Low Temperature Injury to Peach Flower Buds in Western Colorado in Recent Years

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Low temperature injury to flower buds of peach cultivars in Western Colorado can occur at various seasons, including late fall, winter, or early spring. The increased frequency of critical low temperatures in recent years has provided an opportunity to obtain relative hardiness performance of buds of a number of peach cultivars under natural conditions. Extensive injury occurred at the Orchard Mesa Unit in the fall of 1967, and again in January of 1971 and of 1972. Counts on the extent of bud injury were made when the full amount of damage was evident, the percent of live buds was determined, and the results are presented in Tables 1 and 2. Flower buds were classed as dead when internal floral parts were brown to blackish in color resulting from oxidation of damaged tissues. Injury be-

Table 1. Summary of Peach Flower Bud Injury, Fall Freeze, 1967, Western Slope Branch Stations, Orchard Mesa Unit.

	Percent Live Buds		Percent Live Buds
Triogem	85.5	Kalhaven	73.5
Redskin	84.4	Richhaven	73.5
Sungold	83.3	Giant Elberta	73.4
Dawne	82.5	J. H. Hale	72.4
Colora	81.9	Ranger	71.5
Suncling	81.8	Fairhaven	70.7
Loring	81.4	Washington	70.7
Redhaven	81.4	Hale Haven	70.5
Elberta	80.9	Redtop	66.1
Lateglo	80.5	Redwin	65.4
Gleason	80.2	Glohaven	65.0
Redglobe	79.9	Blake	64.5
Cresthaven	78.7	Dixired	62.3
Herb Hale	77.8	Southland	62.3
Earliglo	77.6	Candoka	60.4
Sunshine	77.2	Veteran	60.3
July Elberta	77.0	Sunhaven	58.4
Sunhigh	76.9	Cardinal	34.0
Western Pride	75.1	Golden Red	31.5
Rio Oso Gem	74.2	Red Gold	24.2

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Table 2. Summary of Peach Flower Bud Injury, from January Freezes in 1971 and 1972, Orchard Mesa Unit, Western Slope Branch Stations.

	Avg. Percent Live Buds 1971 & 72	Percent Live Buds 1971	Percent Live Buds 1972		Avg. Percent Live Buds 1971 & 72	Percent Live Buds 1971	Percent Live Buds 1972
Colora	59.0%	91.0%	27.0%	Sunshine	20.5%	32.0%	9.0%
Suncling	56.5	90.0	23.0	Hale Haven	20.0	39.0	1.0
Summer Crest	56.0	87.0	25.0	Sungold	19.0	12.0	26.0
Delp Early Hale	54.0		54.0	July Elberta	19.0	36.0	2.0
Summer Queen	52.5	84.0	21.0	Red Queen	18.0	33.0	3.0
Daroga Red	49.0		49.0	Kalhaven	17.5	31.0	4.0
Reliance	46.0		46.0	Rio Oso Gem	17.0	29.0	5.0
Redglobe	42.0	79.0	5.0	Triogem	17.0	32.0	2.0
Madison	40.5	81.0	10.0	Velvet	16.0	32.0	0
Redwin	38.5	60.0	17.0	Washington	15.5	31.0	0
Sunhaven	37.0	74.0	0	Cresthaven	14.5	23.0	6.0
Stardust	35.0		35.0	Redcrest	13.5	27.0	0
Garnet	35.0	51.0	19.0	Redskin	13.0	26.0	0
Herb Hale	35.0	66.0	4.0	Sunhigh	13.0	26.0	0
Western Pride	34.5	51.0	18.0	Loring	12.2	23.0	1.5
Comanche	33.0		33.0	Loring	11.5		0
Late Redskin	33.0	34.0	32.0	Richhaven	10.8	20.0	1.6
Dawne	33.0	43.0	23.0	Glohaven	10.5	20.0	1.0
Ranger	32.5	56.0	9.0	Golden Red	10.5	18.0	3.0
J. H. Hale	30.5	50.0	11.0	Early Red Haven	8.5	17.0	0
Veteran	30.5	52.0	9.0	Hale Harrison	6.0	9.0	3.0
Candoka	30.0	56.0	4.0	Fairhaven	5.0	10.0	0
Dixired	28.5	53.0	4.0	Redhaven	5.0	10.0	0
Lateglo	28.0	43.0	13.0	Elberta	4.5	9.0	0
Garnet Beauty	27.5	28.0	27.0	Giant Elberta	3.5	4.0	3.0
Redtop	26.0	25.0	26.0	Southland	3.0	3.0	3.0
Suncrest	22.0	15.0	29.0	Cardinal	2.5	5.0	0
Jersey Queen	22.0	41.0	3.0	Earliglo	2.0	4.0	0
Blake	21.0	28.0	14.0	Red Gold	1.5	3.0	0
Newday	21.0	33.0	9.0	Gleason	0	0	0

came apparent soon after temperatures rose above freezing, following the critical lows.

The percentages shown are based on counts of at least one hundred flower buds from each cultivar. Before counts were made sufficient time (usually 2-4 weeks) was allowed following the low temperatures to enable the full extent of injury to show. Branches were collected at random from around several trees at 5 to 8 foot heights, brought into the lab, the buds sectioned, counted with the aid of a microscope, and recorded. Results are reported as percent of live

buds based on the total count per cultivar.

Pre-Conditions: Environmental conditions surrounding each freeze injury period are given as background information. The damage in 1967 apparently occurred before all flower buds and wood tissue were sufficiently hardened. The mean maximum temperatures for October, 1967, was 71.6°F with a range of 51° to 84°F, and the mean minimum temperature was 41.2°F with a spread of 22° to 63°F. Following generally mild temperatures during October, a cold front, with light snow, moved into the area on October 29. Temperatures reached lows of 22°F on October 30th, and 18.5° and 22.5°F on November 4 and 5, respectively. The pattern of wood and bud injury corresponded with results reported by Edgerton (1960) who found that wood tissues exhibited less hardiness in early fall than flower buds and by early to mid-winter the reverse situation occurs. While some flower bud injury occurred from the October 1967 frost, wood tissue in the current season's shoots, especially in the center and lower parts of the trees, showed extensive injury. The relative percentage of bud survival of 40 cultivars is shown in Table 1.

Temperatures in 1971 dropped to −4°F on January 5, to −12°F on Jan. 6, and −9°F on Jan. 7. A mass of cold air settled over the area and remained as daytime temperatures only reached a high of 9°F on Jan. 6 and 10°F on Jan. 7. Temperatures remained below 0°F for 18 and 14 hours on the nights of January 6 and 7. Temperatures prior to the injury were moderate during December 1970. There was a mean minimum of 23.4°F with a range of 14°-33°F, and a mean high of 41.3° with a spread of 33° to 53°F. The minimum hardiness level of the peach flower buds was not known at that date. Bud injury most likely resulted from a combination of low temperatures near the critical injury level plus the long duration of low temperatures.

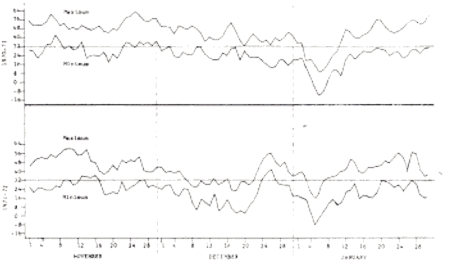

Figure 1. Daily Temperature Fluctuations for November, December, January, 1970-71 and 1971-72.

Injury in 1972 was caused again by low temperatures in early January when 15°F on Jan. 3, −9°F on Jan. 4, and 0°F on Jan. 5 were recorded. This injury was preceded by a favorable fall for maturity, but a cold and stormy December. Temperatures remained low on the morning of Jan. 4 for a period of five to six hours.

A mild spell arrived on December 23, 1971, melted all the snow, and kept night temperatures above freezing until the New Year. The pattern of bud injury in the station orchards suggested that cold air stratified near the ground since few buds below the six foot level survived, while many buds on the upper branches were less severely damaged. Injury to flower buds in January of 1970 and 1971 was probably due to prolonged low temperatures below the critical bud hardiness levels. The temperature patterns for the months of November, December, and January for both years are shown in Figure 1.

References

Edgerton, Louis J. 1960. Studies on Cold Hardiness of Peach Trees. *Cornell University Agr. Exp. Station*, Ithaca, N. Y. Bulletin 958.