

Pharmacognosy lab. 3rd stage

Saponin Glycosides

This group of glycoside is widely distributed in higher plants. Saponin glycosides form colloidal solution in water that foam upon shaking, this is due to **a decrease in the surface tension action done by saponin glycosides**, as a result of the hydrophobic/ hydrophilic characteristics of the saponin, and due to this property the saponins are used in the manufacturing of beer, and soap.

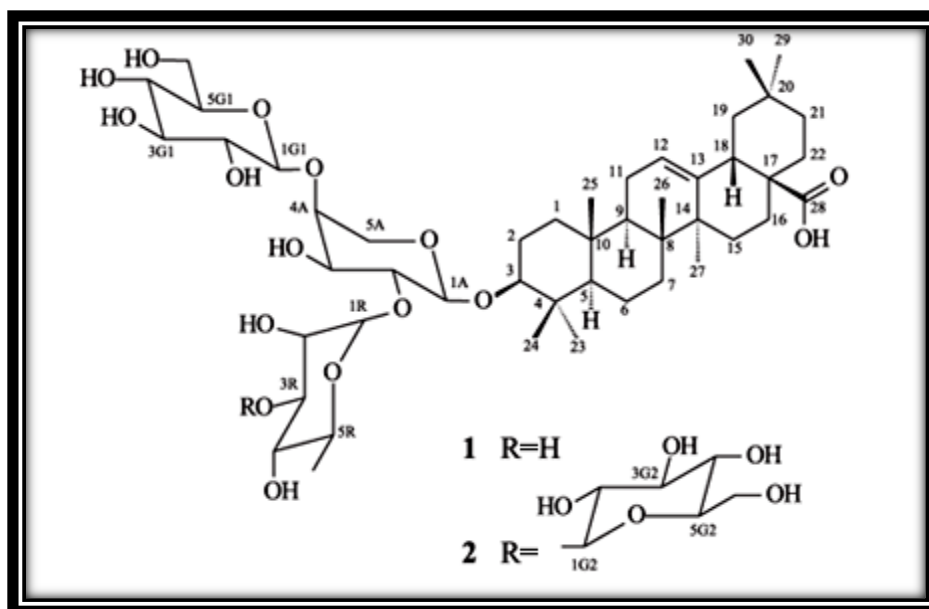
Saponins have a bitter, acrid taste, and drugs containing them are usually sternutatory and otherwise irritating the mucus membrane.

They destroy red blood corpuscles by hemolysis and are toxic especially to cold blooded animals therefore many saponins are used as fish poisons. The more poisonous saponin is often called **sapotoxin**, many are toxic to insects and mollusks, and some are used to control schistosomiasis snails.

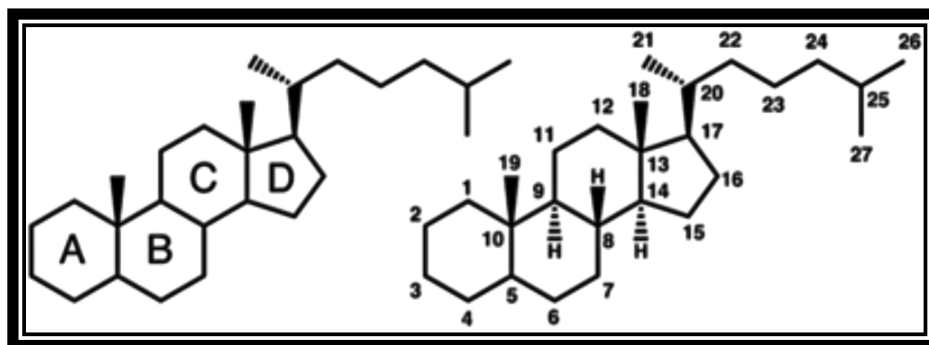
Saponin upon hydrolysis yield an aglycone known as **sapogenin**, which are crystallized upon acetylation, therefore this process is used for purification.

According to the structure of the aglycone, two kinds of saponin are recognized:

1. Pentacyclitriterpenoid saponins (acidic, and the C-atom is C₃₀)
2. Steroidal saponins (neutral C- atom is C₂₇).



Pentacyclic triterpenoid saponin



Steroidal saponin

Isolation & Identification of the Saponin Glycosides:

Procedure:

Method of extraction: Decoction.

Plant used: Saponaria officinalis family Caryophyllaceae.

Part used: Dry root.



Saponaria officinalis

Add **0.1 gm** of saponaria root in coarse powder to **20 ml** distilled water in a beaker and boil gently for **2-3 minutes**. Filter hot and allow cooling:

- a) Dilute **5ml** of the filtrate with water and shake vigorously.
- b) To the remaining of the filtrate add **5ml** of **dilute H_2SO_4 acid** and boil gently for **3-5 min_s**. The aglycones are obtained by acid hydrolysis and are insoluble in water but are soluble in **90% alcohol**.
- c) Make the filtrate obtained from (b) alkaline with **NaOH**, (litmus paper) and then carry **Fehling's test** or **Benedict's test** (**5ml** filtrate + **2ml** of Benedict's reagent heat for **10min_s** on boiling water bath).

Specific Reaction:

1. The Hemolytic Test

Aim: Identity test (*specific*) for saponin glycosides

Equipments & Reagents:

- ✓ Two test tube.

- ✓ 10% solution of blood in normal saline.
- ✓ Normal saline.

Procedure:

Take two test tubes and place in each one **5ml** of a **10% solution of blood** in normal saline. To one of them, add **5ml** of **normal saline** solution and to the other one add **5ml** of the extract of Saponaria root. Shake both tubes gently and notice the result.

Results:

The test tube containing 5ml of the extract of Saponaria will cause **blood hemolysis**.

2. Foam Index (according to Kofler)

Foam index is a value, which is used to express the quantity of the saponin glycosides in the crude drugs. The method is based upon the property of saponin to form foam when shaken with water. The foam index signifies the dilution of the substance or drug to be tested which gives a layer of foam **1cm** high if the aqueous solution is shaken for **15 seconds**, and then allow standing for **15 minutes** before reading is made.

Foam Index

Aim: Identity test (*specific*) for saponin glycosides

Equipments & Reagents:

- ✓ 10 Test tubes having the same diameter.
- ✓ Graduated pipette.
- ✓ 0.1% decoction from the powdered drug.
- ✓ 1% solution of sodium carbonate.

Procedure:

1. Prepare **0.1%** decoction from the powdered drug, neutralized it by adding solution of **1% sodium carbonate** drop wise (litmus paper) and filter.
2. Into 10 test tubes having the same diameter, **1 to 10 ml** of this decoction is added respectively using a graduated pipette, complete the volume to **10 ml** with **distilled water**.
3. Shake the content of each test tube thoroughly for **15 seconds** and allow to stand for **15 minutes**.
4. After this time, the reading is made in the test tube containing the most dilute solution with a ring of foam **1 cm** height.

For example: When this is occur in the test tube number 8, which contains 8ml of the decoction and 2 ml of water, then 8 ml of 0.1% decoction corresponds to 0.008 gm of the drug and the dilution is calculated from the following calculation:

$$\begin{array}{rcl} \text{gm} & & \text{ml} \\ 0.1 & & 100 \end{array}$$

$$\begin{array}{rcl} X & 8 & X = 0.008 \text{ gm. of saponin in 8ml of decoction.} \end{array}$$

$$\begin{array}{rcl} \text{gm} & \text{ml} & \\ .008 & 10 & \\ 1 & X & X = 10/0.008 \\ & & X = 1250 \text{ ml} \end{array}$$

That means the ring of foam 1cm high is formed by a solution diluted 1:1250. The foam index is therefore 1250.

Note/The addition of sodium carbonate is to convert the acidic saponins that may be present in the decoction, to salts, which are soluble in water.

Herbal medicinal products

Thyme



extract has been used orally to treat dyspepsia and other gastrointestinal disturbances; coughs due to colds, bronchitis and pertussis; and laryngitis and tonsillitis (as a gargle). Topical applications of thyme extract have been used in the treatment of minor wounds, disorders of the oral cavity, and as an antibacterial agent in oral hygiene. Both the essential oil and thymol are ingredients of a number of proprietary drugs including antiseptic and healing ointments, syrups for the treatment of respiratory disorders.

Glycyrrhizae (licorice)



As a demulcent in the treatment of sore throats, and as an expectorant in the treatment of coughs and bronchial catarrh. Also in the prophylaxis and treatment of gastric and duodenal ulcers, and dyspepsia , As an anti inflammatory agent in the treatment of allergic reactions .

astragalus



- **Reducing side effects of chemotherapy.** Early research suggests that giving astragalus intravenously (by IV) or using Chinese herbal mixtures containing astragalus might reduce nausea, vomiting, diarrhea, and bone marrow suppression (a decrease in the cells that provide immunity) that is associated with chemotherapy treatments.
- **Diabetes.** Early research suggests that astragalus, given intravenously (by IV) or taken by mouth as a combination product, might help control blood sugar and insulin levels in people with type 2 diabetes.
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ivy leaf extract (*Hedera helix*)



Bronchitis. Early research shows that taking cough syrup (Prospan;) or herbal drops (Prospan Herbal Drops) containing English ivy leaf extract by mouth, alone or with usual treatment, for about 1-3 weeks might improve lung function in children ages <1 to 15 years, as well as adults, with sudden or recurring bronchitis. can be used as an expectorant (a medicine that helps to bring u p phlegm) for productive (chesty) coughs

Barberry (*Berberis*)



- **acne.** Early research shows that taking European barberry capsules for 4 weeks seems to reduce acne in adolescents.
- **Vaginal infection called bacterial vaginosis.** Using a cream with European barberry and metronidazole seems to stop bacterial vaginosis infection from happening again.
- **Dental plaque.** Early research suggests that brushing teeth with a European barberry extract gel for 3 weeks reduces dental plaque. The effects appear to be similar to a commercial toothpaste (Colgate).

- **Diabetes.** Early research suggests that taking European barberry by mouth for 8 weeks does not improve blood sugar control in people with type 2 diabetes.
- **Gum swelling (gingivitis).** Early research suggests that brushing teeth with a European barberry extract gel for 3 weeks reduces gingivitis.

rose hip (*Rosa canina* L)



is the round portion of the rose flower just below the petals. Rose hip contains the seeds of the rose plant. Dried rose hip and the seeds are used together to make medicine.

Osteoarthritis. Most research shows that taking a specific rose hip product by mouth twice daily for 3-4 months reduces pain and stiffness and improves function in people with osteoarthritis.

Rheumatoid arthritis. Early research shows that taking a specific rose hip product by mouth improves some symptoms of rheumatoid arthritis.

Stretch marks (striae gravidarum). Early research shows that applying a specific cream containing rose hip oil and other ingredients to the skin at least twice daily during pregnancy reduces the severity of stretch marks. It also might reduce the chance of getting stretch marks in women who didn't have stretch marks before becoming pregnant.

Boosting the immune system.

Withania somnifera (ashwagandha)



- **Stress.** Taking a specific ashwagandha root extract 300 mg twice daily after food for 60 days appears to improve symptoms of stress.
- **Anxiety.** Some clinical research shows that taking ashwagandha can reduce some symptoms of anxiety or anxious mood.
- **Fatigue in people treated for cancer (chemotherapy).** Early research suggests taking a specific ashwagandha extract 2,000 mg during chemotherapy treatment might reduce feelings of tiredness.

Uvae Ursi (bearberry)



Urinary tract infections (UTIs). Developing research suggests that taking a combination product containing both uva ursi and dandelion by mouth seems to reduce the recurrence rate of UTIs in women

Actaea racemosa (black cohosh)



Menopausal symptoms. Research shows that taking some black cohosh products can reduce some symptoms of menopause. However, the benefits are only modest. Black cohosh might lessen the frequency of hot flashes.

Kelp



Kelp is a brown seaweed that grows as big as a tree in the ocean. Kelp doesn't have roots like most plants do, but anchors itself to the ocean floor through a system called a "holdfast." This "sea tree" algae is loaded with nutrition.

- Kelp has been linked to many health benefits, including cancer prevention, thyroid regulation and weight management.
- If you have a family history of diabetes, you should know that kelp is rich in a little-known mineral called vanadium, which is being studied as an important regulator of insulin and blood sugar.
- The iodine content can vary in kelp, depending on where it was grown, the water, and other environmental factors. Your thyroid needs iodine to do its job (regulating hormones).