STORAGE/SHELF LIFE RECOMMENDATIONS

	AMBIENT STORAGE <70°F	REFRIGERATED STORAGE <45°F	FROZEN STORAGE <0°F
EVAPORATED APPLES / INTERMEDIATE MOISTURE APPLES			
Contains Sulfites (500-1500 ppm)	18 Months	2 Years	Not Necessary
No Treatment	1 Year	2 Years	Not Necessary
Alternative Preservatives	Not Recommended	6 Months	2 Years
LOW MOISTURE APPLES			
Contains Sulfites (500-1500 ppm)	2 Years	4 Years	Not Necessary
No Treatment	2 Years	4 Years	Not Necessary
Alternative Preservatives	18 Months	2 Years	Not Necessary
Tenderized/Rolled Flakes (totes) (With or without preservatives)	6 Months	2 Years	Not Necessary
LOW MOISTURE POWDERS AND FLAKE POWDERS			
Standard (with Calcium Stearate)	Not Recommended	2 Years	Not Necessary
Without Calcium Stearate	Not Recommended	2 Years	Not Necessary
INFUSED APPLES AND FRUIT SENSATIONS®			
Infused Apples	Not Recommended	18 Months	2 Years
Fruit Sensations®	1 Year	18 Months	2 Years
APPLE SAUCE			
Unopened in Original Container	Not Recommended	1 Year	Do Not Freeze

Please note: Based on new shelf life studies, we have revised our storage and shelf life recommendations. Products manufactured after 8/1/19 will reflect these updates on product labels.

STORAGE/SHELF LIFE RECOMMENDATIONS

FRUIT JUICE CONCENTRATES

	AMBIENT (<70°F)	REFRIGERATED (<45°F)	FROZEN (<0°F)
Standard (Type I) or Organic	Not Recommended	18 Months	2 Years
Natural/Cloudy Apple Concentrate	Not Recommended	Not Recommended	2 Years
All Color Reduced Concentrates	Not Recommended	Not Recommended	18 Months
Specialty Concentrates	Not Recommended	Not Recommended	18 Months

FRUIT PUREE (SINGLE STRENGTH & CONCENTRATED)

	AMBIENT (<70°F)	REFRIGERATED (<45°F)	FROZEN (<0°F)
Aseptic Packaged (Tree Fruit)	2 Years	3 Years	Do Not Freeze
Aseptic Packaged (Berries)	6 Months	18 Months	Do Not Freeze
Pasteurized Purees*	Not Recommended	21 Days at <40°F*	2 Years

ESSENCE

	AMBIENT (<70°F)	REFRIGERATED (<45°F)	FROZEN (<0°F)
All Fruit Juice Essences	Not Recommended	24 Months	Not Recommended

FRUIT PREPS AND BASES

	AMBIENT (<70°F)	REFRIGERATED (<40°F)	FROZEN (<0°F)
Aseptic Packaged	6 Months	18 Months	Not Recommended
Pasteurized	Not Recommended	21 Days at <40°F	2 Years

Please note: Based on new shelf life studies, we have revised our storage and shelf life recommendations. Products manufactured after 8/1/19 will reflect these updates on product labels.

TREE TOP
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Dried Shelf Life Study Leads to Updated Recommendations

June 24, 2019

Tree Top processes fruit into numerous dried ingredients for the food industry. Apples are air dried into evaporated or low moisture pieces. Some of these low moisture pieces are further processed into flakes, primarily for the hot cereal industry, or further reduced in size to granules or powder. Fruit is also processed into a low moisture powder utilizing drum dry technology. Tree Top has a long history of producing safe, quality dried ingredients for the food industry.

Historically, the declared shelf life of these products range from 18 months to 5 years at refrigerated temperatures based on quality as the safety of these products is likely ensured well beyond this time period. There have been shelf life studies carried out over the years, but none encompassing the breadth of Tree Top's dried product offerings or examining the full range of attributes of concern. With this information in mind, a five year study was undertaken in 2016 to create a body of data for our low moisture and evaporated moisture products. The data supports extending the shelf life beyond our current shelf life for some of our products.

Full cases of finished goods were stored at 0°F, 40°F, and ambient storage. A case or bag of each product was pulled from storage 4 times the first year. In the subsequent years, products were pulled twice a year at 40°F and ambient and once per year for 0°F. Attributes measured (when appropriate) were moisture, water activity (A_w), Hunter color (Lab), micro (total plate count, yeasts, and mold), sulfites, caking, and flavor. Data has now been collected and analyzed for 2 years.

Evaporated apples have been dried to 12-26% moisture. Sulfites are applied to some items to preserve color. Sulfited items are typically higher in moisture (20-26% moisture) whereas untreated evaporated apples are typically less than 20% moisture due to mold concerns. The previous refrigerated shelf life recommendations for evaporated apples were 2 years for sulfited and 18 months for untreated apples. The data revealed that untreated apples do not lose quality any faster than sulfited apples, so the shelf life for untreated evaporated apples has been extended to 2 years.

Low moisture apples are air dried to less than 4% moisture. Sulfites can be added to preserve color. The previous refrigerated shelf life recommendations for low moisture apples were 5 years for sulfited and 2 years for untreated apples. The data revealed that untreated apples do not lose quality any faster than sulfited apples. Moisture uptake over time is a concern and based on the data, the shelf life for low moisture sulfited was decreased from 5 years to 4 years. The refrigerated shelf life of untreated low moisture

apples was increased to 4 years to align with sulfited low moisture apples based on the shelf life study results.

Low moisture powders are produced by two different processes. One process involves taking low moisture air dried apples that are milled and sieved to specification. The other powder process is drum drying. The previous refrigerated shelf life recommendations for powders were 2 years with calcium stearate and 12 months without calcium stearate. The data showed that clumping does not significantly increase during refrigerated storage while it remained in the original sealed packaging. For this reason, the shelf life of powders without calcium stearate was increased to 2 years to align with powders containing calcium stearate based on the shelf life study results.

This shelf life study has greatly increased our knowledge of low moisture and evaporated apple storage at 0°F, 40°F, and ambient temperatures and has generated valuable data. It is important to note that no food safety issues have developed over time at any of the storage temperatures, which was expected based on the low water activities of these products. The shelf life recommendations are based on quality due to the enduring safety of Tree Top's low moisture and evaporated products. More in depth summaries are available on these product lines upon request. I am happy to share and discuss the data if you have any questions.

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