BHARATH COLLEGE OF SCIENCE AND MANAGEMENT

PG AND RESEARCH

DEPARTMENT OF NUTRITION AND DIETETICS

SUBJECT NAME: FOOD CHEMISTRY

SUBJECT CODE: 16SACND2

STAFF: S.DEEPAPRIYA ASST PROFESSOR,

DEPARTMENT OF NUTRITION AND DIETETICS

UNIT-5

CHEMISTRY OF PECTIC SUBSTANCES, PLANT PIGMENTS, SPICES AND CONDIMENTS:

a) pectins, phenolic components, enzymatic browing in fruits and vegetables.
b) volatile compounds from cooked vegetables, different types of plant pigments-water and fat soluble pigments.
c) properties and active principles of spices and condiments.

PECTINS

Pectic substances are a group name for the derivatives of carbohydrate. They are methylated polymer of galacturonic acid. They are present in the primary cell wall and the middle lamella of fruits and vegetables.

protopectin is the water- insoluble form of pectic substances occurring in immature fruits and to a less extent in vegetables. protopectin gives firm texture to unripe fruits.

protopectin------- raw fruits and vegetables

pectinic acid------- slightly ripened fruits

pectin -------- optimum ripe fruits

pectic acid -------- over ripe fruits

The pectic substance in cell walls and the middle lamella undergo degradation as a result of the increasing levels of two types of enzymes , pectinesterases and polygalacturonases. other enzymes include hemicellulase and cellulose.

PHENOLIC COMPONENTS

The term phenolic or polyphenol can be defined chemically as a substances which possesses an aromatic ring bearing one or more hydroxyl substituents, including functional derivatives (esters, methyl ethers, glycosides etc.) most phenolics have two or more hydroxyl group and are bioactive substances occurring widely in food plants that are eaten regularly by substantial numbers of people.

occurrence of phenolic compounds:

The phenolic compounds which occur commonly in food material may be classified into three groups, namely simple phenols and phenolic acids, hydroxycinnamicacid derivative and flavonoids.

phenolic compounds including simple phenols and phenolic acids, hydroxycinnamic acid derivatives and flavonoids are bioactive substances occurring widely in food plants. phenolic compounds are closely associated with the sensory and nutritional quality of fresh and processed plant foods. the enzymatic browing reaction of phenolic compounds, catalyzed by polyphenoloxidase, could cause the formation of undesirable color and flavor and the loss of nutrient in fruits and vegetables. many phenolic compounds in plants are good sources of natural antioxidants. it is a great interest in recent years that many phenolic compounds in foods have inhibitory effects on mutagenesis and carcinogenesis.

- Natural phenolic compounds play an important role in cancer prevention and treatment.
- Phenolic compounds from medicinal herbs and dietary plants include phenolic acids, flavonoids, tannins, stilbenes, curcuminoids, coumarins, lignans, quinines, and others.

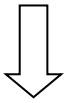
- Various bioactive of phenolic compounds are responsible for their chemo preventive properties (e.g., antioxidant, anticarcinogenic, or antimutagenic and anti-inflammatory effects.)

ENZYMATIC BROWNING IN FOODS

Enzymatic browning is a chemical process which occurs in fruits and vegetables by the enzyme polyphenoloxidase, which results in brown pigments. enzymatic browning can be observed in fruits (apricots, pears, bananas, grapes), vegetables (potatoes, mushrooms, lettuce) and also in seafood (shrimps, spiny lobsters and crabs).

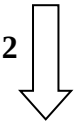
- polyphenols is a main components in enzymatic browning.
- It is also called phenolic compounds, are group of chemical substances.
- They are substrate for the browning enzyme.
- phenolic compounds are responsible for the colour, taste and flavor.
- polyphenols can be divided into anthocyanins (colour in fruits), flavonoids (catechins, tannins in tea and wine).

Cut fruits containing catechins, tyrosine, chlorogenic acid mono and dihydroxy phenols.



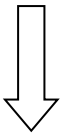
O2 **polyphenolase**

DOPA (dihydroxy phenyl alanine orthodiphenol)



O2 **polyphenolase**

orthoquinones



polymerised

melanins

PREVENTION OF ENZYMATIC BROWNING

- Blanching
- Refrigeration
- Freezing
- Change PH
- Dehydration
- Irradiation
- High pressure treatment
- Binding chemicals like salts and sugar syrups.

PIGMENTS

The bright colours of many vegetables contribute much to their appeal. the colours result from the various pigments contained in their tissues. most of the pigments occur in plastids specialised bodies lying in the protoplasm of the cell. sometimes, the water-soluble pigments are dissolved in the vacuoles and not generally distributed throughout the cell. the chief pigments of vegetables and fruits can be classified as water insoluble and water soluble.

Plant pigments like,

1. chlorophyll (green)
2. carotenoids(yellow, red, orange)
3. flavonoids; anthocyanins + anthoxantins (red, blue,purple)
4. betalains (red,yellow,purple)

The chief pigments of vegetables and fruits can be classified as:

1. Water soluble pigments (anthocyanins, betalins,anthoxanthins)
2. Water insoluble pigments (carotenoids, chlorophyll)

ACTIVE PRINCIPLES OF SPICES AND CONDIMENTS

CONDIMENTS:

A condiments is a spice, sauce or other food preparation that is added to food to impart a particular flavor to enhance its flavor.

SPICE:

A spice is a product from another part of the plant (usually dried), including seeds, berries, bark, roots and fruits.

Spices can be categorized botanically according to their source of plan part as follows:

Leaves of aromatic plants: Examples include bay leaf, rosemary, thyme, etc.

fruits or seeds: Examples include fennel, nutmeg, coriander, fenugreek, mustard, and black pepper etc.

Roots or bulbs: Examples include garlic, galangal, turmeric, ginger etc.

Bark : cinnamon, cassia ,etc.

LIST OF HEALTHY SPICES:

- All spice or pimento
- all spice ani seed
- bay leaf
- peppercorns
- Black pepper capers
- capers caraway seeds
- cardamom
- ajwain seeds
- green chili peppers
- cinnamon
- cloves
- coriander seeds
- cumin
- fennel seeds
- fenugreek seeds
- mace spice
- mustard seeds
- nutmeg
- saffron
- tamarind
- vanilla beans

The essential volatile oils in certain spices (cloves, peppers, etc). May work as a rubefacient (soothes skin around the site of application and improves the local site of application and improves the local blood circulation), increasing the flow of blood to make the skin feel warmer. They are being applied as a popular home remedy for arthritis and sore muscles, and used either as poultice or in hot baths.

Spices essential oils are being used in the aromatherapy as well as de-odorants in the perfume industry. Throat gargling with tepid thyme water can help relieve sore throat and bronchitis symptoms. Thyme is also being used as an anti-septic mouthwash in the treatment of caries and gingivitis. Decoction of certain healthy spices is taken by mouth for the treatment of colds, influenza, mild fevers, indigestion, stomach upset, and painful menstruation. Spices are also known to have natural anti-helminthes (control worm infestation) function in traditional medicines.

ACTIVE PRINCIPLES IN SPICES AND CONDIMENTS

Spice active principles are reported to have anti-diabetic, anti-hypercholesterolemia, antilithogenic, anti-inflammatory, anti-microbial and anti-cancer properties. Spices and their active principles inhibit 5- lipoxygenase and also formation of leukotriene C4.Modulatory effect of spice principles viz., eugenol, capsaicin, piperine, quercetin, cur cumin, cinnamaldehyde and allyl sulphide on in vitro human platelet aggregation has also been reported.

Spice active principles inhibit platelet aggregation induced by different agonists, namely ADP (50microM), collagen 500 microg/ml), arachidonic acid (AA), (1.0Mm), and calcium ionophore A-23187 (20microM). Spice active principles showed preferential inhibition of arachidonic acid induced platelet aggregation compared to other agonists. Among the spice active principles tested, eugenol and capsaicin are found to be most potent inhibitors of AA-induced platelet aggregation with IC50 values of 0.5 and 14.6 microM, respectively.

The order of potency of spice principles in inhibiting AA-induced platelet aggregation is eugenol>capsaicin>curcumin>cinnamldehyde>piperine>allyl>sulphide>quercetin. Eugenol is found to be 29-fold more potent than aspirin in inhibiting AA-induced human platelet aggregation. Eugenol and capaicin inhibited thromboxane B2 (TXB2) formation in platelets in adose-dependent manner challenged with AA apparently by the inhibition of the cyclooxygenase

(cox-1). Eugenol –mediated inhibition of platelet aggregation is further, eugenol and capsaicin inhibited platelet aggregation induced by agonists- collagen, ADP and calcium ionophore but to a lesser degree compared to AA. These results clearly suggest that spice principles have beneficial effects in modulating human platelet aggregation.