ODESSA NATIONAL MEDICAL UNIVERSITY
Department of General and Clinical Pharmacology and Pharmacognosy

METHODICAL DEVELOPMENT OF THE LECTURE

Course: "Pharmacognosy"

Lecture № 8

"Diterpenoids. Resins and balms. Medicinal plants and raw materials that contain diterpenoids, resins and balms. General characteristics."

Course: 3rd Faculty: medico-pharmaceutical

The lecture was discussed
at the methodical meeting
departments
August 30, 2024
Protocol № 1
Head departments _____
prof. Rozhkovsky Ya.V.

Odessa-2024

Lecture № 8:"Diterpenoids. Resins and balms. LR and raw materials containing diterpenoids, resins and balms. General characteristics"

(2 years)

1. **Actuality of theme. Rationale for the topic.**

Consideration of diterpenes, resins, balms and raw materials containing them, logically continues the study of isoprenoids. Although diterpenes, which are part of resins and balms, are widely used mainly in the East and South, turpentine from more common conifers is important for world medicine and modern pharmacy as a source for turpentine, rosin, camphor synthesis - products used. for the manufacture of some dosage forms, and also have their own medicinal properties. Of the modern sources of diterpenoids, HFC 1.3 includes stevia, which is now in high demand.

2. Objectives of the lecture

-educational:

1. Define the basic concepts: diterpenoids, resins, balms;
2. Find out the features of the chemical structure of diterpenes;
3. Identify the relationship between the chemical structure of diterpenes, their physicochemical properties and methods of their isolation from plant products;
4. To form an idea of the distribution of diterpenes, resins and balms in plants from different families;
5. To find out the medicinal properties and ways of modern use of plant products of diterpenoid nature.

-educational:

Education of students of modern professional thinking through the expansion of understanding of the sources of diterpenoids and possible ways of their use

Formation of ecological worldview on the example of rational, fuller use of forestry secondary products.

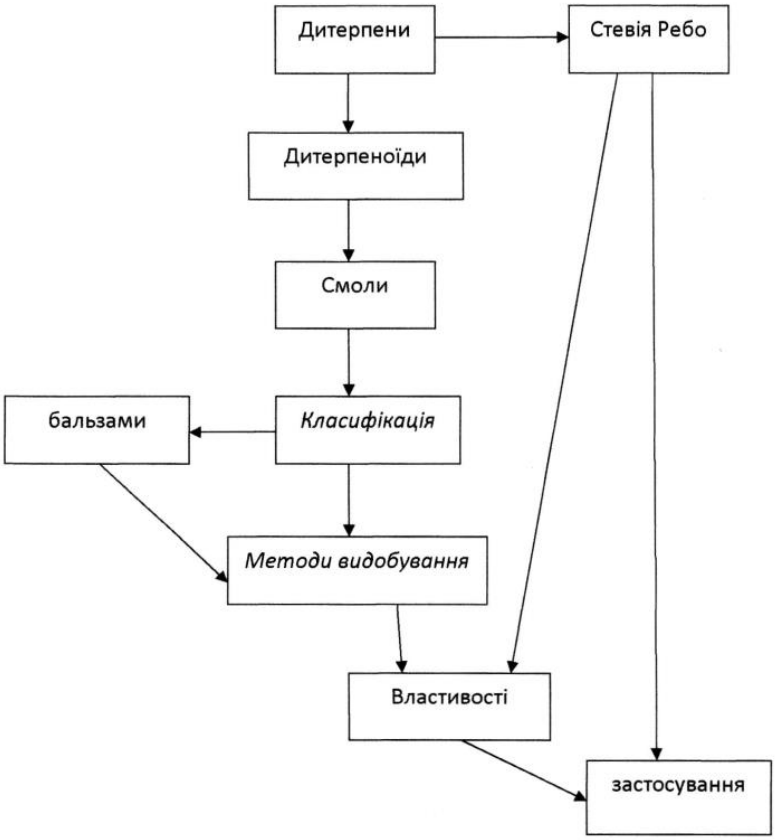
3. Plan and organizational structure of the lecture

№	The main stages of the lecture and their content	Goals in levels of abstraction	Type of lecture, lecture equipment	Time distribution
1	2	3	4	5
I. 1. 2.	**Preparatory stage** Defining a learning goal Providing positive motivation			5%

II. 3.	**The main stage** Teaching lecture material Plan: 1. Definitions. 2. Classification of diterpenes 3. Phys.-chem. properties of diterpenes and diterpenoids in resins and balms and methods of their extraction 4. Distribution of resins and balms in the plant world in members of different families. 5. Assortment of resins, oil-resins and balms in modern medical and pharmaceutical use	 I II II- III II II	Combined, tables, overhead projector, slides, herbariums of LR, samples of LRS, drugs	 90%
III. 4. 5.	The final stage Summary of the lecture, general conclusions. Lecturer's answers to possible questions. Tasks for self-preparation		References, questions, tasks	5% 2% 2% 3%

4. Content of lecture material:

-Structural and logical scheme of the content of the topic:



- lecture text (attached)

5. Materials on activating students during the lecture:

Question:

1. Give the general formula of diterpenes?
2. What kind of wood from the Pine family is the most common in Ukraine and is used for resin extraction?
3. Which formations and plant organs contain pine resin?
4. Name LRS - buds that contain salts.
5. What are the properties of stevia used in treatment and prevention?

Situational tasks:

1. Explain why turpentine is extracted from resin by steam distillation.
2. What makes balms usually have a pleasant smell?
3. Explain how the physical properties of the resin change after its extraction and why it does not deteriorate in the open air?

6. General material and methodological support of the lecture:*equipment: overhead projector (or multimedia projector), screen;*

- *illustrative materials: slides, herbariums of LR, samples of LRS, packed up LRS, pharm. preparations.*

7. ***Materials for self-preparation of students:***

AND) on the topic of the lecture

literature

Question

1. Name the types of diterpenes that are most common.
2. What is resin.
3. Give the classification of resins.
4. Name the most common method of resin extraction.
5. What is the source of asafetida gum-resin?
6. What pharmacological activity do resins show?
7. Name the ways of using resins.

Situational and test tasks

1. If turpentine is a volatile substance (essential oil) in pine resin, then how is it usually extracted?

AND. Distillation with water vapor

B. Extraction with hot water

B. Alcohol extraction

D. Evaporation

D. Pressing

1. Toxic diterpenes include

A. Diterpene alkaloids

B. Resin acids

B. Stevioside

D. Diterpene alcohols

D. Aromatic resins

3. Resins dissolved in essential oil are called

A. Oil-resin

B. Comedy-resin

B. Actually resin

G. Gumi

D. Rosin

4. The resin contained in this LRS, participates in the overall pharmacological action of the drug as a diuretic. This LRS

A. Birch buds

B. Buckthorn bark

B. Leaves of legumes

D. Rose hips

D. Flax seeds

5. Glassy pieces of yellow color, crispy, shiny, used in technology and in the manufacture of patches - are:

A. Rosin

B. Turpentine

B. Wax

G. Lanolin

D. Paraffin

6. What is the negative effect of resins when using a decoction of hay (cassia)? How can the negative effects of hay resins be avoided?

Reply:Side effect - stomach pain. Avoid it by using a settled and filtered decoction of leaves, or a decoction of fruits that do not contain resins.

B)on the topic of the next lecture (Triterpenoids. Steroids. Saponins).

Question

1. General formula of triterpenoids.
2. Define the concept of saponins.
3. Give the classification of saponins.
4. What is the difference between the structure of triterpene and steroid saponins?
5. What is the pharmacological activity of phytopreparations based on LRS containing three terpene saponins? Steroid saponins? Name these drugs.

Test tasks

1. Saponins - a group of natural compounds that are well soluble in:

A. Water

B. Any solvents

V. Ethers

G. Chloroform

D. Acetone

2. Which of the following species of LR containing saponins corresponds to the description: perennial herbaceous vine with strongly branched horizontal rhizome, petiolate leaves. broadly ovoid., 3 = 7gloves: -

A. Dioscorea nipon

B. Blue cyanosis

B. Temptation is high

G. Sweet naked

D. Manchurian Aralia

3. Sapogenins are:

A. Saponin aglycones

B. Synonym of saponins

B. Carbohydrate part of saponins

G. Saponins that do not show hemolytic activity

D. Independent group of biologically active substances

4. What do steroidal saponins, cardiac glycosides and sex hormones have in common:

A. The presence of cyclopentaneperhydrophenanthrene complex

B. Pharmacological effects in the body

B. Common carbohydrate part

D. Positive test for foaming

D. Common qualitative color detection reactions.

5. The basis of one of the methods of quantitative determination of the content of this substance in the blood is the principle of its interaction with saponins. This substance

A. Cholesterol

B. Hemoglobin

B. Prothrombin

G. Sugar

D. Sodium chloride

6. What plant containing saponins grows in the tropics, but can be cultivated in protected soil:

A. Orthosyphon stamen

B. American agave

B. Sea onion

G. Ginseng

D. Blue cyanosis

7. The raw material of which plant is called "licorice root":

A. Licorice naked

B. Ginseng

B. Dioscorea Caucasian

G. Dioscorea of Nipona

D. Temptations

8. Literature used by the lecturer to prepare the lecture

1. Antonyuk VO A practical course of pharmacognosy (Laboratory manual) / VO Antonyuk, RM Lysyuk, L. Ya. Antonyuk. - Lviv: LNMU, 2011. - 499 p.
2. State Pharmacopoeia of Ukraine: in 3 volumes / State Enterprise "Ukrainian Scientific Pharmacopoeial Center for Quality of Medicines". - 2nd type. - Kharkiv: State Enterprise "Ukrainian Scientific Pharmacopoeial Center for Quality of Medicines", 2015. - Vol. 1. - 1500 p.
3. European Pharmacopoeia. - 8th ed .; - Druckerei CH Beck, Nordlingen (Germany), 2013.- 3655 p.
4. Workshop on the identification of medicinal plant materials: textbook. way. / [B. M. Kovalev, SM Marchyshyn, OP Khvorost and others]; for order. VM Kovaleva, SM Marchishin. - Ternopil: TSMU, 2014. - 250 p.
5. Pharmacognosy: a basic textbook. for students. higher pharmacy. textbook zakl. (pharmac. f-tiv) IV level of accreditation / V.S. Кисличенко, I.O. Журавель, C.M. Marchyshyn and others; for order. V.S. Кисличенко. - Kharkiv: NUPh: Golden Pages, 2015. - 736 p.
6. Medicinal plant raw materials and phytomedicines under Society. ed. Wednesday PI, Kiev, VSI "Medicine", 2010
7. Pharmacognosy. Medicinal raw materials of plant and animal origin. Ed. Яковлева Г.П. St. Petersburg, Spetslit 2013

8. Pharmacognosy: a textbook (University of I-III years) / VP Khodakivska, IA Бобкова, Л.В. ВарлаховаAll-Ukrainian specialized publishing house "Medicine" 2018.
9. Pharmacognosy: textbook (I-III years) / I.A. Бобкова, Л.В. Варлахова. - 3rd edition All-Ukrainian specialized publishing house "Medicine" 2018, 504p.
10. Pharmacognosy with the basics of phytotherapy A. Pastushenkov, N. Bespalova Phoenix Publishing House 2016.

The lecture was composed by _____ MD, Professor Ya.V. Rozhkovsky

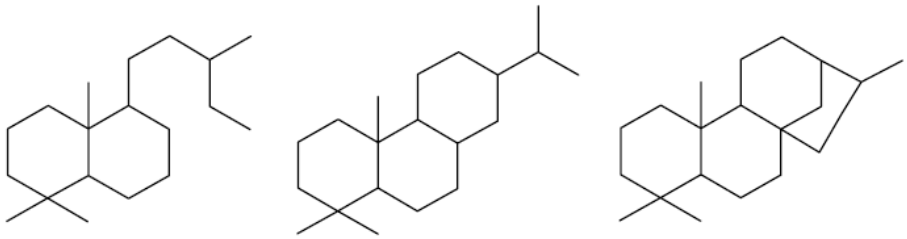
LECTURE TEXT

DITERPENS. RESINS AND BALMS

Diterpenes. General formula: C20H32.

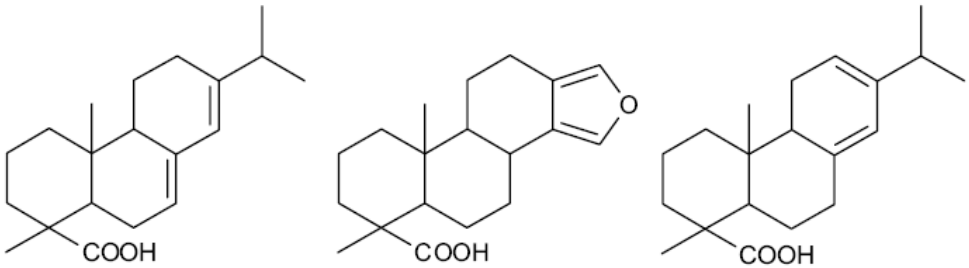
They can have acyclic, mono-, di-, tri- and tetracyclic structure.

The most common are 3 types: labdana, abietana, kaurav.



D. are most common in plants sim. Pine, heather, wolfberry (wolfberry), milkweed.

D. type of abietan, so called. resin acids: abietic, lambertin, levopimaric:

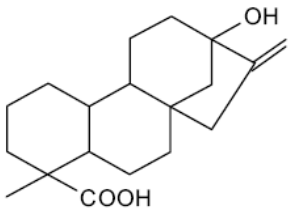


(pine-rosin) (Siberian cedar) (Siberian fir)

are part of resins and balms (solutions of resins in essential oil).

Sources of diterpene compounds (in Ukraine): plants seven. Pine.

D. type kaurav found in the grass (leaves) of stevia:



steviol

Physico-chemical properties of diterpenes

Amphoteric substances, ie can be lipophilic and hydrophilic (the latter depends on sugar residues). Do not distill with steam! Resin to-you - acidic properties, form crystallizing salts.

Biological role and physiological activity of diterpenes

Phytol alcohol is a component of chlorophyll. It is also used for the semi-synthesis of tocopherol and vitamin K. Vitamin A is a monocyclic diterpene alcohol. Aromatic resins - increase the activity of proteases (rosemary). Resin acids - wound healing properties. Stevioside is a sugar substitute.

Toxic D. - diterpene alkaloids of the family Buttercup (delphinium), Yew (yew berry).

RESINS

Resins are the products of some plants, the main components of which are diterpenoids.

Resins - are contained in special containers, resin passages, milk jugs located in various fabrics and bodies (more often wood). Very common resinous plants in the tropics. Sometimes they are produced only in response to damage and perform a protective function. Often present together with other compounds: e.m. , gums, tannins, lignans, sterols, rubber.

Classification

<table>
<tr><td>Actually resin-
Resinae</td><td colspan="2">Oil-resin-
(S., dissolved in e.m.)
Oleo-resinae</td><td>Gum-resins (oil-gum-resins) -
Oleo-gummi-resinae</td></tr>
<tr><td rowspan="2">(sandalwood, rosin)</td><td rowspan="2">(turpentine, mastic)</td><td>+ benzoic or cinnamon to-that= balms</td><td>These are liquid mixtures of gums and resins dissolved in em.</td></tr>
<tr><td>(Styrax, Peruvian, Tolutan)</td><td>(myrrh, assa-fetida, gummigut, incense)</td></tr>
</table>

Extraction methods

Subscript (most common)

Dry distillation (wood is cut, heated in special vessels)

Extraction (extraction from the crushed raw material with a special solvent, then purification).

Physico-chemical properties

Solid (hardens in air), usually amorphous, less often - crystalline or syrupy, insoluble in water, soluble in chloroform, acetone, ether, benzene, oils. Melt when heated, forming a film, burn (smoked). Do not turn sour, do not rot, do not oxidize in air! Some have a characteristic odor, taste and color.

Application

Earlier resins were widely used in medicine, now - mainly in traditional medicine (antisept., Expectorants., Laxatives., Local irritant; emulsifiers, soft plasters).

But (!) Widely - in technology (plasticity: varnishes, plastics, soap, paper, insulation).

A number of LR in addition to the main dr. contain a significant amount of resins that are involved in the overall pharmacological action.

Birch buds - diuretic; hay leaves - a side effect -pain in the stomach

CHARACTERISTICS OF RESINS

Sandarak resin - Resina Sandaraca

LR: Sandarak tree (Tetraclinis articulata, Cupressaceae). Grows in mountainous areas of N / W Africa. The resin hardens quickly in air, transparent, pale yellow, brittle, fragrant, bitter.

Chemical composition: resin-k + you + e.m. (slightly). Application: in the preparation of patches and in the treatment of dysentery.

Turpentine oil-resin - Oleo-resina Terebinthina

LR: pine species (Pinus sylvestris, Pinaceae). Coniferous tree up to 40 m tall with reddish-golden bark, needle-like leaves - 2 on shortened shoots. Distributed in the European part of the CIS, Siberia,on sandy and loamy soils.

Oleoresinis a traditional export from Russia. Localized in resin passages in wood and bark. Obtained by tracking. In the air is a granular mass.

Chemical composition: 70-80% resin (rosin) and 15-30% essential oil (turpentine). Turpentine is removed from the resin by steam distillation, and the residue is raw rosin.

Turpentine - purified Oleum Terebinthinae rectificatum- volatile liquid with a pungent odor (75% foamed) -used in ointments as a local irritant for colds and rheumatism. And also used as a raw material for the synthesis of terpene hydrate and camphor

Rosin-peeled and dried -Colophonium - crispy, shiny, glassy pieces of yellow. Chemical composition: 95% resin alcohols and 5% slices. Application: ent. to the composition of the patches.

Oil-resin mastic - Oleo-resina Mastix

LR: mastic tree, pistachio mastic (Pistacia lentiscus, Anacardiaceae.). Grows in the Mediterranean. The resin is localized in containers in the bark and large branches of male trees. Extracted podsochkoy. The resin is light yellow, balsamic odor, bitter. Chemical composition: up to 90% of the resin (rubber, resin acids, resp. Triterpenoids) and up to 3% e.m. Usage: tincture for rinsing the mouth, in the manufacture of dental fillings.

Styrax liquid balm - Balsam Styrax liquidum

LR: eastern liquidambar (Liquidambar orientalis, Hamamelidaceae). Tree. It grows in Asia Minor, close species - in P. and P. America and P / V Asia. Extract podsochkoy or boil the bark in water. Purified balm -thick viscous liquid amber - yellow with a pleasant odor.

Chemical composition: 50% resin (resin k-ti, phenolic alcohols), 7% e.m. , 10% of esters of cinnamon and other aromatic k- t. Usage: as a stimulant, expectorant, antiseptic. In the form of ointments - for skin diseases.

Comedy - myrrh resin - Gummi - resina Myrrha

LR: Abyssinian comiphora (Commiphora abissinica, Burseraceae). Tree. Grows in Southeast Asia and Africa. Gum - resin is contained in the

parenchyma of the cortex. Ave. a piece of different shape and size, bitter, easily broken and form an emulsion with water. Burns with a glowing flame and does not melt.

Chemical composition: 60% gum, 25% resin (rubber and resin esters), 2-10% e.m. (pinene, limonene, eugenol, sesquiterpenoids, etc.). Usage: for catarrh of the upper respiratory tract; as an astringent in diseases of the gastrointestinal tract and gums; externally as an antiseptic.

Gum - ace resin - fetida -Gummi - resina Asa - foetida

LR: stinking ferula, etc. species of the genus (Ferula foetida, Apiaceae). Herbaceous perennial, grows in the deserts of Central Asia. Product collection - in the spring from non-flowering specimens. First, remove the aboveground part, then cut the plates from the overgrown turnip root and collect the released latex. Gum - resin "smelly" -gray - white, then yellow or red, round or flat pieces. It has a sharp garlic smell and a bitter burning taste .

Chemical composition: resin 65% (rubber and Resinol, their esters with ferulovoy and other aromatic to-tami, ferulovaya to-ta, sesquiterpene.lactones), gum to 25%, e.m. -up to 10% (coumarins -umbelliferon, org.sulfides). Application: anticonvulsant, carminative, antispasmodic, expectorant - powders, emulsions, tinctures

RAW MATERIALS CONTAINING RESINS

Pine buds- Gemmae Pini (Pinus sylvestris, Pinaceae). Harvesting in late winter and early spring crowns with remnants of stems less than 3 mm long. Drying under canopies with good ventilation for 10-15 days. Storage - separately from other species, not more than 2 years.

Chemical composition: up to 0.45 e.m. (pinene, limonene), resin, oak. substances, pinipicrin. Application: expectorant, disinfectant. At chronic bronchitis - infusion, in fees; externally - for inhalation .

Pine needles - Folia Pini are harvested at any time.

Chemical composition: up to 1% e.m. (A-pinene, limonene, borneol, bornyl acetate), ascorbic acid (0.2%); resin, oak.substances. From the needles get the essential oil -Oleum Pini. Application: e.m. ent. to the composition of drugs "Phytolysin", "Pinabin", "Pinosol" - anti-inflammatory. , antispasmodic in urinary tract. for inhalations; of pine needles - bath extract and concentrate containing vitamin C., infusion of pine needles - as part of anti-asthmatic mixture Traskov.

Tar - Pix liquida - a product of dry distillation of pine shavings - consists of phenols: disinfectant, insecticidal, locally irritating, part of ointments and liniments (Vishnevsky, etc.) for skin diseases, eczema, scabies.

Buds of a poplar black -Gemmae Populi nigrae (Populus nigra, Salicaceae). It grows all over Ukraine, in floodplains a year, sometimes cultivated. The leaves are ovate - rhombic, glabrous, shiny. Harvesting during flowering to the divergence of the scales - collected from the side branches, drying - airy, cool.

Chemical composition: resin, e.m. - Up to 0.5%; glycosides, salicin and populin; flavonoids. Usage: infusion and as part of the fees - antirheumatic agent.

RAW MATERIALS CONTAINING DITERPENES

Stevia leaves- Folia Steviae (Stevia rebandiana, Asteraceae). Family - South America. Cultivated as an annual in Ukraine, Moldova, Europe, China, Japan. Called honey grass.

Chemical composition: eight sweet glycosides, the aglycone of which is the diterpene alcohol steviol. Osn. glycoside stevioside (5-10%) is 300 times sweeter than sucrose, rebaudioside (2.4%) is 450 times sweeter. Usage: powders, tablets, capsules or pure stevioside - sugar substitutes. Calorie-free product that normalizes blood pressure, CNS function, etc.