Thermostabilized Shelf Life Study

M.H. Perchonok, P.M. Catauro
NASA JSC, 2101 NASA Parkway, Houston, TX 77050

ABSTRACT

The primary goal of the Advanced Food Technology Project is to develop shelf-stable foods for use during long-duration space missions. The project is investigating a range of potential shelf-stable foods, which might include dehydrated meats, dehydrated vegetables, and dehydrated fruits. Foods 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 a difference from control testing and overall acceptability testing. Textural analysis includes the texture, color, moisture, and water activity determination.

MATERIALS AND METHODS

Products stored at three temperatures, 40°F, 72°F, and 95°F for an accelerated shelf life test. Products are evaluated for baselines 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 a difference from control testing and overall acceptability testing. Textural analysis includes the texture, color, moisture, and water activity determination.

RESULTS AND DISCUSSION

Entrées Pork Chops, Tuna Noodle Casserole

**Grilled Pork Chops**
- Vitamin B1 levels showed losses at higher storage temperatures
- Droniness of the product was cited as a reason for product failure
- Shelf life projected to be 87 months at 72°F

**Tuna Noodle Casserole**
- Product failure was attributed to declining scores for hardening of noodles and darkening of color during the 36 month study
- Vitamin A, B1 and B12 demonstrated a linear decline with temperature
- Shelf life projected to be 48 months at 72°F

Sweets (Bread Pudding)

**High sugar items tend to have longer shelf lives**
- Overall flavor, level of sweetness, and texture, and overall acceptability showed a decline due to the Maillard Browning reactions. The three most prevalent ingredients; milk, sugar, and egg, would provide sufficient amounts of free amino groups and reducing sugar to allow for condensation reactions to occur
- Shelf life projected to be 48 months at 72°F

Vegetables (Carrot Coins, Sugar Snap Peas)

**Gradual decreases in all related color values for all temperatures over the storage period, yellow in particular.**
- Vitamin B1 levels showed losses at higher storage temperatures
- Overall acceptability scores for carrot coins declined gradually over the storage period with the comments as “too mushy”
- The 40°F and 72°F samples were still acceptable after three years.
- The sugar snap peas were unacceptable at all temperatures at 20 months due to bitter aftertaste and darker color
- Shelf life projected to be 20 months at 72°F

Cheese and Vegetable (Palak Paneer)

**Overall acceptability and specifically aroma scores decreased over time likely due to oxidation of the spices and lipids (cheese).**
- Color changes indicated a loss of green color in the spinach and a darkening of the cheese over time.
- Shelf life for both products projected to be 20 months at 72°F

Shelf Life for both products projected to be 20 months at 72°F

Starch (Homestyle Potatoes)

**Flavor decreased over time due to acidic aftertaste, off aroma, and overall decrease in flavor.**
- There was a significant decline in folate content and pantothenic acid
- Shelf life projected to be 48 months at 72°F

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
- Food products tend to broken 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

EXTENDS

- Complete analysis of 16 month data for the last two products – Roasted Vegetables and Thyme Brown Rice
- Based on the projected shelf life of these 13 items, shelf life of all of NASA’s thermostabilized food products will be predicted. Report will be completed in April 2009.

REFERENCES