

Anthraquinones glycosides

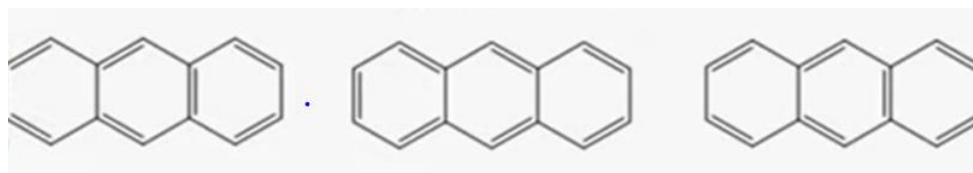


Pharmacognosy lecture stage 3

By D. Zainab Tuama

ANTHRAQUINONES GLYCOSIDES

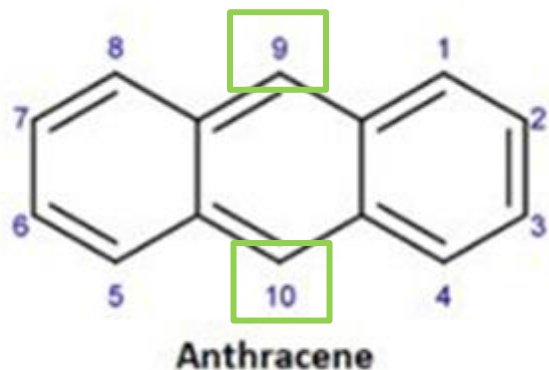
- Anthraquinones are glycosides have aglycon related to anthracene are present in many crude drugs as **Aloe** and **Rhubarb** used as laxative. The basic structure of anthracene.



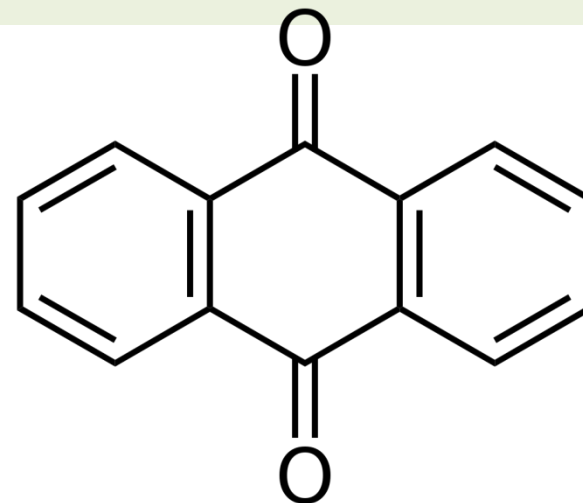
Anthraquinone Glycosides

□ Anthraquinone:

Oxidation of anthracene nucleus at position 9 and 10 give di keto compound called Anthraquinone.



Oxidation

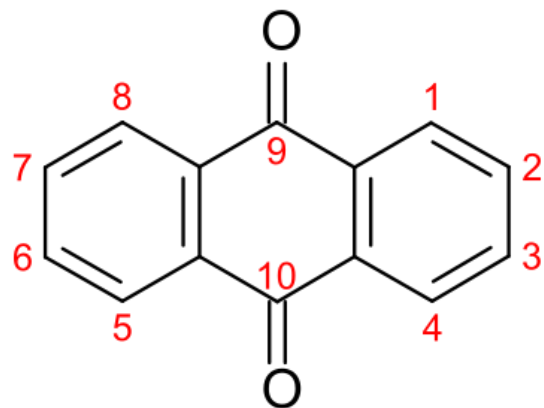


9,10- di keto anthracene

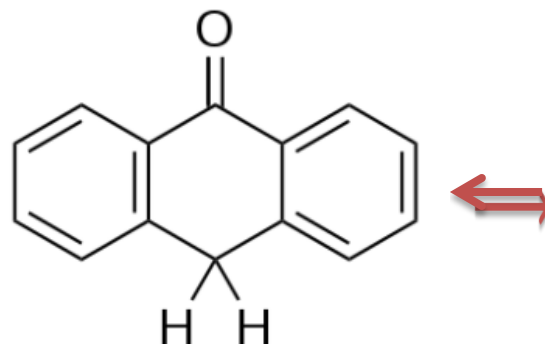
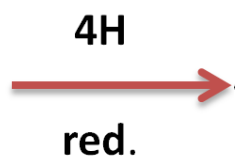
Anthraquinone

The relationships between the oxidized and reduced forms of the anthraquinone nucleus are:

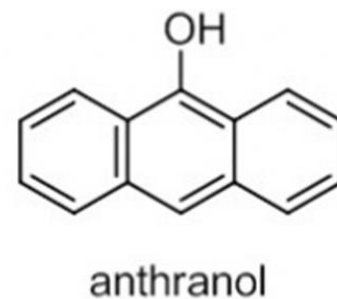
Reduction and oxidation anthraquinone



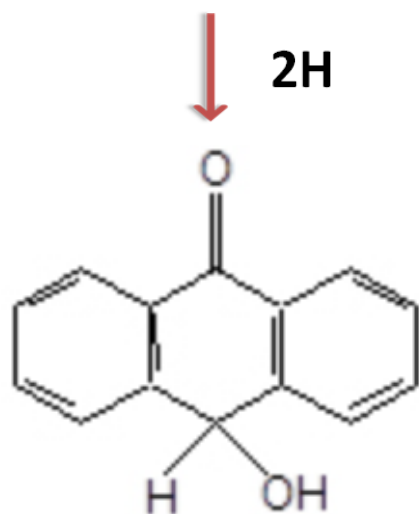
Anthraquinone



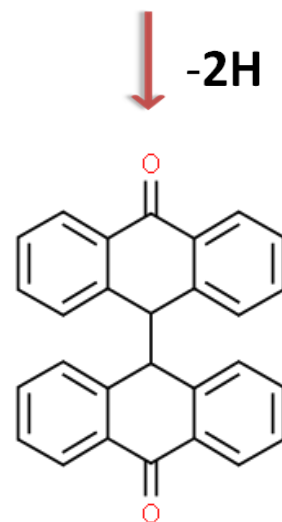
Anthrone



anthranol



Oxanthrone

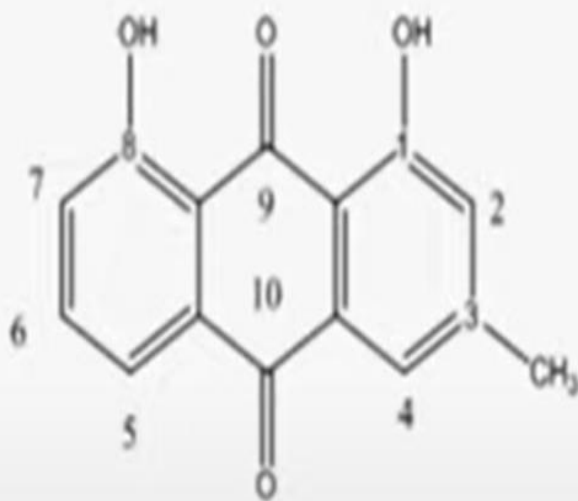


dianthrone

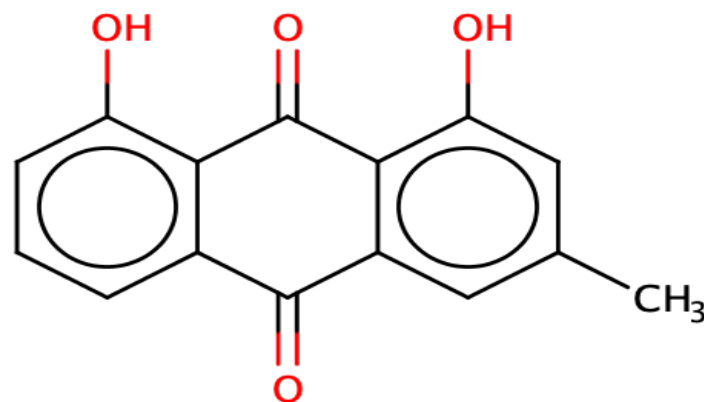
The derivatives of anthraquinone are:

1. chrysophanol

It is dihydroxy phenols at position 1 and 8 and methyl group at position 3.



Chrysophanol

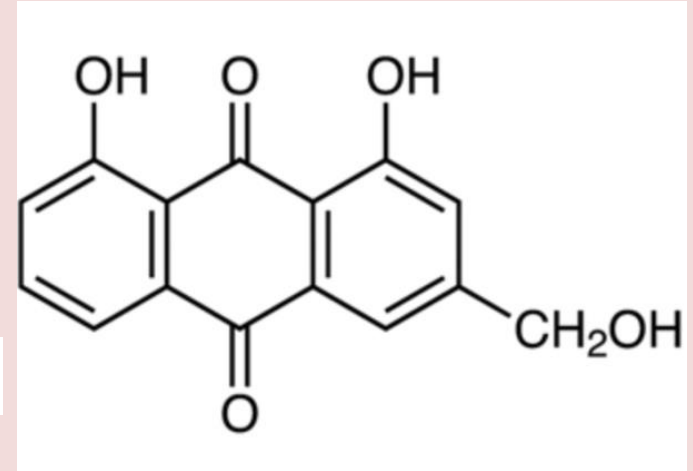


1,8- dihydroxy-3- methyl anthraquinone

2. Aloe- emodin:

It is dihydroxy phenol at position 1 and 8 and hydroxy methyl group at position 3

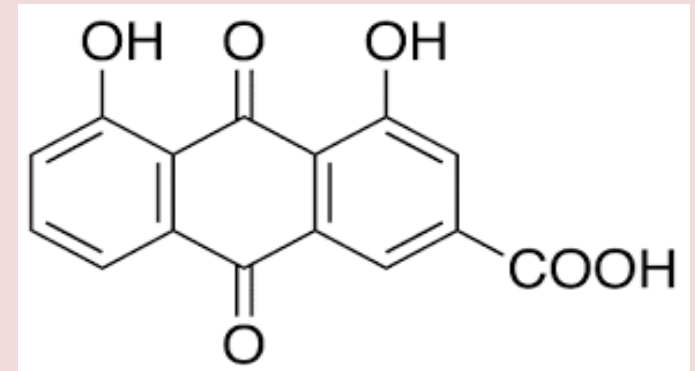
1,8- dihydroxy-3- hydroxy methyl anthraquinone



3. Rhein:

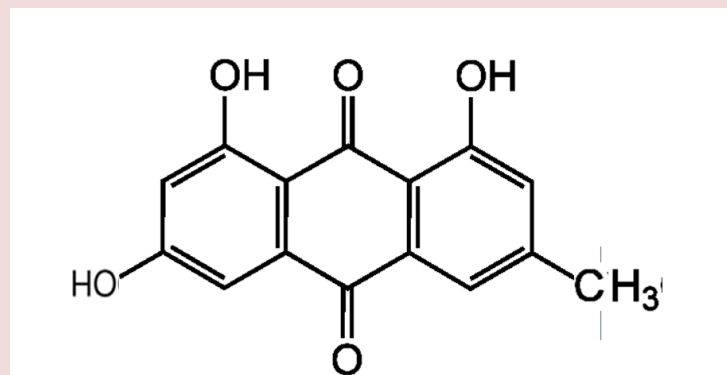
It is di hydroxy phenols at positions 1 and 8 and carboxylic acid (-COOH)at position 3

1,8-dihydroxy-3-carboxy anthraquinone

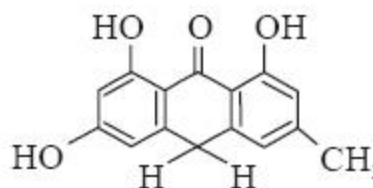


4. Emodin:

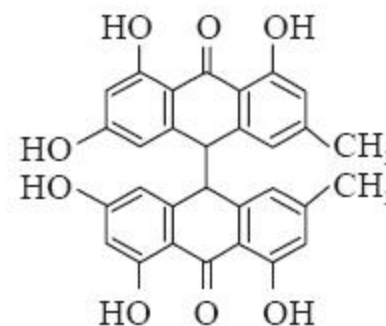
It is tri hydroxy phenol at positions 1,6 and 8 and methyl group at position 3.



1,6,8- trihydroxy-3-methyl anthraquinone



Emodine Anthrone



Emodin Dianthrone

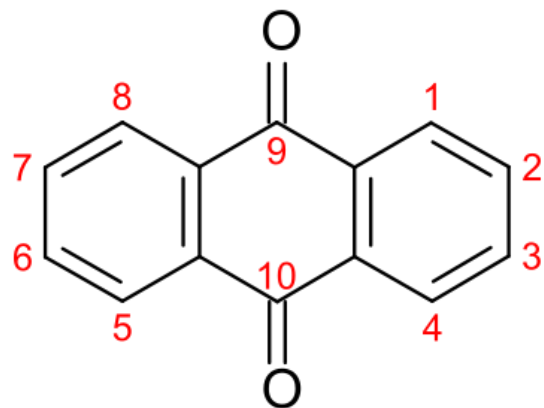
Anthrone and anthranol These reduced anthraquinone derivatives found either free or combined as glycosides. They are isomeric and one may be partially converted to an other in solution.

The parent substance anthrone is a pale yellow, non-fluorescent substance which is insoluble in alkali, its isomer fluorescent solution in alkali.

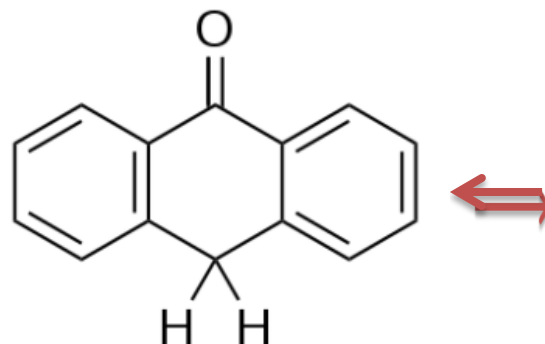
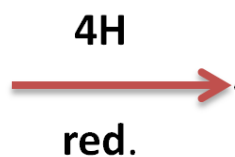
Oxanthrones:

These are intermediate products between anthraquinones and anthranols.

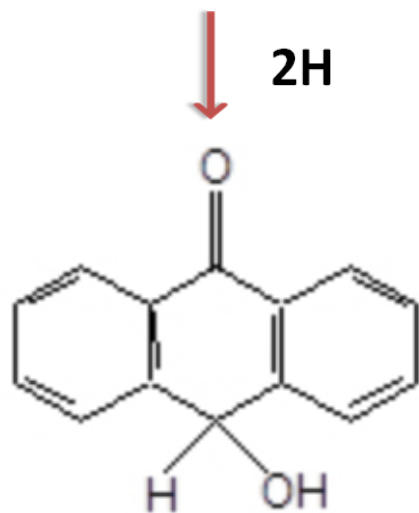
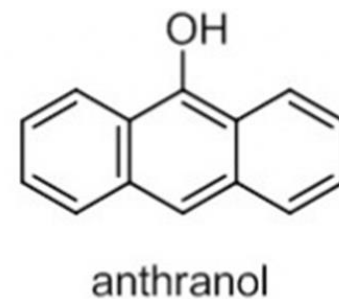
Reduction and oxidation anthraquinone



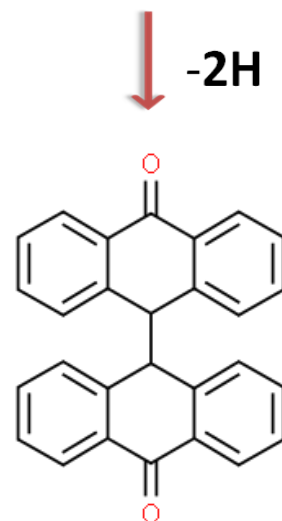
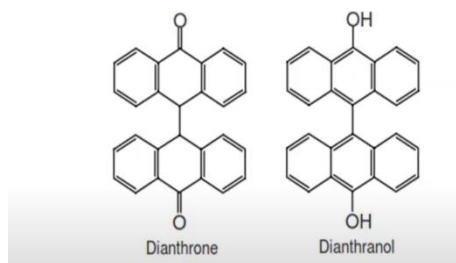
Anthraquinone



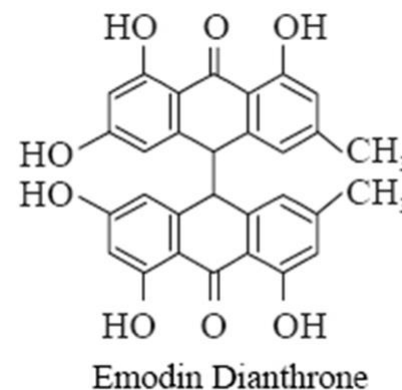
Anthrone



Oxanthrone



dianthrone



Dianthrone: these are compounds derived from two anthrone molecules which may be identical or different.

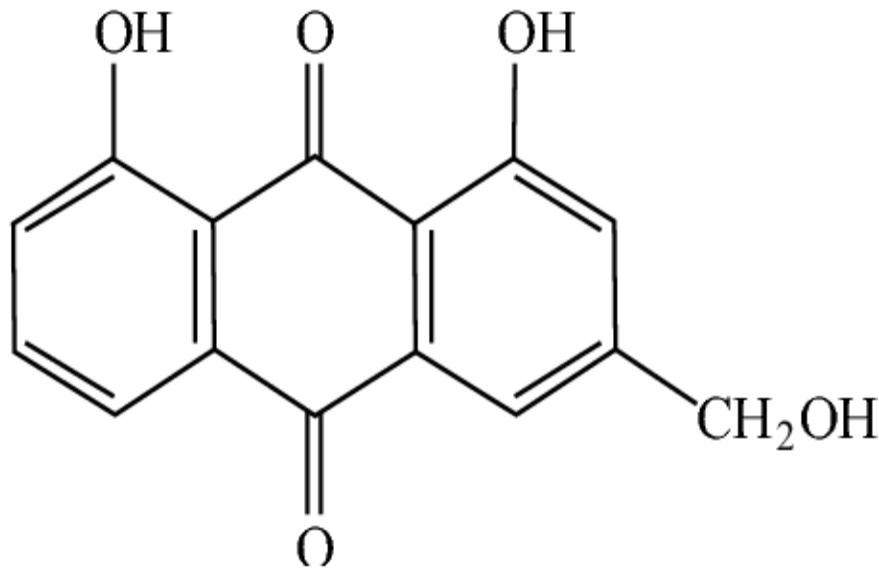
❑ Anthraquinones and reduced derivatives (oxanthrones, anthranols and anthrones) and compound derived from two anthrone molecules (dianthrone) found either free or combined with sugar as glycosides.

❑ The sugar residue is important for pharmacological effect...Glycosylation is also important (sugar moiety serves to transport the aglycone to the site of action in the large intestine). Act as prodrugs

Anthraquinone Glycoside

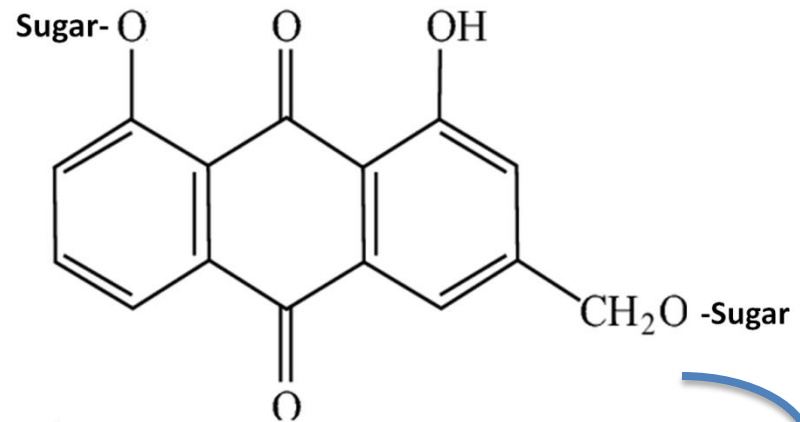
There are two types of glycosides formed

- ❑ **O-glycosides** when sugar attached to the oxygen of phenol or alcohol in the anthraquinone aglycon and its derivatives.



aloë-emodin

phenol
oxygen

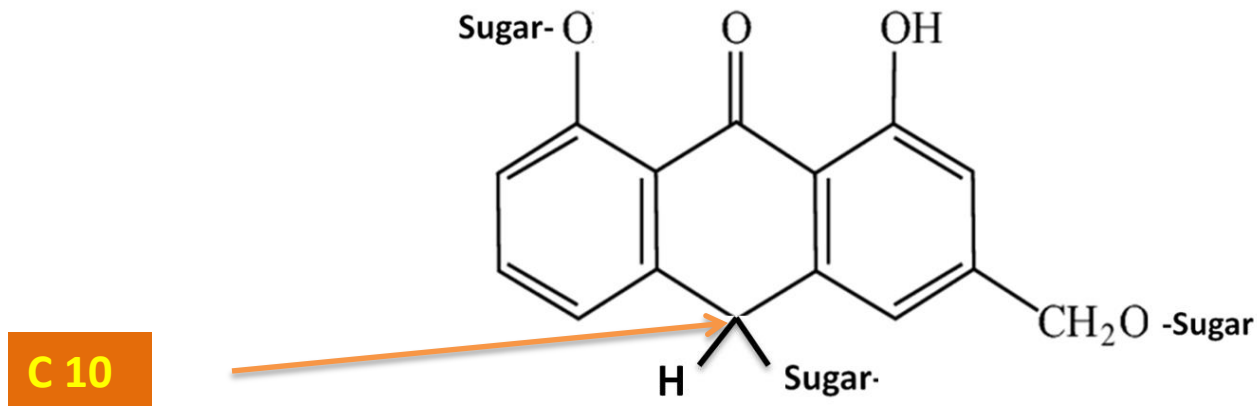


O-glycosides

alcohol
oxygen

Anthraquinone Glycoside

- ❑ C-glycosides when sugar attach to carbon ion of the reduced anthraquinone derivatives at position 10



C & O anthrone glycoside

Anthraquinone Glycoside

❑ Pharmacological activity:

The anthraquinone and related glycosides are stimulant cathartics and exert their action by increasing the tone of the smooth muscle in the wall of the colon. Also it stimulates the secretion of water and electrolyte into the large intestine.

Plants containing anthraquinone glycosides

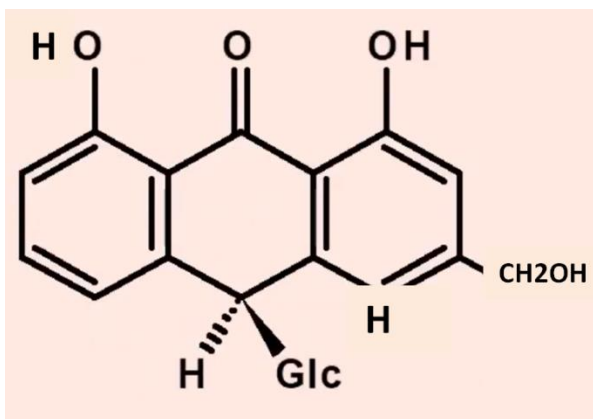
❑ Cascara bark:

It is dried bark of *Rhamnus purshianus*

F: Rhamnaceae

Constituents:

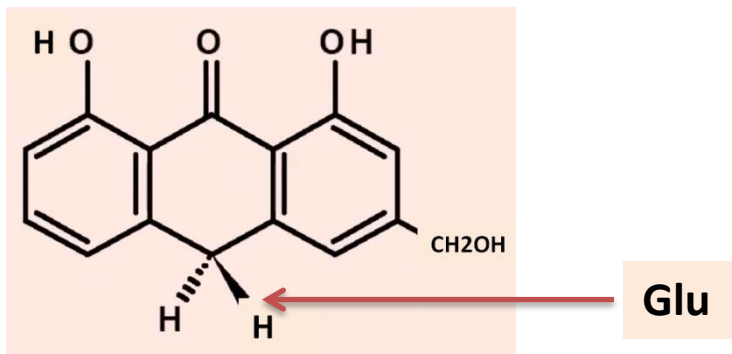
four primary glycosides or cascarosides (A,B,C,and D) that contain both O-and C-glycosidic linkages, and free anthraquinones



C-glycoside

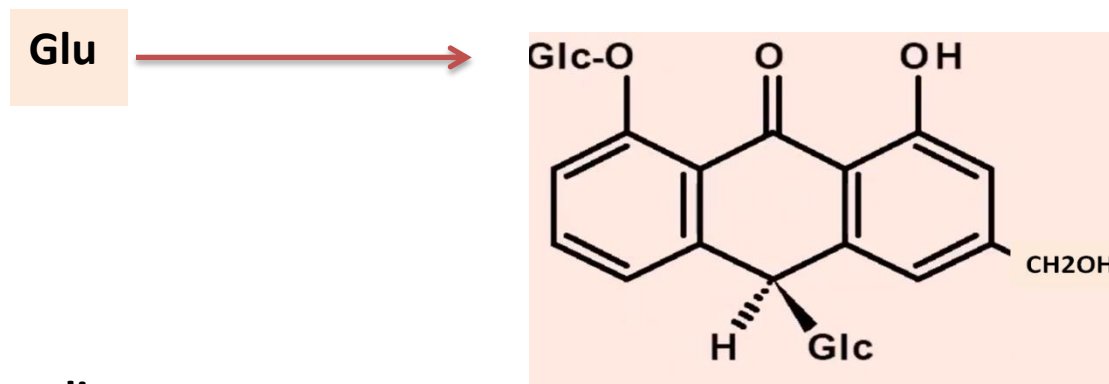
Barbaloin (is C-glycoside of Aloe-emodin anthrone)

Secondary glycoside



Aloe-emodin anthrone

Aglycon

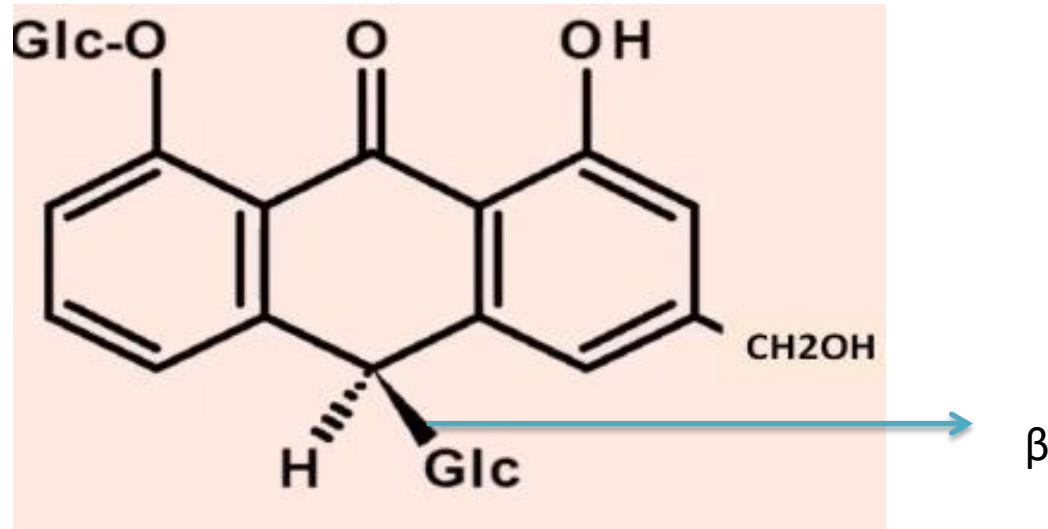


O and C-glycoside

Cascaroside A and B

Primary glycoside

Cascaroside A and B hydrolysis to secondary glycoside (barbaloin) which after hydrolysis convert to aglycon Aloe-emodin anthrone



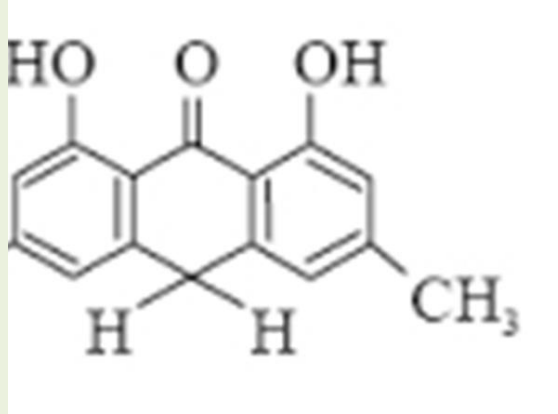
Cascaroside A and B

Cascaroside A& B:

- A in β -configuration.
- B in α -configuration

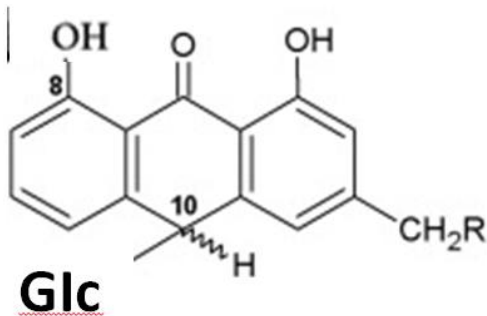
Cascaroside C &D:

- C in β -configuration.
- D in α -configuration



Chrysophanol anthrone

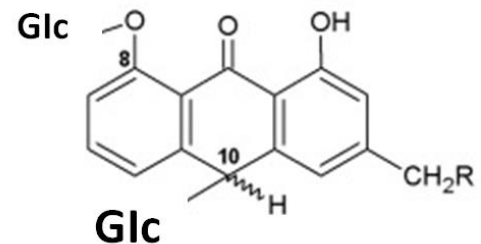
Aglycon



C-glycoside

Chrysaloïn (is C- glycoside of Chrysophanol anthrone)

Secondary glycoside



O and C-glycoside

Cascaroside C and D

Primary glycoside

Hyd.

2- senna leaf

Senna is the fruit (pod) or leaf of the plant *cassia acutifolia*. It is approved in the US as a laxative for short-term treatment of constipation.

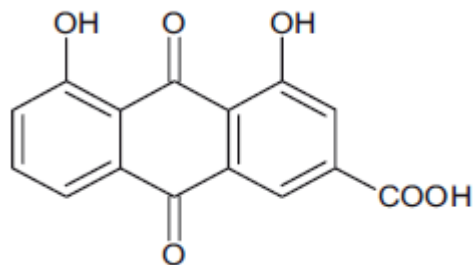
F: Leguminosae



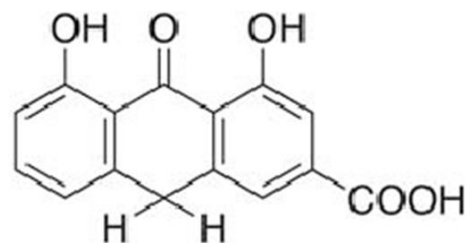
Constituents

1- the principle active constituents of senna are dimeric glycosides:

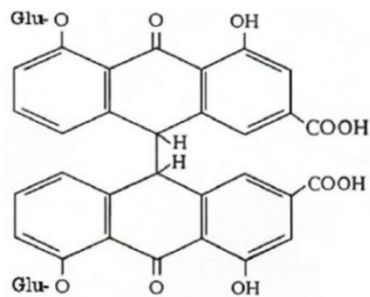
Sennoside A and B which are pair of stereoisomer whose aglycones are rhein homo dianthrone that present in greatest concentration



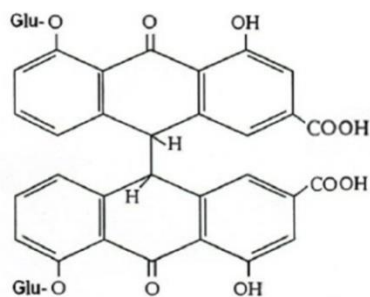
Rhein



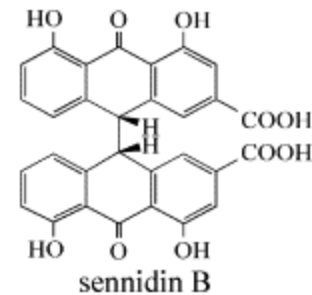
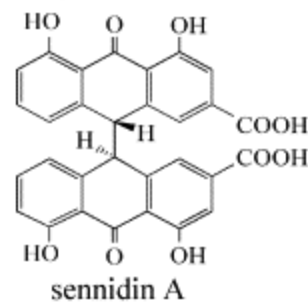
Rhein anthrone



Sennoside B

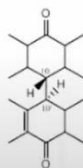


Sennoside A

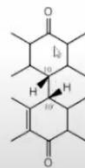


one beta_ other
α....

Sennoside A
C₁₀-C_{10'}
Trans

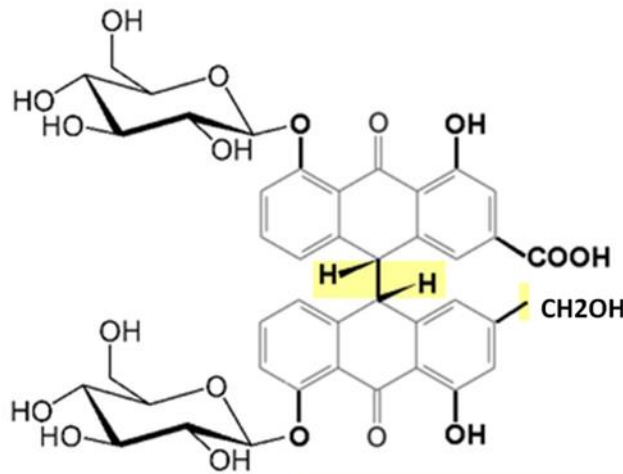


Sennoside B
C₁₀-C_{10'}
Meso



Both β

2- Sennidin C and D which composed of aloe-emodin and rhein



Sennoside C

Rhein

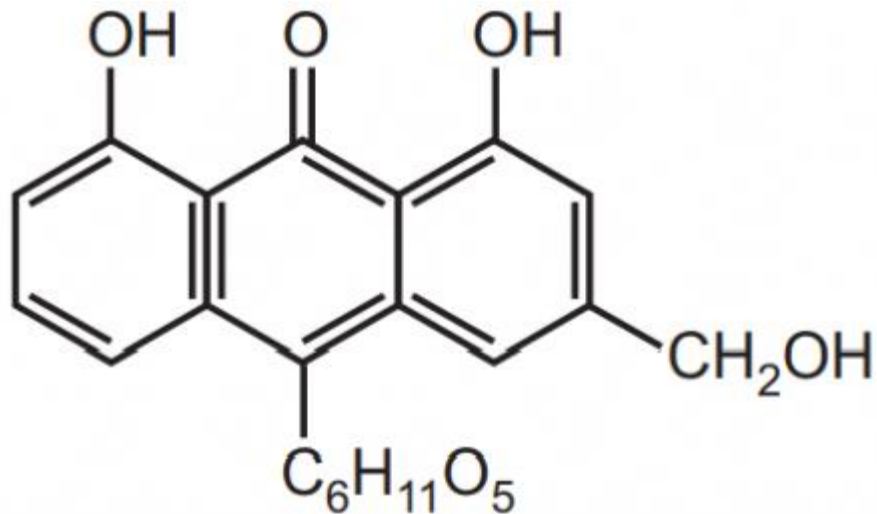
aloe-emodin

Sennoside A and C (H) on a different side
Sennoside B and D (H) On similar side

3- Aloe species

Aloe vera

Aloin, *also* known as barbaloin



Barbaloin

4- Frangula bark

consists of the dried, whole or fragmented bark of the stems and branches of *Rhamnus frangula L*

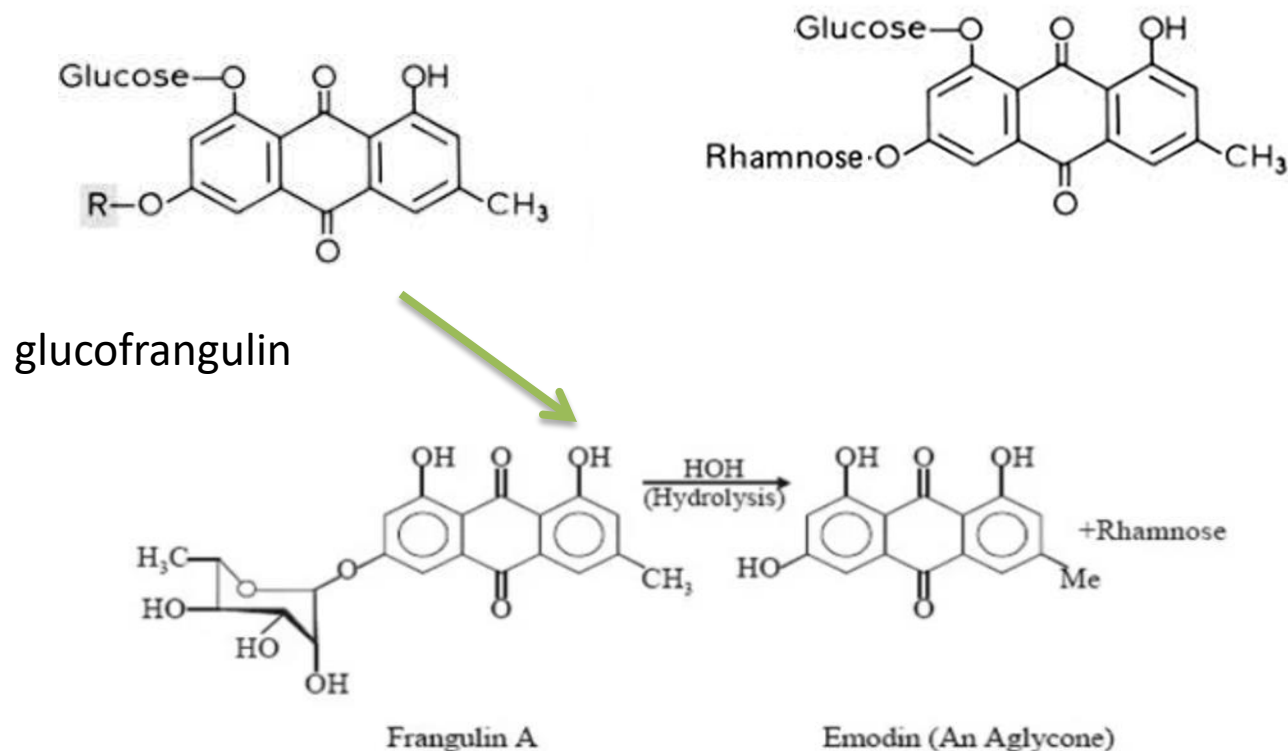


The constituents with known therapeutic activity of frangula bark are emodin-di- and mono-glycosides. the diglycosides glucofrangulin and the monoglycosides frangulins

Present of high concentration of anthrone glycosides may cause emesis & bloody diarrhea So drug must be stored longer before use (for 1 year, or dried at 100°C for 2 h), because the fresh bark contains highly active anthrones that are converted by oxidation to the less active form (anthraquinone)

Hydrolysis of glucofrangulin yields frangulin and glucose while hydrolysis of frangulin gives frangula emodin and rhamnose.

Uses: - as a mild cathartic.



5- Rhubarb

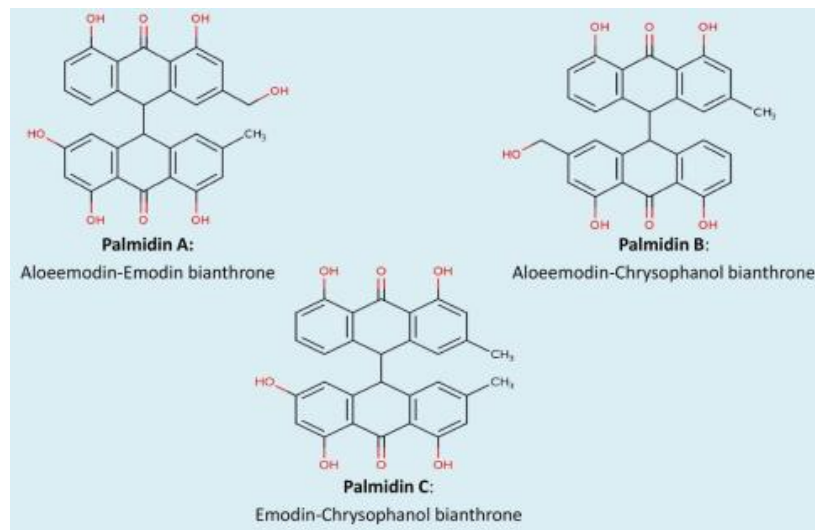
Dried rhizomes of *Rheum palmatum* & other species of *Rheum* except *R. Rhaponticum* (fam: polygoniaceae)

Glycosides of the
above listed aglycones

a) Sennoside A,B

b) Sennoside C,D

c) plamidins A,B,C,D



Contains **Tannins**:

Which counteract the laxative effect of rhubarb and make it mild laxative

Due to presence of tannin which produce astringent effect after laxative action (and antibacterial activity)



Long- term use of laxatives should be avoided, because it may produce a harmful effect on intestinal mucosa which leads to a condition known as melanosis coli (or pseudomelanosis).

This is usually observed after a minimum of 9-12 months of regular stimulant laxative use

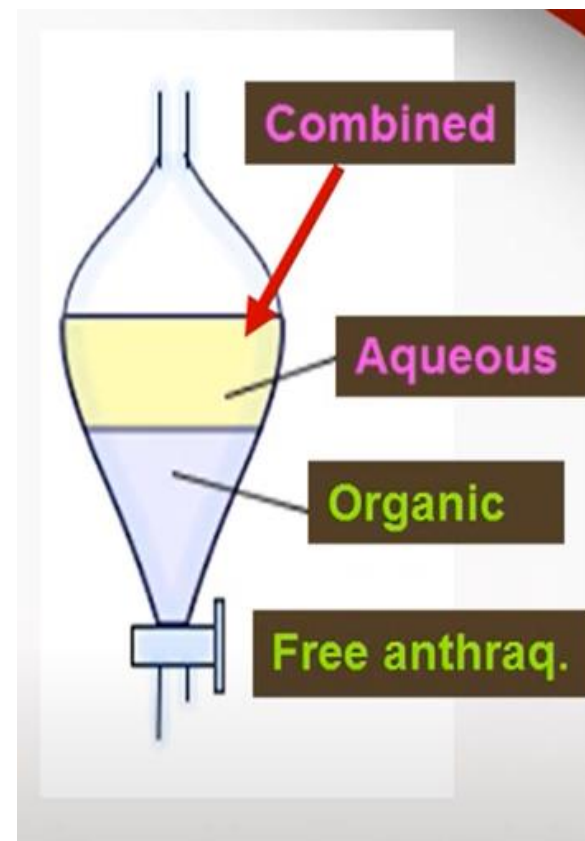


Tests for Identification of anthracene glycosides

Borntrager reaction: upon dissolving the anthraquinone in alkaline aqueous medium (KOH), a red color develops. This reaction is only positive with free anthraquinones.

Borntrager modified reaction:

The plant is powdered and extracted with hydroalcoholic solution. The aqueous phase is extracted with an organic solvent, which eliminates the free anthraquinone forms present.



Then aqueous solution is oxidized (FeCl_3) and hydrolyzed (HCl), the resulting anthraquinones are extracted by organic solvent.

