# ESU 009– Effect of storage on nutraceutical compounds

Lecture 34

- Compared to losses during processing, subsequent storage often has a small but significant effect on vitamin and bioactive compound contents.

- Reaction rates are relatively slow at ambient or reduced temperature.

- Exclusion of oxygen (e.g., through vacuum or hot filling, oxygen impermeable packaging or inert atmosphere), protection from light, storage at low temperature protect these compounds from decomposition.

- Nutrients in dehydrated products are more likely to undergo degradation during storage because of the greater surface area exposed to oxygen and light.

- Blanched products generally resist decomposition better than unblanched foods during storage.

# Degradative Reactions during Processing and Storage

- The chemical changes during processing and storage of carotenoids, ascorbic acid, anthocyanins and folates will be discussed because these are the health-promoting food components most susceptible to degradation.
- The major alterations of the highly unsaturated carotenoids during processing and storage are isomerization and enzymatic or non-enzymatic oxidation.
- Isomerization of *trans*-carotenoids, the usual configuration in nature, to the *cis*-isomers is promoted by acids, heat and light.
- Enzymatic or non-enzymatic oxidation is the main cause of carotenoid destruction during processing and storage of food.

- Enzyme-catalyzed oxidation takes place prior to heat treatment, during peeling, slicing and pulping.

- Non-enzymatic oxidation occurs during and after thermal processing.

- It is increased by destruction of the cellular structure, increase of surface area or porosity, duration and severity of processing, duration and conditions of storage, permeability of the packaging material to oxygen and exposure to light.

- Oxidation begins with the introduction of oxygen into the carotenoid molecule, forming carotenoid epoxides, followed by cleavage.

- Among the flavonoids, anthocyanins are the most studied in terms of processing and storage effects, probably because they are highly unstable and reactive, and they play the dual role of being natural pigments and bioactive compounds.

- They impart red, blue and purple hues to fruits, especially temperate fruits,

- Anthocyanin stability has been shown to be affected by various physical and chemical factors, such as the chemical structure and concentration of the anthocyanins, temperature, pH, light, oxygen, presence of enzymes, proteins, metallic ions and other flavonoids and phenolics.

- These pigments readily degrade during processing and storage of foods, resulting in dramatic impact on color and their health-promoting properties

# Recommendations for maximum retention of health-promoting food components

For home preparation and storage:

- Plant or buy varieties/cultivars rich in micronutrient and bioactive compounds.
- Store raw fruits and vegetables intact and keep storage time short. Store at refrigerated temperature for more prolonged storage.
- If sun-drying is needed, protect food from direct sunlight.
- Avoid peeling fruits and vegetables when the peel is edible.
- Wash fruits and vegetable before peeling or cutting, not after.
- Avoid cutting of fruits and vegetables into very small pieces and consume or cook them immediately after peeling, cutting, chopping or pulping.

For commercial processing and storage:

- Choose raw materials rich in micronutrients and bioactive compounds.
- Store raw fruits and vegetables intact; keep storage temperature low and the duration short.
- Wash fruits and vegetable before peeling or cutting, not after.
- Process immediately after cutting operations; minimize losses during pulping or juicing.
- Blanch and process under conditions optimized for each food.
- Minimize processing time and temperature. High-temperature, short time processing is a good alternative.

- Exclude oxygen through vacuum or hot-filling, oxygen-permeable packaging or inert atmosphere.

- Protect food from direct sunlight during traditional sun-drying or use a solar dryer.

- Protect processed product from light and store at low temperature.

# Thank you

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