

ORGANIC ACIDS AND MINERAL COMPOUNDS



Carboxylic acids are organic compounds characterized by the presence of a carboxyl group (-COOH).

Found in plants in free state and as salts

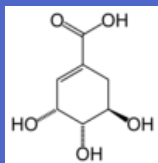
TYPES OF ORGANIC ACIDS CLASSIFICATION

I. Depending on the nature of the carbohydrate radical

1) Aliphatic

- Saturated: lauric, myristic, palmitic etc.
- Unsaturated: oleic, linoleic, linolenic, arachidonic etc.

1) Alicyclic: quinic, shikimic etc.



1) Aromatic: benzoic, salicylic, gallic, phthalic etc.

I. Depending on the number of carboxylic groups

1) Monocarboxylic: formic, acetic etc.

2) Dicarboxylic: oxalic, malonic etc.

3) Tricarboxylic: citric, isocitric etc.

4) Polycarbonic

PLANT SOURCES OF ORGANIC ACIDS

Malic acid -Rowan -Barberry -Apple	Oxalic acid -Spinach -Garden sorrel	Tartaric acid -Grapes -Tamarind
Citric acid -Citrus fruits -Pomegranate -Hibiscus	Salicylic acid -Raspberry -High bush cranberry	Benzoic acid -Cranberry

MINERAL ELEMENTS



MACROELEMENTS

- calcium
- magnesium
- potassium
- sodium
- phosphorus
- sulfur
- chlorine
- nitrogen
- oxygen
- carbon

MICROELEMENTS

- Ferrum
- Copper
- Zinc
- Manganese
- Bromine
- Iodine
- Chrome
- F
- Cobalt
- Molybdene
- Arsenicum

PHARMACOLOGICAL EFFECTS OF SOME ORGANIC ACIDS AND ELEMENTS

Salicylic acid: anti-inflammatory, treatment of Seborrhoeic dermatitis, acne, psoriasis, calluses, corns, keratosis pilaris, and warts.

Benzoic acid: as food preservatives E210, E211, E212, and E213; as topical antiseptics

AHAs (glycolic, malic, lactic, citric pH adjusting agent in creams and gels of all kinds): in cosmetology as exfoliants to treat acne, wrinkles

Si: litholytic, strengthens the lung tissue

Ca - Mg: take part in the work of muscles (contraction-relaxation)

PHARMACOLOGICAL EFFECTS OF SOME ORGANIC ACIDS AND ELEMENTS



NB! Sunscreens!



- Glycolic acid
- Lactic acid
- Citric acid
- ✓ Exfoliation
- ✓ Cleansing skin
- ✓ Anti-wrinkle
- ✓ Softening
- ✓ Smoothing
- ✓ pH adjusters

Horsetail herb - *EQUISETI HERBA*

Common horsetail - *EQUISETUM ARVENSE*

Family - *EQUISETACEAE*



Description. Horsetail appears in two forms during the year. From March to April the red-brown to straw yellow simple stem develops with leaves arranged in a number of levels on the stem in whorls. The leaves are brown, fused to a sheath at the lower level with black-tipped, dry sporangia cones at the tip sprinkling greenish spore powder. In May and June there is a sterile summer form with 10 to 14 cm high stems and numerous branches that are arranged in whorls at the nodes. The stem and branches are deeply grooved, usually square and rough.

Constituents. Silicic acid (a general name for a family of chemical compounds containing the element silicon attached to oxide and hydroxyl groups); flavonoids (equisetrin, luteolin); saponins; organic acids (aconitic, oxalic, malic, linoleic)

Uses - diuretic, litholytic, anti-haemorrhagic, anti-inflammatory. It is used in the complex treatment of tuberculosis, as antidote at lead poisonings, as gargles in stomatitis

Knotgrass herb - *POLYGONI AVICULARIS HERBA*

Common knotgrass - *POLYGONUM AVICULARE*

Family - *POLYGONACEAE*



Description. Knotgrass is a highly polymorphous annual, widespread in fields, waste places, and along paths and roads, with prostrate, branched shoots and elliptic to narrow, ca. 3 cm long leaves with a transparent ochrea. Small, greenish to reddish, axillary flowers appear in groups of 1 to 5.

Constituents. Silicic acid (a general name for a family of chemical compounds containing the element silicon attached to oxide and hydroxyl groups); flavonoids (avicularin, quercetin, kaempferol, isorhamnetin); tannins; organic acids (aconitic, oxalic, malic, linoleic); coumarins (scopoletin, umbelliferon)

Uses - anti-haemorrhagic, diuretic, litholytic, anti-inflammatory. It is used in the complex treatment of tuberculosis, urolithiasis.

Contraindication - pregnancy (uterotonic activity)

Garden sorrel leaf- *RUMICIS ACETOSAE FOLIA*

Garden sorrel - *RUMEX ACETOSA*

Family - *POLYGONACEAE*



Description. Sorrel is a slender plant about 60 cm high, with roots that run deep into the ground, as well as juicy stems and edible, oblong leaves. The lower leaves are 7 to 15 cm in length, slightly arrow-shaped at the base, with very long petioles. The upper ones are sessile, and frequently become crimson.

Constituents. Organic acids (oxalic, malic); flavonoids (avicularin, quercetin, kaempferol, hyperoside, catechins); tannins

Uses - diuretic, cholagogue, anti-inflammatory, capillary protective, antisclerotic. Externally - as anti-inflammatory.

@ CNC Department, NUPh, 20.09.2017

Caution in patients with enterocolitis, gastritis, gastric ulcer.

Spinach leaf- *SPINACEAE OLERACEAE FOLIA*

Spinach - *SPINACEA OLERACEA*

Family - *AMARANTHACEAE*



Description. It is an annual plant (rarely biennial), which grows to a height of up to 30 cm. Spinach may survive over winter in temperate regions. The leaves are alternate, simple, ovate to triangular-based, very variable in size from about 2-30 cm long and 1-15 cm broad, with larger leaves at the base of the plant and small leaves higher on the flowering stem.

Constituents. Organic acids (oxalic, citric); flavonoids (rutin, quercetin, kaempferol); vitamins (B1, B2, Bc, K, E, C); lipids; proteins; carbohydrates (fructose, glucose, saccharose); compounds of iodine, ferrum, phosphorus, calcium, magnesium

Uses - source of vitamins, anti-inflammatory, capillary protective, antisclerotic, mild laxative. Externally - as anti-inflammatory.

Contraindication - urolithiasis, nephritis, gout.

Schisandra fruit - *SCHIZANDRAE FRUCTUS*

Schisandra (Magnolia vine) - *SCHIZANDRA CHINENSIS*

Family - *SCHIZANDRACEAE*



Description. A deciduous woody climbing vine, up to 8 m long. Leaves are alternate, petiolate, ovate or oblong-obovoid, 5-11 cm long, 2-7 cm wide, the apex is acute or acuminate; the base is cuneate or broadly cuneate, membranous. Flowers are unisexual, dioecious, solitary or clustered axillary, yellowish-white to pinkish; the male flower is stalked, with five stamens, filaments united into a short column; the female flower has numerous carpels. Fruits, 5-8 mm in diameter, are arranged into a long spike with globular, deep-red berries. Seeds, one to two per berry, are reniform, shiny, smooth, yellowish brown, 4.5 mm long, 3.5 mm in diameter

Constituents. Up to 20% organic acids (citric, malic, tartaric); flavonoids; vitamin C; lipids; sugars; lignans

Uses - CNS stimulant, hypoglycaemic, stimulates regeneration of tissues, uterotonic.

Contraindication - insomnia, hypertension

Blackcurrant fruit - *RIBIS NIGRI FRUCTUS*

Redcurrant fruit - *RIBIS RUBRI FRUCTUS*

Blackcurrant - *RIBES NIGRUM*

Redcurrant - *RIBES RUBRUM*

Family - *GROSSULARIACEAE*



Description. These are medium sized shrubs, growing to 1.5 x 1.5 metres. The leaves are alternate, simple, 3-5 cm long and broad, and palmate with five lobes, with a serrated margin. The flowers are 4-6 mm diameter, with five reddish-green to brownish petals; they are produced in racemes 5-10 cm long.

Constituents. Organic acids (malic, tartaric, citric); flavonoids (rutin, quercetin, kaempferol, cyanidin); vitamins (K, P, C, carotenoids); carbohydrates (fructose, glucose, saccharose, pectins); compounds of iodine

Uses - source of vitamins, anti-inflammatory, capillary protective, mild laxative

Culinary uses - jams, fruit soups, filling for tarts

Cherry fruit - *CERASI VULGARIS FRUCTUS*

Sour cherry - *CERASUS VULGARIS (PRUNUS CERASUS)*

Family - *ROSACEAE*



Description. It is a tree 2,5 - 6 m high. Leaves are glabrous, shiny, without glands on stalks, elliptic or ovate, with serrate margin. Flowers are large, bisexual, actinomorphic, with 5 white petals. Fruits is a fleshy dark crimson-to-near black drupe. Flowers in April - May.

Constituents. Organic acids (oxalic, citric); flavonoids (anthocyanidins); vitamins (B group, C, PP); lipids; carbohydrates (sugars, pectins); compounds of ferrum, magnesium, cuprum, potassium

Uses - expectorant, mild laxative, diuretic, antiseptic, improve appetite. The syrup is used to improve the taste of drugs

Raspberry fruit - *RUBI IDAEI FRUCTUS*

Raspberry - *RUBUS IDAEUS*

Family - *ROSACEAE*



Autumn Bliss Ra



wiseGEEK

Description. It is a sprawling and prickly shrub (up to 3 m) bearing compound leaves with prickles along the midrib, and sparse hairs on the lower surface. The flowers are white to pale pink and are followed by clusters of black berries. Raspberry is less prickly but has a dense layer of white hairs on the lower surface of the leaves.

Constituents. Organic acids (salicylic); dietary fiber; flavonoids (anthocyanidins); vitamins (B group, C, PP); lipids; carbohydrates (sugars, pectins); compounds of magnesium

Uses - diaphoretic, anti-inflammatory. The syrup is used to improve the taste of drugs

Raspberry fruit - *VITIS FRUCTUS*

Raspberry - *VITIS VINIFERA*

Family - *VITACEAE*



Description. It is a liana growing to 35m tall, with flaky bark. The leaves are alternate, palmately lobed, 5-20cm long and broad. The fruit is a berry, known as a grape. Fruit is 6 mm diameter and ripens dark purple to blackish with a pale wax bloom; in cultivated plants it is usually much larger, up to 3cm long, and can be green, red, or purple.

Constituents. Organic acids (tartaric); dietary fiber; flavonoids (anthocyanidins); vitamins (B group, C, PP); lipids; carbohydrates (sugars, pectins); tannins

Uses - anti-inflammatory, mild laxative, antioxidant

Pomegranate fruit - *PUNICAE FRUCTUS*

Pomegranate - *PUNICA GRANATUM*

Family - PUNICACEAE



Description. The pomegranate is a fruit-bearing deciduous shrub or small tree growing to between five and eight meters tall. The leaves are opposite or sub-opposite, glossy, narrow oblong, entire, 3-7 cm long and 2 cm broad. The flowers are bright red, 3 cm in diameter, with four to five petals (often more on cultivated plants). Some fruitless varieties are grown for the flowers alone.

Constituents. Organic acids (citric); dietary fiber; flavonoids (anthocyanidins); vitamins (B group, C); carbohydrates (sugars, pectins); tannins

Uses - anti-inflammatory, antioxidant, hypotensive

Cranberry fruit - *OXYCOCCI FRUCTUS*

Cranberry - *OXYCOCCUS QUADRIPETALUS*

Family - ERICACEAE



Description. Cranberries are low, creeping shrubs or vines up to 2 m long and 5 to 20 cm in height; they have slender, wiry stems that are not thickly woody and have small evergreen leaves. The flowers are dark pink, with very distinct reflexed petals, leaving the style and stamens fully exposed and pointing forward. The fruit is an epigynous berry that is larger than the leaves of the plant; it is initially white, but turns a deep red when fully ripe. It is edible, with an acidic taste that can overwhelm its sweetness.

Constituents. Organic acids (citric, malic, quinic); dietary fiber; flavonoids (anthocyanidins); vitamin C; carbohydrates

Uses - anti-inflammatory, antioxidant, treatment of urinary tract infections

Roselle flowers - *HIBISCI FLORES*

Red Roselle - *HIBISCUS SABDARIFFA*

Family - Malvaceae



Description. This is an erect annual that can reach 4 m in height. It has lobed leaves and yellow flowers, each with a bright red, fleshy calyx and epicalyx (the epicalyx is a whorl of bracts that resemble a second row of sepals). The calyx and epicalyx are persistent and are collected in the fruiting stage. These edible and sweet-sour structures are known as “hibiscus flowers”..

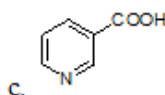
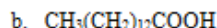
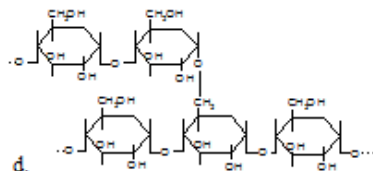
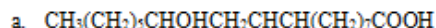
Constituents. Organic acids (citric, malic, tartaric, and a unique hibiscus acid); flavonoids (anthocyanidins); vitamin C; carbohydrates

Uses - anti-inflammatory, antioxidant, diuretic, treatment of appetite loss

Control of the Substantial Module 1
"Polysaccharides, lipids, vitamins, organic acids"

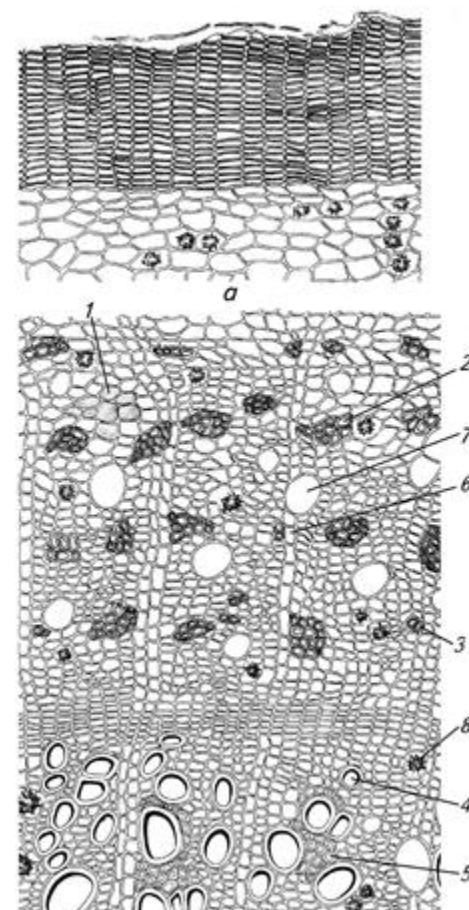
Question card №1

- Describe qualitative tests for different carbohydrates. Describe the structure and role of pectins for human body.
- Build the logic chain: A. Formula → B. Name of compound → C. Class of biologically active compounds.



- Nicotinic acid
 - Myristic acid
 - Amylopectin
 - Ricinoleic acid
 - Unsaturated fatty acid
 - Heterocyclic vitamin
 - Saturated fatty acid
 - Homopolysaccharide
 - Vitamins
 - Lipids
 - Polysaccharides
 - Organic acids
- Define the medicinal plant in the herbarium № 1. Write the Latin name of medicinal herbal raw material, plant source and family. Describe the basic morphological and diagnostic features of this medicinal plant. Describe the chemical composition (**with formulas**) of the medicinal herbal raw material, pharmacological activity and application.
- Define the medicinal plant in the herbarium № 1a. Write the Latin name of medicinal herbal raw material, plant source and family. Describe the basic morphological and diagnostic features of this medicinal plant. Describe the chemical composition (**with formulas**) of the medicinal herbal raw material, pharmacological activity and application.
- Identify the medicinal plant material using its morphological and microscopical characteristics. Write the Latin name of medicinal herbal raw material, plant source and family. Describe the basic morphological and microscopical features of the medicinal plant. Enumerate possible types of medicines and their application.
- Write the structure of vitamin K. Characterize its function in the human body and the Latin names of plants and their families, which are the sources of phyloquinone.
- Write the Latin names of plant material, plant and family for medicinal plants and build the logic chain: A. Medicinal plant → B. Biologically active compound → C. Pharmacological activity.
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№	A	B	C
1.	Spinach	Mucilage, non-drying fatty oil	Anti-haemorrhagic
2.	Wheat	Semi-drying fatty oil	Wound healing
3.	Marigold	Organic acids, vitamins, microelements	Antisclerotic, prostate protector
4.	Pumpkin	Homopolysaccharides	Laxative, antisclerotic
5.	Flax	Vitamins, flavonoids, <u>saponins</u>	Emollient, tablet-forming agent



**THANK YOU FOR
ATTENTION AND
GOOD LUCK TO
YOU, GUYS!**

