

CARDIOTONICS

Cardiotonics are the drugs which give strength or energy to the activity of the heart. They increase the force of contraction of cardiac muscles and stimulate activity of the heart. They may be cardiac glycosides, sympathomimetics or other drugs. They are used after myocardial infarction, cardiac surgical procedures, in shock or in congestive heart failure.

Digitalis

Synonyms

Digitalis, purple foxglove, finger flower.

Biological Sources

Digitalis consists of dried leaves of *Digitalis purpurea* Linn., belonging to family *Scrophulariaceae*.

Geographical Sources

It is mainly found in England, Germany, France, North America, India, Iraq, Japan, Kurdistan, Mexico, Nepal, Spain, Turkey.

Cultivation and Collection

Digitalis is a biennial herb growing wild but good quality of the drug is obtained especially from cultivated plant. The plant will flourish best in well drained loose soil, preferably of siliceous origin, with some slight shade. It grows best when allowed to seed itself, if it is desired to raise it by sown seed, 2 lb of seed to the acre are required. For cultivation special strains of the seeds are selected which would produce disease-resistant plants with maximum activity. Collection of these leaves is carried out from September to November by hand and thus other organic matter and discoloured leaves are avoided. After collection the leaves should be dried as soon as possible at 60°C. By quick drying characteristic green colour of

the leaves is maintained. Drying is carried out till moisture is not more than 5%. Leaves are packed under pressure in airtight containers.

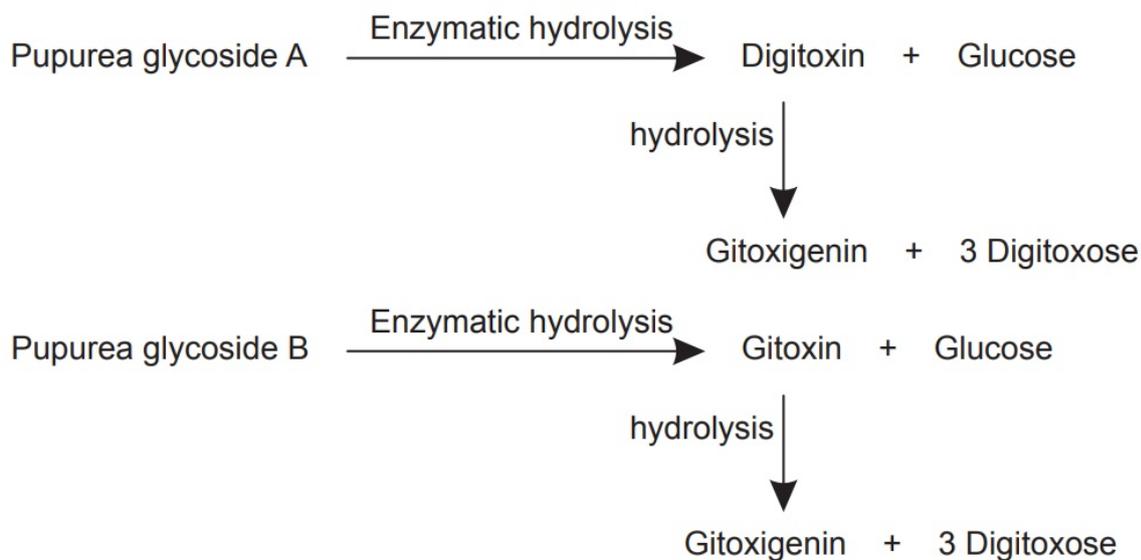
Morphology.

Colour	Dark greyish green in colour
Odour	Odourless
Taste	Bitter
Shape	Ovatelanceolate to broadly ovate. Leaves have a subacute apex, decurrent base and crenate or dentate margin. The upper surface of leaf is hairy, slightly pubescent, dark green and little wrinkled. The lower surface of leaf is hairy, greyish-green and very pubescent.
Size	10–30 cm long and 4–10 cm wide

Chemical Constituents

Digitalis leaves contains 0.2–0.45% of both primary and secondary glycosides. Purpurea glycosides A and B and glucogitoxin are primary glycosides. Because of greater stability of secondary glycosides, and lesser absorption of primary glycosides a higher content of primary glycosides are not considered ideal and secondary glycosides are used. Purpurea glycosides A and B are present in fresh leaves and by their hydrolysis digitoxin and glucose or gitoxin and glucose are obtained respectively. Hydrolysis of purpurea glycosides can take place by digipuridase (enzyme) present in the leaves. Digitoxin yields on hydrolysis digitoxigenin and three digitoxose. By hydrolysis of verodoxin, gitaloxi-genin and digitalose are obtained. Digitalis leaves also contains glycosides like odoroside-H, gitaloxin, verodoxin and glucoverodoxin.

Verodoxin was found to potentiate the activity of digi-toxin by synergism. Digitoxose and digitalose are desoxy sugars found only in cardiac glycosides and answers Keller– Killiani test. The important saponins include digitonin, tigonin and gitonin, and luteolin, a flavone responsible for the colour of the drug are also present in the leaves.



Chemical Tests

Digitalis glycosides having five membered lactone ring answers positive for the following tests which are due to the intact lactone.

1. **Baljet Test:** To a thick section of the leaf sodium picrate reagent is added. Yellow to orange colour indicates the presence of glycoside.
2. **Legal Test:** Glycoside is dissolved in pyridine and sodium nitroprusside solution is added to it and made alkaline. Pink to red colour is produced.

3. **Keller–Killiani Test:** The isolated glycoside is dissolved in glacial acetic acid and a drop of ferric chloride solution is added followed by the addition of sulphuric acid which forms the lower layer. A reddish-brown colour is seen in between two liquids and the upper layer becomes bluish green.

If the powdered leaves are used, 1 gm of the powdered leaves is extracted with 10 ml of 70% alcohol for couple of minutes, filtered and to 5 ml of filtrate 10 ml of water and 0.5 ml of strong solution of lead acetate is added and filtered and the filtrate is shaken with 5 ml of chloroform. Chloroform layer is separated in a porcelain dish and the test is carried out as mentioned above.

Uses

The foxglove is a widely used herbal medicine with a recognized stimulatory effect upon the heart. It is also used in allopathic medicine in the treatment of heart complaints. It has a profound tonic effect upon a diseased heart, enabling the heart to beat more slowly, powerfully and regularly without requiring more oxygen. At the same time it stimulates the flow of urine which lowers the volume of the blood and lessens the load on the heart. It has also been employed in the treatment of internal haemorrhage, in inflammatory diseases, in delirium tremens, in epilepsy, in acute mania and various other diseases. Digitalis has a cumulative effect in the body, so the dose has to be decided very carefully.

Arjuna

Synonyms

Arjun bark, arjun.

Biological Source

Arjuna consists of dried stem bark of the plant known as ***Terminalia arjuna*** Rob, belonging to family **Combretaceae**.

Geographical Source

The tree is common in Indian peninsula. It is grown by the side of streams and very common in Chotta Nagpur region.

Cultivation and Collection

Arjuna is found as naturally growing plant in the dense forests. It is very common in Baitul in Madhya Pradesh and also in Dehradun. Arjuna can be successfully raised by sowing seeds or by means of stumps. The seeds take about 21 days for germination. It needs moist fertile alluvial loam and rainfall in the range of 75 to 190 cm. It grows satisfactorily up to 45°C.

Morphology

Colour	Colour of the outer side, as well as, inner side of bark is greyish-brown.
Odour	None
Taste	Astringent
Shape	Flats
Size	The pieces of various-sizes, about 15 × 10 × 1 cm
Extra features	The presence of the cork is not reported in the commercial drug. As arjuna is collected from the old trees, the cork gets removed due to exfoliation. The appearance of the transversely cut surface is dark brown with characteristic greyish shining patches.

Chemical Constituents

The dry bark from the stem contains about 20 to 24% of tannin, whereas that of the bark obtained from the lower branches is up to 15 to 18%. The tannins present in arjuna bark are of mixed type consisting of both hydrolysable and condensed tannins. The tannins are reported to be present are (+) catechol, (+) gallo catechol, epicatechol, epigallocatechol, and ellagic acid. The flavonoids such as arjunolone, arjunone, and baicalein have been reported from the stem bark.

Chemical Test

Ethereal extract of arjuna shows pinkish fluorescence under ultra-violet light.

Uses

Arjuna bark is used as a diuretic and astringent. The diuretic properties can be attributed to the triterpenoids present in fruits. It causes decrease in blood pressure and heart rate. It is used in the treatment of various heart diseases in indigenous systems of medicines. The bark was extensively used in the past by the local tanneries for tanning animal hides. It yields a very firm leather of a colour which is similar to babool tanned leather.