harvesters, when operated by competent personnel under proper conditions, can harvest cherries with a minimum of bruising. In one notable example in 1963, a robin egg was shaken from a tree and collected—unbroken—among cherries in the orchard tank. Despite the tenderness of cherries in 1964, some mechanical harvesting systems were quite satisfactory in respect to bruise damage. In one system only 8 percent of the

TABLE 1. *Harvest bruising of tart cherries increased in 1964*

Harvest method	Orchards tested, number	Year	Bruised cherries, percent
Hand	8	1962	4.8
Hand	4	1963	4.4
Hand	11	1964	17.0
Average	.....	.....	8.7
Machine	12	1962	8.3
Machine	17	1963	6.7
Machine	12	1964	19.4
Average	.....	.....	11.5

cherries were bruised. This compares favorably with the 17 percent of bruise damage obtained by the average hand picker.

On the other hand, bruise damage to the extent of 32 percent was obtained by other mechanical harvesting systems. Several reasons for excessive bruising can be cited. Many growers in 1964 were using new equipment for the first time and therefore lacked experience and know-how. (Perhaps a training school would be worthwhile.) There was a tendency to use the harvesters in second rate orchards that were unacceptable to hand pickers. Orchards were inadequately prepared, cherries were immature, and trees were improperly pruned. Inconspicuous details which influence the extent of bruising were overlooked. "Pocketing," overloading, undue haste, careless handling, and lax supervision were common. Moreover, the low price of cherries hurt morale and incentive. Truly, improvements can easily be made in many cases. Let the question be "What is the excellence of my product?" not "How much abuse will the trade bear?"

Post-Harvest Bruising

Laboratory Studies. Previous studies in a laboratory have shown some of the effects of bruising and rebruising cherries at intervals (Table 2).

TABLE 2. *Laboratory studies show effect of recurrent bruising on quality and yield of tart cherries. All samples were maintained in water at 50°F. for 24 hours before processing.* (*Average of 4 tests in 3 years*)

Cherries	Treatment (Time and number of bruises)	Scald in 24 hours, percent	Change in weight of whole cherries, percent	Yield of pitted cherries, percent
1	Control, not bruised	0	+4.2	88.7
2	Bruised at 0 hour (harvest)	0	−0.5	85.6
3	Bruised at 0 and 3 hours	34	−5.3	80.2
4	Bruised at 0, 3, and 6 hours	76	−7.9	77.2
5	Bruised at 0, 3, 6, and 24 hours	74	−8.6	74.0

Cherries can indeed survive one serious bruise provided they are maintained at a cool temperature. Under commercial conditions, this first bruise corresponds to the harvest bruise. If, however, the cherries are bruised a second time after a 3-hour delay, they deteriorate rapidly, develop scald, and give a poor yield of pitted product. In commercial practice, this second bruise corresponds to the beating cherries take during unloading operations at receiving stations and processing plants. When cherries are bruised a third or fourth time, they show proportionate reductions in yield and quality.

Field Tests. Our observations under field conditions in Michigan in 1964 confirm the laboratory findings. In order to pinpoint the effect of secondary or post-harvest bruising, we took samples of cherries at packing plants just before, and immediately after, unloading operations. Each pair of samples was held for identical periods at the same temperature before being measured for scald. The results of 12 tests in 4 plants showed that the unloading operations did in fact double the incidence of scald (Table 3). On the average, scald was increased from 15 percent to 32 percent by the unloading steps.

TABLE 3. *Post-harvest bruising doubled the incidence of cherry scald in 1964*

Processing plant	Number of tests	Scald (percent)	
		Before unloading	After unloading
A	2	13.7	34.6
B	6	13.8	22.4
C	2	16.0	37.3
D	2	16.5	33.8
Average		15.0	32.0

Unloading Methods. Unloading methods differed widely in the amount of bruising they caused. Direct, simple methods were least damaging. In one plant, for example, cherries were dumped directly from lugs or small orchard tanks into the water in soak tanks. Dropping cherries into water causes no significant bruising. This plant (not listed in Table 3) encountered no particular bruise problem with either hand or machine picked fruit. Cherries often were held for 18 hours or more without noticeable deterioration.

In contrast, fruit deterioated rapidly after unusually rough unloading procedures. In one example, from 500 to 700 pounds of dry cherries were thrown from lugs into an iron pit about 3.5 feet deep, weighed, tumbled on a steep elevator, and then flumed to the soak tanks. Although this procedure apparently was satisfactory with firm cherries of years ago, it was not acceptable with the soft fruit of 1964.

In another example, dry cherries were dropped successfully 1.5 feet onto a wire mesh belt, 1.5 feet onto a hard rubber belt, 1.5 feet onto a sloping metal plate, and finally 1.5 feet onto a hard belt. After this beating, a high percentage of cherries failed to firm up during the soak period.

Processing. In addition to the major or minor bruises incurred during harvesting and unloading operations, cherries receive a third bruise. This occurs as they are conveyed within the cannery after the soak period. The third bruise, if severe, leads to a decrease in drained weight. Our tests have shown, for instance, that passage of cherries through electric sorting machines decreases drained weight by 0.6 percent to 1.7 percent, depending on the degree of bruise. The smallest decrease was obtained when cherries were discharged into water, and the largest decrease followed discharge onto a hard rubber belt.

In the cannery, twice bruised cherries that failed to firm up during the soak period gave rise to a multitude of difficulties. They pancaked on conveyor belts, piled up at curves and cut-off points, and spilled onto the floor. They fouled electric sorting machines, clogged pitters, and passed pits. They seriously cut plant capacity, increased the cost of processing, and in the end gave a product of poor quality and yield. Use of careful handling procedures within the cannery eased, but did not overcome, the difficulties.

Summary and Conclusions

In 1964 tart cherries were unusually soft and easily bruised. Both hand and machine picked lots showed about a 3-fold increase in bruising in 1964 over previous years. Depending on orchard conditions, the bruising of machine picked cherries varied above or below the level of hand picked fruit. The harvest bruise problem was aggravated by the occurrence of a huge crop and by the natural tendency toward haste, overloading, and lax supervision.

Experiences of 1964 showed that tart cherries could survive just one serious bruise, regardless of cool temperature treatment. Two serious bruises spaced a few hours apart resulted in rapid deterioration of cherry quality. If the harvest bruise had been severe, little or no post-harvest bruising could be tolerated. If the harvest bruise had been mild, a moderate amount of post-harvest bruising was permissible. Unfortunately, in commercial practice both harvest and post-harvest bruises were often severe. In some cases the post-harvest bruising caused by unloading operations at processing plants and receiving stations was indeed as severe as that of a rough harvest. As a result, processed yield and quality were low.

For these reasons, growers and processors are urged to seek and adopt methods that will reduce both harvest and post-harvest bruising, and will accommodate naturally soft as well as firm cherries. Let efforts also be put forth to produce firm fruit through judicious spray and fertilizer programs. The incentives are worthy and the costs are low.

Acknowledgments. We are sincerely grateful to each of the growers and processors whose enthusiastic cooperation made this study possible.