ESU 009– Effect of Processing on nutraceutical compounds

Lecture 33

INTRODUCTION

- Bioactive compounds are sourced from plant and animal secondary metabolites.
- They are linked to the reduction of the development and progression of life style diseases
- Now-a-days most of the plant foods are processed. Recent studies have shown, the processing technology and storage can alter the functional properties. So it is important to know the improvement or diminishment of bioactive compounds after different types of processing.
- Thermal processing (boiling, microwaving, roasting, steaming, drying etc) and novel non-thermal processing (freezing, irradiation, high hydrostatic pressure, pulsed electric field, reverse osmosis, fermentation) affect the concentration of bioactive ingredients.
- Food processing that include physical damage such as maceration, exposure to elevated temperatures and separation techniques can result in oxidation, thermal degradation and leaching of bioactive compounds in processed food.

EFFECT OF BOILING

- The length of time for boiling (boiling point 100 C) process varies greatly. Boiling normally decreases the concentration of water-soluble compounds such as ascorbic acid.
- However, bioactive phenolic compounds that do not possess the same water solubility are less likely to leach out into the processing water.
- Also, ascorbic acid and similar compounds that are heat-unstable may also result in additional loss at high temperature.

EFFECT OF STEAMING

- Steaming increased the content of polyphenols in carrot cauliflower and spinach ;limited the depletion of carotenoids in spinach.

- Accordingly, Total antioxidant capacity remained unvaried or increased both for steamed carrot and spinach.

EFFECT OF MICROWAVE

- It has been shown to cause significant phytochemical degradation in some cases, including the loss of flavonoids and phenolic acids.

- However, shorter processing times can lead to smaller losses in bioactivity, and, in some cases, the antioxidant capacity of the samples are not affected.

EFFECT OF DRYING

- Drying methods caused a significant decrease in total phenolics, total flavonoids and antioxidant capacity of purslane leaves (used both as a vegetable and as an herb for medical and therapeutic purposes).
- Drying by hot-air at 50ºC and freezedrying had the lowest adverse effects on antioxidant capacities of purslane leaves while microwave drying cannot be a competitive process for preserving antioxidants and antioxidant capacity of purslane leaves.
- The changes in the antioxidant capacity due to the drying methods were positively correlated with the content of phenolics showed freeze-drying is good for retaining phenolic compounds, synephrine and antioxidants; hot air-drying is good for retaining flavonoids; sun-drying, hot air-drying and freeze-drying methods can be used for retaining limonoid

EFFECT OF ROASTING

- Roasting process is responsible for triggering the Maillard reaction, which can cause changes in the phenolic profile of a sample, resulting in a lowered antioxidant capacity . Overall, a decline in antioxidant capacity after roasting was observed.

EFFECT OF THERMAL PROCESSING

- It is reported that thermal processing(88 °C for 2 min -commercial processing condition for canned tomato, cooked at 88 °C for 15 min, and cooked at 88 °C for 30 min.) on tomato elevated total antioxidant activity and bioaccessible lycopene content in tomatoes and produced no significant changes in the total phenolics and total flavonoids content, although loss of vitamin C was obsereved .

HIGH PRESSURE PROCESSING AND THERMAL PASTEURIZATION

- The antioxidant capacity (total phenolic content (TPC), oxygen radical absorbance capacity (ORAC), and ferric reducing antioxidant power (FRAP)) and individual anthocyanins (By HPLC) were determined prior to and following processing(High pressure processing-HPP(600 MPa/20 °C/5 min) and thermal pasteurization- TP (88 °C/2 min) and after three months of refrigerated storage (4 °C).
- Depending on the cultivar, HPP caused 15–38% and 20–33% inactivation of polyphenol oxidase and peroxidase, respectively, compared to almost complete inactivation of these enzymes by TP. Significant decreases (p b 0.05) in ORAC, FRAP, TPC and anthocyanin contents were observed during processing and storage of both HPP and TP samples
- . Anthocyanins were the most affected with only 19– 25% retention after three months of refrigerated storage (4 °C). Slightly higher (p b 0.05) loss of TPC and antioxidant capacity were observed during storage of HPP samples compared to TP. The microbiological assessments showed that total plate counts, yeasts-moulds and fecal coliforms in both processed infusions were acceptably eliminated.

- The antioxidant capacity (total phenolic content (TPC), oxygen radical absorbance capacity (ORAC), and ferric reducing antioxidant power (FRAP)) and individual anthocyanins (By HPLC) were determined prior to and following processing(High pressure processing-HPP(600 MPa/20 °C/5 min) and thermal pasteurization- TP (88 °C/2 min) and after three months of refrigerated storage (4 °C).
- Depending on the cultivar, HPP caused 15–38% and 20–33% inactivation of polyphenol oxidase and peroxidase, respectively, compared to almost complete inactivation of these enzymes by TP. Significant decreases (p b 0.05) in ORAC, FRAP, TPC and anthocyanin contents were observed during processing and storage of both HPP and TP samples
- . Anthocyanins were the most affected with only 19– 25% retention after three months of refrigerated storage (4 °C). Slightly higher (p b 0.05) loss of TPC and antioxidant capacity were observed during storage of HPP samples compared to TP. The microbiological assessments showed that total plate counts, yeasts-moulds and fecal coliforms in both processed infusions were acceptably eliminated.

EFFECT OF PULSE ELECTRIC FIELD

- When applied to samples of orange juice, PEF showed no significant difference between the radical scavenging capacity (measured with the DPPH method) of the untreated juice and the treated juice. This suggests that PEF is more effective than any heat treatment, including low-temperature and high-temperature pasteurizations, in preserving bioactive compounds and the radical scavenging ability of orange juice.

Thank you

Dr. Rahul Thory
School of Bioengineering and Food Technology
Shoolini University
Village Bajhol, Solan (H.P)

+91 9466266628(Mob No.)
rahul.560@shooliniuniversity.com