STEM in Food Science in Technology and Living

Fruits & Vegetables

Vegetables : texture changes during heating

- High temperature:
  - gelatinises starch
  - decreases bulk by softening the cellulose
  - causes a reduction in turgor due to water loss

- Long cooking time is suitable for potatoes or legumes but not for most vegetables

Raw vegetables | Cooked vegetables

Vegetables : texture changes during heating

- Adding alkaline ingredients can speed up the breakdown of cellulose and produce a mushy texture

Baking soda in water | Water only | Vinegar in water

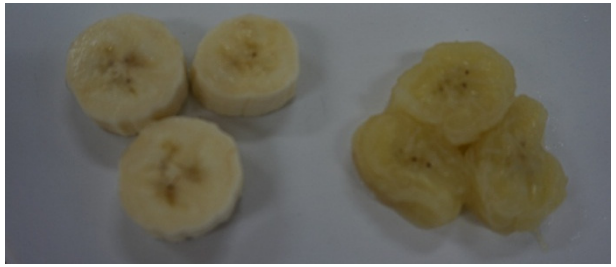
Odour released during heating

- When onion and cabbage are cooked, pungent odour is released especially when overheating

- In cabbage, heat triggers the enzyme to release excess hydrogen sulphide

Fruits : texture changes during heating

- Fruits will become soft when cooked and mushy if cooked for a long time
  - conversion of fruit protopectin to pectin
  - degradation of cellulose and hemicellulose
  - denaturation of cell membrane protein → cell membrane loses its function to maintain turgor



Raw Cooked

Raw Cooked

Fruits and vegetables : colour pigments

- Chlorophyll, carotenoids and anthocyanins are three common pigments in fruits and vegetables

- There will be loss of pigmentation during heating

Chlorophyll changes during heating

- Chlorophyll is rich in broccoli, choi sum and kiwi
- Chlorophyll (blue green) → bright green when start heating (deficient of air)
- Application of heat continues→ acid in cells released form pheophytin (dull olive brown)

Keeping vegetables green

- If alkaline such as baking soda is added in the water, acid from vegetables will be neutralised and the chlorophyll in vegetables can keep its colour

- Drawback : loss of vitamins is much faster

Learning activity
Heating green vegetables under different pH conditions

Baking soda in water | Water only | Vinegar in water

Anthocyanin changes during heating

- Anthocyanin is rich in red cabbage, blueberry and red cherry

- Anthocyanin is red in colour in an acidic environment, while blue in colour in alkaline situation

- Anthocyanin is water-soluble → leaching out during boiling → becomes dull reddish brown

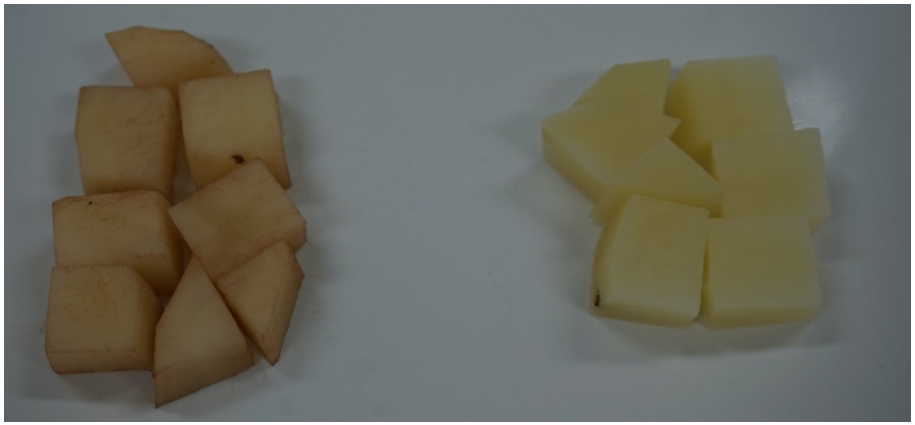
With baking soda | Control | With vinegar

Anthocyanin, pH and heating

- Baked goods with baking soda or powder in the flour mixture will discolour anthocyanin to blue
- Use sour cream instead of milk can maintain its colour
- Red cabbage can be prevented from turning blue when vinegar is added during cooking

Blanching of vegetables

- Polyphenol oxidase can be destroyed during heating
- Enzymatic browning is prevented



Raw potatoes exposed to air

Blanched potatoes exposed to air

Related Food Tests

Food Test Number	Food Test
Food Test 6	Browning reaction in apples
Food Test 7	Heating of green vegetables
Food Test 8	Maillard reaction in onions