

Pineapples

Revised 2018

Thermal Properties

	English	Metric
Moisture, %	86.50	--
Protein, %	0.39	--
Fat, %	0.43	--
Carbohydrate, %	12.39	--
Fiber, %	1.20	--
Ash, %	0.29	--
Specific Heat Above Freezing	0.92 Btu/lb*°F	3.85 kJ/(kg*K)
Specific Heat Below Freezing	0.46 Btu/lb*°F	1.91 kJ/(kg*K)
Latent Heat of Fusion	124 Btu/lb	289 kJ/kg

Storage Conditions

Temperature	45-50°F (7-10°C)
Relative Humidity	85-95%
Storage Period	2-4 weeks, depending on cultivar and ripeness stage
Freezing Point	30°F (-1°C)

Fresh Market

Pineapples are sensitive to chilling injury (CI) and should not be held below 45°F (7°C). Susceptibility to chilling varies with fruit maturity and cultivar. Pineapples subjected to too low a temperature take on a dull hue, develop water soaking of the flesh, darken at the core (endogenous brown spot), and are particularly subject to decay when removed from storage. Among those people associated with the production of pineapples for the fresh market, it is generally recognized that a fruit should not be harvested until 1/8 of the outer surface, commonly called the shell, shows a yellow color. This insures a reasonably good quality of fruit, based upon sugar content, acid level, and the presence of substantial quantities of volatile flavor components. Harvesting pineapples at the mature-green stage is not recommended, as pineapples is non-climacteric and do not ripen after harvest.

There are times that the external shell color may be less than 1/8 yellow, yet the internal ripeness may be of good quality with more than 12% soluble solids content. This is generally due to weather conditions during fruit development and ripening. Judgment as to the exact relationship between shell color and internal quality must be made at the time of harvest and can only be made by the grower.

Pineapples can be stored at 45-54°F (7-12°C) for 2-4 weeks under commercial handling conditions, depending on cultivar and fruit maturity. Two weeks is the practical limit for fruit stored at 54°F (12°C); longer storage is possible at 45°F (7°C).

Therefore, it is critical that refrigerated storage of pineapples be uninterrupted. Prolonged display (4-7 days) at room temperature in a retail outlet can, and frequently does, negate all prior careful handling of the fresh product. The longer a fruit is kept out of refrigerated storage, the more likely the fruit will be of poor eating quality.

Fresh pineapple is now dipped in a food grade fruit wax preparation to increase internal carbon dioxide concentration to 5-10% during subsequent handling. This treatment reduces the problem of internal brown spot. Fruit treated in this manner and stored at 45°F (7°C) can be expected to retain quality for at least 3 weeks of storage plus up to 1 week of display.

Diseases and Injuries

Thielaviopsis Rot	Caused by a fungus which generally enters the fruit through a wound. Conditions leading to the maintenance of an open wound in a moist condition, such as rain or wet storage, will lead to an increased incidence of this disease. It is characterized as a soft, wet rot of fruit and core, accompanied by an abnormally yellow color and a strong, fruity odor. In severe cases, the fruit may be reduced to an almost empty shell, containing little but blackened fibers of the vascular system. Control: Through careful handling of fruit, it will be possible to minimize mechanical damage, including cuts and bruises. Little or no <i>Thielaviopsis</i> rot occurs in fruit held at 45°F (7°C), but it may develop when the pineapples are placed at room temperature. The symptoms can become severe in 4-7 days. Control of this rot is possible by using registered postharvest fungicide treatments.
Internal Brown Spot (IBS)	A physiological disorder of the flesh, beginning at the base of the fruitlets (eyes) near the core of the fruit. In the early stages, the spots are watery in appearance and turn gradually to light brown spots. These spots appear about halfway between the core and the shell. In its more severe form, the individual spots enlarge, merge, and eventually involve most of the fruit. This disorder has also been called endogenous brown spot (EBS) and is a form of chilling injury. Control: Continued storage at 45°F (7°C) has resulted in the lowest incidence of the disease when fruit is later displayed at room temperature. It is recommended that storage temperatures of fruit be maintained at 45°F (7°C) and that the display time at room temperature be kept to a minimum. The majority of pineapples are treated with food grade fruit waxes. This treatment results in maintaining a satisfactory shell

	appearance and reducing internal brown spot in fruit held under refrigeration for 3 weeks. Quality is maintained for an additional week of display.
--	---

Fresh Cut Products

Fresh pineapples are increasingly being marketed as value-added, fresh-cut and ready-to-eat slices, wedges, cubes, or other products that are packaged for foodservice or retail markets. These products should be kept at 32-41°F (0-5°C). The lower the storage temperature, the longer the shelf-life of the finished product will be, ranging from 7 to 14 days.

Freezing

Frozen pineapple chunks have been an item of commerce for quite a few years. The principal variety frozen is the Smooth Cayenne, grown in Hawaii and, to a limited extent, in Puerto Rico and other tropical regions. The Red Spanish variety may develop off-flavors when it is frozen. Pineapple, more than most other fruits, has a good texture when thawed due to its slightly fibrous structure.

In recent years, other pineapple products such as crushed and tidbits have been made available as frozen products for the institutional market, principally the bakery trade. Frozen juice concentrates are available for reprocessing.

Pineapples for freezing are prepared in about the same way as for canning. Bins of fruit arriving from the plantation are unloaded onto conveyor belts or into flumes of water. Next, they are washed thoroughly, graded into three or four sizes, and mechanically peeled and cored to produce a cylinder. The cored cylinders are inspected, trimmed, and diverted to a slicing machine and a fixed blade chunk cutter. The chunks are conveyed directly to an IQF or tunnel blast freezer at -30°F (-34°C). Individually frozen pieces are packed in polyethylene bags prior to packaging and frozen storage. Bulk-frozen packages are filled directly from the product line (crushed or tidbits), syruped, and frozen in a low-temperature blast freezer.

Juice concentrate is usually prepared in the same manner as orange juice concentrate and, for reprocessing or repackaging, is packed in collapsible wooden bins or 55-gal (208-L) steel drums lined with polyethylene bags.

Frozen pineapple products can be stored in vapor-proof packages at 0°F (-18°C) for up to 1 year or at -10°F (-23°C) for up to 1.5 years.

WFLO is indebted to Dr. Adel A. Kader, Department of Plant Sciences, University of California at Davis, and Dr. Elhadi Yahia, Universidad Autonoma de Queretaro, for the review and revision of this topic.