

الجامعة المستنصرية

كلية العلوم

قسم علوم الحياة

المرحلة الثالثة

فرع فطريات ونباتات طبية

أيض ثانوي - نظري

Plant secondary metabolism

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میرزا یحییٰ خان قزوینی

They are complex chemical compounds, one of the secondary metabolism and be spread widely in plants where each plant must contain the tannins but the percentages vary from one plant to another, a deposition of proteins make it used in leather tanning and transformation of skins soft to strong solid skins.

- **properties**

1. Non -crystallized so difficult to obtain from the plant.
2. deposition of proteins and alkaloids.
3. use in case of poisoning by alkaloids .
4. widely used cancer-causing.
5. can be deposited by Heavy elements such as lead, iron.
6. dissolve in water, alcohol and acetone and Glycerol and insoluble in chloroform.
- 7- tannins are so bitter taste

- **Classification of tannins**

1. Hydrolysable tannins **تانينات قابلة للتحلل**
2. Condensed tannins **تانينات غير قابلة للتحلل**
- 3- Pseudo tannins

1. Hydrolysable tannins:

These tannins are hydrolyzed by acids, or enzyme and produce gallic acid and ellagic acid. Chemically, these are esters of phenolic acid like gallic acid and ellagic acid. The tannins derived from gallic acid are known as gallitannins and from that of ellagic acid are known as ellagitannins. The gallic acid is found in rhubarb **راوند** , clove **القرنفل** and ellagic acid is found in eucalyptus leave and pomegranate bark. These tannins treated with ferric chloride **كلوريد الحديدك** to produced blue or black color.

2. Condensed tannins:

These tannins are resistant to hydrolysis and they derived from the flavonols, catechins and flavan-3, 4-diols.. These tannins are called as catechol tannins. These tannins are found in cinchona bark لحاء الكينا , male fern السرخس الذكر , , tea leaves etc. they produce green color with ferric chlorides.

3. Pseudo tannins:

They are phenolic compounds of lower molecular weight and do not show the goldbeater's test. They are found in catechu and nux- vomica, etc.

• Physiological functions in plant

1. have a role in the photosynthesis are found in parts of the developing fruits, leaves.
- 2- source of energy consumed by the plant in the process of metabolism.
- 3- working on the deposition of proteins ترسيب البروتينات to that found in the dead parts such as wood, this protective effect .
- 4- has the function of respiratory oxygen because it has attracted a property because they contain phenol for this increase in the plant's ability to get oxygen. لها وظيفة تنفسية لان لها خاصية جذب الاوكسجين لاحتوائها على الفينول لهذا تزداد قدرة النبات في الحصول على الاوكسجين
- 5- material phenolic disinfectant مطهرة protects the plant from harmful insects and fungi maintain the plant during its growth.

Uses

1. used against any diarrhea اسهال.
2. used in the treatment of burns.
3. The anti-poisoning alkaloids heavy metals.
4. anti-inflammatory.
5. used to stop the bleeding.
6. used in laboratories for detection purposes or deposition of protein and alkaloids.
7. used in leather tanning as tannic material is transforming the animal skin soft skins to non-perishable so as to precipitate the proteins found in the skin تستخدم في دباغة الجلود حيث ان المواد الدباغية تعمل على تحويل الجلد الحيواني الطري الى جلود غير قابلة للتلف وذلك لترسيب البروتينات الموجودة في الجلد

• Plants which contain tannins

1- (*Hamamelis virginiana*) Witch hazel

is a source of tannin used in a number of skin care products.

Witch hazel has been used to treat bee stings, skin abrasions, and poison oak and ivy لعلاج لسعات النحل، سحجات الجلد، والبلوط السام . tannins are also used in mouth washes, eye washes . واللبلاب

2- (*Vaccinium macrocarpon*) cranberries توت بري

have been medically proven to help prevent urinary tract infections in women by reducing the ability of the bacteria *E. coli* from adhering to cells lining the urinary tract. Similarly, this anti-adhesive property may reduce the ability of *H. pylori* to cause stomach ulcers. Recent medical research has also shown.

that these polyphenolic compounds can also reduce LDL cholesterol and improve cardiac health.

Resins

In polymer chemistry and materials science, resin is a "solid or highly viscous substance **مواد لزجة جدا**," which are typically convertible into polymers. Such viscous substances can be plant-derived or synthetic in origin. They are often mixtures of organic compounds. Many plants, particularly woody plants produce resin in response to injury. The resin acts as a bandage protecting the plant from invading insects and pathogens.

Plants secrete resins and rosins for their protective benefits they confound a wide range of herbivores, insects, and pathogens while the volatile phenolic compounds may attract benefactors such as parasitoids or predators of the herbivores that attack the plant.

- **PROPERTIES**

1. All resins are heavier than water , they are usually amorphous ,hard.
2. They are insoluble in water and usually insoluble in petroleum ether but dissolve more or less completely chloroform and ether. in alcohol
3. Many resins ,when boiled with alkaloids yield soaps.
4. Resins are often associated with volatile oils (oleoresins), with gums (gum-resins) or with oil and gum (oleo-gum-resins).
5. Resins may also be combined in a glycoside manner with sugars.

6. Chemically resins are not pure substances but complex mixtures of several resinous substances as resin acids, resin alcohols, resin esters, and neutral resins. ' Resins '(do not contain nitrogen elements Non nitrogenous compounds).

• CLASSIFICATION OF RESINS

Resins are classified in three different ways:

- 1- Taxonomical classification, i.e. according to botanical origin, e.g. Berberidaceae resins.
- 2- Classification according to predominating chemical constituent; e.g. acid resins, resene resins, glycosidal resins; etc.
- 3- Resins may be classified according to the portion of the main constituents of the resin or resin combination; e.g. Gum resins, oleoresins, oleo-gum-resins, Glycol – resins , balsams.

وفقا لجزء من المكونات الرئيسية من الراتنج أو الراتنج مزيج

Gum resins ex. Myrrh

Oleoresins ex. Turpentine

Oleo -gum -resins ex. Asafetida

Glycol – resins ex. Podophyllum

Balsams : are resinous mixtures that contain large proportions of cinnamic acid, benzoic acid or both or esters of these acids.
balsam of Peru.

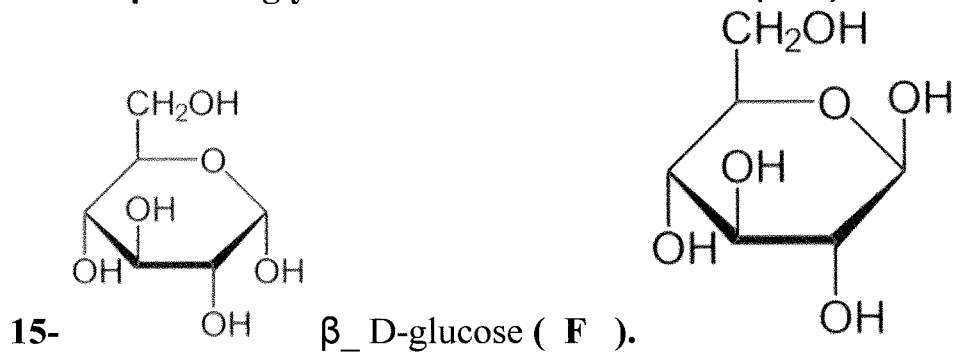
Q1- Choose the correct answers only (14) questions .

- 1- Alkaloid used antimalarial ----c----
a- ephedrine b- homo harringtonine c- quinine d- emetine
- 2- -----b---- used as an anesthetic.
a- Morphine b- cocaine c- caffeine d- Narcotine
- 3- -----a----- which contain nitrogen in the heterocycle and originate from amino acids.
a- True alkaloids b- Protoalkaloids c- Pseudoalkaloids d- Polyamine alkaloids
- 4- Some alkaloids are colored yellow , like ---b---
a- nicotine b- berberine c- coniine d- cathinone
- 5- Most alkaloids have --a---- taste.
a- bitter taste b- sweet taste c- no taste d- all of them
- 6- ----b---- reduce the risk of diabetes
a- Cocaine b- caffeine c- terpenoids d- carbohydrates
- 7- primary metabolites include ---a-----.
a- Proteins b- NH₃ c- sulfur d- oxygen
- 8- -----a---- antioxidant .
a- Delphinidine b-terpenoids c- Belladonine d- atropine
- 9- Alkaloids activate enzymes --b-----.
a- cAMP b- ADHase c- ATPase d- ADPase
- 10- ----c---- used as cough suppressant.
a- Vincristine b- Ephedrine c- codeine d- Ergot
- 11- some plants contain alkaloids in seeds , such as---b----.
a- Tobacco b- strychnine c- hemlock d- *phytolaccine*
- 12- ----c---- Stimulant to the nervous system
a- Theobromine b- Theophylline c- Caffeine d- Purine.
- 13- -----a----- used for treatment angina pectoris.
a- Theobromine b- Veratrum c- Solanum d- Cocaine
- 14- -----a----- used to migraine headache.
a- Ergotamine b- Ergometrine c- *solasonine* d- *Vinblastine*.
- 15- ----d----- is used for heart-failure.
a- Codeine b- Ephedrine c- Vincristine d- Digoxin

Q2: answer the following questions with true or false only (14) questions

- 1- The first glycoside ever identified was genin.(F) amygdalin
- 2- Plants produce α - _ glycosides(F). β _ D-glucose
- 3- Properties glycosides Solids volatile.(F) non volatile
- 4- Glycosides as laxative is Sennosid.(T)

- 5- If the glycone group of a glycoside is it is fructose, then the molecule is a fructoside (T).
- 6- Amygdalin poisonous glycoside.(T).
- 7- white mustard used in chemical wars (F).black mustard
- 8- The aglycone is coumarin. example apterin (T).
- 9- Anthraquinone glycosides arbutin (F).antron
- 10- One of the linkages present between glycone and aglycone is S-linkage/glycosidic bond (T).
- 11- Salicin us anti inflammatory effect.(T)
- 12- Rutin us antioxidant effect (T).
- 13- Digoxin us cardieestimi (T).
- 14- Properties glycosides some sweet taste (T).



Allelopathy is a biological phenomenon by which an organism produces one or more biochemicals that influence the germination, growth, survival, and reproduction of other organisms. These biochemicals are known as allelochemicals and can have beneficial (positive allelopathy) or detrimental (negative allelopathy) effects on the target organisms and the community. Allelochemicals are a subset of secondary metabolites,^[1] which are not required for metabolism (i.e. growth, development and reproduction) of the allelopathic organism. Allelochemicals with negative allelopathic effects are an important part of plant defense against herbivory.^{[1][2]}

The production of allelochemicals are affected by biotic factors such as nutrients available, and abiotic factors such as temperature and pH.

Allelopathy is characteristic of certain plants, algae, bacteria, coral, and fungi. Allelopathic interactions are an important factor in determining species distribution and abundance within plant communities, and are also thought to be important in the success of many invasive plants.

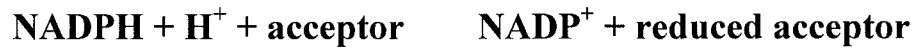
Cyclic adenosine monophosphate (cAMP, cyclic AMP, or 3',5'-cyclic adenosine monophosphate) is a second messenger important in many biological processes. cAMP is a derivative of adenosine triphosphate (ATP) and used for intracellular signal transduction in many different organisms, conveying the cAMP-dependent pathway.

Functions

cAMP is a second messenger, used for intracellular signal transduction, such as transferring into cells the effects of hormones like glucagon and adrenaline, which cannot pass through the plasma membrane. It is also involved in the activation of protein kinases. In addition, cAMP binds to and regulates the function of ion channels such as the HCN channels and a few other cyclic nucleotide-binding proteins

NADPH dehydrogenase

In enzymology, a NADPH dehydrogenase (EC 1.6.99.1) is an enzyme that catalyzes the chemical reaction



The 3 substrates of this enzyme are NADPH, H⁺, and acceptor, whereas its two products are NADP⁺ and reduced acceptor.

This enzyme belongs to the family of oxidoreductases, specifically those acting on NADH or NADPH with other acceptors. The systematic name of this enzyme class is NADPH:acceptor oxidoreductase. Other names in common use include NADPH2 diaphorase, NADPH diaphorase.

Role in metabolism: The main role of NADPH in human organism is the synthesis of lipids and the detoxification of the organism.