Department of Pharmacy GP (Uttawar)

DRUGS CONTAINING GLYCOSIDES

Unit 4th (3)
(Pharmacognosy)

Glycosides

Glycosides are compounds that yield one or more sugars upon hydrolysis. The term glycoside is a generic term for natural product that is chemically bound to a sugar. Thus the glycoside composes of two parts: the sugar and the aglycone. The aglycon may be a terpene , a flavonoid, a coumarine or any other natural product. Glycoside showed extra chemical diversity. Among the sugars found in natural glycosides, D-glucose is the most abundant one, L rhamnose and L-fructose also occur quite ferequently. Of the pentoses : L-arabinose is more common than D-xylose. The sugar part can be disaccharide.

INTRODUCTION

A glycoside is an organic compound, usually of plant origin, that is composed of a sugar portion linked to a .non-sugar moiety

Sugar portion ……. Glycone

Non-sugar portion…... Aglycone / Genin

Linkage between sugar and non-sugar is ”usually an “oxygen linkage

TYPES

Based on atoms involved in glycosidic linkage

O- glycosides

C- glycosides

S- glycosides

N- glycosides

TYPES

According to Sugar moiety

- Glucosides
- Ribosides
- Rhamnosides

CLASSIFICATION

a)Cardioactive glycosides: Digitalis, Strophanthus and) white squill

b)Anthraquinone glycosides: Cascara, Aloe, Rhubarb,) Cochineal and Senna

c) Saponin glycosides: Glycyrrhiza, Sarsaparilla)

d)Cyanophore glycosides: Wild cherry)

e)Isothiocyanate glycosides: Black Mustard)

f) Lactone glycosides: Cantharide)

g)Aldehyde glycosides: Vanilla)

h) Miscellaneous glycosides: Gentian, Quassia, Dioscorea)

Cardiac glycosides

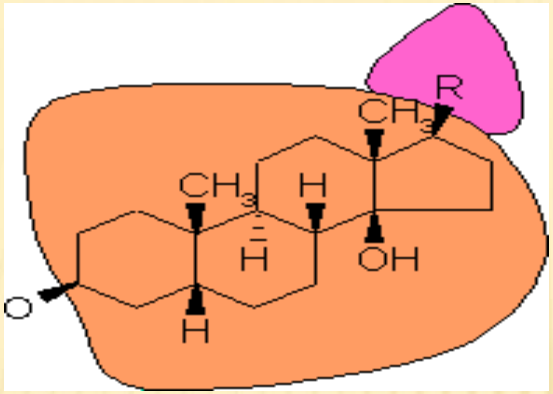
Glycosides that exert a prominent effect on heart muscle and heart rhythm are called cardiac glycosides example digitoxin from Digitalis purpurea. Their effect is specifically on myocardial contraction. They are commonly found in the genera *Convallaria*, *Nerium* and *Digitalis*. The aglycone portion is steroidal in nature and it is sometimes referred to as a **cardenolide** being **card**ioactive and possessing an alkene and **olide** (cyclic ester).

;Therapeutic activity depends upon

Chemical nature of aglycone. 1

Number of sugars. 2

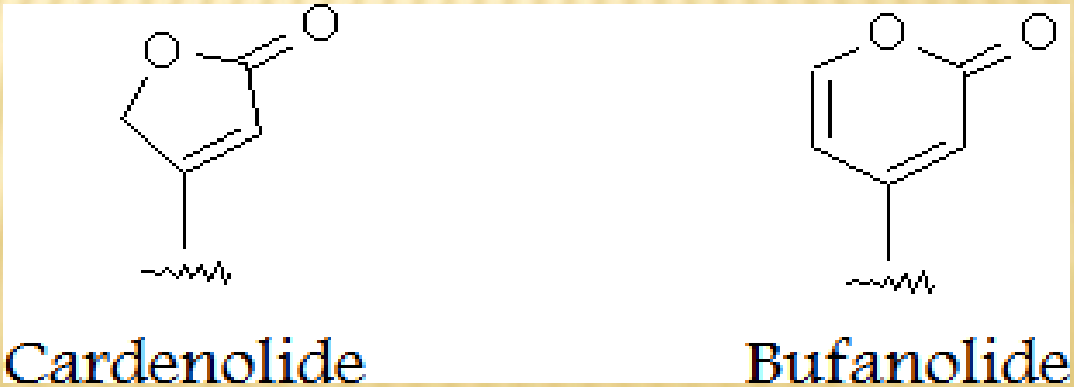
.AGLYCONE IS STEROIDAL



Aglycone may be

(Cardenolide (5-membered lactone at place of R

(Bufanolide (6-membered lactone at place of R



PHARMACOLOGICAL ACTION OF CARDIAC GLYCOSIDES

- Effectiveness depends on both the aglycones and the sugar attachments
- Medicinal action depends on the aglycone
- But the sugars make the compound more soluble in increases the fixation of the glycoside to the heart muscle

PHARMACOLOGICAL ACTION OF CARDIAC GLYCOSIDES

The overall action of *Digitalis* glycosides is complicated by the number of different effects produced.The exact mode of action on the myocardial muscle still needs investigation

It is thought to act in competition with K ions for specific receptor enzymes)ATPase) sites in the cell membranes of the heart muscle when there is an influx of Na ions

Effect is to increase the force of heart contraction &
Diuretic action relates to the improved circulatory effects

A) DIGITALIS

:Botanical Origin

Digitalis purpurea

Digitalis lanata

:Family

Plantigenaceae

:Part used

Dried leaves

:Collection

Leaves collected from 2nd year growth of plant .in June before opening of flower

Drying is done by applying artificial heat (.(temperature not more than 65°C

CHEMISTRY

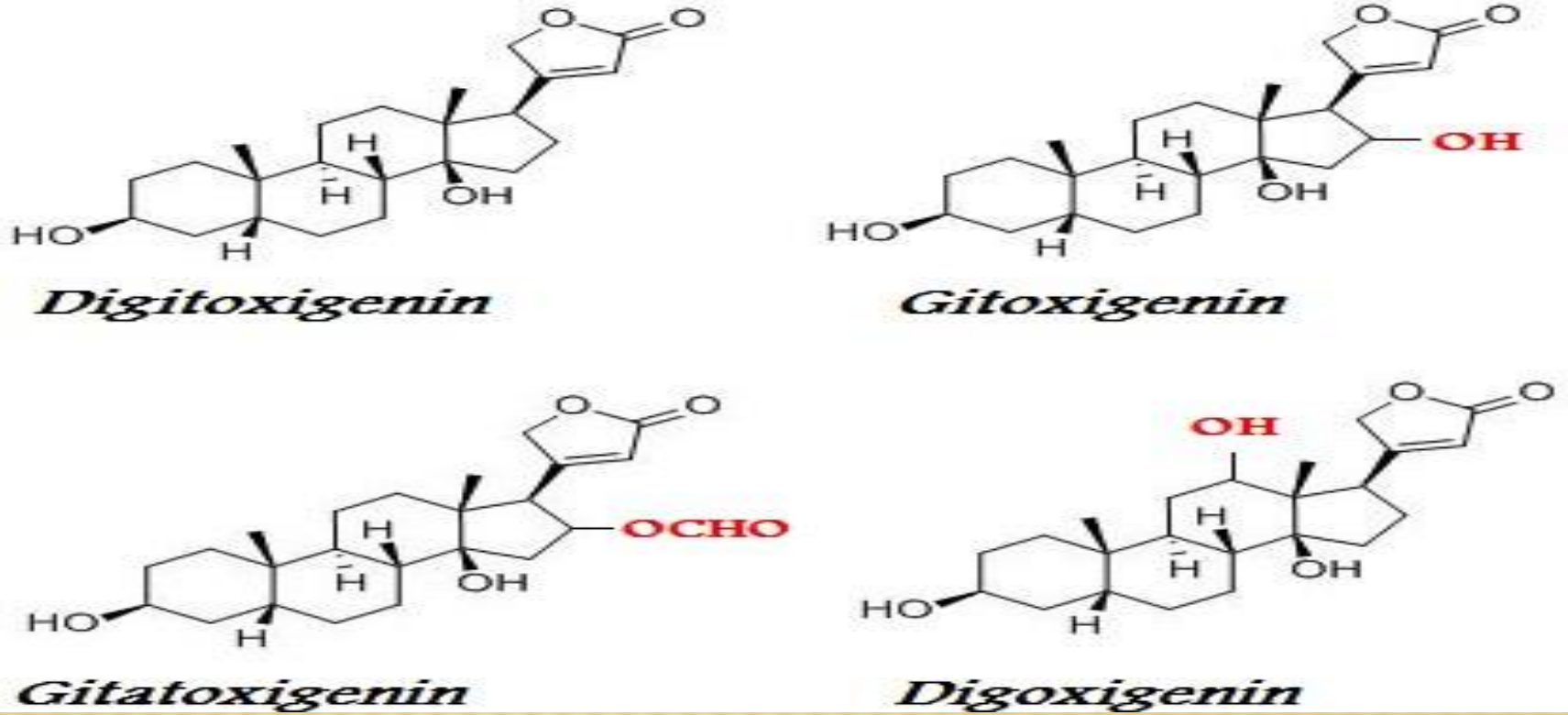
Four aglycons in Digitalis

Digitoxigenin

Gitoxigenin

Gitatoxigenin

(Digoxigenin (only in Digitalis lanata



DERIVATIVES

	D. purpurea	*D. lanata*
Digitoxigenin	*Digitoxin* *Glucodigitoxin* *(Digitoxin + 1 glucose)*	*Acetyl digitoxin* *Lanatoside A* *(Acetyl digitoxin + 1 glucose)*
Gitoxigenin	*Gitoxin* *Glucogitoxin* *(Gitoxin + 1 glucose)*	*Lanatoside B* *(Acetyl gitoxin + 1 glucose)*
Gitatoxigenin	*Gitatoxin*	*Lanatoside E* *(Acetyl Gitatoxin + 1 glucose)*
Digoxigenin		*Digoxin* *Acetyl digoxin* *Lanatoside C* *(Acetyl digoxin + 1 glucose)* *Deslanoside* *(Digoxin + 1 glucose)*

WHITE SQUILL

:Botanical Origin

Urginea maritima

:Family

Liliaceae

:Part used

Dried fleshy scales of bulb

:Collection

Bulbs are collected in August. Outer scale is removed and inner scale is divided .into pieces and dried in sunlight

:Uses

Emetic
Expectorant
Cardiac tonic
Diuretic

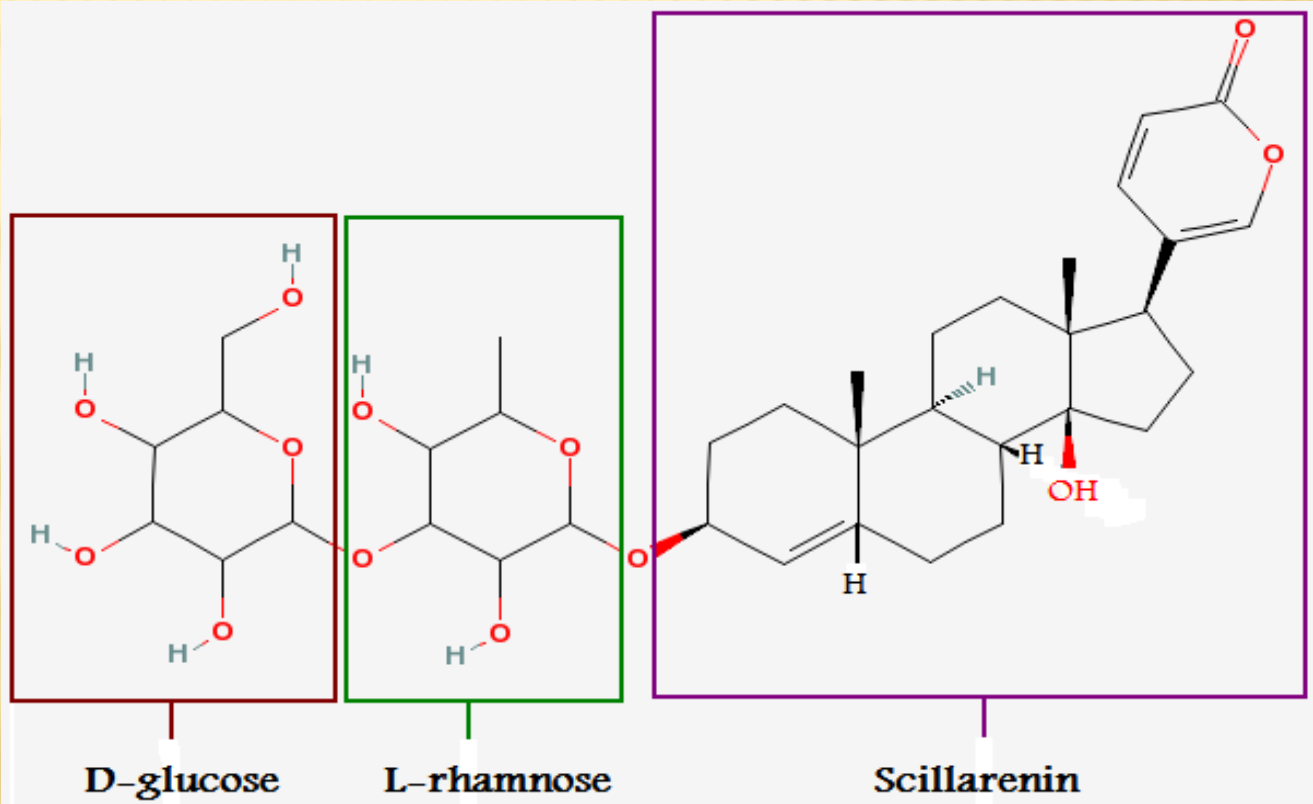
:CHEMISTRY

*Active constituent is **Scillaren***

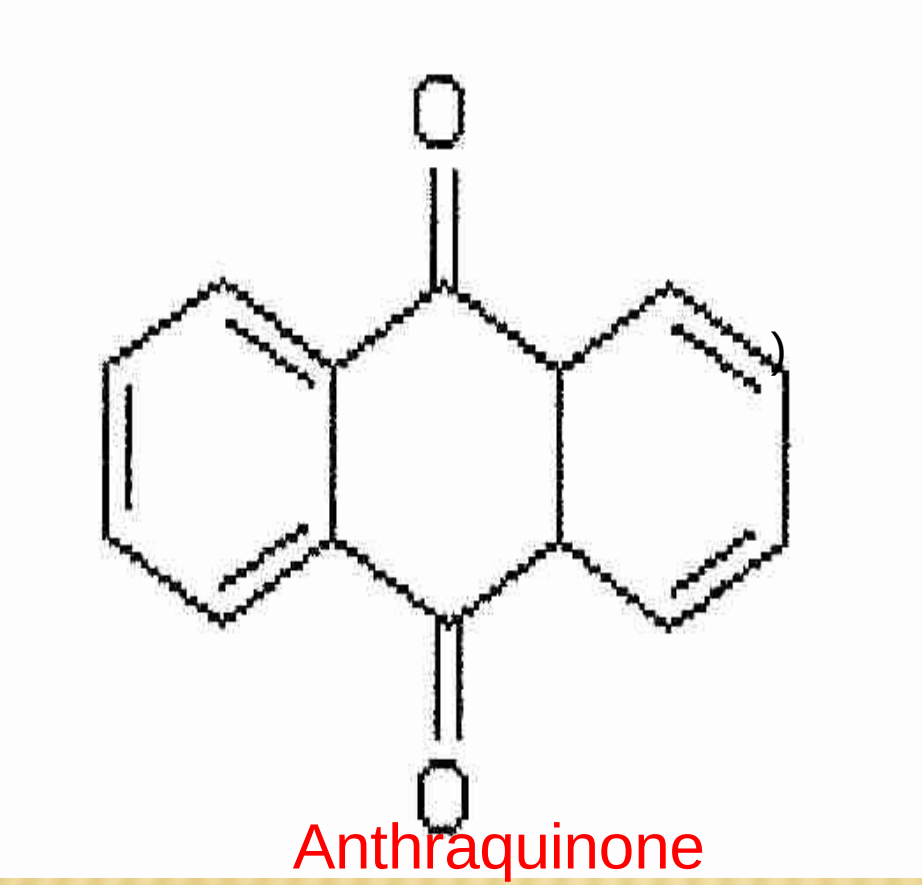
Upon hydrolysis it yields

Scillarenin

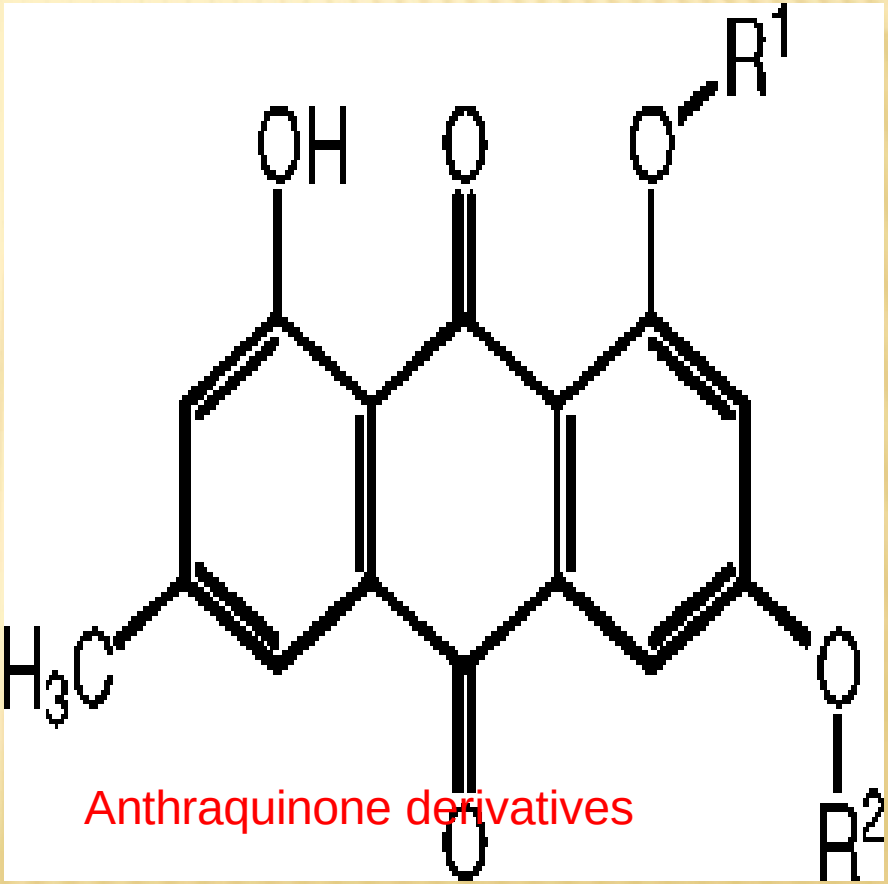
(Sugars (1 molecule of glucose + 1 molecule of rhamnose)



ANTHRAQUINONE GLYCOSIDES



Anthraquinone



Anthraquinone derivatives

INTRODUCTION TO ANTHRAQUINONES

Historically: Rhubarb, Senna, Aloes and Cascara were all used as purgative drugs

Monocotyledons: Only Liliaceae Most commonly C-glycoside: barbaloin

Dicotyledons: Rubiaceae, Leguminosae, Polygonaceae, Rhamnaceae, Ericaceae, Euphorbiaceae, Lythraceae, Saxifragaceae, Scrophulariaceae and Verbenacacea. Also in certain fungi and lichen

REDUCED DERIVATIVES OF ANTHRAQUINONES

Oxanthrones, anthranols and anthrones

Compounds formed by the union of 2 anthrone molecules

Dianthrones

Aglycones

Chrysophanol/Chrysophanic acid ◊ Rhubarb and Senna

Rhein ◊ Rhubarb and Senna

Aloe-emodin ◊ Rhubarb and Senna

Emodin ◊ Rhubarb and Cascara

ANTHRAQUINONES – CHEMICAL PROPERTIES

Anthraquinone derivatives: orange-red compounds.Soluble in hot water/dilute alcohol

Identified via **Borntrager's test**

Powdered drug – macerated with ether Filter Add ammonia/caustic

Shake ◊ pink, red or violet colour – positive for anthraquinone derivatives

If the Anthraquinones are reduced (within the herb) or stable (glycosides) test will be negative

ANTHRANONLS AND ANTHRONES

- Reduced anthraquinone derivatives
- Occur either freely)aglycones) or as glycosides Isomers

Anthrone: Parent structure)pale yellow, non soluble in alkali, non-fluorescent

Anthronol: brown-yellow, soluble in alkali, strongly fluorescent

Anthronol derivatives)e.g. in Aloe – have similar properties – fluorescence used for identification

MECHANISM OF ACTION

The glycosides are absorbed from the small intestine and re-excreted in the large intestine where they increase the motility so produce relaxation

Aglycones produce griping effect so it is recommended to prescripe antispasmodic with them

MECHANISM OF ACTION

Molecules have to possess certain features for :activity glycosides[1] carbonyl keto function on centre ring[2] positions have to have –OH- 8,-1[3]

Potency anthrone > anthraquinone> dianthrone

Aglycones not therapeutically active in animals , lipid soluble absorbed in stomach and never reach colon to produce a local effect

HIGHLY ACTIVE PHENOLIC GROUP IRRITANT TO MUCOSA

Glycosides very water soluble – reach large intestine where they are hydrolysed by *E.coli* enzymes and become lipid soluble and absorbed into circulation

- 5-8 hours to act

take night before

in low doses – drug metabolised by liver and recirculated via bile to give more effect

people especially elderly can become reliant on them needing higher dose to produce an effect

carcinogenic to melanosis coli

SENNA - LEGUMINOSAE

Definition: Consists of the dried leaflets of *Cassia senna* (Alexandrian senna), or *Cassia angustifolia*(Tinnevelly senna

CASSIA - SENNA

Indigenous to Africa (tropical regions Used since 9th and 10th century

Itroduced into medicine by Arab physicians (used both the leaves and pods

Exported by Alexandria – name of the Sudanese drug

SENNA - COLLECTION

Collected in September Whole branches bearing leaves are dried in the sun

Pods and large stalks are separated with sieves

Leaves are graded (whole leaves and half- leave mix, siftings Whole leaves – sold to public

SENNA - CONSTITUENTS

Senna consist four types of glycosides

Sennoside A, Sennoside B Sennoside C Sennoside D

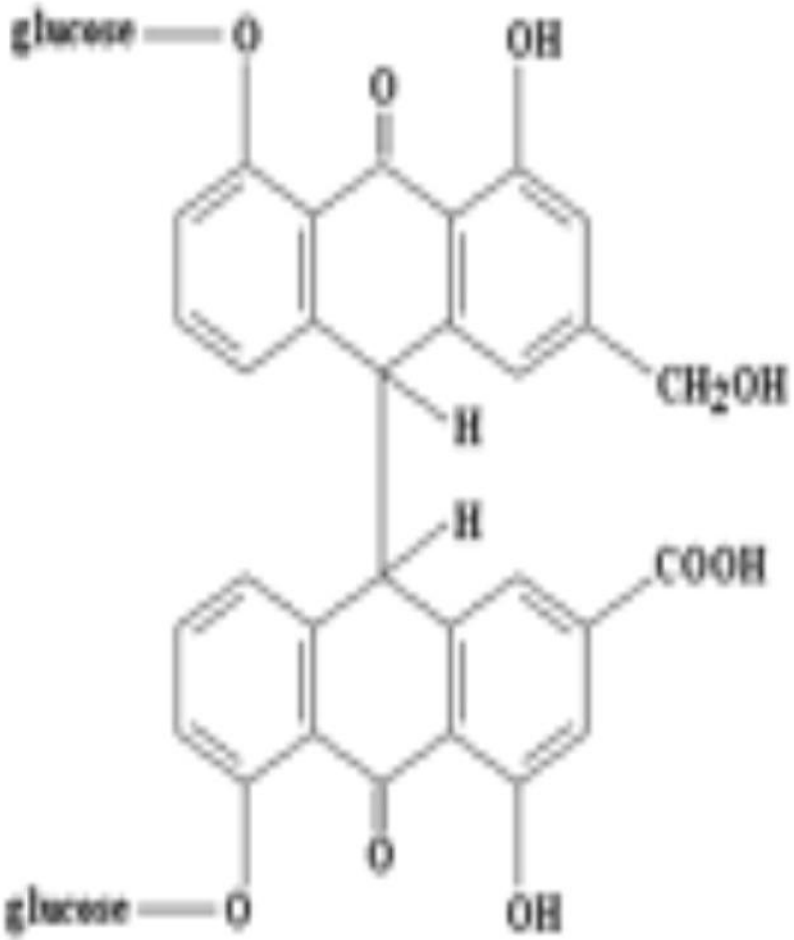
In their active costituents are sennoside A, sennosides B

Upon hydrolysis of sennosides it gives two molecules glucose+aglycones: Sennidin A and Sennidin B

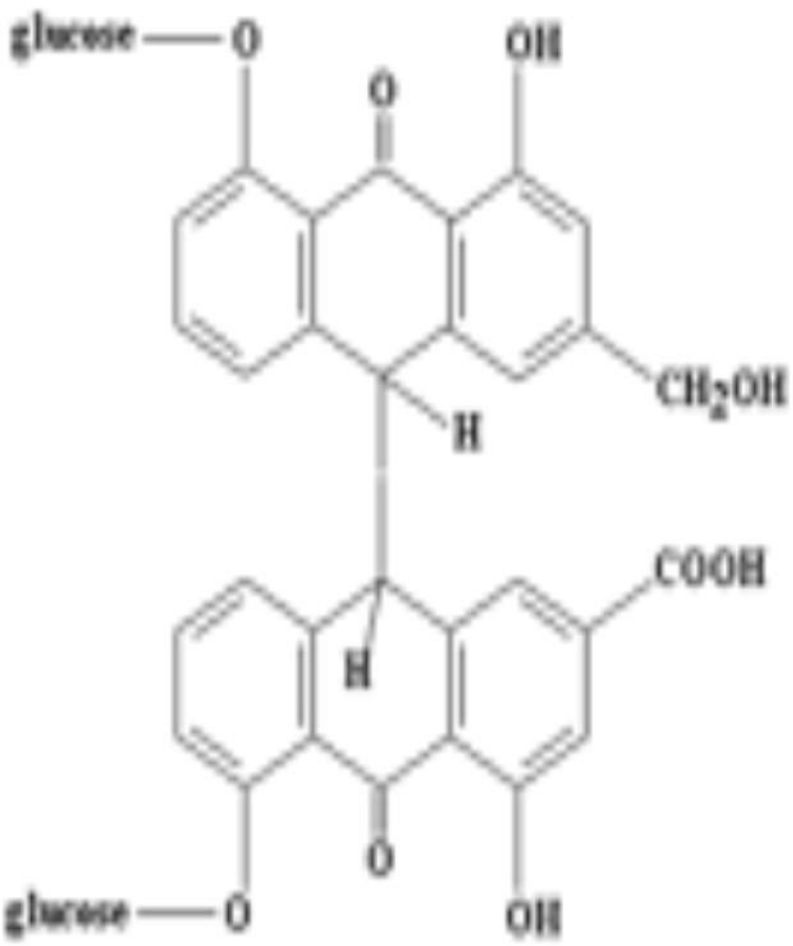
Sennoside C & Sennoside D

Rhein Aloe-emodin

Palmidin A (Rhubarb



SENNOSIDE A



SENNOSIDE B


Thank
you!