Let's Excel Together

CANADIAN ACADEMY OF SPORTS NUTRITION

Lecture 61:

Phytonutrients

Part 1

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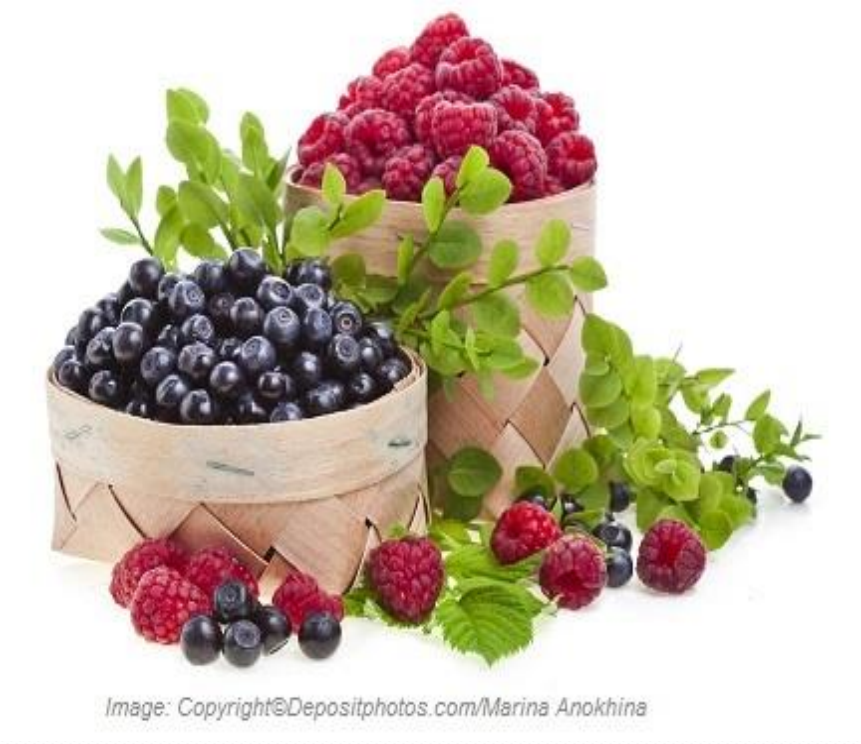
- **Phytonutrients are the nutrients isolated from fruits and vegetables.**

- **Also known as phytochemicals, phytonutrients are naturally occurring substances in plants that cause their colors, aromas, flavors (taste), and disease-fighting abilities.**



- **Phytonutrients outnumber macronutrients (carbohydrates, proteins, and fats) and micronutrients (vitamins and minerals) with as many as 10,000 varieties of them.**

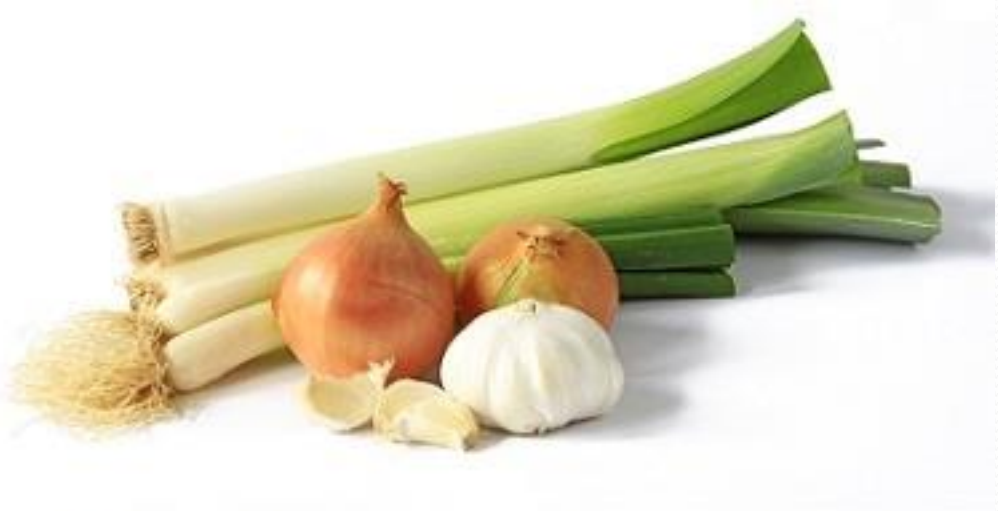
- **Being at the center of many research works recently, phytonutrients confer many health benefits. Phytonutrients are highly diverse and complex and essential for optimal health.**

Allicin, Alliin, and Ajoene:

- **They are sulfur-containing compounds, notably found in garlic.**

Food Sources:

- **garlic, leek, and onion.**



Garlic, onion, and leek are high in the phytonutrients alliin, allicin, and ajoene. *Image: Copyright©Depositphotos.com/Joachim Opelka*

Health Benefits:

- **a) Allicin is a natural antibiotic that has antibacterial, antiviral, antifungal, anti-inflammatory, and anti-thrombotic properties and reduces the risk of atherosclerosis.**

- **b) Alliin is a potent antioxidant with immune-enhancing activity.**

- **c) Ajoene has antibacterial, antifungal, anti-cancer and anti-thrombotic effects.**

Anthraquinones:

- They are phenolic compounds

- Subtypes: Sennosides, emodin and rhein.
- Food Sources: rhubarb.
- Health Benefits:
- a) They have laxative and cathartic effects.
- b) Are used in constipation and colon cleansing.

Rhubarb is rich in anthraquinones.
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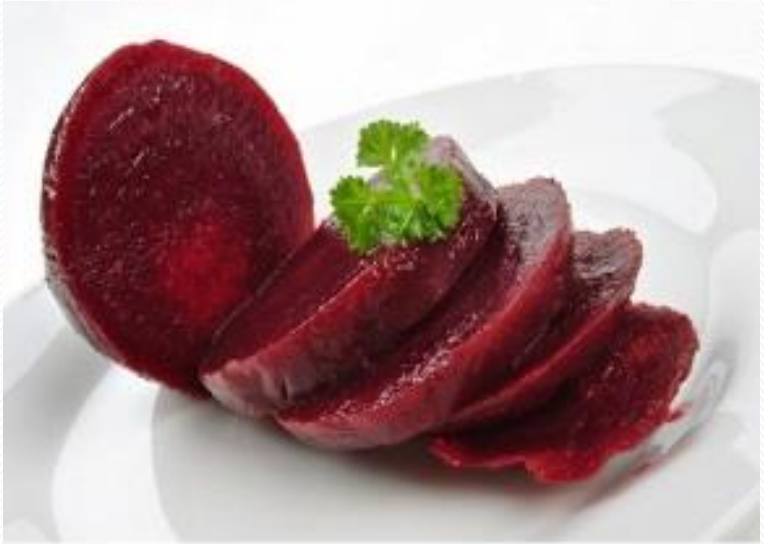
Betaine:

- **Known also as "beet sugar", betaine is a sweet-tasting alkaloid that acts as a methyl donor in the body. Betaine is not a pigment.**

- **Food Sources: beets, spinach, and sweet potatoes.**



Beet is the best food source of betaine.
Image: Copyright©Depositphotos.com/Joerg Beuge

Health Benefits:

- **a) Functions along with vitamins B12, B9 and B6 to lower homocysteine level.**
- **b) May be used in inherited homocystinuria.**
- **c) Reduces the risk of cardiovascular diseases.**
- **d) May have a protective effect against deposition of fats in the liver (fatty liver).**
- **e) Acts a liver detoxifier.**
- **f) Is used as a food supplement, betaine hydrochloride, to increase stomach acid level in people with a stomach acid deficiency.**

Betalains:

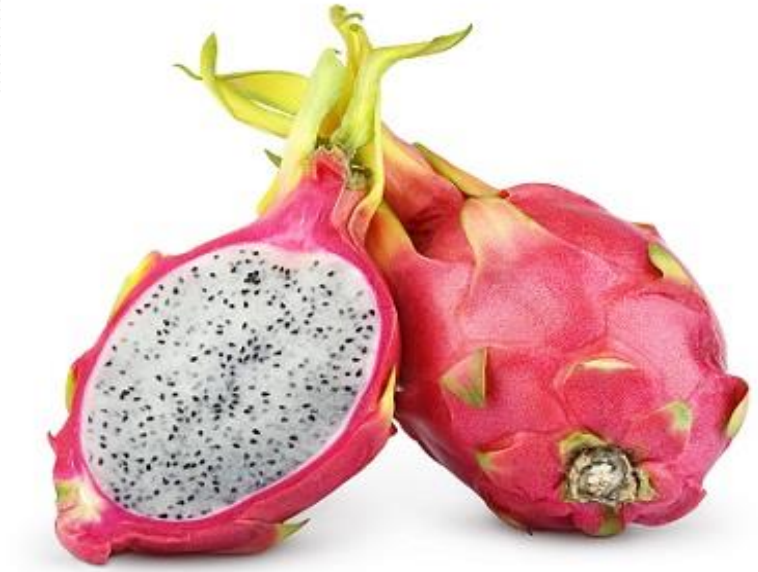
- **Betalains are alkaloid phytonutrients found in plants. They are water soluble pigments that determine the colors of some plants.**

- **Subtypes:**
- **There are two subtypes of betalains: betacyanins (for example, betanin) that cause reddish to violet colors, and betaxanthins (for example, vulgaxanthin and indicaxanthin) that cause yellow to orange colors.**

Food Sources:

- **Fruits:** prickly pear (nopal fruit), and red dragon fruit (Pitaya).
- **Vegetables:** amaranth, beets, rhubarb, and Swiss chard.

Beet is the best food source of betalains.
Image: Copyright©Depositphotos.com/Tatjana Baibakova



Pitaya: *Copyright©Depositphotos.com/Roman Samokhin*

Health Benefits:

- a) They are antioxidants.
- b) Stimulate detoxifying enzymes in the liver.
- c) Have anti-inflammatory activities.
- d) Reduce the risk of blood clotting.
- e) Protect cells, especially brain cells, from carcinogenic toxins.
- f) Are used as food-coloring agents to color meats, sausage and ice cream.

Capsaicin:

- **Capsaicin is the active phytochemical in chili pepper and creates heat when taken into the body. It blocks the release of substance-P, a neurotransmitter that signals pain.**
- **Food Sources: chili peppers (higher amounts), and bell pepper (smaller amounts).**

Chili pepper has the highest amount of capsaicin.
Image: Copyright©Depositphotos.com/Peter Hermes Furian

Health Benefits:

- **a) Topical forms of capsaicin are used to relieve pain in arthritis, muscle ache, strains and sprains, fibromyalgia, and pain associated with nerve damage as in diabetic neuropathy, shingles, and phantom pain.**

- **b) Causes apoptosis (programmed cell death; cell suicide) in prostate and lung cancers.**

- **c) Inhibits the growth of cancer cells in leukemia.**

- **d) Reduces itching and inflammation in psoriasis.**
- **e) Helps adjust blood sugar level.**
- **f) Helps lower cholesterol and triglyceride levels.**
- **g) Prevents from platelet aggregation.**
- **h) Helps lose weight by increasing thermogenesis.**
- **i) Improves sexual erectile dysfunction by enhancing blood flow to the area.**
- **j) Is widely used by athletes to alleviate pain and discomfort from strains and sprains and to heat up as a pre-competition warm up.**

Carotenoids:

- **They are organic compounds giving the yellow and orange colors to fruits and vegetables.**
- **They are basically pigments <u>that absorb light</u>.**

Subtypes:

They are two groups of carotenoids:

- **1) Carotenes (alpha-carotene, beta-carotene, gamma-carotene, delta-carotene, zeta-carotene, and lycopene).**

- **2) Xanthophylls (lutein, zeaxanthin, astaxanthin, canthaxanthin, cryptoxanthin, and neoxanthin).**

Food Sources:

- **Fruits:** apricot, bilberry, blackberry, cantaloupe, canary melon, cherimoya, cherries, clementine, cranberry, dates, durian, figs, gac, goji berries, grapefruit, grapes, guava, honeydew melon, kiwi, mandarin, mango, nectarine, olive, orange, papaya, peach, persimmon, pineapple, pitaya, plantain, plums, sea buckthorn, tangerine, Satsuma, tamarillo, passionfruit, and watermelon.

- **Vegetables:** alfalfa sprouts, artichoke, arugula, avocado, basil, beets, bell pepper, Bok Choy, broccoli, Brussels sprouts, cabbage, carrots, cauliflower, chard, chili pepper, chicory, collard greens, corn, coriander, eggplant, endive, gai-lan, green beans, green peas, kale, leek, lettuce, mustard greens, parsley, parsnip, potatoes, pumpkin, radicchio, radish, spinach, squash, sweet potatoes, tomatoes, turnip greens, watercress, and yams.

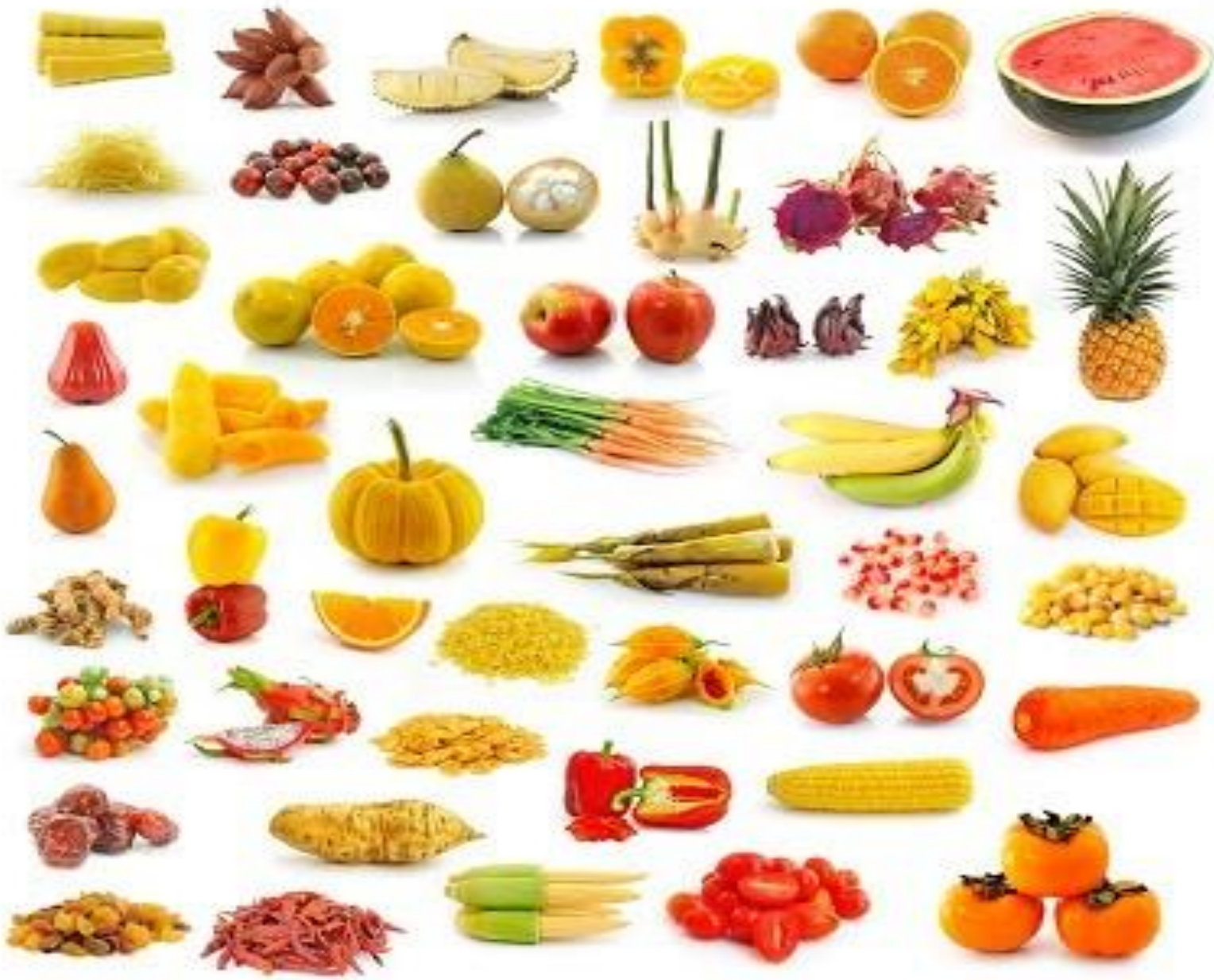


Image: Copyright©Depositphotos.com/Sommai Larkjit

Health Benefits:

- **a) They are potent antioxidants.**
- **b) Act as a pro-vitamin A.**
- **c) Promote healthy eyes and vision.**
- **d) Prevent from age-related eye diseases.**
- **e) Protect from age-related macular degeneration (ARMD).**
- **f) May reduce risk of developing certain cancers, especially prostate, bladder and lung cancers.**

Cucurbitacins:

- **Cucurbitacins are naturally occurring triterpenes found in plants, mostly in Cucurbitaceae family.**

- **Being classified as plant steroids, they are toxic alkaloids produced by plants to defend themselves against diseases.**

Subtypes:

- There are many subtypes of cucurbitacins. The most researched ones are:
- cucurbitacin A
- cucurbitacin B
- cucurbitacin C
- cucurbitacin D
- cucurbitacin E

Food Sources:

- **Fruits:** melons (cantaloupe, honeydew melon, watermelon, winter melon, and canary melon).

- **Vegetables:** cucumber, gourds, luffa (Chinese okra), pumpkin, and squash.

Cucumber is high in cucurbitacins.
Image: Copyright©Depositphotos.com/Valentyn_Volkov

Health Benefits:

- **a) They are potent cathartics and laxatives.**
- **b) May have anti-cancer activities.**
- **c) Possess anti-inflammatory and analgesic effects.**
- **d) Show antibacterial and anthelmintic properties.**
- **e) Have hepatoprotective, cardioprotective, and anti-diabetic effects.**

Falcarinol and Falcarindiol:

- **They are organic compounds produced by some plants as a defense mechanism.**
- **The main substance responsible for bitterness in parsnips and carrots is falcarindiol.**

Food Sources:

- carrots (falcarinol and falcarindiol)
- parsnips (falcarinol and falcarindiol)
- dill (falcarindiol)
- parsley (falcarindiol)
- red ginseng (falcarinol)
- Ivy (falcarinol)

Carrots, parsnips, and parsley are high in falcarinol and falcarindiol.

Health Benefits:

- a) They are potent antioxidants.
- b) Have anti-cancer, anti-inflammatory and anti-fungal properties.
- c) Allergic reactions and irritant contact dermatitis by Ivy results from falcarinol.

Homework:

- 1) Describe the health benefits of betaine.
- 2) Describe the health benefits of carotenoids.