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Effects of long-term storage on quality of retail-packaged pinto beans

Cyrus M. Larson, Aram R. Sloan, Lynn V. Ogden and Oscar A. Pike
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Abstract
There is interest in storing low-moisture foods for long periods of time for uses such as personal preparedness, disaster relief efforts and space travel. Pinto beans in restaurant-canned 10¢ cans are available in the retail market, but work is needed to determine the effects of storage-conditions and monitoring on the quality of long-term stored pinto beans.

Introduction
There is interest in storing low-moisture foods for long periods to use in disaster relief efforts and space travel. Pinto beans in restaurant-canned 10¢ cans are available in the retail market, but work is needed to determine the effects of storage-conditions and monitoring on the quality of long-term stored pinto beans.

Methodology
Samples
Fifteen samples (and duplicates from the same lot of samples 1-14, 16 and 20) of pinto beans packaged in 10 cans were obtained from donors. The pinto beans were monitored at 34 °C and 62% RH for a period of 20 years. The beans were stored at room temperature (approximately 32 °C) and ranged in age from 0.75 to 22.16 years. A 58-member consumer taste panel evaluated the sensory quality and acceptability using a 9-point hedonic scale. Acceptance was determined by asking if a sample would be eaten. The percentage was determined by an experienced evaluator. The sensory acceptance and rejection of pinto beans were categorized as excellent, good, satisfactory or poor. All other cans received ratings of poor. The high oxygen levels in the samples resulted in the absence of the characteristic aroma, texture, flavor and overall acceptability of the beans.

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Craig C. Chieren 1982). Water activity significantly increased with age (Roberts and others 2002) which corresponds to a range in digestibility of the collected samples giving an indication of their visual appearance.

There was significant correlation between water activity and texture, flavor and overall acceptability. There was no correlation between the headspace oxygen and the sensory quality of beans.

Acceptance as a part of a regular diet ranged from 18.3 to 75.0%, and acceptance for emergency pinto beans ranged from 20.2 to 84.4% (Figure 4). For both regular diet and emergency use, sensory acceptance was declining significantly with increasing sample age.

Protein digestibility
In vitro protein digestibility was evaluated following the standard method of the American Association of Cereal Chemists. The method includes the extraction of protein and the determination of the nitrogen content. The method is described in detail in Table 2. The method includes the extraction of protein and the determination of the nitrogen content. The method is described in detail in Table 2.

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Activity and Color
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Results and Discussion
Table 1. CIE 1976 L*, a* and b* values for uncooked pinto beans stored up to 20 years.

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>L*</th>
<th>a*</th>
<th>b*</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1</td>
<td>25</td>
<td>4</td>
<td>25</td>
</tr>
<tr>
<td>1-5</td>
<td>24</td>
<td>3</td>
<td>25</td>
</tr>
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<td>24</td>
<td>3</td>
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<td>10-15</td>
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<td>4</td>
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<td>15-20</td>
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<td>20-25</td>
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<td>&gt;25</td>
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References


REFERENCES

Statistical analyses were performed using ANOVA and Duncan’s multiple range tests for means separation using SAS software. A *p<0.05 was considered significant.