

Frost Hardiness in Peaches at the Shuck-Split Stage

G. D. OBERLE
Blacksburg, Virginia

The autumn issue of the 1950 volume of Fruit Varieties and Horticultural Digest carried an article reporting on the variation in resistance to frosts shown by peach and nectarine varieties during the blossoming season at Blacksburg, Virginia. The article reviewed the literature pertaining to frost resistance and presented data on the set of fruit that escaped frost damage in 1950 on 132 varieties and seedling selections growing in the experimental orchard of the Virginia Agricultural Experiment Station. A temperature of 18° F. recorded in the orchard while the trees were in the open blossom stage destroyed all the crop on Elberta, Golden Jubilee, Summercrest, Early Crawford, and other less well known varieties and selections. Other varieties such as Marigold, Prairie Daybreak, Prairie Sunrise, Raritan Rose, Triogem, Sunhigh, Halehaven, and J. H. Hale produced a few fruits, while others such as Veteran, Vedette, Redhaven, Erly-Red-Fre, Colora, Fisher, Sunrise (N. J. 133) and some unnamed seedling selections bore good crops of fruit, and in some cases even required thinning of the fruit in order that commercial size of fruit might be developed.

The 1953 season offered another opportunity to observe variations in resistance to frost shown by peach and nectarine varieties. The frost in 1953 occurred, however, at a later period in the development of the fruit than in 1950. Considerable variation in the degree of injury was recorded. Full bloom occurred from about March 31 to April 2. By April 19 the young fruits were approaching the "shuck split" stage. A sharp drop in tempera-

ture occurred on April 19. It was accompanied by a strong wind, and the temperature fell to 27° F. early in the morning on April 20. The combination of strong wind and low temperature caused severe injury to the foliage of the trees and it soon became apparent that the young fruits had also been damaged. The temperature fell to 28° F. on April 22, following which no increase in the extent of the injury could be observed.

Close examination of the young fruits showed many to have a wilted appearance by the afternoon of April 20. By the next day the ovules had turned dark and showed signs of breaking down. The first observations indicated that up to 90 per cent of the fruits appeared to be killed on many trees. No attempt was made to estimate the proportion of the fruits that were killed, but the prospects for a crop of fruit appeared most doubtful.

Favorable weather and growing conditions prevailed after the April 22 frost. The young uninjured fruits developed rapidly. A week later many of those damaged by the freeze started shedding. Not all of the remaining fruits developed at a uniform rate. Some lagged in growth and there was rather steady dropping of fruits up to early June, at which time it became evident that many trees in the orchard carried enough fruit to warrant thinning of the crop. Hand thinning was done on all trees that appeared to be overloaded.

The blossom production for each tree had been evaluated during the full bloom period by scoring each tree as indicated in Table 1. The data

TABLE 1. Data on peach and nectarine blossom production; fruit thinning, fruit set and ripening season at Blacksburg, Virginia, 1953.

Variety	Days ripe before or after Elberta	Blossom Production *	Thinning Record *	Crop *
World's Earliest	-63	VH	M	H
Cherry Red	-50	H	O	H
Sunrise (N. J. 133)	-49	M	M	H
Erly-Red-Fre	-41	H	H	H
Earlyeast	-41	H	M	H
Dixired	-39	H	H	H
Gaheb	-39	M	L	H
Prairie Daybreak	-36	H	M	-H
Early Flame Nectarine	-34	-VH	M	H
Fisher	-32	H	VH	H
Prairie Sunrise	-32	H	H	H
Starking Delicious	-32	H	L	H
Jerseyland	-29	H	M	H
Raritan Rose	-29	VH	VH	H
Redhaven	-29	H	H	H
Dixigem	-28	H	VL	-H
Triogem	-27	H	M	H
Vanguard	-26	H	H	H
Missouri	-25	H	M	H
Golden Jubilee	-25	VH	O	-M
Golden Globe	-25	VH	O	H
Southland	-24	VH	M	H
July Elberta	-23	-H	L	-H
Redrose	-22	VH	H	H+
Flaming Gold Nectarine	-22	-VH	O	M
Rubired Nectarine	-21	VH	O	VL
Fireglow	-21	M	O	M
Newday	-21	VH	VL	M
Vedette	-20	VH	H	H
Goldeneast	-18	M	O	-M
Summerrose	-18	VH	O	-M
Prairie Rose	-18	VH	M	-H
Pacemaker	-18	M	L	H
Sunhigh	-18	M	O	L
Ozark	-17	H	O	L
Halehaven	-17	VH	VH	H+
Vimy	-15	-VH	M	-H
Early Haven	-15	VH	L	H
Ambergem	-15	-VH	M	H
Prairie Schooner	-14	M	L	H
Garden State Nectarine	-14	VH	O	L

*VH—Very heavy bloom; very heavy thinning.

H—Heavy bloom; heavy thinning; full commercial crop.

M—Irrregular clusters of blossoms; medium thinning; medium fruit set.

L—Scattered blossoms; light thinning; light fruit set.

O—No thinning.

VL—A few irregularly scattered fruits.

TABLE 1. Data on peach and nectarine blossom production, fruit thinning, fruit set and ripening season at Blacksburg, Virginia, 1953 (Continued).

Variety	Days ripe before or after Elberta	Blossom Production *	Thinning Record *	Crop *
Colora	-13	VH	H	H
Nectarose	-13	VH	O	H
South Haven	-13	M	M	H
Champion	-12	H	L	-H
Redchief Nectarine	-12	VH+	O	L
Surecrop Nectarine	-11	VH+	O	VL
Cavalier Nectarine	-10	VH+	M	H
Nectaheart Nectarine	-9	VH	O	H
Veteran	-9	H	VH	H
Fairhaven	-9	VH	O	M
Nectacrest Nectarine	-7	H	O	M
Veefreeze	-7	H	VL	M
Sullivan Early Elberta	-5	VH	VL	H
Hunter Nectarine	-5	VH+	O	L
Redcrest	-4	-VH	L	-H
Ideal	-4	VH	M	H
Georgia Belle	-4	H	M	H
Sunday Elberta	-3	VH	L	H
Shippers Late Red	-2	H	M	H
Fertile Hale	-1	H	O	H
Elberta	0	VH	O	M
Texaberta	0	H	O	H
Fuzzless Berta Nectarine	0	VH+	O	-VL
Late Rose	0	H	O	M
Newcheer	0	VH	H	H
Redskin	+1	H	L	H
Hardyberta	+1	H	O	M
Hale Harrison Brilliant	+1	H	O	L
Wilma	+4	H+	O	-M
Prairie Rambler	+4	H+	L	H
Afterglow	+4	VH	L	H
J. H. Hale	+4	VH	M	H
White Hale	+6	-VH	M	H
Rio Oso Gem	+6	-VH	H	H
Late Canadian Queen	+6	M	O	H
Nectalate	+6	VH	O	H
Honeygem	+7	VH	M	H
Constitution	+7	-VH	L	H
Lizzie	+12	VH	H	H
Goodcheer	+13	H+	O	-M
Frankie	+18	VH	M	H

*VH—Very heavy bloom; very heavy thinning.

H—Heavy bloom; heavy thinning; full commercial crop.

M—Irrregular clusters of blossoms; medium thinning; medium fruit set.

L—Scattered blossoms; light thinning; light fruit set.

O—No thinning.

VL—A few irregularly scattered fruits.

shows that most trees had a heavy bloom.

The trees in this orchard vary in age, size, and productive capacity due to the constant discarding of material that proves to be of no value in the breeding and testing program. Therefore, no measured yield records are taken on any of the material. The set of fruit relative to the productive capacity of the tree was estimated as shown in Table 1.

Data are also presented on relative season of ripening, expressed in days before or after Elberta, scoring on the basis of amount of bloom produced, the relative amount of fruit thinning given to trees of each variety, and the scoring for relative size of crop of fruit.

A study of Table 1 shows that most varieties produced full commercial crops of fruit, as indicated by the scores of H given them. Exceptions were Golden Jubilee, Newday, Golden east, Summerrose, Sunhigh, Ozark, Fairhaven, Veefreeze, Elberta, Laterose, Hardy Berta, Hale Harrison Brilliant, Wilma, and Goodcheer. The Flaming Gold, Rubired, Garden State, Redchief, Surecrop, Nectacrest, Hunter, and Fuzzless Berta Nectarine varieties all had reduced crops of fruit. Only the Early Flame, Cavalier, Nectarose, Nectaheart, and Nectalate varieties of nectarine bore full crops of fruit. Inspection of the scoring for relative production of blossoms by the different varieties shows that all had sufficient bloom to produce full crops of fruit. Probably of greater significance is the relative amount of fruit thinning of the different varieties that was necessary to reduce the crop to obtain good fruit size. Varieties such as Sunrise, Erly-Red-Fre, Fisher, Raritan Rose, Prairie Sunrise, Redhaven, Vanguard, Redrose, Vedette, Halehaven, Colora, Veteran, Newcheer, Rio

Oso Gem, and Lizzie all required heavy to very heavy thinning, indicating a much greater survival of fruits than on such varieties as Starking Delicious, Dixigem, Golden Globe, July Elberta, Fireglow, Golden east, Pacemaker, Prairie Schooner, Fairhaven, Sunday Elberta, Fertile Hale, Texaberta, Laterose, Prairie Rambler, Afterglow, and others, which required only light or no thinning to reduce the crop to a desirable level.

The list of varieties requiring the most amount of thinning in 1953 is almost identical with the list of varieties that produced good crops of fruit after the hard freeze of 1950 when the temperature fell to 18° F. in the same orchard from which these observations were taken.

It appears that varieties that show greater resistance to frosts and freezes at blossoming season also show greater resistance to freezes or frosts at later stages of development. It appears too that young peach fruits may be injured by less extreme temperatures during stages up to the shuck split stage than at the open blossom stage or shortly thereafter. This point has been emphasized by other workers.

There is reason to believe that the ability shown by varieties like Elberta, Golden Jubilee, Sunhigh, and the Crawford types to develop above average size of fruit may be a result of a lower level of resistance to frost shown by their flowers and young fruits. The greater natural thinning of the fruits due to light spring frost may be the reason for the more uniform fruit size of these varieties as compared with the hardier varieties. However, peach growers in areas having frequent spring frost hazards might derive great benefit from the development of superior commercial types having greater hardiness to frost.