Shoolini University

ESU 009– Nutraceuticals stability concerns and shelf life testing

Lecture 36

- The acceptability of a food product is achieved by its quality and nutritional content being maintained from the time of processing through distribution and storage to the final consumption of the product.

- Nutraceuticals are subjected to the same types of quality losses during storage as food and pharmaceutical products.

- To maintain consumer acceptance and avoid possible governmental action, nutraceuticals should be evaluated for stability, including determination of product shelf life and insuring accurate label claims.

- The physiological benefits of nutraceuticals are achieved only if

(1)The product is consumed

(2)The bioactive substance is present at the required concentration.

- Shelf life is defined as the length of time after processing that a product remains acceptable to the consumer from a quality or safety perspective.

A product can lose shelf life in several ways:

✓Microbial growth

✓Physical changes

✓Chemical reactions

Effect of temperature on stability

- Temperature has a dramatic effect on the rates of chemical reactions.
- The primary effect of temperature is changes in water activity, melting of lipids etc.
- Product deterioration increases as temperature increases, which is the rationale for storing food and pharmaceutical products under refrigerated conditions.
- Establishing quality control procedures during processing and distribution can help reduce excessive temperature exposure of the product.
- Controlling temperature abuse is the primary way to increase the shelf life of nutraceuticals and functional foods and to improve the accuracy of their nutritional labeling.

Effect of moisture on stability

- The importance of moisture content and water activity has long been recognized with respect to the evaluation of product stability and prediction of shelf life, especially for dry powders and intermediate moisture foods.

- Food stability generally correlates better with water activity than moisture content.

- Water activity (aW), which is related to the chemical potential of water, can be defined as:

$$aW = p/po$$

  - where p is the partial pressure of water in a product at a given temperature, and po is the partial pressure of pure water at that same temperature.

  - Water activity values range from 0 at dryness to 1 for pure water

- Moisture transfer within a product or between the product and the exterior environment can lead to a loss of shelf life.

- Moisture gain can cause enhanced chemical reactivity as well as undesirable physical changes (stickiness, loss of crispness).

- Thus, the selection of packaging to reduce moisture gain (or loss) is important for maximizing nutraceutical stability.

- The use of anticaking agents, such as calcium silicate, can help reduce undesirable clumping of powders, whereas the use of humectants (e.g., glycerol, sucrose, salt) can reduce water activity.

- Controlling undesirable effects associated with moisture is the second approach toward improving nutraceutical stability

Effect of oxygen on Stability

- Several nutraceutical ingredients are sensitive to oxygen. Polyunsaturated fatty acids, β-carotene, and vitamin C are all subject to enhanced degradation due to oxidation.

- For example, water containing vitamin C and 5 ppm copper at pH 3.2 and 30°C lost 30% more vitamin C when shaken for 30 min (oxygen incorporated) as compared to unshaken solutions.

- Lipid oxidation is also affected by the amount of available oxygen

- If oxygen-sensitive substances exist in the nutraceutical, selection of oxygen impermeable packaging can help extend product shelf life.

Thank you

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