Medical Botany
5: Active compounds in plants- cont.

Alkaloids

- • Nitrogenous bases which are found in plants and which are commonly found in plants and which can form salts with acids.
  • They are present as primary, secondary, tertiary, quaternary ammonium hydrates.
  • Alkaloid name is given because of similarity of alkalinity.
  • It is usually found in plants at 0.1-10%.
  O In the context of an alkaloid-bearing plant, the term usually means> 0.01% alkaloid.

- Alkaloid morphine first isolated from the environment (Derosne and Seguin 1803-1804, Serturner 1805)
  O First synthesized cone (Ladenburg 1886)
  O The first used striknin (Magendie 1821)

- Plants often have multiple alkaloids in different amounts in similar structures.
  • An alkaloide can be found in more than one plant family, as well as a single plant species.
  • Alkaloids are usually found in plants in their own water, in the form of their salts (salts with acids such as malic acid, tartaric acid, oxalic acid, tannic acid, citric acid).
  • They are found in almost all parts of plants (root, crust, leaf, seed etc.) but in different amounts.
  This does not mean that an alkaloid will be found in all parts of a plant.
  Some fruits only fruit (morphine, etc., while there are poppy seeds, not in the seed),
  Some of them are found in leaves and flowers (not found in the seeds of nicotine tobacco plant).
- Nicotine, cones, other than those without oxygen in the constructions are usually white, crystallized dust; The above two substances are liquid.
  • Alkaloids are almost insoluble in water as free base (atropine, morphine);

Some effects of alkaloids

- Alkaloids have a wide variety of effects; Some alkaloids for some effects are as follows.
- • Bitter alkaloids: Quinine, quinidine, kynonine, kinkonidine.
- • Adenosine receptor antagonist: caffeine, theobromine, theophylline.
- Adrenergic receptor antagonist: xylopinin, berberine, xylopinin, yohimbine.
- • Pain reliever: opioids such as Argemonin, morphine etc.
- • Aphrodisiac: ibotenic acid, muscimol, yohimbine.
- • The inhibitor of ACE activity: Berberine, deoxypeganine, deoxivasicinon, eseramin, eseridin, artichoke (fizostigmine), galantamine, palmatin, peganine, vasicinol.
- • Analeptic: Caffeine, strychnine.
- • Antelmintic: Pelletierin.
- • Antibacterial: phagaronine, gerardine, pteleatin, sanguinarin.
- • Antimicrobial: Dictyamine, β-phagarin, □-phagarin, flindersin, gerrardine, haplopine, isodicytamine, cocusaginin, maculocidin, N-methylfindersin, O-methylptelefolonium, veprisinium.
- • Anti-microsporidium: Haemantidine, 7-deoxynarcicline.
- • Addictive: opioids like codeine, heroin, morphine.
- • Sputum suppressant: Emetin, psychotrin.
- • Renal osmoprotectant: Stacridine, 3-hydroxystarchine.
- • COX-2 inhibitor: Tryptantrin.
- • Striated muscle-heart stimulator: Ryanodin
- • Dioxin receptor agonist: Tryptantrin.
- • Preventing dopamine re-uptake: benzoylcigonine, benzoyltropine, ecgonine, cinnamiolcocaine.
- • Smooth muscle relaxant (spasmolytic): Arborin, edulin, codeine, dionine, japonin, morphine, narcotine, vasicinon.
- • Photomutagenic: Dictyamine, □-phagarin, β-phagarin.
- GABA receptor agonist: Muscimol, risinin.
- GABA receptor antagonist: Bikukkulin.
- • GABA vehicle inhibitor: Guvacin.
- • α-, β-Glycosidase inhibitor: Alecine, australin, deoxymannoglycinine, deoxynojirimycin, hiasintasin-B1, -C1, castanospermin, cucumber.
- Glycine receptor antagonist: Striknin.
- • Glutathione deficiency: Convicide, vicin
- Glutamate receptor agonist: ibotenic acid.
- Glutamate receptor antagonist: Iboganin.

Some effects of alkaloids

- • Halucinogenic: Bifotenine, DMT, ergometrine, ergosine, ergocrin, ergocristine, ergokrinin, ergotamine, 5HT, gramine, harmaline, blend, harmin, ibotenic acid, LSD, N-methylcytidine, muscimol, psilocybin, psilocin, cytidine.
- • 5HT (serotonin) receptor agonist: Ergometrine, ergosine, ergotamine and other ergot alkaloids; Prolactin secretion.
- • 5HT receptor antagonist: cocusaginin, confusamelin, β-phagarin, yohimbine.
- • 5HT inhibitor: benzoylcigonine, benzoyltropine, eugonine, cinnamiolcocaine.
- • Blood sugar lowering: 13-hydroxylupanine, kasimiroedin, N-methylhistamine, tekomine, trigonellin.
- • Liver poison / carcinogenic: Pyrrolizidine alkaloids (angularin, echimidin, heliosupin, heliotrin, heliotridin, indicin, isatidine, jacobin, lasiocarpine, monocrotaline, retrosin, riddelin, senecionin, senecifillin).
- • Promotes the development of hair: Reticuline.
- • Cholinergic-muscarinic receptor agonist: Slaframine.
- • Cholinergic-muscarinic receptor antagonist (atropine-like effect): Anisodamine, apoatropin, atropine, benzoyltropine, hyosine (scopolamine), lithotin, tiglodine, tropine, tropacocaine, usambarenin.
- • Cholinergic-nicotinic receptor agonist: Anabasin, anabasin, anatoxin-□, arecaindin, arecolin, coninide, konicein, lobelanin, lobelanidine, lobelin, lobinin, N-methylconidine, N-methylcytidine, myosin, nicotine, pilocarpine, pilocin, cytosine.
- • Cholinergic-nicotinic receptor antagonist (curative-like effect): Daurisin, elatin, erysinin, erythrothrin, erythratin, □-, □-erythroidin, codelfin, condondine, curar, magnofluorine, methylaconitin, rodiacin, serpin, toxiferin.
- • Vomit: Apomorphine, emetine, psychotrine.
- Na-channel blocker: Lupine, lupinein.
- • Na, K-ATPase activity inhibitor: Eritropleguin, kassaine, casassin, shihunidine, shihunin.
- • Narcotics: Heroin, codeine, morphine, rhoeadin.
- Mannosidase: Swainsonin.
- • Microsporidium effective: Pancratistatin.
- • iNOS inhibitor: Tryptantrin.
- • Cough cutter: Codeine, narcein.
- Protein kinase inhibitor: Scheringgrin.
- • Psychoactive: Haplofilidine, cocaine, robustine.
- • Ryanodine receptor stimulant: Caffeine
- • Effect on Schizophysis: Cucurbitin
- • Inhibition of sAMP-FDE activity: caffeine, papaverine, theobromine, theophylline.
- • Effective against: Augustin, febrifugin, isofebrifugin, quinine, kinkonin, kinkonidin, krinamin, lycorin.
- Teratogenic effect: Amiodendrin, anabasin, anagirine, N-acetylhistrin, 3-O-acetylgervine, O-diacetylgervine, 13a-dihydroergin, elimoclavine, N-formylgervine, jervine, N-coneine, coniceine, N-methylamodendrin, methyljervine, , Rubijervin, caconidine, monocrotaline, senecionin, cyclopamine, cyclopocine, cytisine, solanidine, solasodin, usaramin.
- • Topoisomerase I inhibitor: Camptothecin
- • Platelet activity inhibitor: Cocusaginin, confucamelin, β-phagarin.
- • Tumor suppressor / inhibitor: Ambelline, acetylcarbinine, docetaxel, komptothecin, taxin, taxol (paclitaxel), vinblastine, vincristine.
- • Tuberculosis and leprosy are effective: Sefarantin.
- • Anti-inflammatory: Achillein, gentianin, gentianamin, gentianin.

2. Glycosides

- • Hydroxyl or sulphydryl group are the compounds made with sugar.
- O Sugar (known as glycone) and non-sugar portion (known as genus or aglycone) are linked to each other by an ether linkage (glycosidic link, oxygen bridge).
- The part that is effective / effective is the non-sugar part (genetically or aglycone).

- • Bond; Enzymes (such as β-glucosidase, β-galactosidase) found in the digestive tract of plant tissues or animals are easily hydrolyzed under hot, UV light, humidity, extreme acidic or alkaline conditions.
- O The glycoside dissociates itself into the constituent parts.
- This significantly changes the pharmacokinetics and pharmacodynamics of glucoside.

- Care should be taken when preparing or using the plant.

- • Glycosides, which are broadly active, usually dissolve in water and alcohol solutions.
- • Glycosides are usually named after the active substance in -in or -inum (Latin).

- • Glycosides in the digestive tract (usually the strong alkaline medium of the large intestine) are exposed to hydrolysis and break down into their constituent parts.
- Some of the agglissons are subject to change here (loss of influence)
- Some are absorbed and form their influence.

- Saponic glycosides (ginsenosides) found in ginseng (Panax gingeng) are decomposed by digestive tract bacteria.
- The release of aglycones (panaxadiol, panaxatriol) produces a stronger effect (such as an anti-cancer effect) than parenterally administered glycosides.

- • Important glycosidic substances in terms of pharmacology and toxicology.
- O Cardiac glycosides
- O Glucosinolates
- O Saponin glycosides
- O Solaninler
- O Coumarin glycosides
- O Antaglycosides
- O Cyanogenetic glycosides
- O Calcinogenic glycosides
- O Bitter glycosides
- O Flavonoids
- O Nitropropanol glycosides

- 2 a. Cardiac glycosides (Table 4a)
- • There are hundreds (> 300) plant species in the constructions containing cardiac glycosides.
- O Gullworms (Digitalis species),
- O Strofantus (Strophanthus species),
- O Adash (Urginea maritima),
- O Pearl (Convallaria majalis),
- O Oleander (Nerium oleander),
- O Helicobacter (Helleborus orientalis) glycosides are of pharmacological importance.

- ll of the cardiac glycosides have a group of β-OH in C3 and C14; If the OH group is more than 5, these also depend on C5, C11 and C16.
- • In glycosides, the sugar molecule is linked to the C3 by an oxygen bridge (glycosidic bond).
- • Cardiac glycosides are triterpenic; They are divided into two according to their agricons.
- O Cardenolids (such as digitoxigenin, gatifoxygen, gitaligenin, strophanidin)
- O Bufadienolidler (hellebrigrin, convallatoxin, such as sillarenin)
- O The two structures are often similar, with little difference between them.
- O Lakton ring;
- In cardenoid glycosides (such as digitalis, strofantus) 5-member,
- Bufadienolid is a 6-member in glycosides (such as bufatolin, sillarenes).

- • Cardiac glycosides increase the contraction power of the heart muscle by inhibiting the activity of the Mg-dependent Na, K-ATPase (the protein or pump that carries the sodium in the cell and the potassium outside the cell) in the heart muscle cell membrane; This is known as the cardiotonic effect.

- O Blocking the effectiveness of the pump increases the sodium concentration in the heart chambers.
- This activates another pump (Ca / Na exchange system, Ca / Na-TR) in the cell membrane.
- The system exchanges sodium in the outside with calcium in the outside.

- O Increasing concentrations of calcium ions in the cell allow the heart muscle to contract more strongly.
- O Heart rate under the influence of heart glycosides;
- Slower but stronger stiffness,
- Increase in heart rate,
- The heart uses energy-saving; That is, it does more work than the energy you're spending.

Saponins

- Saponin name comes from sapo name in Latin.
- • Saponin-containing plants (such as Saponaria officinalis, Panama tree-Quillaja saponaria) or plant parts have been used especially for washing clothes.
- • They are considered as a subgroup of glycosides.
- • The aglycon is called sapogenol (or sapogenin).
- O According to Aglikona;
- Steroidal saponins (Figure 4ba),
- Triterpenoid saponins (triterpenic saponins, Fig. 4bb).
- There are also steroidal saponin-like substances; They are known as phytosterols (such as campesterol, sitosterol, stigmasterol).

- O Steroidal saponins (such as dioscin, protodioscin) are prepared from acetyl-CoA.

- The steroidal saponins are 4-ring (also, in C17 there are 5- and 6-membered lactone rings, both of which are oxygen).
- They are found in more monocotyledons.
- • In some plants (such as Dioscora species, Agave species, Yucca species) of monocotyledonous plants, Negisgiller / Amaryllidaceae, Karaasmagiller / Diosporaceae, Liliaceae,
- • Dicotyledons are found in some plants (such as Trigonella faenum-graecum) in Legumes (Fabaceae / Leguminosae).
- They are neutral reactions.
- Yellow with sulfuric acid (Salkowski reaction) gives color.

- O Triterpenoid saponins (amirin, azadiractin, cimicifugoside, ginsenosides, glycyrrhizic acid, hederin, lupeol) are prepared from isoprene molecules (C6H5).
- Triterpenoid saponins are 5-ring.
- □ More commonly found in dicot plants (Kabakgiller-Cucurbitaceae, Caranfilgiller-Caryophyllaceae, Sabunagaciller-Sapindaceae, Milkweed / Milkweed-Polygalaceae).
- □ They are acid reactions.
- □ Chlorosulfonic acid (Brieskorn-Briner reaction) gives red color

- • Along with being different, there are many common properties of molecules.
- O Triterpenoid saponins are acid, steroidal saponins are neutral reaction.
- O Molecules are great; In molecules;
- □ On the one side, the water-loving group (the side to which aglikon is bound)
- □ On the other side are the oil-loving group (the group that does not like water).
- • This is known as the amphipatic feature.
- • Thus, they are emulsifier and surface tension reducing effect.

- • Odorless, amorphous, colorless, shaky flavor ingredients.
- O Usually soluble in oil and boiling alcohol; It collapses when cooled.
- It forms a stable foam when rinsed with water.
- □ Reduces surface tension by means of foaming agents; Foam, especially in the air-water gap.
- • They are used to keep water-insoluble substances in emulsion or suspension in pharmacy.
- • They are used to remove / remove water-insoluble substances (eg oil, phospholipids) (detergent effect).

- • Saponins are extremely irritant and poisonous.
- Especially poisonous to aquatic organisms (fish); They are used as a trap for catching fish.
- It usually affects blood as a poison.
- □ are bound to cholesterol or lecithin on the skin of the red blood cells; The membrane either breaks down or becomes hemoglobine (Hb) permeable; So that Hb escapes.
- □ This effect is seen when they are given more intramuscularly or when they are exposed to a very large amount of mouthful-rich plant.
- O They are absorbed very limitedly from the digestive tract; In this way they are generally safe.
- O An unknown mechanism leads to malfunction of the digestive system.
- □ But it is good for these disorders to be taken with food.

- •

- Saponin-rich plants such as Hedera helix produce reflux and expectorant effects.
- O This effect is very useful in cough, especially dry cough.

- • All saponins, especially steroidal-saponin-like substances, are cholesterol;
- O Reduces absorption through the digestive tract and synthesis in the liver.
- O Accelerates the body (cholesterol-lowering effect).

- Saponins (especially triterpenoid ginsenosides found in Ginseng);
- O Regulating the immune system,
- O Blood sugar and cholesterol lowering,
- O Compliance and fatigue remover,
- O Tumoral involvement plays a role.

- • Antimicrobial effects, especially fungi.
- • There are many versatile effects (such as stomach protective, anti-inflammatory, antiviral) of Meyan's milk saponins (such as glycyrrhizic acid, glycyrrhizinic acid).

- Phytosterols / Phytostanol (Steroidal saponin-like substances, Figure 4bc)
- The most important sterol cholesterol found in mammals (with 27C).
- O From this, steroid substances (feminine-male hormones, cortisol, etc.) are prepared.
- Cholesterol and lanosterol, the predominant forms of animal sterols, are found in some plants.
- Some plants (Yellowpox-Pinus silvestris) are male hormones (such as androstenedion, testosterone)
- Some are feminine hormones (such as 17β-estradiol),
- Some others; Plant phytoplasms include phytoecdyses resembling the maturation / alteration hormones (ecdysons) in insects.
- These break down the development of insects.

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- Phytosterols enter the structure of the cell membrane and affect the permeability of the membrane.
- Primary items found in plants; Among the main ones,
- O Campesterol (24-methylcholesterol),
- O Sitosterol (24-ethylcholesterol),
- O Stigmasterol (D22,24-ethylcholesterol).

- Phytostanol (such as campestanol, β-sitostanol) are found in plants in small quantities.
- O The counterparts are easily formed by the hydrogenation of phytosterols.

- Phytosterols and phytostanol are found in plants such as free alcohols, esters made with long-chain fatty acids (linolenic acid, oleic acid, palmitic acid), glycosides.
- O Good solubility in oil; For this reason, they pass easily through cell membranes.

- There are many influences in the memories; Some of them are as follows.
- O Cholesterol (digestive and biliary sourced) is absorbed through the digestive tract and reduces synthesis in the body.
- In humans, 2-4 g phytosterols a day lower cholesterol in serum by 10-15%, accelerating their elimination.
- Reduces absorption of fat-soluble vitamins by 10-15%.

- O increase the strength of the vein walls; Reduce the shape of some inflammatory mediators, and increase some.

- O β-Sitosterol;
- Fire suppressor,
- Ulcer preventive and healing,
- Blood sugar lowering,
- Fire prevention,
- It is a protective effect against cancer.
- Increases the levels of interleukin-2 (IL-2) and gamma-interferon (-IFN), stimulating the proliferation of natural killer cells and Th1-cells.
- • In small doses, phytosterols are involved in reading related genes; Enhances the sensitivity of other mediators and co-factors.

Solanines (Steroidal-alkaloids, Azasteroids,

- • Glyco-alkaloid (steroidal-alkaloid) found in plants.
- • nitrogen-like analogues of steroidal saponins; Also known as azasteroids.
- O When they are hydrolyzed, sugar and nitrogen steroids are released.
- O between one and four sugar molecules in C3 (such as galactose, glucose, xylose, rhamnose)
- • They are insoluble in water and resistant to heat.
- • They share many properties of saponins (such as activity on the surface, breakdown of red blood cells).
- • In particular, they are found in Solanaceae and Liliaceae.
- • Potatoes, mainly solanaceae (Solanaceae), cacao, solasonin, tomatin solanınlar başlancalardır.
- He is the solitary in the path; Solanidine aglycone and glucose-galactose-rhamnose sugars,
- O Domestic tomatine; Tomatidine aglycone and galactose-glucose-glucose-xylose sugars.

Antraglycosides (Antroquinones

- • Phenolic structure is an effective substance.
- • They find few plants; Orange, red, brown-red.
- • Similar to other glycosides in terms of their solubility.
- • They do not change much in the stomach and small intestines.
- Hydrolyzed active substances (such as emodin, chrysophanic acid) are released in the severe alkaline medium (pH 10-11) of the large intestine.
- O The effects of the system are delayed (6-36 hours).
- ▪ By stimulating the parasympathetic nerves (Auerbach and Maessner) in the large intestine,
- They produce water-electrolyte secretion and drive effect.

- • Antaglycosides also have the following effects.

- O Antifungal
- O Prevention of renal tubular cell proliferation
- O Delays the worsening of the condition of patients with renal compromise
- O Regulator of fire (partially avoiding COX activity)
- O Antiseptic (with its reducing properties)

- • Antraglycosides are stored partly in the wall of the large intestine; It gives a dark brown color (Pseudomelanosis coli).
- • Disposable products also change the color of urine according to pH.

Glucosinolates (GSs, Thioglycosides)

- . • Sulfuric substances prepared from amino acids (such as phenylalanine).
- • There are many items; Some of them are:
- O Glucoalissin 4- (methylsulfinyl) pentyl-GS
- O Glucobuteroin 5 (methylthio) pentyl-GS
- O Glucobrassicin (indole-3-methyl-GS)
- O Glucoerisolin [4- (methylsulfonyl) butyl-GS ^
- O Glucoerus 5- (methylsulfonyl) butyl-GS
- O Glucokapparin (methyl-GS)
- O Glucoamine 3- (methylsulfinyl) propyl-GS
- O Glucoquinoline 3- (methylsulfinyl) propyl-GS
- O Glucorafanil [4- (methylsulfinyl) butyl-GS ^
- O Glucotropeolin (benzyl-GS)
- O N-Metoxyibrassicin
- O Progoitrin (3-hydroxy-but-3-enyl-GS)
- O Sinaline (p-hydroxybenzyl-GS)
- O Sinigrin (prop-2-enyl-GS)

- It is similar to other glycosides in many ways; Themselves dissolve in water, while aglycons are insoluble.
- O coexist with the plant myrosinase (thioglucosidase); The plant tissue is damaged or is hydrolyzed by this enzyme during cooking and digestion in the digestive tract.
- Isothiocyanates (such as allyl isothiocyanate, acrylisothiocyanate, phenethylisothiocyanate, methylisothiocyanate), which are highly toxic and malodorous aglycones, arise.
- O These are; Also known as mustard oil.
- Sugar and potassium hydrogen sulphate are also released.
- As isothiocyanate aglycons, substances such as indole-3-carbinol (I3C), diindolylmethane (DIM) are also released.
- • Isothiocyanate aglycoses suppress microsomal enzymes (especially CYP1A1, CYP1A2, CYP2B1); Carcinogenic metabolites (as well as aflatoxins).
- • I3C accelerates the 2-hydroxylation of the estrogen (inactive reflex reaction).
- O This reduces the amount of hormone to be exposed to 16- and 4-hydroxylation.
- Thus, it is beneficial to the events leading to the increase of the hormone secretion, while at the same time it causes the hormone deficiency (due to the weak effective metabolite formation).

- Glucosinolates are more commonly found in plants (such as mustard, cauliflower, rapeseed, cabbage, rocket, garlic, onion, turnip, radish) in the Crassus / Mustard / Turpgiller (Brassicaceae / Cruciferae) and Resedaceae; They are found in more seeds of plants.
- • There is insufficient information about tasks in plants; They are attractive for plant parasites (such as lice), caterpillars and worms.

- • In particular, it affects glucoquyroline, glucotropeolone and progoitrin as goitre makers.
- • goitrin (5-vinyl-oxazolidon-2-thion) formed by cleavage of progoitrin;
- It grows in the thyroid gland (goitre), thus causing a decrease in thyroid gland activity.
- O Increases glutathione-s-transferase activity.
- This creates a protective effect against substances such as aflatoxin.

- Isothiocyanates;
- O Insect attractant and repellent,
- O Smell and flavor,
- O Tearful,
- O Cell venom,
- O They have antibacterial effects.
- O they cause irritation / redness / fire in skin and mucous membranes; Cause the enlargement of the skin veins and the feeling of warmth.
- This results in the relief of pain and fire in nearby or deeper tissues.
- O Extremely active.
- Reacts with thiol and amino groups in proteins.

- Bitterglycosides
- • Extremely bitter glycosides (amarogentine, amaroswerin, gentiopicroside) are found in Jensian plants (Gentiana lutea).
- O Gentiopikroside (gentiopicrin) reacts with ammonia to form gonadian (monoterpene alkaloid).
- • Promotes taste buds in the mouth, increases saliva and gastric secretion.
- O Opening appetites encourages and facilitates the digestion of foodstuffs.
- • Naringin in grapefruit (Citrus paradisi)
- • Neohesperidin in citrus (Citrus aurantium)
- • Quasi-intense bitter taste flavanon glycosides found in the bitter gourd (Quassia jamaicensa).

- Coumarin glycosides
- Information on phenolic substances (3e Koumarins) will be given

Cyanogenetic glycosides

- • Enzymatic (such as β-glucosidase, emulsin) or acid hydrolysis releases hydrocyanic acid (HCN).
- • The most important reason for cyanide poisoning in pets is the plants containing these glycosides (cyanogenetic plants).
- O Heads of cyanogenetic glycosides found in plants
- • Amigdaline
- • Dhurrin
- • Linamarin
- • Linustatin
- • Lotaustralin
- • Lukumin
- • Prunasin
- • Sambunigrin
- • Taxifilline
- • Trigloquinin
- • Tetraflilline
- • Vicianin
- • Zierin
- O By enzymatic decomposition of these substances, the sugar molecule, cyanide ion (CN-), aldehyde (usually benzaldehyde) is released.
- • The cyanide ion can not be released while the plant texture is maintained.
- • Glycosides are first cleaved off with cyanohydrins (α-hydroxynitriles) and sugars by the action of β-glucosidase (also found in the plant but located in separate cells with the glycosides, while plants are present in plants), during the digestion of plants or feedstuffs, damage or digestion in the digestive tract.
- O Cyanohydrins release HCN by the action of certain enzymes (such as emulsions, hydroxynitrile lyases) that are found in the plant tissue and become end resultant from the disintegration of plant cells.
- O Reaction is slow in acid environment, fast in alkaline environment.

History of Terpenes

- History of terpenes dates back to various civilizations. The essential oils were used in the ancient Egypt for various ceremonies. Camphor was introduced by Arabs around 11th century.
- The process of distillation of oils from rosemary and sage was described by Arnaud de Villanosa (1th century).
- Analyses of oils obtained from plants started by JJ Houston in 1818. Dumas proposed the name ‘Terpene” derived from turpentine.
- In 1887, Wallah O proposed that isoprenoid unit (5C) is present always in terpenes.
- The structure of beta carotene from carrot was isolated by Wackenrodder and its correct molecular formula was determined by Will Statter

- Simple phenol glycosides
- • Glucosides which give simple phenolic substance by hydrolysis.
- • The phenyl ring carries alcohol, aldehyde, carboxyl group.
- Salicylalcohol and salicylic acid in the species Willow (Salix species), Poplar (Populus species) species; The main examples are glycovanilin, which is composed of vanillin and glucose in the types of vanilla (Vanilla species).
- • Salivate in plants; Glycation of salicylaldehyde followed by reduction of the carbonyl group (CHO) (CH2OH).
- Some of the phenol glycoside-containing droplets are pain reliever-antipyretic, some of which are antiseptic.
- • Some of them are smoky; They are used as fragrance or odor corrector.
- • Salicin is used as analgesic, vanillin spasmolytic and nerve stimulator.

- Carbon glycosides (C-glycosides)
- • Glucosides to which the sugar molecule and the aglycone are linked by the C-C bond.
- • The bond is acid-resistant to hydrolysis; Can be hydrolyzed with FeCl3.
- • They are rarely encountered in plants; More commonly found in Legumes (Fabaceae / Leguminosae).
- • Some flavonoids (orientin "luteolin 6-C-glucoside") such as some ankuroquinone derivatives (aloin in Aloe forex, kaskaroside in Cascara sagrada), isoflavonoids (genistein 8-C-glucoside, daidzein 8-) Are such glycosides.
- Especially isoflavonoid glycosides have vasoprotective effects.

- Phenolic substances (Table 5a)
- Phenolic substances are used to describe compounds bearing the phenol (hydroxybenzene, C6H5-OH) group.
- • They are prepared from the hydroxycinnamoyl-CoA in plants; First the phenylpropanoid group (structure consisting of the benzene ring and the 3 carbon side chain) is formed.
- • There are many groups and / or subgroups in the main group of phenolic substances; Main:
- • Simple phenols
- • Mono-cyclic compounds (quinones)
- • Two-ring compounds (chalks, stilbens)
- • Tri-cyclic compounds (such as anthocyanins, benzofurans, flavonoids, isoflavonoids, chromones, coumarins)
- • Plural-phenolic materials (tannins)

- • They are usually found in plants as sugary compounds (glycosides).
- O Apigenin and naringenin are aglycones of apinine and naringin named phenolic glycosides, respectively.
- O Agrocons of anthocyanins (such as malvidin 3-O-glucoside, cyanidin 3-O-glycoside) are anthocyanidins (such as malvidin, pelargonidine, cyanidin).
- • Some are isomeric (catechol, epicatechol, etc.).
- • Those with small molecular weight are partly volatile (aromatic).
- • They take place in vacuoles in the plant cell.
- • Solubility in water.

- • The most important features of phenolic materials are that they contain a large number of hydroxyl groups, so they are electronically rich.
- • This gives the phenolic substances in the body a very important property in the biological direction.
- • Makes effective oxygen groups (such as O2 * -, HO *, and 10O2) that are composed of foreign substances that enter or enter the body during metabolic events in the body (oxidation inhibitor / antioxidant effect).
- • Phenolic group, proton (H +) acts as an acceptor.
- O The phenolate ion (phenyl-O-) is formed.
- This is oxidized to form quinone (aryl = O) and aryl group (aryl-O *).
- • Phenolic groups facilitate the passage of protons to the mitochondrial inner membrane, which breaks the oxidative-phosphorylation bond.

-

- The antioxidant / antioxidant power of the plants is assessed according to the capacity of the active oxygen groups (Oxygen Radical Absorbance Capacity; ORAC); ORAC values (µg / 100 g) for some plants / fruits are as follows according to their potency:
- O Garlic (Allium sativum) 2000
- O Blackwort (Brassica oleracea var acephala): 1770
- O Spinach (Spinacia oleracea): 1260
- O Alfalfa (Medicago sativa): 930
- O Broccoli (Brassica oleracea var. Italica): 890
- O Onion (Allium cepa): 450
- O Maize (Zea mays): 400
- O Peas (Marshall sativum): 390
- O Eggplant (Solanum melongena): 390
- O Cabbage (Brassica oleracea var. Capitata): 300
- O Potato (Solanum tuberosum): 300
- OLettuce(Lactuca sativa): 250
- O Green beans (Phaseolus vulgaris): 200
- O Tomato (Lycopersicon esculentum): 200
- O Carrot (Daucus carota): 200
- O Celery (Apium graveolens): 100
- O Cucumber (Cucumber sativus): 100

- Some of the phenolic substances (such as flavonoids) contain too many conjugated double bonds.
- O This structure absorbs the visible light and brightens the compound.
- • They are very sensitive to enzymatic oxidation; They are cleaved by the phenolase present in all plants during their separation from the plant material with the solvents.
- O Hot-boiling alcohol inhibition inhibits enzymatic activity; For this reason, extraction of the tannins is utilized from this application.
- O To prevent this disintegration, substances which inhibit the activity of the enzyme (such as sodium dithionite) or liquid aztoton are used.

- • Color phenolic substances act as attractants for pollinators; Phenylpropanoids and other phenolic substances are found in the pollen structure.
- • Tannins bind tightly to proteins; With their bitter tastes, protect the plants from herbivores.
- • Establishing / harmonizing effective oxygen groups constitutes the basis of anti-inflammatory-anti-oxidation effects.
- • Aspirin, the acetyl ester of salicylic acid, is a fever reducer, pain killer and anti-inflammatory.

- • Phenols have many different and different effects compared to compound cisidines; These effects are as follows in the main headings; They will be examined separately in each group of substances.
- O Antimicrobial (such as bacteria, fungi).
- O Shocker / precipitator.
- O Color and fragrance.
- O Oxidation inhibitor (harmless effect of free oxygen groups such as O2 * - group).
- O Protector for tissues and organs.
- O Prevents the activity of various enzymes (such as COX, LOX).
- It is tempting for insects.
- O like estrogenic effect.

Simple phenols / Phenolic acids

- Phenol; Hydroxybenzene (carbolic acid-C6H5-OH) structure.
- • Holds a large number of substances bearing a hydroxyl (OH) and / or methyl (CH3) group.
- • Unlike phenolic acids, free phenols are very rare in plants; Hydroquinone, floroglucinol, catechol, and pyrogallol are the main simple phenols.

- • Simple phenols are painkillers, antiseptics, antimicrobials, odoriferous substances.
- • Many (such as anacardic acid, ginkgol, grevillol, catechol, salicylic acid, sesamol) enter into the form of preparations used in skin diseases.

- • Phenol, o-, m-, p-cresol, catechol, pyrogallol, resorcinol are antiseptic / disinfectant effective.
- • Phenolic acids such as benzoic acid, gallic acid, gentic acid, ginkgoic acid, pyrocatechic acid, salicylic acid are antimicrobial effective.

- • Fragrant substances.
- Some (such as p-anisaldehyde, phenethylalcohol, guaiacol, 4-hydroxybenzaldehyde, heliotropin, vanillin) are added to various foodstuffs to give scent.

- • Anacardic acid, 2,6-dimethoxyphenol, ginkgoic acid, ginkgol, salicylic acid COX; Ginkgol prevents the grevillol 5-LOX activity.

- . Phenolic ketones (Table 5a)
- Phenylpropanoid derivatives.
- Most are based on the principle of fluoroglucinol (1,3,5-trihydroxybenzene).
- Pain-tasting, pain-killer, antiseptic, estrogenic effective substances.
- • Pain: xanthoxylin, tricycodehidrohumulon.
- • Antibacterial: Humulone, lupulone.
- • COX, LOX inhibitor: 2,6-Dimethoxy-4-hydroxyacetophenone, xanthoxyline

- Phenylpropanoids / Phenylpropenes (Table 5b)
- • Natural phenolic materials bearing aromatic rings and 3-carbon side chains.
- • Prepared from cinnamic acid by shikimic acid; Phenylalanine derivatives.
- • Ferulic acid, kaffeic acid, coumaric acid, sinapic acid, cinnamic acid are important mainstays.
- O These are; Cinnamic acids or hydroxycinnamic acids.
- O Plants are usually found in the form of an ester (especially cinnamylacetate).

- • Lignin building stones in plants.
- • In the regulation of growth / development, they work in the presence of diseases / harms.

- • They are exposed to many reactions; They constitute a large number of substance groups / substances.
- Aldehydes or alcohols are formed by reduction of the double bonds or carboxyl groups in the side-chain.
- It shapes glycosides with sugars.
- O Sugars and other substances (especially quinic acid, shikimic acid) form carboxylic acid esters.
- It shapes the amids.
- O Decarboxylation (formation of phenylpropanes and phenylpropenes),
- They are exposed to reactions such as phenolic hydroxylation (methylenedioxy compounds are formed).

- •

- They are found in the form of kaffeic acid, quinic acid ester, chlorogenic acid (5-O-caffeoylquinic acid).
- O Isomers (such as isochlorogenic acid),
- O Sugar (kaffeoylglycoside, such as orobakin),
- O Organic acids (such as kaffeoyltartaric acid, rosmarinic acid) are also available.
- O Hydroxycoumarins, phenylpropenes and lignans are the main phenropanoid compounds.

- • Similar to many monoterpenoids and sesquiterpenoids.
- O Good solubility in oil.
- O Strong odor / volatile / sweet substances.
- They are usually found in the essential oil part of the plant with volatile terpenes, especially the phenylpropenes.

- •

- They are well absorbed from the digestive tract and the respiratory tract; They enter the brain.
- • The body is excreted especially by respiration and kidneys; They are effective in diseases related to these systems.

- • Some of the phenylpropanoids are extremely harmful; Some of them have many useful effects.
- Some of the allylbenzene (phenylprop-2-ene; AB) derivatives (such as elemicin, estragol) form 2,3-epoxide groups in the body.
- The epoxide group, which is a highly effective intermediate product, binds to DNA and causes mutagenic and carcinogenic effects (gene-toxic effect).
- Most of these materials are found in plants consumed by humans (such as chicory, cinnamon, star anise).

- O Some AB compounds (myristidine, eugenol) and phenylprop-1-ene (PB) compounds (-asarone, isosafrole, methylisoleogenol) are linked to DNA; But they do not usually cause genetic disorders.
- Epoxide hydrolase (also known as epoxide hydratase) is believed to have a protective effect against gene-toxic phenylpropenes.
- Enzyme converts epoxides to trans-dihydrodiol derivatives.
- Phenylpropenes, such as safrole, isosafrole, myristice;
- 3,4-Methylenedioxy-N-methamphetamine (MDMA, Ecstasy),
- 3,4-Methylenedioxymethamphetamine (MDA),
- • are precursors of amphetamine-like CNS stimulators such as 3,4-methylenedioxy-N-ethylamphetamine (MDE, MDEA); They can be used in the synthesis of these substances.
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- Phenylpropanoid ketones (such as gingerols) prevent COX and 5-LOX activity.
- □ prevents the formation of PGs and LTs.
- □ This effect; Anti-inflammatory and analgesic effects.

- O Some other substances and their inhibited enzymes are as follows.
- □ COX: Coniferylaldehyde, phagaramide, yakukinon.
- □ 5-LOX and sAMP-FDE: Biphenylpropanoid glycosides forsithiaside, helicoside, suspensacid.
- □ MAO: Miristisin.
- □ H, K-ATPase: Salvianolic acid-A (triacaffeic acid derivative).
- PK: Kaffeic acid esters vanikoside A-B, diferuloyl kurkumin.
- □ Xanthine oxidase: Caffeic acid.
- □ Tirosinase: Ferulic acid, kurkumin, yakuinon-B.
- HIV-1 integrase: Kurkumin, caffeic phenylethylester.

- Eugenol;
- O Strongly prevents the melanoma cells from jumping to the surrounding tissues (metastasis).
- It causes apoptosis.
- It prevents ATP production.
- O Various microorganisms change the permeability of cell membrane.
- The final effect describes the antimicrobial effect of plants rich in eugenol.
- • Vanillin removes the singlet-oxygen groups (10).

- Benzofurans / Dibenzofurans (Table 5c)
- • Benzofuran, a 5-member furan ring fused with the benzene ring (one oxygen, the other carbon)
- • The dibenzofurans carry two furan rings fused with the benzene ring.

- • Benzofurans are antimicrobial, especially against fungi in plants.

- • They are antioxidants, pain killers, gluconeogenesis, inflammation and oxidation inhibitors in mammals.
- O Prevents toxol, tremetone and dehydrotremetone gluconeogenesis; Causes ketosis in cows.
- O Mulberrofurans prevent COX activity.
- O Lithospermic acid (rosmarinic acid dimer) removes active oxygen groups, inhibits the activity of pyrrolyl hydroxylase and hydroxylation of collagen.
- O removes active oxygen groups (especially the O2 * - group) of morasins and chalcomorrhiza.
- O Usnic acid prevents cell division, breaks oxidative-phosphorylation stent, affects tubercular bacillus, inhibits vegetative protoporphyrinogen synthetase activity.

- Chromones and Chromates (Table 5d)
- • Made of benzene and fused firin (one oxygen-free 6-membered unsaturated ring).
- • Many other cyclicals have become controversial.
- O A large number of groups such as alkyl, aryl, hydroxyl, methoxy are attached to the molecules.

- • Its role in plants is unknown.

- •

- In mammals, they generally act as antimicrobial and cell toxins.
- O Biflorine oxidizes (removes active oxygen groups) and prevents sAMP-FDE activity.
- O Encekaline and mallotchromene inhibit HIV-1 reverse transcriptase activity and act as cell poisons.
- O prevents capillary's aldose reductase activity; It is good for the effect of glucose on liquor in diabetics.
- O Khellin is visibly sensitive to light and avoids sAMP-FDE activity; Relaxes the vessels (especially coronary vessels) and smooth muscles with the last effect.
- □ Khellin is used for asthma and pre-chest pain.
- □ Cromoglycate, the Khellin synthetic compound; In the prevention and treatment of asthma, allergy, hay fever and the like.
- O Pulverochromenol is antibacterial and cell-poisonous.
- O Preocene-1 and -2 insecticides (which inhibit juvenile hormone production) are effective
- These substances in the form of prodrugs are converted into compounds (insect-growth regulator) which prevent juvenile hormone synthesis in insects and result in the failure / development of insects.

Coumarins

- • Coumarin is formed by the incorporation of the parent compound (1,2-benzopyrone) benzene and pyran-2-one (five carbon bearing pyran structure) groups; O-hydroxycinnamic acid is lactone.
- • They are found free or glycosidic in plants (eskulin, koumaric glucoside such as scopolin).

- • Fragrant substances; Fresh cut-fresh grass.
- • Some times, some were used as taste and odor corrections in foods; But they have been discontinued for this reason because they are toxic to the liver.

- • The psoralens are separated into two parts by their long positions in the chemical structures, namely flat, furanokoumarin (psoralen) and angiofuranokoumarin (angelicin, pimpinellin)
- O Psoralens make the skin sensitive to UV light; Sunburn and severe swelling.
- O Chromophore compounds; Absorbs UV light; This radiation induces the formation of melanin pigments at the bottom.
- Bergapten, xanthotoxin, psoralen found in plants such as Bergamut (Citrus bergamia), Celery (Apium graveolens), Sedeforu (Ruta graveolens), Parsley (Petroselenium sativum) cause problems (such as allergy, light sensitivity, sunburn) in contact with these plants.

- Coumarins
- O Antibacterial,
- O Prevents clotting,
- O Removing effective oxygen groups,
- O Stimulating,
- O Capillaries are substances with versatile effects such as enhancing vessel stiffness.

- O ammoresinol, dafnetin, esculetin, eskulin, herniarin, umbelliferone antibacterial effect.
- O Fraxetine removes 4-methyldafetine effective oxygen groups and prevents 5-LOX activity.
- O Fractional, 4-methyldiphenylin, xanthotoxol removes active oxygen groups.

- Furanokoumarins (such as angelicin, bergapten) are covalently linked to DNA.
- Light-sensitive DNA compounds are formed by alkylating pyridine bases with light effect (sunlight-sensitizing effect).
- O Furanokoumarins prevent NOS formation.
- O Xanthotoxin; Vitiligo and so on.
- Following oral administration, long wave UV irradiation is performed very carefully.
- It blocks Visnadine Ca-channels; Vasodilator and spasmolytic is effective.

- • Avoids the efficiency of various enzymes; Some examples.
- O Eskuletin and umbelliferone: Xanthine oxidase
- O Osthol: sAMP-FDE.
- O Skoparone: Tyrosine kinase.
- O Dikoumarol: Vitamin K-epoxide reductase.
- O Byakangelikol, oxypeukedanin, knidilin, pimpinellin, sphondin, xanthoxine: NO synthase.
- O Furanokoumarins (isopsoral and psoralenes): MAO-A and -B.
- O Inophyllum-B and -P: HIV-1 reverse transcriptase.

- Quinones (Table 5f)
- • color materials found in plants; Colors, ranging from pale-yellow-to-gray.
- O Because they are masked with other coloring matter, the plant's color has little to contribute.

- • The plants are found especially in parts such as shell, stem, root and leaf.
- • Isoprenoid quinones function in cell respiration (ubiquinones, C40-C50 side chain) and photosynthesis (plastokinons, C45 side chain).
- O Ubiquinones are found in all living things and serve as electron carriers in the electron transport chain in mitochondria.
- O It consists of 4-hydroxybenzoic acid which is formed in plants and animals by movement from 4-coumaric acid.

- •

- Quinones are antimicrobial agents.
- • Strongly upgrade the main element of Kuinon; It is easily reduced to hydroquinone (p-hydroxyphenol).
- • In the body oxidation-reduction reactions (redox reactions) are linked to proteins by hydrogen bonds.
- O this feature; It forms the basis of its activities as a scab, antimicrobial and cell toxic.

- • There are a large number of substances with versatile effects; Some of the effects and the resulting substances are as follows.
- O Position: Alizarin, like Emodin.
- O Light Sensitive: Hypericin, cerosporin.
- O Allergic: Acamelin, geranylbenzoquinone, pyrenylbenzoquinone.
- O Antimicrobial and irritant: Many of them.
- O Light Sensitive: Hypericin.
- O Antioxidant and anti-aging: Koenzim-Q10.
- O Preventing COX activity: Arnebion.
- O Leukotriene receptor antagonist: Ardisianon, kornudentanon.
- O PK inhibitor: Alizarin, damnakantal, emodin, hypericin, juglone, krisazin, naftazarin, plumbagin, purpurin.
- Preventing blood clotting: Vitamin K1, K2.
- O reverse transcriptase inhibitor; B-lapachone, 7-chloroemodine; Antimicrobial and cell poisoning.

- Resins (Gluceine, Table 7a)
- O Gum like materials; Volatile oils are products of oxidation or polymerization.
- It is physiological or pathological in plants.
- O They are insoluble in water.
- He will not drift with the Substance.
- O Softens with heat.
- It burns with a flame.

- O Chemical structures are not known.
- O Major non-volatile terpenoids (such as diterpenes, triterpenes, polyterpenes),
- O Partially from volatile terpenoids (monoterpenes, sesquiterpenes).
- O Headings of the constituents of the resins (Fig. 7a);
- O Resin alcohols (resinols, resinotannols),
- O Resin esters,
- O Resin acids,
- It is grouped as Reins.

- Resin alcohols; Resinol and resinotannol.
- □ Resins are monomers.
- • Some are made up only of alcohol and triterpenic (β-amirenol).
- • Some also carry both alcohol and phenolic groups (such as coumarin, propylbenzene, tetrahydronaphthalene).
- □ Resinotannol materials are polymers; Are formed by the incorporation of certain aromatic and hydroxylic compounds. The construction is not fully known.

- O Resin esters, resinol and resinotenes are compounds with plant organic acids (such as benzoic acid, benzoyl acetic acid, ferulic acid, kumarinic acid, salicylic acid, cinnamic acid, umbellic acid).

- Resin acids are terpenic substances.
- □ Some of them are diterpene (reten or pimentantene derivative, mainly resin acids: abietic acid, d-pimaric acid, 1-pimaric acid).
- □ Some of them are triterpenes (amiren derivative, mainly resin acid: siaresinolic acid).

- O Reformers are polytropic; Things are not very well known.

- O Resins do not stand alone in plants;
- It is either dissolved in a volatile oil (known as oleoresin)
- O Either with gums (known as gomreçine)
- O In some plants they are found as oleomomycetes which also contain essential oils.
- O Herbal product containing both resin and latex is known as lactoreceine.

- The main ones of plant families that contain resin are:
- O Legumes (Fabaceae / Leguminosae)
- O Balsam (Burseraceae)
- O Laughter (Convolvullaceae)
- O Coniferae (Coniferae)
- O (Apiaceae / Umbelliferae)

- O

- When resins are exposed to the air (oxidation), the flow decreases, the color and consistency become darker and harder.
- They emit a fragrance when they are burned; They are often used as incense.
- O Generally, injuries (such as stabbing, scraping) are obtained from plants.
- O Some plant resins (Kahkahagiller-Convolvulaceae) are obtained by consuming ethyl alcohol or ether.

- O In some plants (Myroxylon species) there is no secretory channels.
- In cases such as injuries etc. (shell / body boot, stripping, hammering / hammering / tattooing) the secretion channels are formed and the balsam / resin is shaped.
- O Some have secretory channels; In cases such as injury, the number of secretory channels and the amount of the epidemic increase.

- O Resins are generally antimicrobial effective.
- O Accelerate the healing of burns and wounds; These effects;
- □ Accelerate the recruitment of epithelial tissue,
- □ Involvement of local immunity.

- O Daily herb (Boswellia serrata) resin (frankincense) asthma and ulcerative colitis are beneficial; The effect of which is partially related to the prevention of 5-LOX.
- O Mirra resin (Commiphora myrrha) is pain-killer, anti-tumor and antiparasitic.
- O Cannabis resin (Cannabis sativa) is a pain killer, hallucinogenic effect.
- O Kahkahagiller (Convollulaceae) and Kabakgiller (Cucurbitaceae) resin increases intestinal motility (driving effect).

- Oleoresin
- It is a mixture of essential oils and resins.
- O Especially volatile terpenoids are found in the structure.
- O Fluid consistency.
- O Important examples are turpentine oil (turpentine), pine gum

- Balsams
- O The name given to the product obtained from the plants and bearing the resin.
- O oleoresins containing benzoic acid or cinnamic acid or derivatives thereof.
- O They remain soft at room temperature.
- O Extremely pleasant smells.
- O Perubalsamı, tolubalam, tobacco, aspidium are the main examples.
- O They are antimicrobial.
- O Accelerate wound and burn healing.

- Oils
- O According to their volatility they are divided into fixed oils and essential oils (aromatic, basic or etheral oils).

- 6a. Fixed oils
- O They are in solid and / or liquid state; Esters of fatty acids (saturated, unsaturated) with glycerin.
- □ Those that do not contain double bonds in the carbon chain are saturated fatty acids,
- □ Those containing double bonds are also known as unsaturated fatty acids; According to the number of double bonds in the last chain structures;
- • Mono-unsaturated fatty acids,
- • Polyunsaturated fatty acids are separated into two.

- O Color, fairly dark or solid.
- O Insoluble in water, soluble in the majority of organic solvents (hexane, petroleum ether, etc.).
- O saponify with alkalis (such as sodium hydroxide); Soap and glycerin.
- It is painted with osmic acid and leaves a continuous fat trace on paper.
- O Separate with wait.
- O Fixed oils are called oil.

- O According to the source that is obtained, they are separated.
- O Vegetable oils (such as olive oil, corn oil, linseed oil, peanut oil, poppy oil, almond oil, Indian oil)
- O Animal fats (such as pork oil, cod oil, domestic oil)
- O Mineral oils (such as liquid paraffin, solid paraffin).
- O Vegetable oils are generally used as food ingredients.

- O Fixed oils are found in all parts of the plants, especially the seeds (olive oil olive bran).
- O They are obtained by methods such as squeezing from plants or plant parts, extraction with organic solvents or boiling with water.
- O First, the oily plant part is warmed / roasted and the water is evaporated; Then it is squeezed in hot water to obtain oil.
- O oils used in pharmacy,
- □ Obtaining by squeezing in cold,
- □ Neutralization (NaOH),
- □ Opening the enrichment (treatment of the retaining substances on the surface)
- □ Removing the odor (by heating under vacuum) is recommended.

- O In the construction;
- □ Solids containing saturated fatty acids (such as arachidic acid, lauric acid, myristic acid, palmitic acid, stearic acid)
- □ Contains unsaturated fatty acids (arachidonic acid, erucic acid, linoleic acid, linolenic acid, oleic acid, ricinoleic acid) in liquid form.

- O Unsaturated fatty acids (cis-acetic acid, trans-11-octadecenoic acid) except for one (cis-structure).
- O Hydroxyacids polymerize to form the suberin; Which form fungal tissues in plants.

- O Plant-derived unsaturated oils;
- ▪ -6 fatty acids (such as arachidonic acid, dihomo-gamma-linolenic acid, docosadienoic acid, eicosadienoic acid, gamolenic acid, linoleic acid, stearidonic acid)
- contains -9 fatty acids (such as erucic acid, nervonic acid, oleic acid).

- Plant oils containing -6 fatty acids are sunflower oil, corn oil, cotton oil, soybean oil
- -9 fatty acid is found in hazelnut oil, canola oil, olive oil.

- Only some plants and fruits (Table 8a) have a -3 fatty acid (α-linolenic acid).

- O Double bonds in unsaturated fatty acids and glycerides can be saturated by taking up hydrogen.
- O Thus, margarine oils are obtained.
- O This process reduces the tendency of oil to rub, increases its durability.

- O Societies that consume unsaturated fatty acid-containing fats inadequately can show deficiencies such as skin rash, acne and hair loss.
- O Consuming oils containing unsaturated fatty acids such as arachidonic acid, linoleic acid, linolenic acid prevents or prevents them from occurring.
- O These fatty acids are known as essential fat factors and are called vitamin F.

- O Conjugated linoleic acid (CLA) (especially cis-9, trans-11-octadecadienoic acid and trans-10, mixture of cis-12-octadecadienoic acid isomers) is similarly effected and used.

- O Unsaturated fatty acids act as cholesterol carriers; The cholesterol esters of these oils do not tend to accumulate in the vessel wall.
- O Unsaturated fatty acid-rich oils (such as Corn oil, Sunflower oil, Olive oil) are recommended against vascular stiffness.

- O Unsaturated fatty acids or drugs that carry them (such as castor oil, ketchup oil, olive oil) are influential in rats; The effect of hydroxy fatty acids is stronger.

- O

- O Some fatty acids (such as erucic acid) cause toxic / harmful effects in animals.
- □ For this reason, the cultivation of Canola (Rape, Brassica hirta, B.juncea) has decreased considerably.

- O Some oils are extremely special.
- □ Lorenzo oil (a 4: 1 mixture of glyceroltrioleate and glyceroltrierukatine) is not beneficial in adrenoleukodistrophic patients showing symptoms, but may be helpful in those without symptoms.
- □ Working oil □ (S) -13- (cyclopent-2-enyl) tridecanoic acid is effective in lepra (Mycobacterium leprae).

- note
- O omega (□-) fatty acids from unsaturated fatty acids; Carries multiple unsaturated bonds with 18-22 carbons.
- O One of the unsaturated bonds is n-3 (□-3).
- O Fatty acids;
- □ From the group of carbonyl carbonyl (COOH)
- □ Physiologists "□" start counting from the carbon atom (the end where the alkyl "-CH3" group is attached)

- The first double bond from the -end is the third C-C bond; The name "-3" comes from here.
- O According to this, since the first couple is the nearest carbide to the methyl group,
- -3 (n-3),
- ▪ -6 (n-6),
- known as -9 (n-9) fatty acids
- O None of these -3 and -6 fatty acids are formed in the body; It needs to be taken from the outside.

- O -3 fatty acids are eicosanoid precursors; It is very important in terms of cell zirconia.
- O

- □-3 fatty acids, arachidonic acid □-6 fatty acids in mammals and other □-6 fatty acids.
- O Leading □-3 fatty acids in the diet;
- □ Eicosapentaenoic acid (20: 5, EPA) and
- □ Docosahexaenoic acid (22: 6, DHA).
- □ These are found in the main sea fish (mainly Anchovy, Istavrit, Tuna, Herring, Sardine, Salmon, Mackerel), that is, fish oil.

- □ Some of the other □-3 fatty acids found in fish oils are (number of carbons: unsaturated bond):
- • α-Linolenic acid (C18: 3; ALA)
- • Docosapentaenoic acid (C22: 5; DPA)
- • Eicosatetraenoic acid (C20: 4, ETA)
- • Helicosapentaenoic acid (C21: 5)
- • Clupanodonic acid (C22: 5)
- • Moractic acid (C18: 4)

- O ALA forms the source of □-3 fatty acids; Desaturaz and elongases in the living body are partially translated into EPA and DHA.
- O Fish oils and pure □-3 fatty acids;
- □ Blood lipids and cholesterol lowering,
- □ Fire retardant and
- □ Preventing clustering of platelets.
- O They are very important for the prevention of vascular stiffness and cardiovascular diseases (such as heart infarction).

- O ALA; It is also found in some plants / fruits such as broccoli, spinach, squash, dark-green leafy vegetables, walnut, ketchome, soybeans.

- O The purity of fish oil formulations and the □-3 fatty acid content are highly variable; The dosages are adjusted accordingly.
- O formulations used for lowering blood lipids (for an adult);
- □ Containing 17% EPA and 11.5% DHA, 5 g / day,
- □ 2-4 g / day with 46% EPA and 38% DHA,
- The final formulation is used in an amount of 1 g to prevent heart infarction.