

ESU 009– Functional vegetable products

Lecture 32



- The term vegetable embraces a large and diverse category of plants and parts thereof.
- Vegetables serve functional and nutraceutical roles, such as anticancer and heart-protective affects.

Cruciferae

- The cruciferae is a large, homogenous plant family consisting of well over 2000 species.
- Crucifers that are eaten as vegetables provide concentrated source of nutrients such as vitamins, minerals and fibre and nonnutrient phytochemicals such as sulphur containing compounds.
- Cruciferous vegetables are often referred to as cole crops and include broccoli, brussel, sprouts, cabbage, cauliflower etc.
- The leaves, buds and flower of cole crops may be consumed raw or cooked, fermented and occasionally dried.

Classification of vegetables based on morphology of plant organ

Type	Examples
Roots	Sweet potatoes
Modifies stems	Potatoes
Modified bulb	Onion, garlic
Leaves	Cabbage, spinach, lettuce
Petals	Celery
Flower buds	Cauliflower
Sprouts	Asparagus, artichoke
Legumes	Peas, green beans
Cereals	Sweet corn
Vine fruits	Cucumbers
Berry fruits	Tomato

Vitamins

- Cole crops is important sources of vitamin C and other water soluble vitamins in the diet including riboflavin, niacin and thiamine.
- Crucifers are also good source of fat soluble vitamins generally grouped together as vitamin A,
- The fat soluble vitamin K1 is also found in cole crops

Health benefits

Isothiocyanates

- Inhibits or block tumors induced by chemical carcinogens.
- Isothiocyanates play a direct role in suppression of tumour growth.
- Allyl isothiocyanate is believed to play a role in both chemoprevention and suppression of tumor growth.

Indoles

- Indolyl glucosinolates or their metabolites play a significant role in cancer prevention.
- Indole 3 carbinol may be useful chemoprotective agent against hormone induced cancers, particularly estrogen-related uterine and breast cancers

Dithiolthiones

- They are potent inhibitors of carcinogenesis.
- Dithiolthiones has been widely investigated and has been shown to inhibit tumorigenesis of the breast, skin, lung, colon, trachea, stomach, liver and urinary bladder in rodents.
- This compound has also been reported to inhibit the replication of the human immunodeficiency virus.

Vitamins

- Vitamin C and A has been reported to protect against cancer
- Vitamin C is essential for the formation of collagen and is required for the development of cartilage, bone and teeth, proper wound healing, formation of hemoglobin and erythrocytes and immunological reactions.
- Vitamin A plays a significant role in vision and in the synthesis of glycoproteins.
- Vitamin K is essential for synthesis of blood clotting factors in the liver

Onions and garlic

- There are more than 250 members of the genus *Allium*, the onion family.
- Two of these, Onion (*A. cepa*) and garlic (*A. sativum*), have been used in traditional medicine for over 4000 years
- Disorders for which both garlic and onions are used includes asthma, arthritis, arteriosclerosis, chicken pox, the common cold, diabetes, malaria, tumors and heart problems

- Alliums and their constituents have several therapeutic effects, including antiplatelet aggregation activity, anticarcinogenic effects, antimicrobial activity and antiinflammatory and antiasthmatic effects.

Bioactive compounds of Onion and garlic products

Compound	Biological activity
Allicin	Antimicrobial
Alliin	Hypolipidaemic, antimicrobial , hypoglycaemic
Ajoene	Antithrombotic
Diallyl sulfide	Chemopreventive, Insecticidal
Thiosulfinaes	Antiinflammatory, antiasthmatic
Cepaenes	Antiasthmatic
Saponin	Antihyperlipaemic
Ascorbic acid	Antioxidant
Caffeic acid	Antitumor, antimutogenic, antioxidant and antiviral
Linoleic acid	Immunomodulation

- The type and concentration of sulfur compounds extracted from onions and garlic are affected by plant maturity, production practices, cultivar, location in plant and processing conditions

Non sulphur containing compounds

Flavonoids:

- Flavonoids (rutin, quercitrin) are present in the bulbs as well as the leaves of alliums.
- Flavonoids are potent antioxidants with a wide array of biochemical functions.
- They are involved in immune function, gene expression, liver function, phospholipids, cholesterol and histamine metabolism.

Health benefits of onion and garlic

- **Anticarcinogenic effect**
- **Cardiovascular protective effects**
- **Effect on blood and tissue lipids**

Vegetable rich in nondigestible oligosaccharides

- Oligosaccharides are one of the most popular functional food components.
- Functional oligosaccharides are short chain polysaccharides that have unique chemical structures and that are not digested by humans.
- The health benefits of oligosaccharides consumption arise primarily from increased numbers of bifidobacteria in the colon.

- Chicory roots, asparagus, tomatoes, alliums are rich source of fructo-oligosaccharides.
- The health benefits associated with the consumption of these sugars include reduction of constipation, blood lipids, blood cholesterol, blood pressure and intestinal toxins.

Thank you

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