

ESU 009– Nutraceuticals stability concerns and shelf life testing

Lecture 37



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.

- Encapsulating these ingredients to shield them from oxygen may also limit oxidation.
- In addition, the use of antioxidants can be beneficial for extending product quality.
- The stability of lycopene in tomato oleoresins was improved by incorporating antioxidants.
- Packets of iron enclosed in the product's package also keep the oxygen content low; the iron reacts with oxygen to form iron oxide (i.e., rust).
- By removing oxygen from the package, these oxygen scavengers help prevent undesirable oxidation during product storage.

Effects of ingredients on stability

- Nutraceuticals and functional foods contain more than just the bioactive ingredient in the formulation.
- These products often contain amines (e.g., amino acids, proteins), carbonyls (e.g., sugars, flavors), minerals, and buffer salts, among other substances.
- These substances can have dramatic effects on the chemical stability and ultimate acceptability of the nutraceutical.
- Amines and carbonyls react via the Maillard reaction to cause flavor modification, amino acid destruction, and brown discoloration.
- If the bioactive substances in nutraceuticals contain amine or carbonyl groups, the possibility exists for them to degrade via the Maillard reaction.

- The presence of minerals, either intentionally added or naturally occurring, can also influence product stability.
- Lipid oxidation is catalyzed by the presence of minerals (e.g., iron, copper), which results in potent off-flavors and aromas.
- A small amount of such oxidation can result in an unacceptable product. Similarly, vitamin C degradation is also catalyzed by metal ions.
- Thus, fortifying a nutraceutical with both vitamin C and a mineral, such as iron, can lead to enhanced vitamin C degradation and nutritional labels that are no longer in accordance with federal regulations.

Thank you

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