Winter Injury to Buds of Fruit Trees in Michigan, 1971-72

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In the course of studies on spring freeze injury to tart cherries in Michigan, many flower buds on trees in frost pockets were found to have been killed prior to bud swell. Thermometers were therefore placed in several orchards in south and west-central Michigan to monitor minimum temperatures during the winter of 1971-72. Additional thermometers were located in selected sweet cherry, apricot, and peach orchards. Peach flower bud samples were taken as part of a plant breeding research project.

September and October were mild with only scattered frosts in the fruit growing areas. The first general freezes occurred during the first week of November, with temperatures dropping to the mid-20's. Following several warm days with maximum temperatures in the high 60's, lows of 5° to 15°F occurred on November 22 and 23. Little injury to cherry buds was observed except in frost pockets (Table 1). In Orchard 1, injury to tart cherry buds at the bottom of such a pocket (−12° F) was severe, but damage was slight at the top, where the temperature did not fall below +4°. Thermometers were not installed in 3 additional orchards until early December. However, minimum temperatures were estimated by comparing

Table 1. Injury to cherry flower buds following freezes, 1971-72.

	Orchard and Location	Date of Freeze	Min. Temp.[1] (°F)	% Dead Flowers	Date of Freeze	Min. Temp.[1] (°F)	% Dead Flowers
			Montmorency Tart Cherry				
	Hartford	11/22	a. −7 to −12	85 to 100	1/16	a. −18 to −20	95 to 100
			b. +4	8		b. −20	14
	Brighton	11/22	a. 0*	6	1/16	a. −23 to −26	11 to 28
			b. +3*	0		b. −21	4
	Belding	11/23	a. +5*	20	1/16	a. −20	29
			b. +12*	2		b. −15	0 to 8
4.	Shelby	11/23	a. +4*	27 to 34	1/15	a. −16	18 to 33
			b. +10*	0 to 4		b. −15	0 to 4
	E. Lansing				1/16	−14	2
	Hartford				1/16	−19	7
			Sweet Cherry				
	Shelby	11/23	a. +4*	26	1/15	a. −16	64
			b. +10*	12-14		b. −14	45
						c. −13	29
5.	E. Lansing				1/16	−14	82
6.	Hartford				1/16	−19	66
7.	Mears	11/23	+14		1/15	−11	2

*Estimated from records of nearest weather stations.
[1]a, b, c. indicate increasing elevations on slopes.

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subsequent minima with those recorded at the nearest weather stations. Injury patterns similar to those observed in Orchard 1 were noted in 2 of these orchards (Orchards 3 and 4) in early December, although the damage was less severe. Estimates of temperatures in orchards 3 and 4 are probably high, in view of the extent of injury. Critical temperatures appeared between 0 and 5°F. Sweet cherries were also injured in the November freeze in orchard 4. Again, temperatures could only be estimated.

Moderate temperatures prevailed in mid-January in the fruit growing regions of Michigan, with maximum temperatures in the 30's and low 40's. A cold air mass then moved up from Indiana and Illinois, resulting in subzero temperatures on January 15 and 16. Relatively little injury was noted in tart cherry at temperatures as low as −20° F. In Orchard 2, however, a minimum temperature of −26° F was recorded, and approximately 20 percent of the remaining flowers were killed. Temperatures of −21° to −23° resulted in relatively little injury in this orchard. Sweet cherries were severely injured at temperatures of −14° and below, a temperature of −19° killing about two-thirds of the flowers in Orchard 6. Trees in Orchard 5 were young and vigorous, and suffered greater injury than did older trees on sites with lower temperatures. Although varietal differences were evident in the spring, no data were obtained on relative hardiness.

Little injury to peaches was noted prior to January 16, samples at South Haven and at Hartford in mid-December contain 0 to 7 per cent dead flowers. Severe injury occurred during the January freeze (Table 2), all flowers being killed at temperatures of −11° or below, except for 'Harrow

Table 2. Injury to peach and apricot buds following freeze of January 16, 1972. Buds sampled January 16 or 18.

Orchard and Location	Min. temp. (°F)	Varieties	% Flowers killed
		Peach	
6. Hartford	−19	Blake, Cresthaven, Glohaven, Harrow Blood, Madison, Redhaven, Siberian C	100
8. South Haven	−11	Canadian Harmony, Elberta, Loring, Redhaven, Redskin	100
		Harrow Blood	71
		Siberian C	21
9. South Haven	−8*	Cresthaven	51
	−6	Redskin	58
		Elberta	44
		Glohaven	37
		Redhaven	27
10. South Haven	−11*	Redhaven	100
11. Clarksville	−13	Redhaven	100
		Apricot	
5. East Lansing	−14		95
8. South Haven	−11	Selection from breeding program	50

*Estimated

Blood' and 'Siberian C.' These rootstock varieties suffered 71 and 21 per cent injury, respectively, at −11° (Orchard 8), but all flowers were killed at −19° F (Orchard 6). Varietal comparisons could be made in Orchard 9, where 'Redhaven' was most hardy, 'Redskin' least hardy, and 'Elberta' and 'Glohaven' intermediate.

Most apricot buds were killed at East Lansing, where −14° was recorded; half survived at South Haven at −11°.

Although trunk injury was not evaluated critically, moderate to severe cambium injury was noted on young peach and Stanley plum trees at Hartford prior to bud break. Injury to young peach trees at South Haven was light to moderate.

The following observations are noted: (1) In Orchard 1 temperatures of −7° to −12° on November 22 killed most of the tart cherry flower buds, while temperatures of −20° in mid-January caused only slight injury. This indicates that considerable hardening had occurred between November and January. (2) Critical temperatures for sweet cherry were considerably higher than those for tart cherry in January. Temperatures approaching −25° were necessary for appreciable injury in the latter, while sweet cherries were injured at −14° to −16° F. (3) The critical temperature for commercial freestone peach varieties was approximately −5° F, all flowers being killed at temperatures of −11°. Apricots were somewhat hardier.

American Pomological Society Members Receive Awards

The National Peach Council presented their 1972 achievement award to Dr. George Oberle, Professor of Horticulture at Virginia Polytechnic Institute and State University, Blacksburg, Va. at the council's 31st annual convention in Atlantic City. He is recognized as an authority in cytology, the structure of individual cells, and in genetics, as these are related to fruit breeding. Peaches introduced by Dr. Oberle are particularly important because of their ability to escape blossom season frosts.

At the Centennial Week in May, *The Arnold Arboretum* awarded the James R. Jewett prize for outstanding research on native plants to George L. Slate, Geneva, New York; George R. Darrow, Glen Dale, Maryland; Richard Jaynes, New Haven, Connecticut; Elwyn M. Meader, Rochester, New Hampshire.

Originally offered to encourage research on Cape Code plums, the Jewett prizes now recognize outstanding work on such plants as the grape, raspberry, blueberry, and elderberry. Award winner Darrow worked with strawberries, raspberries and blueberries, concentrating on the development of virus-free stock and disease-resistant strains. Jaynes, a geneticist at the Connecticut Agricultural Experiment Station, has done research on the breeding of disease-resistant American Chestnuts while Meader's interest has been in all small fruits hardy to the Northeast. Slate has worked with uncommon as well as common fruits, naming varieties of persimmon, papaw, and even jujube. A substantial cash prize accompanies each award.