

5.8. DIURETICS

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5.8.1. Introduction

Drugs promoting urine output are known as **diuretic drugs** which refer only to those agents that act directly on the kidneys. These drugs primarily increase the excretion of water and ions like sodium (Na^+), chloride (Cl^-), or bicarbonates (HCO_3^-) from the body. **Glomerular filtration, tubular reabsorption, and tubular secretion** in kidneys determine the excretion of substances.

Tubular reabsorption is a process which involves active transport of electrolytes and other solutes from tubular urine to tubular cells, and then to extracellular fluid. As a result, the glomerular filtration is increased. The mechanism of action of diuretic drugs also involves a decrease in tubular reabsorption. However, these drugs have no effect on glomerular filtration rate or on the action of Anti-Diuretic Hormone (ADH) on the distal portion of nephron. Diuretics effectively treat cardiac oedema (accumulation of fluid in extravascular tissues), especially the one associated with congestive heart failure. They are also employed in the treatment of various disorders like nephrotic syndrome, diabetes insipidus, hypertension, nutritional oedema, oedema of pregnancy, and cirrhosis of liver. They also decrease the intracellular and cerebrospinal fluid pressure.

5.8.2. Gokhru

Its name has been obtained from the sharp thorns that grow from the seeds. The Latin word *tribulus* is converted as **caltrop** which means a **peaked weapon**.

Synonyms

Gokshur, puncture vine, and land caltrops.

Biological Source

Gokhru is the dried ripe fruits of *Tribulus terrestris* Linn.

Family

Zygophyllaceae

5.8.2.1. Occurrence and Distribution

Gokhru grows in the moderate and tropical climates of Europe, America, Africa, Australia, and the southern Asia.

5.8.2.2. Organoleptic Evaluation

The organoleptic features of the annual plant of gokhru are (figure 5.13):

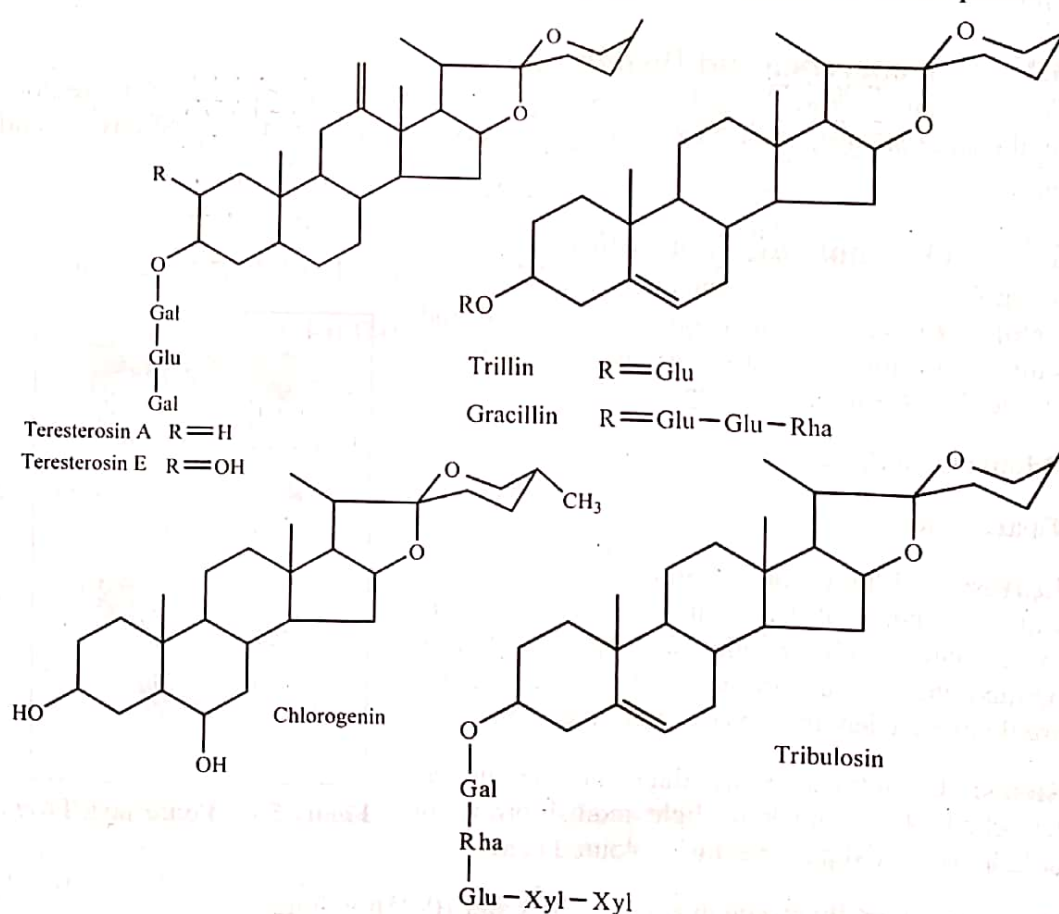
- 1) **Stems:** Diffused or prostrates.
- 2) **Branches:** Flexuous and covered with silky thread-like hairs.
- 3) **Leaves:** Paripinnate and has 6-7 pairs of narrow-elliptic leaflets having a round base and apex.
- 4) **Flowers:** Yellow coloured and are borne solitary and axillary.
- 5) **Fruits:** Yellowish in colour and is in the shape of a weapon-wheel having five parts; each part has two long sharp rigid spines and several shorter spines; the surface is covered with numerous hair.



Figure 5.13: *Tribulus terrestris* Plant

5.8.2.3. Chemical Constituents

The major constituents of the dried fruits of *T. terrestris* are **steroidal saponins**, including **terestrosins** (A, B, C, D, and E), **desgalactotigonin**, **F-gitonin**, **desglucolantigonin**, and **gitonin**. The hydrolysed drug extract contains **sapogenins** such as diosgenin, chlorogenin, hecogenin, and neotigonin. Terestroside F, tribulosin, trillin, gracillin, and dioscin are some other steroidal saponins which have been isolated from the aerial parts of the plants. The flavonoid derivatives present in the fruits are tribuloside and some glycosides of quercetin, keampferol, and isorhamnetin. Some phytosterols such as β -sitosterol, stigmasterol, and cinnamic amide derivative, terestiamide are also present.



5.8.2.4. Therapeutic Efficacy

Gokhru has the following therapeutic properties:

- 1) It is used in the treatment of diarrhoea and dysentery.
- 2) It promotes lactation.
- 3) It is used in the treatment of psoriasis and eczema.
- 4) It has the property of diuretic because of high amount of nitrates and essential oils found in seeds.
- 5) Its dried spiny fruits are used in spermatorrhea, phosphareuria, dysuria, gonorrhoea, gleet, chronic cystitis, calculous affections, incontinence of urine, and impotency.
- 6) It can also relieve the inflammation of urinary passage.

5.8.3. Punarnava

Punarnava is used medicinally since ancient times. It is mainly employed by the practitioners of Ayurveda medicine. It offers a wide range of health benefits. It is beneficial for liver and prevents it from infections.

Synonyms

Hogweed, Vishkhapara, Santha, Gahadpurna, Komme, Saaranathi, and Khatan.

Biological Source

Punarnava is the dried herb of the whole plant *Boerhaavia diffusa*.

Family

Nyctaginaceae

5.8.3.1. Occurrence and Distribution

Punarnava is mainly grown in India and Sri Lanka. It is widely distributed in the regions of Himalayan at an altitude of 2000-2500m. It is also cultivated in China, Malaysia, and Africa.

5.8.3.2. Organoleptic Evaluation

The organoleptic characters of punarnava are:

- 1) **Colour:** Leaves are green on upper surface and whitish on lower surface; stems are greenish-purple; flowers are pink on upper side.
- 2) **Odour:** Odourless.
- 3) **Taste:** Bitter.
- 4) **Leaves:** 25-30mm long, glabrous, thick in texture and, petiolate; small leaves are 12-20mm in length, ovate, oblong sub-orbicular, and apex is slightly pointed with rounded or sub-cordate base; petioles are double the length of blade; margin is entire.
- 5) **Stems:** Cylindrical, stiff, thick at the nodes, branched, about 1ml long, light reddish-brown in colour above and pale greenish coloured below.
- 6) **Flowers:** Internally sessile in small umbels and 10-25mm long.



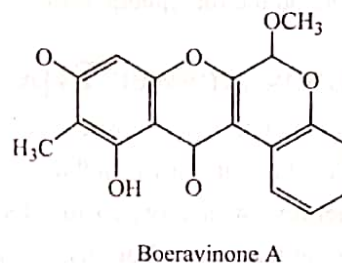
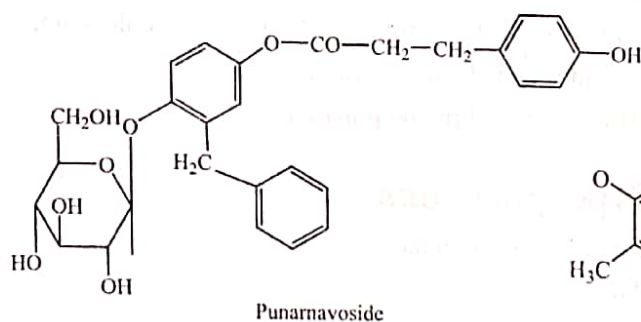
Figure 5.14: Punarnava Twig

- 7) **Fruits:** One sided, glandular, and 0.5cm in size.
- 8) **Roots:** Elongated, fusiform, tapering, and tuberous; grow vertically downwards and penetrate deep into the soil; cream or light brownish-yellow, with very soft skin; old roots have knotty scars of fallen rootlets.

5.8.3.3. Chemical Constituents

Punarnava consists of an alkaloid, **punarnavine** (0.04-0.1%) and an antifibrinolytic agent, **punernavoside**. It consists of potassium nitrate (6%), an oily substance, and ursolic acid.

It has a mixture of alkaloids (together called as punarnavine), a xanthine derivative, ursolic acid, β -sitosterol, and fatty acids (like stearic acid and arachidic acid). Inorganic salts (potassium nitrate, sulphates and chlorides) are also present in large amounts.



5.8.3.4. Therapeutic Efficacy

Punarnava shows the following therapeutic activities:

- 1) **Immunomodulatory Effects:** Its alkaloidal part on oral administration delays hypersensitivity reactions.
- 2) **Antidiabetic Activity:** The aqueous solution of its leaf extract on oral administration decreases the blood glucose level and increases the levels of insulin in plasma.
- 3) **Antioxidant Activity:** Its leaves exhibit a stronger antioxidant activity than roots.
- 4) **Analgesic and Anti-Inflammatory Activity:** The juice of its leaves possesses analgesic property.
- 5) **Anti-Viral Activity:** It shows antiviral activity against phytopathogenic viruses.
- 6) **Hepatoprotective Activity:** Its alcoholic extract on oral administration produces hepatoprotective activity.
- 7) **Antibacterial Activity:** The methanolic extract of its leaves show potential antimicrobial activity.
- 8) **Anti-Fibrinolytic Activity:** The extract of its roots reduces stromal oedema, inflammation, tortuosity of glands, and increases fibrin and platelets deposition in the vessel lumen.
- 9) **Chemopreventive Action:** It prevents tumorigenesis by inhibiting the formation of active carcinogens from their precursors. It also acts by facilitating the process of detoxification.

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