Thermostabilized Shelf Life Study

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RESULTS AND DISCUSSION

SHELF LIFE CALCULATIONS

- Shelf life will be determined by:
  - Identify the quality attribute, such as color, flavor, or texture, that will determine the shelf life.
  - Determine the $Q_f$ for the product based on quality changes for the three temperatures.
  - The $Q_f$ is a measure of the rate of a reaction changes for every 10°C change in temperature.
  - The $Q_f$ provides a prediction of shelf life at different temperatures.

<table>
<thead>
<tr>
<th>Preservation Method</th>
<th>Typical $Q_f$ Values</th>
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</thead>
<tbody>
<tr>
<td>Thermally Processed</td>
<td>1 – 6</td>
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<tr>
<td>Frozen</td>
<td>3 – 40</td>
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</tbody>
</table>

Shelf life at temperature $T$-C:

Shelf life projected to be 48 months at $72^\circ$F

Fruits (Apricot Cobbler)

- Survival of vitamin C demonstrated a clear linear decline with time and temperature. At baseline, the content was 179 mg/100g. After 36-month storage at $72^\circ$F, the content was 4.87 mg/100g.
- Shelf life projected to be 65 months at $72^\circ$F

RESULTS AND DISCUSSION

Minced in general:

- Texture is the most altered quality attribute due to denaturation of the muscle proteins and the migration of free water, cross-linking of proteins and neutralizing sodium chloride contributing to the toughness of meat.
- Fat, fibers, and protein, with higher unaltered lipid content and more variability to contain differing for products.

Grilled Pork Chops:

- Color, texture, and aroma are more susceptible to oxidation failure.
- Product failure was attributed to declining scores for shelf life, resulting in lower quality products and should be investigated further.

Bulk Ingredients - Cocoa Powder, Dried Egg Whites, Corn Starch

All three products maintained their functionality over the three year test suggesting that the shelf life is at least 5 years.

- Corn Starch
  - Shelf life is determined by safety, acceptability, and nutritional content.
- Nutritional content
  - Safety is not an issue due to the processing
  - Acceptability is dependent on formulation and processing conditions
- Nutrition is lost over time
- Nutrition can protect the food from degradation
- Formulations that contain whole eggs at a significant level do not provide acceptable products using the current thermostabilization process
- Fruit products tend to brown over time. The Maillard Browning reaction affects color and flavor
- The current thermostabilization process will not provide a 5-year shelf life for all formulations

Vegetables (Carrot Coins)

- Overall acceptance score for carrot coins declined gradually over the storage period with the comments as "too mushy" or "tasteless, not fresh anymore."
- Shelf life projected to be 48 months at $72^\circ$F

Eggs (Broccoli Soufflé, Vegetable Omelet)

- Eggs are difficult to product a thermostabilized egg product due to egg-white react product dark pigments, decreasing the nutritive value of the protein and results in a higher temperature rise.
- Both products were unacceptable shortly after production indicating a shelf life of 6 months
- Shelf life projected to be 48 months at $72^\circ$F

MATERIALS AND METHODS

- Products stored at three temperatures – $40^\circ$F, $72^\circ$F, and $95^\circ$F for an accelerated shelf life test
- Products are evaluated for baseline within three weeks of production
- Evaluations are every four months for the first 2 years and every 6 months for the 3rd year
- Sensory testing includes difference from control testing and overall acceptance testing
- Analytical tests include texture, color, moisture, and water activity determination

REFERENCES


CONCLUSIONS

- Shelf life is determined by safety, acceptability, and nutritional content
- Safety is not an issue due to the processing
- Acceptability is dependent on formulation and processing conditions
- Nutrition is lost over time
- Sugar can protect the food from degradation
- Formulations that contain whole eggs at a significant level do not provide acceptable products using the current thermostabilization process
- Fruit products tend to brown over time. The Maillard Browning reaction affects color and flavor
- The current thermostabilization process will not provide a 5-year shelf life for all formulations
- The emerging technologies of high pressure processing and microwave sterilization appear to result in higher quality products and should be investigated further.