

## TANNINS

- **Tannins** are complex organic, non-nitrogenous plant products which generally have astringent properties. These compounds comprise a large group of compounds that are widely distributed in the plant kingdom.
- The term 'TANNIN' was first used by **Seguin** in 1796 to denote substances which have the ability to combine with animal hides (skin) to convert them into leather which is known as tanning of the hide.
- According to them, tannins are substances which are detected by a tanning test due to its absorption on standard hide power. The test is known as **GOLDBEATERS SKIN TEST**.
- Tannins are one of the most widely occurring group of natural substances in different families of higher plants.
- These secondary metabolites are present in solution form in the cell sap & also in distinct vacuole.
- They have been known since long time as the astringent substances having the capacity to combine with tissue proteins & precipitate them.
- Chemically tannins can be defined as, they contain the mixture of complex organic substances in which polyphenols are present generally with o-trihydroxy groups on a phenyl ring.
- Normally they have fairly high molecular weight and unlike alkaloids are devoid of nitrogen.

**Properties:-** Tannins form colloidal solution with water and are non-crystalline substances. In solution they show acidic reaction due to phenols. They are also soluble in alcohol, glycerine, and dilute alkalies but practically insoluble in organic solvent acetone.

Tannins exhibit some specific chemical reactions:-

1. Solution of tannin precipitates gelatin & alkaloids.
2. Tannins are precipitated by salts of copper, tin & lead.
3. They are precipitated by strong potassium dichromate solution or chromic acid solution.
4. They show colour reaction with iron salts. Ferric chloride gives bluish-black or brownish-green colour. Potassium ferricyanide with ammonia gives deep red colour.

5. Tannins are precipitated by 2% solution of phenazone, the tannin solution being prepared with sod. acid phosphate.
6. Goldbeater's skin test

**Chemistry:-**Tannins are complex organic, non-nitrogenous derivatives of polyhydroxy benzoic acid which are widely distributed in the vegetables kingdom. They are the active constituents of materials like oak bark which are used in tanning of skins. Tannins precipitate & combine with proteins. The protein tannin complex is resistant to proteolytic enzymes.

**Chemical tests:-**

**Goldbeater's skin test:-**

- 1) A small piece of goldbeater's skin ( a membrane prepared from ox intestine) is soaked in 2% hydrochloric acid, rinsed with distilled water & placed in tannin solution for 5 minutes.
- 2) The skin piece is washed with distilled water & kept in a solution of ferrous sulphate. A brown or black colour is produced on the skin due to presence of tannins.

**Gelatin test:-** To a solution of tannin (0.5-1%), aqueous solution of gelatin (1%) & sodium chloride (10%) are added & white buff coloured precipitate is formed.

**Phenazone test:-**A mixture of aqueous extract (5 ml) and sodium acid phosphate (0.5gm)is heated, cooled & filtered. The 2% solution of phenazone is added to the filtrate. All tannins are precipitated as bulky, coloured precipitate.

**Catichin test (Matchstick test):-** A matchstick is dipped in aqueous plant extract, dried near burner & moistened with concentrated HCL. On warming near flame the matchstick wood turns pink or red due to the formation of phoroglucinol.

**Chlorogenic acid test:-** An extract of chlorogenic acid containing the drug treated with aqueous ammonia. A green colour is formed on exposure to air.

**Vanillin Hydrochloric acid test:-** 1 gm vanillin, 10 ml concentrated HCL are mixed. When the drug is treated vanillin-hydrochloric acid reagent, pink or red colour is formed due to the formation of phloroglucinol.

**Chemical classes:-**Tannins are classified into following classes.

**Hydrolysable tannins:-** These may be hydrolysed by acid or tannase enzyme. They are formed from several molecules of phenolic acid such as gallic acid & hexahydroxy phenic acid which are united by ester linkage to a central glucose molecule. These tannins form blue or black colour with ferric chloride & pyrogallol on heating. They don't give blue colour with bromine solution.

2 types of hydrolysable tannins are:-

- (a) **Gallitannins:-** These are composed of gallic acid units. Eg:-Rhubarb, red rose petals, bearberry leaves, chinese gall, Turkish gall, chestnut etc.
- (b) **Ellagitannins:-** These are composed of hexahydroxy diphenic acid units & are found in plants. E.g. Pomegranate rind, pomegranate bark, oak bark, eucalyptus leaves

**Condensed tannins:-** These are resistant to hydrolysis & are derived from flavanol, catechins & flavan-3,4 diols on treatment with acid or enzymes.

- (a) Condensed tannins convert into phlobaphene (a red insoluble compound). Phlobaphenes give the characteristic red colour to many drugs such as red cinnamon bark which contains these phlobatannins & their decomposition product.
- (b) On dry distillation they yield catechol tannins & these tannins sometimes called catechol tannins like catechol itself, their solution turn green with  $FeCl_3$ .

**Complex tannins:-**Term applied to okada a newly group of tannin which biosynthesized from both hydrolysable tannins mostly a c-glucoside, ellagitannins & condensed tannins. The union occurs through a c-c bond between the c-1 of the glucose unit of the ellagitannin & the c-8 & c-6 of flavon-3-ol derivative.

**Pseudo tannins:-** These are compounds of lower molecular weight than true tannins & they don't respond to the goldbeater skin test. They have a wide occurrence in plant & are usually

found in large quantity in dead or drying cells. They exert an inhibitory effect on many enzymes due to protein. Precipitation contribute a protective function in bark & heartwoods.

#### **Bio-sources:-**

- Gallo-tannins: - Rhubarb, Red rose petals, Bearberry leaves, Chinese galls, Turkish gall, Chestnut, Maple etc.
- Ellagitannins:- pomegranate rind, pomegranate bark, Myrobalans, eucalyptus leaves, Oak bark etc.
- Hydrolysable & condensed: - Tea, Hamamelis bark & leaves.
- Condensed tannins:-
  - Bark: - cinnamon, wild cherry, cinchona, acacia, oak etc.
  - Roots & Rhizomes: - krameria, male fern.
  - Flowers: - lime & hawthorn.
  - Seeds: - cocoa, guarana, kola, areca
  - Leaves: - Hamamelis, hawthorn, tea.
  - Extracts & dried juice: - catechu, acacia, east Indian kino, buteagum, eucalyptus kino.
- Pseudo tannins:-
  - Gallic acid:-Rhubarb
  - Catechins: - catechu, acacia cutch, many Australian kinos, cocoa, guarana, etc.
  - Chlorogenic acid: - mate, coffee (unroasted)

#### **Therapeutic uses:-**

- 1) Styptis: -Traditionally used as styptis (capable to stop bleeding) & internally for the protection of inflamed surface of mouth & throat.
- 2) Anti-diarrhoeal
- 3) Employed an antidotes in poisoning by heavy metals, alkaloids & glycosides
- 4) Anti-tumour activity