

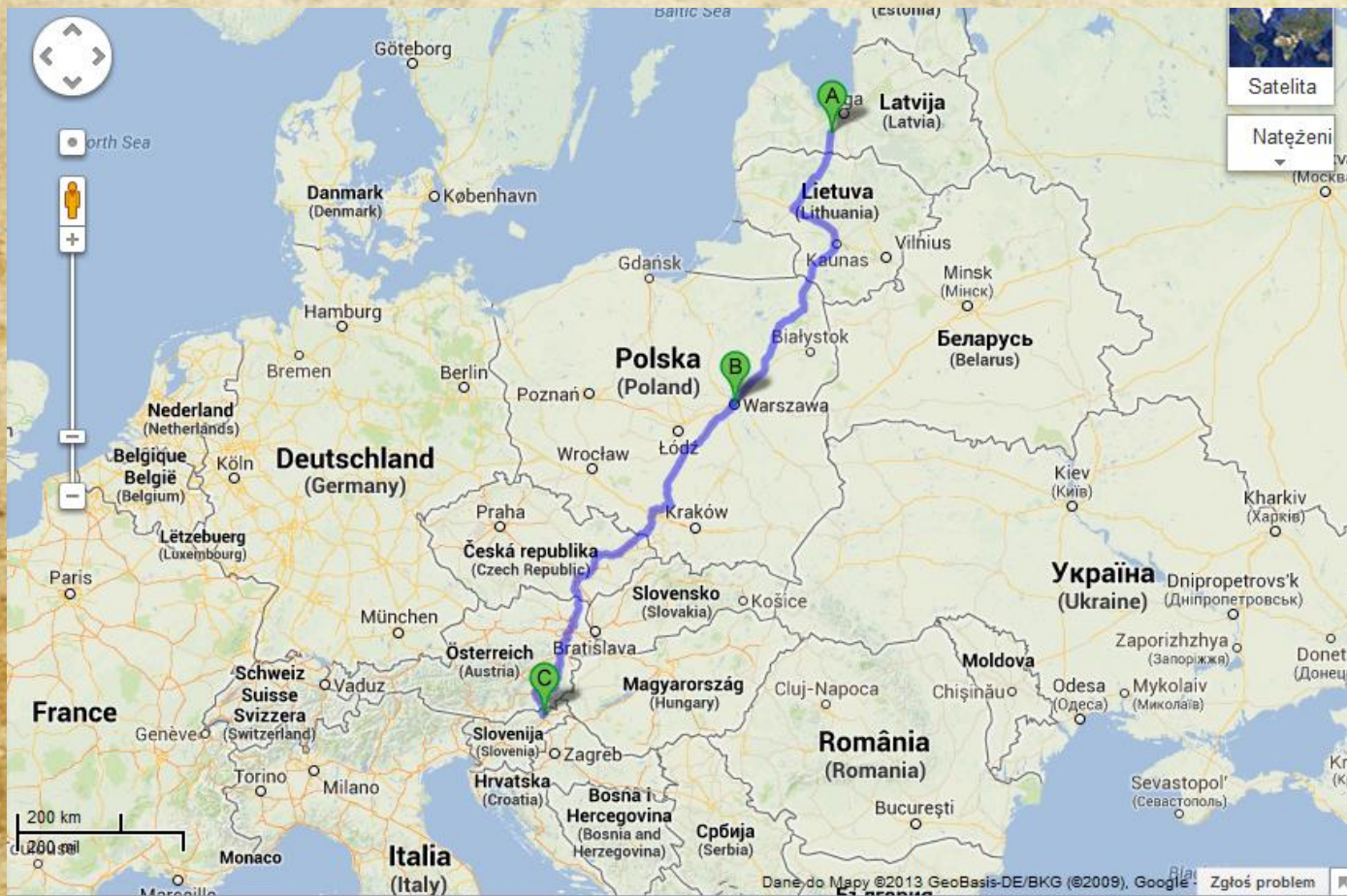




Bioactive compounds in plants and human health

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Where are we from?

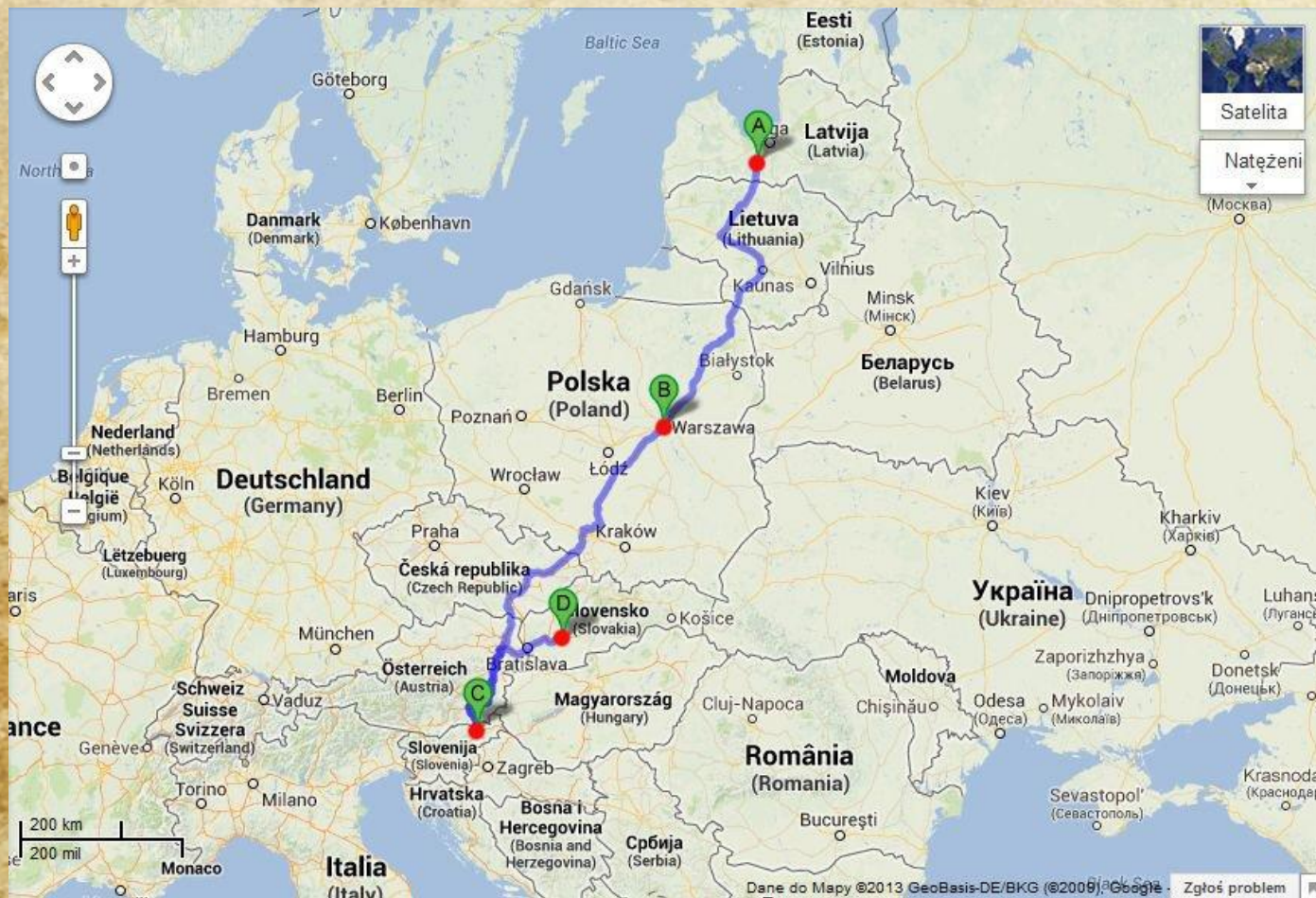


Latvia University
of Agriculture

Warsaw
University of
Life Sciences

University of
Maribor

Where are we now?



Content

- Bioactive compounds
- Flavonoids
- Carotenoids
- Vitamins
- Summary

Bioactive compounds

- are extranutritional constituents that typically occur in small quantities in foods
- the plant-based diets have protective effects of on cardiovascular disease (CVD) and cancer
- vary widely in chemical structure and function and are grouped accordingly



Source:

Kris-Etherton, P.M., Hecker, K.D., Bonanome, A., Coval, S.M., Binkoski, A.E., Hilpert, K.F., Griel, A.E., Etherton, T.D. 2002. Bioactive compounds in foods: their role in the prevention of cardiovascular disease and cancer. *Am J Med.* 113 Suppl 9B:71S-88S

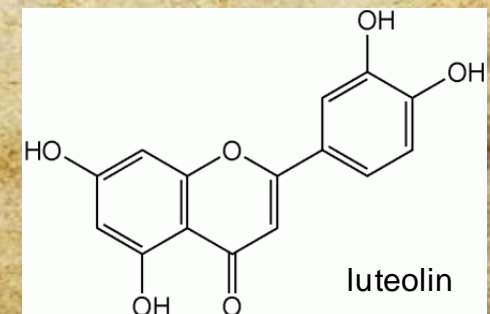
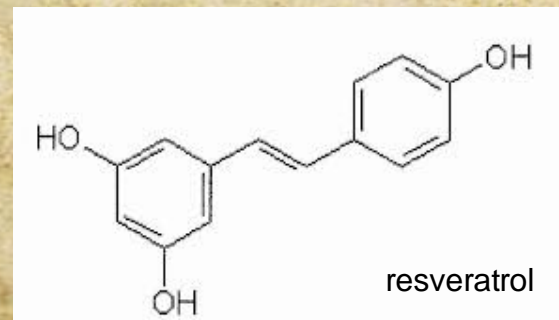
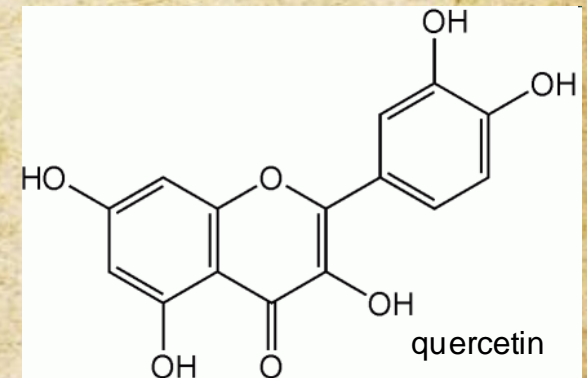
Flavonoids

- belong to secondary metabolites
- flavonoids are polyphenolic compounds that are ubiquitous in nature
- organic compounds
- 8000 different flavonoids are known and 500 among them are known better

Groups of flavonoids

According to chemical structure, they are categorized for few groups:

- flavonols: quercetin, kaempferol, myricetin
- flavons: luteolin, apigenin
- flavanones: hesperidin, naringenin
- flavanonols
- isoflavones: daidzein, genistein, glycitein
- catechines: epicatechin, theaflavin
- anthocyanins: resveratrol, cyanidin, delphinidin, malvidin, pelargonidin, peonidin, petunidin



Sources of flavonoids

- Citrus fruits
- Berries
- Ginkgo biloba
- Vegetables
- Tea
- Red wine
- Dark chocolate
- Cereals
- Legumes
- Nuts
- Olive oil



Impact for plants

- play important roles in the biology of plants by affecting several developmental processes
- most important plant pigments for flower coloration producing yellow or red/blue pigmentation in petals designed to attract pollinator animals
- flavonoids secreted by the root of their host plant help *Rhizobia* in the infection stage of their symbiotic relationship with legumes
- some flavonoids have inhibitory activity against organisms that cause plant disease e.g. *Fusarium oxysporum*
- are called natural insecticides
- play role as fungicides
- decrease harmful radiation impact



Impact for human health

- the most common group of polyphenolic compounds in the human diet are catechins
- help provide protection against these diseases by contributing, along with antioxidant vitamins and enzymes, to the total antioxidant defence system of the human body
- beneficial effects: antiviral, anti-allergic, antiplatelet, anti-inflammatory, antitumor and antioxidant activities, antithrombotic properties
- inhibit carcinogenesis



Carotenoids

- over 600 known carotenoids
- tetraterpenoids
- carotens and xanthophylls

- are organic pigments that are found in the chloroplasts and chromoplasts of plants and some other photosynthetic organisms like algae, some bacteria, and some fungi

- can be produced from fats and other basic organic metabolic building blocks by all these organisms

Sources of carotenoids



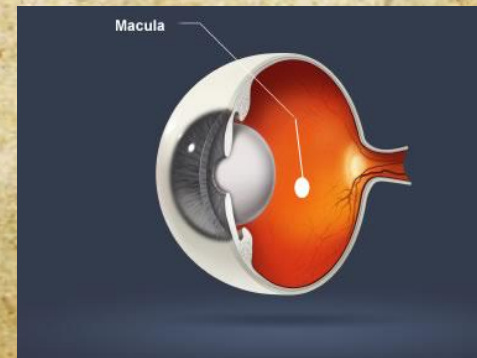
Role in the plants

- they absorb light energy for use in photosynthesis
- they protect chlorophyll from photodamage



Impact for human health

- can act as antioxidants
- four carotenoids (β -carotene, α -carotene, γ -carotene and β -cryptoxanthin) have vitamin A activity
- β -carotene protects human body against some kinds of skin cancer
- lutein, astaxanthin and zeaxanthin act directly to absorb damaging blue and near-ultraviolet light, in order to protect the macula of the retina
- lycopene is thought to protect against prostate and other cancers, and inhibits tumor cell growth in animals
- they decrease level of cholesterol in blood and protect from coronary attack
- they have anti-cancer properties



Vitamins

- The term vitamin was derived from "vitamine," a compound word coined in 1912 by the Polish biochemist Kazimierz Funk when he was working at the Lister Institute of Preventive Medicine.
- Vitamins were discovered between 1913 and 1941.

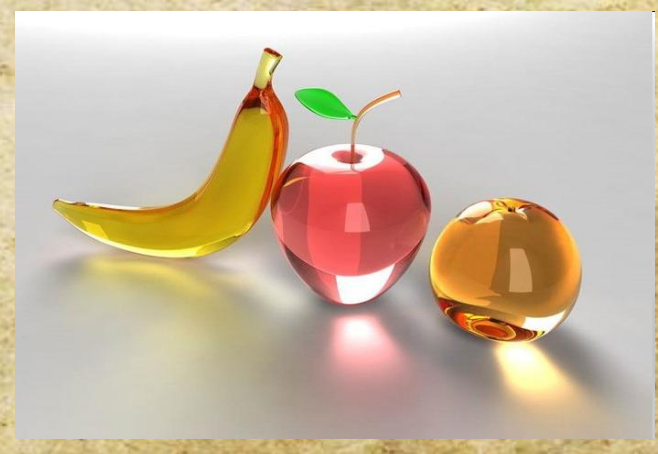
fat-soluble:

- Vitamin A (Retinol)
- Vitamin D (Calciferol)
- Vitamin E (Tocopherol)
- Vitamin K

water-soluble:

- Group of Vitamin B
- Vitamin C (Ascorbic acid)

Sources of vitamins



Impact of Vitamin C

For human health

necessary to form collagen

for healthy bones, teeth

blood vessels

helps the body absorb iron

aids in wound healing

contributes to brain function

For plants

appears to increase a plant's smog tolerance

improve the process of photosynthesis

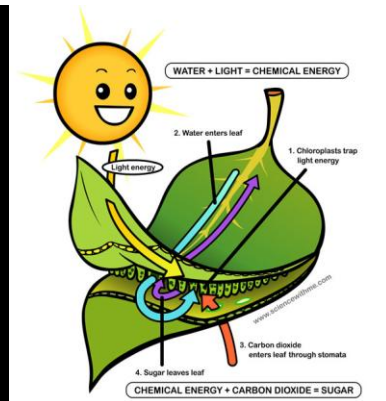
make the fruit more nutritious

a protection against the ozone

decreasing brown spots

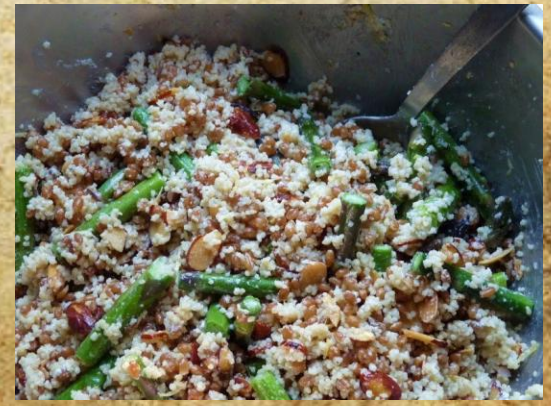
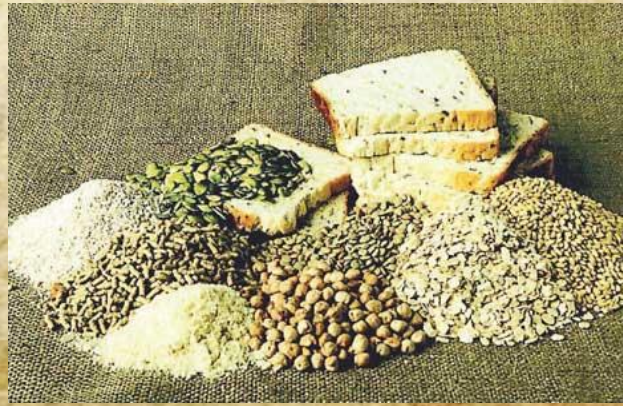
avoiding stunted growth

raising crop yields



Summary

- Numerous bioactive compounds appear to have beneficial health effects.
- There is sufficient evidence to recommend consuming food sources rich in bioactive compounds.
- From a practical perspective, this translates to recommending a diet rich in a variety of fruits, vegetables, whole grains, legumes, oils, and nuts.



**THANK YOU
FOR
ATTENTION!**

