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Review Article

PHYTOCHEMICAL CONSTITUENTS AND MEDICINAL PROPERTIES OF DIGITALIS LANATA AND DIGITALIS PURPUREA

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Herbal Medicine sometimes referred to as Herbalism or Botanical Medicine, is the use of herbs for their therapeutic or medicinal value. An herb is a plant or plant part valued for its medicinal, aromatic or savory qualities. Herb plants produce and contain a variety of chemical substances that act upon the body. The term digitalis or digitalis compounds are all used to refer to the entire group of inotropic (or drugs that increase myocardial contractility). All glycosides have a shared structure of: an aglycone ring structure. The aglycone ring is where the pharmacological activity is found. The main use of Digitalis Purpurea today is as a effective way of treating congestive heart failure. As a group they are classified as cardiac inotropes. Cardiac, of course, refers to the heart. An inotrope is a substance that has a direct effect on muscle contraction. Positive inotropism is an increase in the speed and strength of muscle contraction, while negative inotropism is the opposite. Digitalis has a positive inotropic effect on the heart muscle. During the early 20th century, the drug was introduced as treatment of atrial fibrillation, only subsequently was the value of digitalis for the treatment of congestive heart failure (CHF) established.

Key words:-Digitalis, Congestive Heart Failure, Therapy.

INTRODUCTION

Herbal medicine is the oldest form of healthcare known to mankind. Herbs had been used by all cultures throughout history. It was an integral part of the development of modern civilization. Primitive man observed and appreciated the great diversity of plants available to him. The plants provided food, clothing, shelter, and medicine. Much of the medicinal use of plants seems to have been developed through observations of wild animals, and by trial and error. As time went on, each tribe added the Medicinal power of herbs in their area to its knowledge base ⁽¹⁾. They methodically collected information on herbs and developed well-defined herbal pharmacopoeias. Indeed, well into the 20th century much of the pharmacopoeia of scientific medicine was derived from the herbal lore of native peoples. Many drugs commonly used today are of

herbal origin. The physician/scientist credited with bringing digitalis into mainstream medicine is William Withering. Digitalis is an example of a cardio-active or cardiotonic drug, in other words a steroid which has the ability to exert a specific and powerful action on the cardiac muscle in animals and has been used in the treatment of heart conditions ever since its discovery in 1775. The Biological source of digitalis is Digitalis purpurea Linn. And the family is Scrophulariaceae. The synonym of digitalis is Foxglove, Purple Foxglove, and in India it is called as Tilpuship. The history of Digitalis or Foxglove derives its name from the shape of the flowers that resemble the finger of a glove. It was originally called Folksglove the glove of the 'good folk' or fairies, whose favourite haunts, were supposedly in the deep hollows and valleys where this plant thrives. It is mentioned in a list of



plants in the time of Edward III. It is European legend that bad fairies gave these blossoms to foxes to wear on their toes to soften their steps as they prowled. It is native to most of Europe (2).

BOTANICAL DESCRIPTION:

Digitalis purpurea is an herbaceous biennial or short-lived perennial plant. The leaves are spirally arranged, simple, 10–35 cm (3.9–13.8 in) long and 5–12 cm (2–5 in) broad, and are covered with gray-white pubescent and glandular hairs, imparting a woolly texture. The foliage forms a tight rosette at ground level in the first year.

The flowering stem develops in the second year, typically 1–2 m (3.3–6.6 ft) tall, sometimes longer. The flowers are arranged in a showy, terminal, elongated cluster, and each flower is tubular and pendent. The flowers are typically purple, but some plants, especially those under cultivation, may be pink, rose, yellow, or white. The inside surface of the flower tube is heavily spotted. The flowering period is early summer, sometimes with additional flower stems developing later in the season. The plant is frequented by bees, which climb right inside the flower tube to gain the nectar within.

The fruit is a capsule which splits open at maturity to release the numerous tiny 0.1-0.2 mm seeds.

***Digitalis purpurea* Linn.**

Synonym:-Foxglove, Purple Foxglove, Tilpuship

Biological Source:-*Digitalis purpurea* Linn.

Family:-Scrophulariaceae

Plant Description:

Common foxglove

Plant variety: perennial

Habitat: edge of woods with dry or fresh soil that contains nutrients.

Height: 30 - 150 cm

Properties: Taste is bitter

Odour: slight

Special features

Flower colour: white, pink, lilac, light yellow

Flowering season: June - July

Flowers: Thimble-like bells that hang downwards on a high stem.

Leaf colour: rosette of rough, oval, dark green leaves

Leaves: green

Cultivation and Collection:

It is a biennial or perennial herb of about 1 to 2 meters. In India, it is cultivated in Kashmir and also in Mungappo and Nigeria hills. It is propagated by seeds of the selected strain, containing high glycosidal content. It needs calcareous, acidic sandy, light soil with traces of manganese. Soil is sterilized by steam before sowing. It grows suitably in shady situation, luxuriantly at an altitude of 1600 to 3000m. Favorable temperature range 20s-30° C and rainfall 30-40 cm per annum. The seeds of *digitalis* are very small in size i.e. 100 seeds weight 40 to 70mg. They are mixed with fine sand and sown in the nursery beds in March/April. About 2.5 kg seeds are needed per hectare. The young seedlings are transplanted in September/November. The crop is manure properly and kept free of weeds. The plantation is done twice in year. In the first year, the plant bears rosette leaves and in the second year sessile



Fig. 1: Common or purple foxglove is a European biennial plant which was the source of chemicals in the drug digitalis.

leaves. The plant flowers in the month of April and is followed by the fruiting. If the plants are to be allowed to grow, the flowering tops are removed. Crop is protected from plant diseases, which otherwise lead to loss of potency of drug⁽³⁾.

Subspecies :

The three subspecies of *Digitalis purpurea* are:

- *D. p.* subsp. *purpurea* – most of Europe
- *D. p.* subsp. *heywoodii* – Iberia
- *D. p.* subsp. *mariana* – Iberia

Pharmacological Activity :

1. Congestive Heart Failure (CHF) :

Heart failure does not mean that the heart suddenly stops, but rather that the heart is failing to pump blood well enough to meet the needs of your body. Congestive heart failure occurs when the heart's left lower chamber (ventricle) fails to pump

properly. This causes a buildup of fluid (congestion) in the lungs. Congestive heart failure is the most common cause of heart-related illness and death in the US. Congestive heart failure (CHF) is a condition in which the cardiac output is inadequate to body demands and there is poor cardiac contractility and relaxation, resulting in symptoms of low cardiac output and congestion. It is a common heart disease that carries significant morbidity and mortality. CHF increases risk of death by 3 times and 60% of the patients die within 5 years of the diagnosis. Therefore it requires careful management by drugs and non drug modalities.⁽⁴⁻⁶⁾

2. Cytotoxic effects :

Extracts of *Digitalis lanata* and *Digitalis purpurea* were examined for anticancer activity in 10 human tumor cell lines. They produced cytotoxic effects, but the activity profiles were uncorrelated with those of the standard drugs, possibly indicating new pathways of drug-mediated cell death^(7, 8).

3. Antidiabetic effect :

Digitonin, a saponin from the seeds of *Digitalis purpurea*, improved the glucose tolerance and possessed beneficial effects on serum lipids by improve antioxidant activity in rats⁽⁹⁾.

4. Antioxidant effect :

The scavenging activity of alcoholic extract of *Digitalis purpurea* was measured using DPPH and the total antioxidant capacity of *Digitalis purpurea* was measured by phosphomolybdate using ascorbic acid as the standard. *Digitalis purpurea* 1mg/ml showed 94.25% DPPH scavenging activity and 92.28% total anti-oxidant activity⁽¹⁰⁾.



Fig . 2: (a) (b) (c) The plant forms a rosette of leaves (L and C) which have prominent veins (R).

5. Insecticidal effect :

Studying of insecticidal activity of alcoholic extract of *Digitalis purpurea* against *T. castaneum* revealed that the percentage mortality of *T. castaneum* was 60%, at 100 mg/2 ml of alcoholic extract of *Digitalis purpurea* ⁽¹⁰⁾.

HEALTH BENEFITS OF DIGITALIS:

Digitalis is of value in irritable heart with palpitation from overwork, heart strain, and the arrhythmia of simple dilatation, in moderate degrees of ventricular dilatation, and cardiac asthenia. It is especially commended for the irritable heart of soldiers brought on by long marches and fighting whereby the inhibitory-control is lost or lessened and exhaustion of the heart-muscle is imminent. When palpitation is purely nervous, it is of little value; cactus is then a better remedy. It also fails often in paroxysmal tachycardia, which is also mostly a nervous phenomenon. In Grave's disease, it is not curative,

but sometimes rectifies the cardiac irregularity. In functional palpitation arising from imperfect digestion it sometimes controls the heart symptoms, but gives little or no relief if the trouble is purely nervous, nor does it aid the stomachic disorder. Digitalis is a classic example of a drug derived from a plant formerly used by folklorists and herbalists: herbalists have largely abandoned its use because of its narrow therapeutic index and the difficulty of determining the amount of active drug in herbal preparations. Once the usefulness of digitalis in regulating pulse was understood, it was employed for a variety of purposes, including the treatment of epilepsy and other seizure disorders, now considered inappropriate. Below are some of the medicinal properties of digitalis: Digitalis is mainly used in treating heart diseases. In case of congested heart failure, it promotes and stimulates the activity of all muscle tissues. The herb forces more blood into the



coronaries thereby improving the nourishment to the heart. When blood circulation gets impaired and dropsy sets in, digitalis help in restoration and regulation of the function of the heart. It helps urination by improving the blood supply to the kidneys and removes obstructions within the kidneys. Digitalis is used with gratifying results in some ointment for local application on wounds and burns. In cases of burns, it is very effective in preserving severely damaged cells.

Adverse effects and toxicity :

Digitalis is a toxic plant. At low serum drug concentrations, digitalis was well tolerated. However, it characterized by a very narrow therapeutic index, and digitalis toxicity was one of the most common adverse drug reactions leading to hospitalization. Anorexia, nausea, and vomiting may be initial indicators of toxicity, they occurred due to a direct action of digitalis on the CTZ. Patients may also experience blurred vision, yellowish vision (xanthopsia), and various cardiac arrhythmias. Diarrhea may be noted, as may abdominal discomfort, or pain, headache, malaise and drowsiness were common symptoms, neuralgic pain may be the earliest most symptoms (4, 5, 6).

CONCLUSION

Digitalis purpurea (scrophulariaceae) also called foxglove . Digitalis have played significant role in medical science for more than 200 years. medicinal use of digitalis were known to Englan in 10th century.

But William Withering carried out detailed and elaborate studies on Digitalis, due to which this drug acquired its importance from 1781 onward. Digitalis is cardiac glycosides which contain both primary and secondary cardiac glycoside, which are used in the treatment of cardiac heart failure. Digitalis block the sodium-potassium ATP-ase pump of cardiac muscle so that the intracellure concentration of sodium is increased in calcium ions, released from sarcolemma and there by, brushing action of protein Viz. Action and myosin is enhanced. This is exhibited as more force full contractions of myocardium, grater output per beat and complete emptying of heart. Due to this, the delayed circulation in congestive heart failure is imprived and the Edema is flushed out. Digitalis shorting the length of systole, thereby giving more time to rest between contraction. Also it is used as Antimicrobial agent and in the treatment of Cancer, tuberculosis. But the main disadvantage is the used very carefully because it is toxic in nature. There are various cardiac glycosides Digitalis lanata, Thevetia nerifolia (Thevetia), Urginea maritima (Indian squil), Stropanthus kombe (Stropanthus) . But Digitalis purpurea is more powerful cardiac glycoside and used widely.

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