Let's Excel Together
CANADIAN ACADEMY OF SPORTS NUTRITION

Lecture 63:

Phytonutrients

Part 3

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Phytoestrogens:

- **Phytoestrogens are naturally occurring polyphenolic compounds with structures and effects similar to the hormone estrogen.**

Subclasses of phytoestrogens are:

- **lignans**
- **coumestans**
- **isoflavones**

Food Sources:

Lignans: flaxseed (the highest amount), sesame seeds, sunflower seeds, nuts (pistachios, almonds, walnuts, cashews and hazelnuts), oatmeal, rye, barley, wheat, legumes (lentils, navy beans, kidney beans, pinto and fava beans), soybean, alfalfa sprouts, cabbage, asparagus, green pepper, broccoli, cucumber, apricots, strawberries, peaches, raspberries, and dried prunes.

- **Coumestans:** alfalfa sprouts, lima beans, pinto beans and split peas.

- **Isoflavones:** soybeans (the most common food source), soy products (tofu, tempeh, and miso), alfalfa sprouts, green beans, chick peas and peanuts.

Health Benefits:

- **a) Show antioxidant activities.**
- **b) May have protective effects against breast and prostate cancers (lignans).**
- **c) May improve bone density in osteoporosis (isoflavones).**
- **d) May improve the production of hyaluronic acid in the skin followed by slowing down sun-related skin aging.**

Phytosterols:

- **Phytosterols are plant-based steroids that chemically have similar structures to cholesterol.**

- **They are classified into two groups, sterols and stanols.**

Subtypes are:

- **beta-sitosterol, campesterol, stigmasterol, beta-sitostanol, brassicasterol, and furostanol.**

Food Sources:

- **Fruits:**

coconut, acai berry, goji berry, lemon, persimmon, plum, sea buckthorn, and strawberry.

- **Vegetables:**

alfalfa sprouts, amaranth, avocado, beets, bell pepper, cabbage, celery, cucumber, eggplant, onion, potatoes, pumpkin, tomatoes, turnip, turnip greens, and yams.

Health Benefits:

- **a) They help reduce blood cholesterol level by competing with the absorption of cholesterol in the intestines.**

- **b) They may improve cardiovascular health.**

Proanthocyanidins & Anthocyanidins:

- They are water-soluble pigments and subgroups of flavonoids responsible for red, pink, purple, blue, or violet colors of most flowers and fruits.

Subtypes:

Proanthocyanidins include:

- **procyanidins**
- **propelargonidins**
- **profisetinidins**
- **prodelphinidins**
- **proguibourtinidins**

- **The most commonly studied and researched flavonoid is oligomeric proanthocyanidin, which is also called "pycnogenol".**

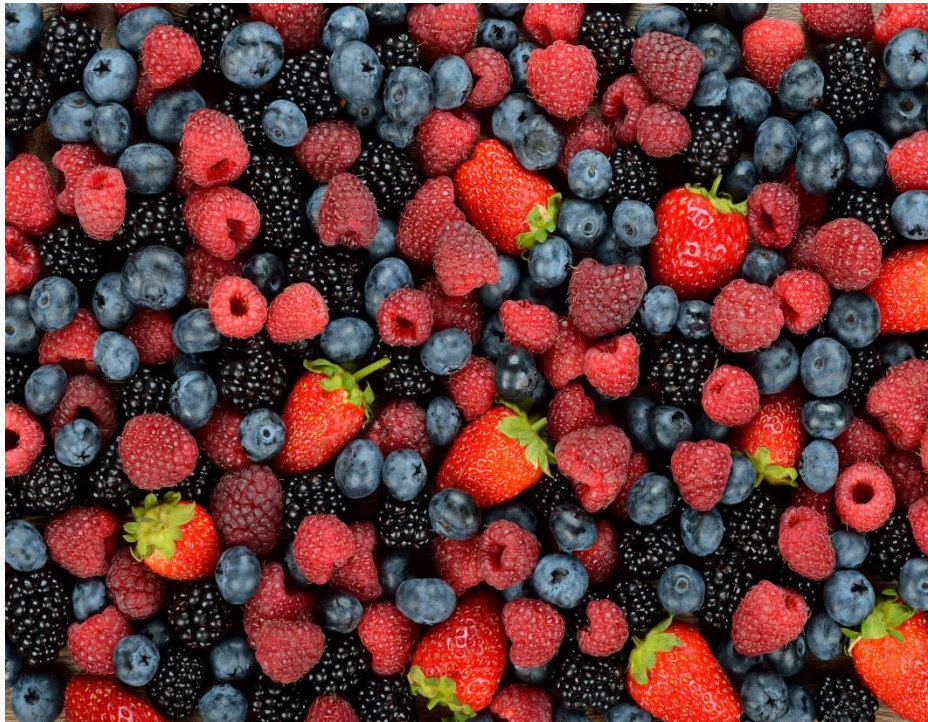
Anthocyanidins are:

- cyanidin
- delphinidin
- malvidin
- luteolinidin
- aurantinidin
- peonidin
- petunidin

Food Sources:

Fruits: acai berry, bilberry, blackberry, blueberry, cherries, cranberry, elderberry, red grapes, litchi, red mulberry, nectarine, peach, olive, pomegranate, raspberry, and strawberry.

Vegetables: eggplant, radish, radicchio, rhubarb, and red cabbage.



Health Benefits:

- a) Are potent antioxidants and scavenge free radicals.
- b) Have anti-inflammatory effects.
- c) Exhibit anti-cancer properties.
- d) May help reduce blood sugar level.
- e) May improve blood flow.
- f) Strengthen walls of the vessels.
- g) May alleviate allergies.

- **h) Enhance immune system.**
- **i) Help reduce bad cholesterol.**
- **j) Stabilize collagen and elastin.**
- **k) May help accelerate healing process of bursitis and tendinitis.**
- **l) Improve motility of sperms.**

Protease Enzymes:

- They are plant enzymes that help break down proteins into amino acids through a process called “proteolysis”.

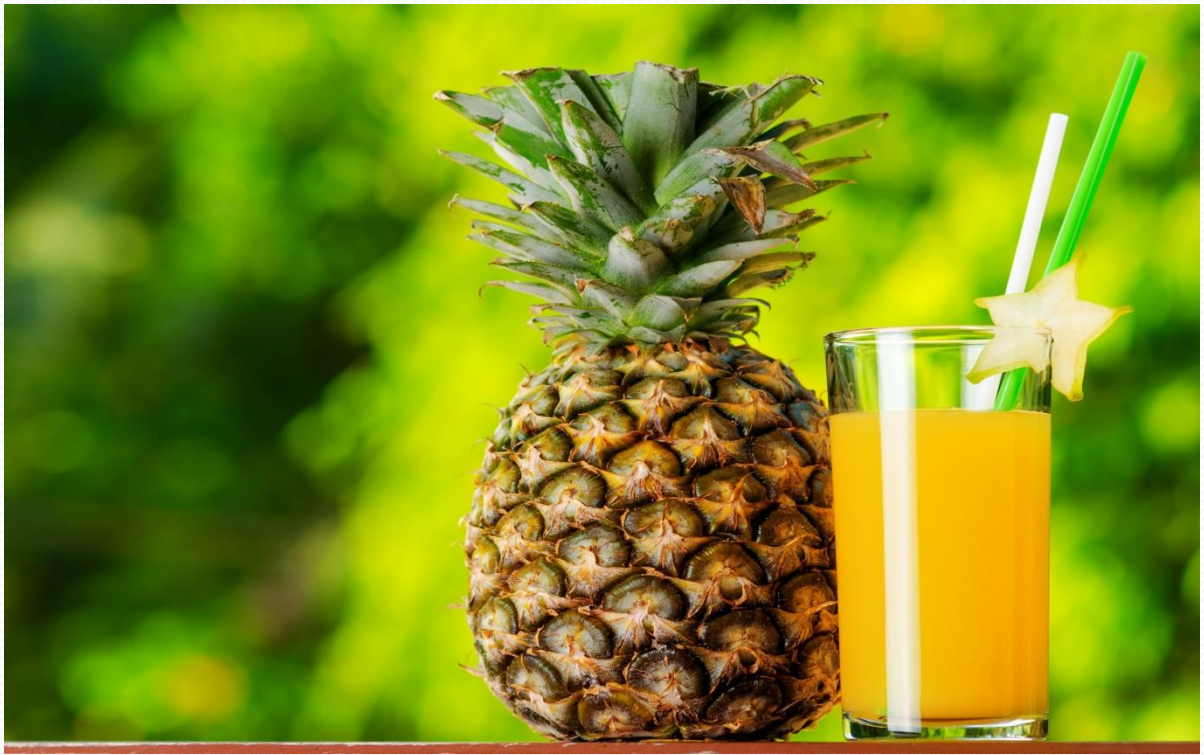
Subtypes:

- The most common protease enzymes in plants are **bromelain, papain,** and **actinidain**.

Food Sources:

Fruits:

banana, kiwi, mango, papaya, and pineapple.



Health Benefits:

- a) Help with digestion of proteins.
- b) Help reduce inflammation.
- c) May speed up healing in burns.
- d) May help alleviate pain and inflammation in arthritis.
- e) Are used as an adjuvant in post-surgical recovery.
- f) May prevent from blood clotting.

Saponins:

- They are naturally occurring glycosides extracted from different plants.

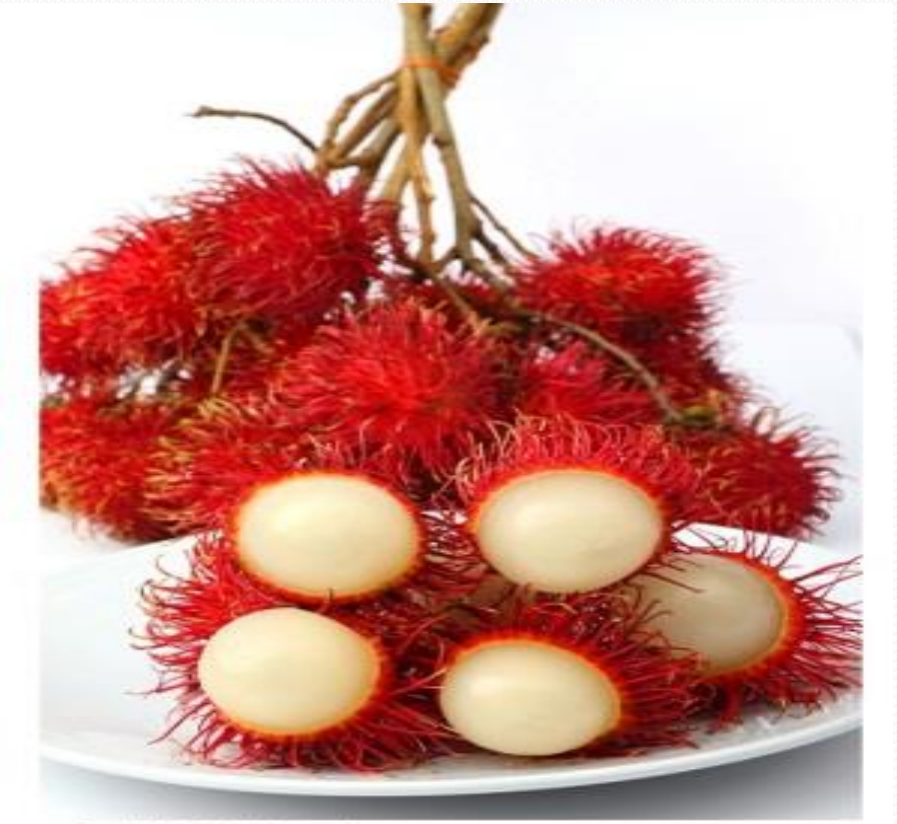
Subtypes:

- They include asparanin A, asparanin B, sarsasapogenin, protodioscin, dioscorin, diosgenin, pisumsaponins I, pisumsaponins II, pisomosides A, pisomoside B, spinosaponin, esculeoside A, esculeogenin B1, esculeogenin B2, and soysapogenol I.

Food sources:

Fruits: Rambutan, and soapberries (Chinese litchi).

Vegetables: alfalfa sprouts, amaranth, asparagus, green peas, spinach, soybeans, tomatoes, and yams.



Rambutan is high in saponins.
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Health Benefits:

- **a)** Have anti-inflammatory activities.
- **b)** Display anti-cancer activities.
- **c)** Help lower an elevated blood pressure (dioscorin).
- **d)** May help reduce blood sugar level (pisomosides and pisumsaponins).
- **e)** May increase bone density (esculeoside A)
- **f)** Relieve symptoms of menopause (esculeoside A).
- **g)** May lower cholesterol and triglyceride levels (spinosaponin).

Squalene:

- **Squalene is a naturally occurring organic compound.**

- **It is a triterpene, a subclass of terpenes.**

Food Sources:

- **olive, amaranth seeds, rice bran, squash, sweet potatoes, wheat germ, and shark liver oil.**

Health Benefits:

- **a)** **Acts as a chemopreventive agent.**
- **b)** **Acts as a precursor for steroid hormones and vitamin D.**
- **c)** **Used as a skin moisturizer in cosmetics and as an adjuvant in vaccines.**

Tannins:

- **Tannins are polyphenolic compounds that can bind and precipitate proteins and are less likely to be absorbed.**
- **They can complex with starch, cellulose and minerals as well.**
- **Tannins are color – providing pigments and astringents.**

Subtypes:

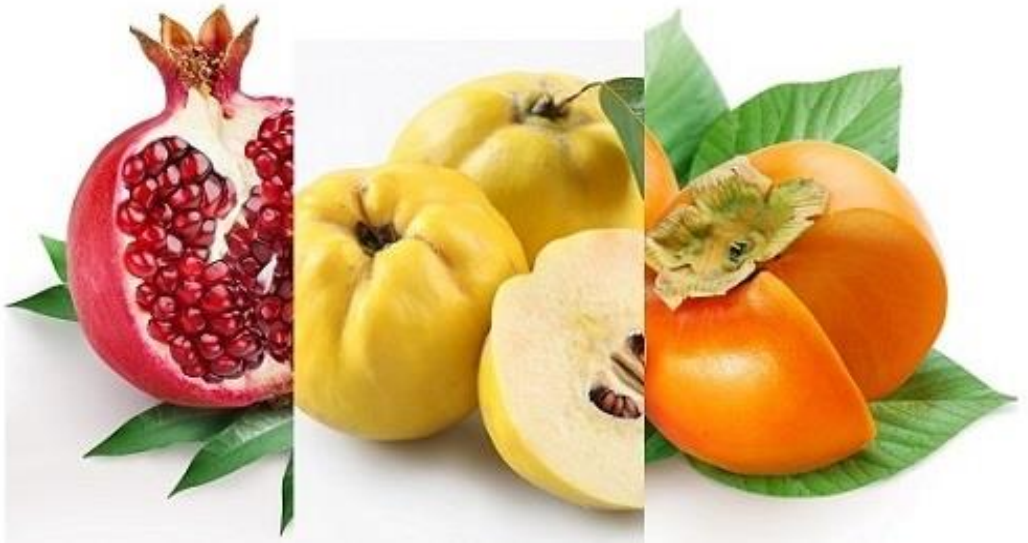
- **Tannins include gallic acid, ellagic acid, pyrogallic acid, punicalagin, profistinidin.**
- **Condensed tannins are called proanthocyanidins.**
- **Hydrolysable tannins include gallotannins and ellagitannins.**

Food Sources:

Fruits: blueberries, loganberry, chokeberry, cranberry, grapes, persimmon, pomegranate, quince, and strawberries.

Vegetables: avocado, eggplant, and parsnip.

Others: legumes, nuts (especially hazelnuts, walnuts, and pecans), tea, and wine.



Health Benefits:

- a) Have anti-oxidative and cancer-preventing properties.
- b) Show antiviral, antibacterial and anthelmintic effects.
- c) May be useful in hereditary hemochromatosis by interfering with the absorption of iron.

Terpenes:

- **Terpenes are a diverse group of organic compounds derived from a substance that contain vitamin B5.**

Subtypes:

- **monoterpenes** (geraniol, limonene, and terpineol)
- **diterpenes** (cafestol, cembrene and taxadiene)
- **triterpenes** (ambrein, ganoderic acid, ziziphin, cucurbitacins, and sequalene)
- **tetraterpenes** (lycopene, alpha-carotene, beta-carotene, and gamma-carotene)
- **sesquiterpenes**
- **sesterterpenes**
- **sesquarterpenes**

Food Sources:

- **Fruits:** **jujube, lemon, lime, mango, olive, and watermelon.**

- **Vegetables:** **dill, reishi mushroom, squash, and sweet potatoes.**

Health Benefits:

- a) They are potent antioxidants.
- b) Demonstrate anti-inflammatory activities.
- c) Enhance immune system.
- d) Have anti-cancer properties.
- e) Ganoderic acid has an anti-cancer activity against liver cancer. It also decreases conversion of testosterone into dihydrotestosterne (DHT).

- **f) Show analgesic and aphrodisiac effects (ambrein).**
- **g) Increases liver glutathione level.**
- **h) Have ability to trap and neutralize benzopyrenes, cancer-inducing compounds found in cigarette smoke, car exhaust fumes, and charcoal grill smoke.**

Volatile Oils:

- **They are aromatic compound extracted from plants.**

Basil oil. *Image: Copyright©Depositphotos.com/Monika Wisniewska*

- **Known also as “essential oils” as well, they cause the strong scents of certain fruits and vegetables.**

- **Volatile oils could be extracted from leaves, peels, roots, seeds, barks, flowers, or rhizomes.**

Subtypes:

- The most commonly studied essential oil is "**eugenol**". Other essential oils are linalool, cineole, ocimene, citronellol, limonene, and myrcene.

Food Sources:

- **Fruits:** guava, grapefruit, lemon, lime, orange, and tangerine.
- **Vegetables:** basil, celery, coriander, parsley, peppermint, and spearmint.

Health Benefits:

- a) Have antibacterial, antiviral, and antifungal activities.
- b) Demonstrate anti-inflammatory property.
- c) Are used to flavour foods and drinks.
- d) Are added to cosmetics and perfumes.
- e) Might fight against certain cancers (not conclusive yet).

Homework:

- **1) Describe the health benefits of phytoestrogens.**
- **2) Describe the health benefits of proanthocyanidins.**