A REVIEW OF CARDIOTONICS OBTAINED FROM NATURAL ORIGIN USING ANALYTICAL METHOD

Rashnita Sharma*, S.Jyotisna , Jyoti

Rungta Institute of Pharmaceutical Education and Research, Kohka,490023, Chhattisgarh, India

***Corresponding Author:** Rashnita Sharma, Rungta Institute of Pharmaceutical Education and Research, Kohka,490023, Chhattisgarh,India.

E-mail: rashnitasharmas@gmail.com

Tel:9340942740

INTRODUCTION:

It is referred to as positive inotropic action when medications make the myocardium of the heart contract more forcefully. Digitalis contains digoxin, which speeds up heart muscle contraction and reduces edoema. It reduces ventricular rate and atrioventricular nodal conduction in arrhythmias. Due to the potent impact it has on the heart, this lovely plant is regarded as poisonous. Bark from the terminalia arjuna It has been applied to the management of angina symptoms. The plant's arjunolic acid has long been thought to offer effective heart protection. [1]

One of the oldest medications still in use in cardiovascular therapy today, both in the United States and internationally, is digitalis. It is often employed in the treatment of heart failure symptoms and in the reduction of atrial fibrillation (AF)-related ventricular rate . In patients with sinus rhythm and a left ventricular ejection fraction (LVEF) of less than 45%[2] , digoxin, one of the first medicines for heart failure management, was proven to reduce hospitalisations without reducing death. Digoxin works by preventing sodium-potassium-adenosine triphosphatase (ATPase). By taking a direct, independent action, digitalis increases the force of heart contraction. It inhibits this enzyme by binding specifically to the extracellular face of cardiac fibre NA+K+ATPASE, which is linked with the membrane. NA + gradually builds up inside cells when this cation pump is inhibited. Ca+ buildup inside cells as a result of this [3]. Based on its inotropic qualities, which are caused by the inhibition of sodium-potassium ATPase, it has a function in patients with heart failure by increasing intracellular calcium concentrations via the sodium-calcium exchanger[4]. As a result of the increased calcium for sarcomeric excitation-contraction coupling, the cardiac action potential lengthens, resulting in reduced heart rates as well as enhanced myocardial contractility[5] Digoxin also affects neurohormones, improving baroreceptor sensitivity, lowering norepinephrine levels, and reducing renin-angiotensin system activation.[6]

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Digoxin has a parasympathetic effect on the electrophysiological level of the sinoatrial node by lowering automaticity, as well as on the atrioventricular conduction system by lowering conduction and raising effective refractory periods[7].Tincture of Digitalis and Digitalis Infusion are two forms of the preparation for the commercial form of the drug.

Phytochemical Constituent Acteoside, purpureasideA, calceolariosideB, and plantain side D are among the four distinct glycosides. Aglyconedigitoxigenin, a primary glycoside of purpurea glycoside A, and digitoxin, a secondary glycoside, are cardenolides that range in concentration from 0.5 to 1.5%. heart-active steroid glycosides in digitalis lanata (1–1.5%) Aglyconegitoxigenin: main glycoside of purpurea, gitoxin (secondary glycoside) Glucoverodoxin, glucogitaloxin, and gitaloxin are examples of aglyconegitaloxigenin. Preg-nane glycosides include digipurpurin, diginin, and digitalonin. [8]

Figure1.Digitalis purpurea (common foxglove)

A putative cardioprotective agent is arjuna. It is an ayurvedic medication that has been referenced in numerous ancient Indian medical literature, including as Charaka Samhita, Sushruta Samhita, and AstangHridayam, since the Vedic time. Vagabhatta was the one who originally recommended using powdered stem bark for heart conditions. [9] It has a presence in classical Indian medical texts like the Charaka Samhita and the AstangHridayam. The first person to recommend using this bark powder to treat heart conditions was the ancient Indian physician Vagbhatta. It serves as a crucial component in several ayurvedic treatments intended to enhance cardiovascular health. It has antidyslipidemic[10], hypocholesterolemic[11] and antioxidant activity properties.[12] Saponins, glycoside, and alkaloids abound in arjuna's bark. These substances are well-known for their cardiovascular action. Free radicals can be neutralised by arjunic acid, arjungenin, and its glycosides (Arjunetin and Arjunglucoside II) without appreciably affecting the generation of superoxide from polymorphonuclear immune cells. The extensive pharmacological research on indigenous tree has resulted in its widespread commercial use as a cardioprotective medication. [13]

Constituent of a plant

15% of arjuna is made up of tannins. Arjunolic acid, arjungenin, B-sitosterol, ellagic acid, and arjunic acid are also present. Arjunine and arjunetine are the reported crystallisable chemical. Arjuna's components include salts of calcium, aluminium, and magnesium as well as colouring agents and sugar. vitamin C, 1.47 mg per 100 g (hydro alcoholic extract) 0.58 mg of vitamin E per 100 g (hydro alcoholic extract). [14]

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Figure2.Stem bark of the plant Terminalia arjuna.

Table1.Chemical properties of drug: digoxin and arjuna

SR.NO	DRUGS	SYNONYMS	B.S/FAMILY	CHEMICAL CONSTITUENTS	USES	CHEMICAL TEST
1	DIGITALIS	Foxgloves leaves, Digitalis leaves	Dried leaves od digitalis purpurea Family- scrophulariaceae	Purpurea glycoside A and B ,digitonin, saponin glycosides, gitonin	Cardiotonic, used in CCF(Congestive cardiac failure)	Killer Killani Test:1 gm. finely powder digitalis boil with 10ml 70%alcohol for3minutes, filter, to the filtrate add 5ml water+ 0.5 ml strong solution of lead acetate, filter, the filtrate treat with equals volume of chloroform evaporate. The extract is dissolve in glacial acetic acid, cool add 2drops of ferric chloride solution _transfer to test tube containing 2ml conc. H_2SO_4 –Reddish brown layer turn bluish green after standing. Due to Presence of Digitoxose.
2	ARJUNA	Arjuna bark	Dried stem bark of termunalia arjuna Family- combretaceae	15% tannins arjunolic acid, allagic acid	Cardiotonic diuretic	The ethereal extract of Arjuna show pinkish fluorescence under ultra violet light. While Terminalia tomentosa give pale blue

Table2.Review of analytical methods used for determination of digitoxin and arjuna

METHODS	MOBILE PHASE (V/V)	REF.
DIGITALIS		
HPLC	water–acetonitrile (72:28, v/v)	15
HPLC-UV	acetonitrile–water (28:72, v/v)	16
HPLC	Water:acetronitrile	17
RP-HPLC	water: acetonitrile (65:35 v/v)	18
HPLC	Ethanol:chloroform Acetonitrile:methanol:water(4:4:5) for tridigitoxosides Acetronitrile:methanol:water(8:30:43)for srospeside	19
RP-TLC	Acetonitrile:methanol;0.5M NaCl (1:1:1) for primary glyosides	20
ARJUNA		
LC-MS/MS	0.1% formic in water & acetonitrile	21
HPLC-MS/MS	0.1% formic acid aqueous solution and acetonitrile at a flow rate of 0.5 mL/min in 55 min	22
HPTLC	chloroform:methanol (90:10)v/v	23
HPTLC	Toluene:Methanol (4: 3)v/v	24

RP-LC	Waters speherisorb S10ODS2 (250*4.6 mm , I.D.,10 mum)	25
HPTLC	Chloroform:methanol (9:1)v/v	26

SUMMARY

Drugs classified as cardiotonics support or energise the heart's function. The cardio tonic boosts the heart's overall activity and intensifies cardiac muscle contraction. Natural medications that have cardiotonic effects include digitalis and arjuna bark. The information on the analytical techniques used to identify the cardiotonic natural drugs Arjuna bark and Digitalis is summarised in the review that is being presented. The glycosides of D. purpurea are also thought to have cytotoxic, wound-healing, hepatoprotective, and antioxidant properties in addition to their reputation as heart stimulants. Along with cardenolides and purpura glycosides A and B, digitalis also contains 0.2 to 0.45% of each. Arjuna's constituents include sugar, colouring agents, calcium, magnesium salts, arjunolic acid, 15% tannin, saponin, and arjunolic acid.

CONCLUSION:

The authors working in analytical chemistry will find the present review to be extremely beneficial for developing methods and validating medications for cardiotonics obtained from natural origin using analytical method.

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