

Optimum Procedures for Ripening Stone Fruit

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This article deals with the ripening of peaches, nectarines, and plums at destination points (distribution centers, retail stores, foodservice operations, etc.). We also covered pre-conditioning/ripening at the shipping point.

In California, peaches, nectarines, and plums are normally picked when ripening has been initiated (high mature stage) thus, producing sufficient ethylene to carry on ripening upon arrival to the warehouse. In fruit picked at low maturity, ethylene application during the ripening at 20°C only reduces firmness variability within the sample without speeding up ripening. Therefore, stone fruits harvested at the "high maturity stage" do not need ethylene exposure to ripen properly. Exceptions are the "very slow" ripening plum cultivars, without the ability to produce their own ethylene.

The rate of fruit ripening varies among peach, nectarine, and plum cultivars and it is controlled by temperature. A fast rate of ripening is achieved at 20 to 25°C and as low rate of ripening is accomplished by using lower temperatures (Table 1). Temperatures higher than 25°C will reduce the rate of ripening, inducing off flavors and promoting irregular ripening. White flesh nectarines and peaches have a high rate of softening (Table 2).

Flesh firmness is the best indicator of ripening and one predictor of the potential shelf life. Fruit that reach 6-8 pounds are considered "ready-to-buy." Fruit that reach 2-3 pounds flesh firmness are considered ripe, ("ready-to-eat"). Thus, the end of ripening is determined by the firmness.

Ripening at Shipping Point: Partial ripening after harvest to a specific firmness is starting to be used commercially. Controlled-ripening at 20°C immediately (conditioning) after harvest for 48 hours limits development of mealiness and flesh browning on chilling injury susceptible peach and nectarine cultivars. Longer ripening can be done based on firmness and buyer's requirements. After this partial ripening treatment fruit must be cooled below 2.2°C as quickly as

possible. This protocol allows delivery of fruit “ready to buy” and free of chilling injury symptoms across the country.

Ripening at Retailer Point: Fruit that arrives in your warehouse or retail store should be tested for flesh firmness using a standard fruit penetrometer. A ripening protocol based on warming should be established according to the anticipated consumption schedule (fruit turning schedule). Soft fruit are more susceptible to bruising than hard fruit. To reduce potential physical damage occurring during transportation from the warehouse to retail stores and, handling at the retail stores, we suggest transferring fruit to the retail store before fruit reach 6-8 pounds for peaches and nectarines, and 4-6 pounds for plums (transfer/ shipping point). The establishment of these transfer/shipping points is based only on our previous experience with fruit damage during retail handling. As bruising incidence varies among different retailer operations and among cultivars, you should fine-tune your own transfer points for your conditions

Temperature conditions for stone fruits during and after ripening should be adjusted according to the desired speed of ripening. The rate of fruit softening (number of days to reach 2-3 pounds-force) varies among peach, nectarine and plum cultivars and can be controlled by the storage temperature used (Table 1). For example, mature O’Henry peaches are usually harvested and shipped with a flesh firmness between 10 and 14lbs-force. If these California O’Henry peaches arrived at the distribution center with an average firmness of 12lbs-force and were placed in the 20oC(68oF) room, they will reach 2-3lbs-force (“ready-to-eat”) after 6 days. To reduce bruises, we recommend that stone fruits be delivered to the retail store before they soften below 5-6lbs-force. Thus, the O’Henry peach should be delivered to the retail store by day 3 after arrival. These peaches will be ready- to-eat (2lbs-force) by 48 hours after delivery to the retail store. As stone fruits will continue to ripen in the display case, they should be checked often and the softest fruit be placed at the front of the display. Checking fruit firmness daily is highly recommended to control ripening rate. To slow down ripening speed, stone fruits should be kept at low temperatures.

Peaches, plums, and nectarines harvested at a lower maturity stage than the “well mature stage”, may need added ethylene (100ppm for

24 hours or longer) to ripen evenly. For the “very slow” ripening plum cultivars (such as Angeleno, Black Beaut, Casselman, Kelsey, Late Santa Rosa, Nubiana, Queen Ann, Red Rosa and Roysum) ethylene exposure is required to induce and accelerate the ripening process. Furthermore, ‘Roysum’ must be continuously exposed to ethylene (100 ppm) for several days (normally 3 to 4) at warm temperatures to ripen properly. Without giving special attention to ripening, these “very slow” ripening plum cultivars vary in performance, depending upon chance exposure to ethylene during handling.

References

- Crisosto, Carlos H. 1997. Stone fruit ripening protocol for receivers. 97/101, slide set with cassette tape. Division of Agriculture and Natural Resources.
- Crisosto, Carlos, Katrina Sheaffer, Joan Boyd, David Garner, John Labavitch, and Ken Shackel. 1998. Improving the ripening protocol for warehouses and retail stores. Delayed cooling. 1998 Research Report, California Peaches, Plums, and Nectarines. California Tree Fruit Agreement, pp. 30-46.

Table 1. Ripening rates of peaches, plums and nectarines at 10^o, 20^o and 25^oC measured with a UC Firmness tester (7.9 mm tip).

Cultivar	Rate of Softening (lbs per day)		
	10 ^o C	20 ^o C	25 ^o C
PEACHES			
Spring Lady	0.5	2.1	2.5
Flavorcrest	1.0	2.3	3.4
Rich Lady	1.0	2.2	2.9
Elegant Lady	1.3	2.6	3.3
Zee Lady	1.3	2.5	3.1
Summer Lady	1.1	2.5	2.9
O’Henry	1.0	2.2	2.9
Ryan Sun	1.7	2.5	3.3
Average	1.1	2.4	3.0

Cultivar	Rate of Softening (lbs per day)		
	10°C	20°C	25°C
NECTARINES			
Mayglo	0.7	2.3	3.0
Rose	0.8	1.7	2.8
Diamond			
Red Diamond	0.6	1.6	1.9
Spring Bright	1.2	2.4	2.8
Summer	0.7	2.2	2.8
Bright			
Summer	1.3	2.0	3.2
Grand			
Summer Fire	0.7	1.8	2.1
August Red	0.3	2.1	2.3
September	0.6	1.8	1.9
Red			
Average	0.8	2.0	2.5
PLUMS			
Black Beaut	0.6	0.6	0.9
Santa Rosa	0.3	0.6	0.8
Blackamber	<0.2	0.6	0.7
Fortune	0.4	0.9	1.3
Friar	0.3	0.6	1.3
Simka	0.8	1.2	1.7
Royal	0.3	0.5	1.1
Diamond			
Casselman	0.2	0.5	0.6
Angeleno	0.2	0.4	0.5
Average	0.4	0.7	1.0
APRICOTS			
Patterson	0.2	1.5	1.6

Table 2. Ripening rates of some white flesh peaches and nectarines at 20°C (68°F) measured on the cheek and suture with a UC Firmness tester (7.9 mm tip).

Cultivar	Rate of Softening (lbs per day)	
	Cheek	Suture
PEACHES		
September	3.2	3.3
Snow		
Snow King	4.2	3.7
Average	3.7	3.5
NECTARINES		
Arctic Pride	4.0	4.1
Arctic Snow	4.1	4.6
Average	3.8	4.0