

Table 1 Storage Requirements and Properties of Perishable Products (Concluded)

Commodity	Storage Temp., F	Relative Humidity, %	Approximate Storage Life	Water Content, %	Highest Freezing Point, F	Specific Heat Above Freezing*	Specific Heat Below Freezing*	Latent Heat (Calcu-lation) ^b
Papayas	45	85-90	2-3 weeks	90.8	30.4	0.82	0.47	130
Parsnips	32	90-95	2-6 months	78.6	30.4	0.84	0.46	112
Peaches and nectarines	31-32	85-90	2-4 weeks	86.9	30.3	0.90	0.46	124
Pears (Chapter 47)	29-31	85-90	—	82.7	29.2	0.86	0.45	118
Peas, green	32	85-90	1-2 weeks	74.3	30.9	0.79	0.42	106
Peppers, Sweet*	45-50	85-90	8-10 days	92.4	30.7	0.94	0.47	132
Peppers, Chili (dry)*	32-40	65-75	6-9 months	12.0	—	0.30	0.24	17
Persimmons	30	85-90	2 months	78.2	28.1	0.84	0.43	112
Pineapples	50-60	85-90	3-4 weeks	—	30.2	—	—	—
Mature green	40-45	85-90	2-4 weeks	85.3	30.0	0.88	0.45	122
Ripe	—	—	—	—	—	—	—	—
Plums, including fresh prunes	31-32	80-85	3-4 weeks	85.7	30.5	0.88	0.45	123
Pomegranates	34-35	85-90	2-4 months	—	26.6	—	—	—
Popcorn, unpopped	32-40	85	—	13.6	—	0.31	0.24	19
Potatoes	50-55	85-90	—	—	30.9	—	—	—
Early crop	38-50*	85-90	—	77.8	30.9	0.82	0.43	111
Late crop	—	—	—	—	—	—	—	—
Poultry (Chapters 32 and 42)	—	—	—	—	—	—	—	—
Fresh	32	85-90	1 week	74.0	27.0*	0.79	—	106
Frozen, eviscerated	-20-0	90-95	9-10 months	—	—	—	—	—
Pumpkins*	50-55	70-75	2-6 months	90.5	30.5	0.92	0.47	130
Quinces	31-32	85-90	2-3 months	85.3	28.4	0.88	0.45	122
Radishes—Spring, bunched or prepackaged	32	90-95	10 days	93.6	30.7	0.95	0.48	134
Winter	32	90-95	2-4 months	93.6	—	0.95	0.48	134
Rabbits	32-34	90-95	1-5 days	68.0	—	0.74	0.40	98
Fresh	-10-0	90-95	0-6 months	—	—	—	—	—
Raspberries	—	—	—	—	—	—	—	—
Black	31-32	85-90	7 days	80.6	30.0	0.84	0.44	122
Red	31-32	85-90	7 days	84.1	30.9	0.87	0.45	121
Frozen (red or black)	-10-0	—	1 year	—	—	—	—	—
Rhubarb	32	90-95	2-3 weeks	94.9	30.3	0.96	0.48	134
Rutabagas	32	90-95	2-4 months	89.1	30.1	0.91	0.47	127
Salsify	32	90-95	2-4 months	79.1	30.0	0.83	0.44	113
Spinach	32	90-95	10-14 days	92.7	31.5	0.94	0.48	132
Squash*	—	—	—	—	—	—	—	—
Acorn	45-50	75-85	4-5 weeks	—	30.5	—	—	—
Summer	32-40	85-95	10-14 days	95.0	31.1	0.96	—	135
Winter	50-55	70-75	4-6 months	88.6	30.3	0.91	—	127
Strawberries	—	—	—	—	—	—	—	—
Fresh	31-32	85-90	7-10 days	89.9	30.6	0.92	—	129
Frozen (Chapter 38)	-10-0	—	1 year	72.0	—	—	0.42	103
Sweet Potatoes	55-60	90-95	4-6 months	68.5	29.7	0.75	0.40	97
Tangerines	31-38	90-95	3-4 weeks	87.3	30.1	0.90	0.46	125
Tomatoes	—	—	—	—	—	—	—	—
Mature green	55-70	85-90	2-5 weeks	94.7	31.0	0.95	0.48	134
Ripe	32	85-90	7 days	94.1	31.1	0.95	0.48	134
Turnips, roots	32	90-95	4-5 months	90.9	30.1	0.93	0.47	130
Vegetable seed	32-50	60-65	—	—	—	—	—	—
Yeast, compressed baker's	31-32	—	—	70.9	—	0.77	0.41	102

* Calculated by Siebel's formula. For values above freezing point $S = 0.008s + 0.20$. For values below freezing point $S = 0.003s + 0.20$. (Work on the calorimetric determination of specific heats is now in progress at the University of Texas but values thus obtained are available for only a few products and therefore are not included in this tabulation.)

^b Values for latent heat (latent heat of fusion) in Btu per pound, calculated by multiplying the percentage of water content by the latent heat of fusion of water, 143.4 Btu.

* See text.

* Average freezing point.

* Eggs with weak albumin freeze just below 30 F.

containers where condensed moisture remains. Contact icing is not recommended.

Beer

Beer in bottles or cans is either pasteurized or filtered so as to destroy or remove the living yeast cells and therefore does not require as low a storage temperature as keg beer. Bottled beer may be stored at ordinary room temperature (70 to 75 F), but for convenience is often stored with keg beer at a lower

temperature of 35 to 40 F. It is essential to protect the bottled product from strong light, especially direct sunlight. The storage life will vary from 3 to 6 months depending largely on the method of processing and packaging. Keg beer, usually stored from 35 to 40 F has a storage life of 3 to 6 weeks (Chapter 35).

Beets

Beets are subject to wilting because of the rapid loss of water when the storage atmosphere is too dry. When stored

Commodity Storage Requirements

Table 2 Approximate Rates of Evolution of Heat by Certain Fresh Fruits and Vegetables When Stored at the Temperatures Indicated*

Commodity	Btu per ton per 24 hrs		
	32 F	40 F	60 F
Apples	300-1,500	600-2,700	2,300-7,900
Asparagus	5,900-13,200	11,700-23,100	22,000-51,500
Avocados	—	—	13,200-39,700
Bananas*	—	9,200-11,400	32,100-44,100
Beans, green or snap	—	—	—
Beans, lima	2,300-3,200	4,300-6,100	22,000-27,400
Beets, topped	2,700	4,100	7,200
Blueberries*	1,300-2,200	11,000-17,600	33,800-50,000
Broccoli, sprouting	7,500	6,600-11,000	13,200-27,500
Russell sprouts	3,300-8,300	—	—
Cabbage	1,200	1,700	4,100
Carrots, topped	2,100	3,500	8,100
Cauliflower	1,600	4,500	10,100
Celery	1,300-1,800	—	8,200
Cherries	—	—	11,000-13,200
Corn, sweet	7,200-11,300	10,600-13,200	38,400
Cranberries	600-700	900-1,000	—
Cucumbers	—	—	2,200-6,600
Grapesfruit	400-1,000	700-1,300	2,200-4,000
Grapes, American	600	1,200	3,500
Grapes, European	300-400	—	2,200-2,600
Lemons	500-900	600-1,900	2,300-5,000
Lettuce, head	2,300	2,700	7,900
Lettuce, leaf	4,500	6,400	14,400
Melons, cantaloupes	1,300	2,000	8,500
Melons, honeydews	—	900-1,100	2,400-3,300
Mushrooms*	6,200	12,100	31,600
Okra	700-1,100	800	2,400
Onions	400-1,000	1,300-1,600	3,700-5,200
Oranges	—	—	—
Peaches	900-1,400	1,400-2,000	7,300-9,300
Pears	700-900	—	8,800-13,200
Peas, green	8,200-8,400	13,200-16,000	39,300-44,500
Peppers, sweet	2,700	4,700	8,500
Plums	400-700	900-1,500	2,400-2,800
Potatoes, immature	—	2,600	6,800
Potatoes, mature	—	1,300-1,800	1,500-2,600
Raspberries	3,900-5,500	6,800-8,500	18,100-22,300
Spinach	4,200-4,900	7,900-11,200	36,900-38,000
Strawberries	2,700-3,800	3,600-6,800	15,600-20,300
Sweet Potatoes	1,200-2,400	1,700-3,400	4,300-6,300
Tomatoes, mature green	600	1,100	6,200
Tomatoes, ripe	1,000	1,300	5,600
Turnips	1,900	2,200	5,300

* Data largely from Table 1 of USDA Handbook No. 66, 1964. Acknowledgment is also due to the following for other commodities: Avocados, J. B. Biale; Beets, J. M. Lyons and L. Rapoport; Cucumbers, L. E. Fike and L. L. Morris; Honeydew melons, H. R. Fraas and L. L. Morris; Plums, L. L. Clayton and F. W. Allen; Potatoes, L. L. Morris; all from the Univ. of California; Asparagus, W. J. Lipton, USDA; Cauliflower, lettuce, okra, and onion, H. B. Johnson, USDA; Sweet corn, S. Tewfik and L. E. Scott, Univ. of Maryland.

* Beans at 68 F, 5,100-7,700; at 70 F, 11,400-15,000.

* Mushrooms at 50 F, 22,000; at 70 F, 58,000.

at 32 F with about 95 percent rh, they should keep for 1 to 3 months. Bunch beets under the same conditions will keep 1 to 3 weeks. Contact icing is recommended. The containers should be stacked so as to allow air circulation.

Berries

Fresh strawberries are not stored commercially except for very short periods at 31 to 32 F; 7 to 10 days is probably the maximum. After 10 days, sometimes sooner, the berries lose their fresh bright color, shrivel, and deteriorate in flavor. Raspberries, blackberries, and dewberries are very perish-

able. They may be kept in fair condition about 7 days at 31 to 32 F in a relative humidity of 85 to 90 percent. Blueberries may be stored 3 to 6 weeks at 31 to 32 F.

Cranberries can be stored up to 3 or 4 months at 36 to 38 F depending on variety. For long storage such as this, they are usually stored in the chaff in field boxes. For still longer storage prior to processing they are frozen at 0 F. Cleaned and sorted cranberries can be stored in crates or prepackaged in ventilated 1 lb film bags or cartons at 32 F for 4 to 6 weeks. Fruit held longer at 32 F may develop low temperature breakdown. Cranberries in this condition are rubbery, the flesh is