Quality and adequacy for long-term storage of dehydrated apple slices packaged in No. 10 cans

T. S. Oesterle

Lynn V. Ogden

See next page for additional authors

Follow this and additional works at: https://scholarsarchive.byu.edu/facpub

Part of the Food Science Commons, and the Nutrition Commons

Original Publication Citation

BYU ScholarsArchive Citation
Oesterle, T. S.; Ogden, Lynn V.; and Pike, Oscar A., "Quality and adequacy for long-term storage of dehydrated apple slices packaged in No. 10 cans" (2003). All Faculty Publications. 35.
https://scholarsarchive.byu.edu/facpub/35

This Poster is brought to you for free and open access by BYU ScholarsArchive. It has been accepted for inclusion in All Faculty Publications by an authorized administrator of BYU ScholarsArchive. For more information, please contact scholarsarchive@byu.edu, ellen_amatangelo@byu.edu.
Authors
T. S. Oesterle, Lynn V. Ogden, and Oscar A. Pike

This poster is available at BYU ScholarsArchive: https://scholarsarchive.byu.edu/facpub/35
Quality and adequacy for long-term storage of dehydrated apple slices packaged in No. 10 cans

Oesterle, T.S., L.V. Ogden, and O.A. Pike
Department of Nutrition, Dietetics and Food Science  Brigham Young University  Provo, UT 84602

ABSTRACT
Dehydrated food commodities can be packaged in restaurant-size No.10 cans intended for long-term storage for such uses as personal storage, emergency relief efforts and military rations. Because foods packaged for long-term storage are seldom opened soon after purchase, the quality of the product or the adequacy of the packaging could be unknown to the buyer for months or even years. The objective of this research was to compare the quality of various brands of dehydrated apple slices sold at the retail level in No. 10 cans and to evaluate the adequacy of the packaging for long-term storage.

Nine brands of dehydrated apples packaged in No. 10 cans were obtained from retail distributors in four states. All were labeled as being pre-treated with sulfur dioxide to prevent browning. All cans contained oxygen absorbers and were labeled as having an oxygen-free environment. A 50-member consumer panel evaluated aroma, flavor, and overall acceptability using a 9-point hedonic scale. Other observations included headspace oxygen, can seam evaluation, product color, water activity and Vitamin C content.

Headspace Oxygen, Can Seams, and Water Activity

Headspace oxygen was measured using the 3500 Series Headspace Oxygen Analyzer (Dumas Instruments, Inc., Jarmulow, IL). Can seams were evaluated using the SeamMate System (Onevision Corporation, Westerville, OH) to measure the following seam dimensions: thickness, width, body hook, cover hook, and overlap. Seam tightness was rated on a scale of 0-100%. The seams were given an overall rating of good, fair, or poor by an experienced evaluator. Water activity was measured using an Aquapal CR-2 (Decovac Devices, Inc., Pullman, WA).

Sensory Evaluation
Sensory analysis was conducted at the BYU Sensory Laboratory using standard procedures. Samples were served from the can, without further preparation, in a randomized manner to a 50-member consumer panel in 4 visits. Panels evaluated aroma, flavor, and overall acceptability using a 9-point hedonic scale.

RESULTS

INTRODUCTION
Apples have been called the most important temperate fruit in the world (Taiwo 2001). Dehydrated apples (approx. 3% moisture) are commonly stored in No. 10 cans for long term storage purposes such as emergency relief efforts, military rations and personal storage. Dehydrated apples have been found to retain their flavor, color, and odor for as long as three years when properly stored (Smock and Neubert 1950; Norseth 1986).

Because foods packaged for long-term storage are seldom opened soon after purchase, the quality of the product or the adequacy of the packaging could be unknown to the buyer for months or even years. The objective of this research was to compare the quality of various brands of dehydrated apple slices packaged in No. 10 cans and to evaluate the adequacy of the packaging for long-term storage.

METHODOLOGY

Samples
Nine brands of dehydrated apples, packaged in No. 10 cans, were obtained from retail distributors in four states. Eight of the brands were apple slices and the ninth was apple cubes. All the brands were stored in oxygen-free environments, contained oxygen absorbers and were pretreated with sulfur dioxide. Product codes indicated the samples were less than 1 year old. Duplicate samples of each brand were evaluated.

FIG. 1. Headspace oxygen content in cans of dehydrated apples. Error bars represent standard deviation.

FIG. 2. Can seam cross section, tightness rating and overall seam rating, for each brand of dehydrated apple.

FIG. 3. Water activity of canned dehydrated apples. All brands are slices except Brand C which is cubes. Error bars represent standard deviation.

The United States standard for dehydrated (low moisture) apples requires a 3% moisture content for grade A apple slices. This corresponds to a water activity between 0.2 and 0.3 (Iglesias 1982). Although water activity varied between brands, all values were within this range.

Sensory Evaluation
Hedonic scores, shown in Fig. 4, ranged from 4.6 to 7.0 (dislike slightly to like moderately). Scores for aroma, flavor and texture mirrored the overall hedonic score for each brand, which ranged from 4.8 to 6.8. Though there were significant differences between brands, seven of the nine brands had overall acceptability scores above 6.0 (like slightly).

Color
L* a* b* values are shown in Table 1. There was little variation in color or the general appearance of the dehydrated apple slices. The sample of cubed dehydrated apples was visibly darker and redder in appearance, as reflected in the L* and a* scores.

Vitamin C
Vitamin C content of each brand is shown in Fig. 5. There was some variation between brands, but all brands exceeded the USDA National Nutrient Database for Standard Reference amount for dehydrated apples (22, µg/g). The high content is likely due to an osmotic dehydration process that includes ascorbic acid in the syrup. Acid-catalyzed reactions increase water loss during processing (Monsalve-Gonzalez 1993). Ascorbic acid was not reported as a preservation or nutritional additive by any of the brands. Brands D, E, F, G, and H reported vitamin C on their labels, but each of these brands had measured amounts that were less than half the label amount. Brands A and B reported 0% vitamin C though it was found in both brands. Brands D and G did not show a nutrition facts label, but vitamin C was present in both brands.

TABLE 1. CIE L*, a*, b* color values of various brands of canned dehydrated apple slices.

<table>
<thead>
<tr>
<th>Brand</th>
<th>Type</th>
<th>L* value</th>
<th>a* value</th>
<th>b* value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Slices</td>
<td>65.047</td>
<td>0.315</td>
<td>3.042</td>
</tr>
<tr>
<td>B</td>
<td>Slices</td>
<td>63.395</td>
<td>0.450</td>
<td>4.409</td>
</tr>
<tr>
<td>C</td>
<td>Slices</td>
<td>62.745</td>
<td>2.175</td>
<td>6.415</td>
</tr>
<tr>
<td>D</td>
<td>Slices</td>
<td>63.069</td>
<td>2.875</td>
<td>6.895</td>
</tr>
<tr>
<td>E</td>
<td>Slices</td>
<td>61.662</td>
<td>4.057</td>
<td>7.264</td>
</tr>
<tr>
<td>F</td>
<td>Slices</td>
<td>62.266</td>
<td>5.336</td>
<td>7.516</td>
</tr>
<tr>
<td>G</td>
<td>Slices</td>
<td>63.057</td>
<td>3.257</td>
<td>9.607</td>
</tr>
<tr>
<td>H</td>
<td>Slices</td>
<td>63.069</td>
<td>2.875</td>
<td>6.895</td>
</tr>
<tr>
<td>I</td>
<td>Slices</td>
<td>62.745</td>
<td>2.175</td>
<td>6.415</td>
</tr>
</tbody>
</table>