Thermostabilized Shelf Life Study

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ABSTRACT

The objective of this project is to determine the shelf life of thermostabilized food items by means of actual storage and testing.

The primary goal of the Advanced Food Technology Project is to assess the potential of the food being positioned prior to the crew arrival. Therefore, it is anticipated that foods which were used during the Mars missions will require a 5-year shelf life.

Shelf life criteria are safety, nutrition, and acceptability. Any of these criteria can be limiting factors in determining the food’s shelf life.

Due to the heat sterilization process used for the thermostabilized food items, safety will be preserved as long as the integrity of the package is maintained.

Nutrition and acceptability will change over time. Since the food can be the sole source of nutrition to the crew, a significant loss of nutrition may determine when the shelf life endpoint has occurred.

Shelf life can be defined when the food item is no longer acceptable. Acceptability can be defined in terms of appearance, flavor, texture, or aroma.

Results from shelf life studies of the thermostabilized food items suggest that the shelf life of the foods range from 0 months to 8 years, depending on formulation.

RESULTS AND DISCUSSION

METHODS

- Products stored at three temperatures – 40°F, 72°F and 95°F for an accelerated shelf life test.
- Products are evaluated for baseline within 3 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.

RESULTS AND DISCUSSION

Materials and Methods

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RESULTS AND DISCUSSION

Entrées (Pork Chops, Tuna Noodle Casserole)

Meats 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 nates/pseudosalt/produced solubility contributes to the toughness of meat.
- Fatty tissues and pork, with higher unsaturated lipid content and more susceptible to oxidation.

Grilled Pork Chops

- Visual results showed losses at higher storage temperatures.
- Changes to the product were rated as a reason for product failure.
- Shelf life projected to be 87 months at 72°F

Tuna Noodle Casserole

- Product failure was attributed to decarboxylation for hardening of meat and discoloring of color during the 36-month study.
- Vitamin B6, thiamine, and pantothenic acid showed linear decline as the holding temperature increased.
- Shelf life projected to be 49 months at 72°F

Vegetables (Carrot Coins)

- Gradual decrease in all related color values at all temperatures over the storage period. Yellow in particular.
- Overall acceptance for carrots declined gradually over the storage period with the comments as “too mushy”.
- Shelf life projected to be 48 months at 72°F

Eggs (Broccoli Soufflé, Vegetable Omelet)

- It is difficult to produce a thermostabilized egg product due to sugar-amino reactions produce dark pigments, decreasing the nutritive value of the protein resulting in a lack of hardening of the texture.
- Both products were unacceptable shortly after production indicating a shelf life of 0 months.
- Testing was conducted to analytical data to try to better understand where the deterioration happens.

Vegetable Omelet

- Sensory panel did not find the 0-month (baseline) product to be acceptable, due to rubbery texture and brown color.
- Color continued to darken over time but the texture did not change.
- Vitamin B1, B6, and pantothenic acid and folate acid demonstrated a linear decline with time and temperature.

Broccoli Soufflé

- Sensory testing shortly after production yielded an overall acceptance score below the established acceptance level.
- Overall decline of product color over time and a decreased in green color for samples held at 72°F and 95°F

REFERENCES