EFFECTS OF FOLIAR APPLIED CALCIUM TO SOUR CHERRIES ON FRUIT QUALITY AND RECOVERY

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Drake and Proebsting (1985) published results indicating that a 1-3% calcium chloride post harvest dip or in the syrup maintained cellular turgidity and reduced the incidence of split fruit in processed sweet cherries. Utah's 'Montmorency' sour cherries are harvested mechanically and processed during the hottest part of the summer. Maintaining sour cherry fruit firmness through harvest and processing is often a problem. Harvested cherries are typically held in cold water several hours before processing. In 1998 we began applying calcium chloride to the cold water in the holding tanks in an effort to maintain cherry firmness. Cherries so treated produced firmer fruit with a higher grade standard than untreated fruit (Anderson and Campbell, 1991: Anderson, et al., 1989).

Laboratory studies of calcium chloride or amino acid chelated calcium (AACa) treated cherries confirmed that calcium reduced sour cherry fruit splitting and extended post-harvest fruit firmness (Anderson and Campbell, 1996). It was also found that calcium maintained cell plasma membrane integrity and osmoregulation of cherry fruit. Membrane protein content was 4-fold greater in calcium treated fruit than in untreated cherries (Anderson and Campbell, 1995).

As calcium chloride proved corrosive to the holding tanks, we began applying calcium as a foliar spray to sour cherries trees in June and July prior to harvest. Three foliar sprays containing 4.7 L/ha (2.0 quarts/acre) of chelated AACa (5% Ca) were applied at 14 day intervals to commercial sour cherry orchards in Payson and Santaquin, Utah and at Utah State University experimental plots in June and July, 1994. Similar treatments (three sprays each except where noted) were repeated in 1994, 1996, and 1997. Four to ten 200-gallon tanks of cherries were mechanically harvested from each treatment in each orchard and processed at commercial cherry processing plants. In every case cherry fruit quality as determined by quality control personnel at the processing plant, quality of AACa treated fruit equaled or occasionally surpassed that of untreated fruit. The percentage of treated fruit recovered after processing generally exceeded that of the untreated fruit.

1994

AACa foliar treatments were applied in a mature sour cherry orchard in Santaquin, Utah. Total processed AACa-treated fruit recovered in 30 lb. containers was 10% greater than the percentage of untreated fruit.

Table 1.
Percent sour cherry fruit recovery after processing, 1994

Rowley Orchard	AACa treated	92.2
	Untreated	82.3

1995

AACa foliar treatments were applied in the Rowley orchard in Sataquin as in 1994 and also in the Allred orchard in Payson. In addition, EZE calcium was applied in an additional (younger) Rowley orchard. Total processed fruit recovered from each treatment was compared to fruit recovery from untreated plots from the same orchard.

Table 2
Percent sour cherry fruit recovery after processing, 1995.

Allred Orchard	3 AACa treatments	89.3
	Untreated	85.7
Rowley Orchards	3 AACa treatments	90.0
	Untreated	89.0
	3 EZE Ca treatments	89.3
	Untreated	94.8
	4 AACa treatments	94.0
	Untreated	92.0

1996

Similar calcium treatments were applied to the same orchards as in previous years. In the Rowley orchards, treatments were applied to the same tree rows. AACa sprays were applied to the south rows in the Allred orchard. Because the 1996 season was exceptionally hot, the fruit tended to be small in size, especially on the south rows of the Allred orchard where fruit was more exposed to the south wind. The fruit was mechanically harvested and processed as in previous years.

Table 3
Percent sour cherry fruit recovery after processing, 1996

Allred Orchard	AACa treated	65.6	A grade
	Untreated	72.0	B grade
Rowley Orchards	AACa treated	79.3	A grade
	Untreated	77.3	A grade
	EZE Ca treated	91.6	A,C grades
	Untreated	86.9	B grade

1997

Similar calcium treatments were again applied to the same orchards as in previous years. The spring of 1997 was wet and cool. Cherry trees were not under as much heat stress as trees in Utah commonly experience. Utah cherry fruit tended to be larger and of better quality in 1997 than is usual for Utah cherries. These cherries were more like Michigan fruit this year. Improvement in cherry percent

recovery following calcium foliar treatments was not observed in 1997. This could possibly be explained in that the trees were not under as much environmental stress this year and did not respond to calcium treatment as in other years. The fruit was mechanically harvested and processed as in previous years.

In a separate study where branches with mature sour cherry fruit were dipped in 0.5% or 0.05% calcium as calcium chloride or AACa solutions for one minute while still on the trees, leaves and fruit dipped in 0.5% calcium chloride showed phytotoxicity symptoms within 24 hours. Calcium chloride, in addition to being corrosive to equipment, has not been recommended as a foliar spray during Utah's hot summers on cherries. No such phytotoxicity was observed following AACa dips at comparable calcium concentrations.

Table 4
Percent sour cherry recovery after processing, 1997

Allred Orchard	AACa treatment	89.9	A, B grades
	Untreated	91.0	A, C grades
Rowley Orchard	AACa treatment	86.7	B, C grades
	Untreated	87.8	C grade

In summary, calcium treatments tend to increase sour cherry fruit firmness. Foliar treatments are especially effective when trees are under stress from adverse environmental conditions such as typically occur during Utah's hot growing seasons. Treatment often results in increased recovery of fruit during processing due to less cullage. Treated fruit, especially AACa treated fruit, grades equal to or higher than untreated fruit. This improved fruit quality is likely due to the stabilization of fruit cell plasma membranes which tend to break down as fruit soften during maturation.

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