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**Research Article**


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## COMPARATIVE CARDIOTONIC ACTIVITY OF GYMNEMA SYLVESTRE WITH DIGOXIN ON ISOLATED FROG HEART

**Shravan Kumar Dholi\*, Prasanna laxmi.K, Ashok.V, Vidhyasree.B, Naresh.**

Department of Pharmacology, Vaageswari Institute of Pharmaceutical Sciences, Beside LMD Police Station, Ramakrishna Colony, Karimnagar, Andhra Pradesh, India.

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### ABSTRACT

*Gymnema Sylvestre (GS) is commonly used herb in Ayurveda. Chewing the leaves actually deadens the sense of sweet tastes and also the bitterness of bitter substances. This property is believed to be due to a glycoside known as gymnemic acid. Gymnemic acid (a mixture of triterpene glucuronides, which was found in the leaves. Present study was carried out to determine the cardiotonic activity by using infusion of G.S with different dilutions & compared with cardiotonic activity of digoxin-the life saving cardiotonic. The activity was tested by using isolated frog heart assembly. The present preliminary studies confirm the better cardiotonic activity of Gymnema Sylvestre than digoxin. Further studies can confirm the reduced toxicity & this will be the advantage of G.S over digitalis. Thus, in future it will be interesting to isolate the active chemical constituents which are responsible for the cardiotonic activity.*

**Keywords:** Cardiotonic activity, Digoxin, Gymnema Sylvestre, Isolated frog heart.

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### INTRODUCTION

Herbal products have gained increasing popularity in the last decade, and are now used by approximately 20% of the population. Herbal products are complex mixtures of organic chemicals that may come from any raw or processed part of a plant, including leaves, stems, flowers, roots, and seeds. Although herbs are often perceived as “natural” and therefore safe.<sup>(1,2)</sup> Despite continuing advances in understanding

the basic pharmacology of cardiac glycosides, digitalis intoxication remains a common clinical problem. It necessitates research for new nature based drugs which increase cardiac muscle contractility with a broad therapeutic index. The essential organ of the human body i.e. Heart when fails to work leads to sudden death. Since the potent cardiotonic drug i.e. the digoxin which is of the plant origin has a long list of ADR and toxicity, it is a need of hour to develop and standardize cardiotonic drugs of herbal origin. *Gymnema Sylvestre* (GS) is commonly used herb in Ayurveda. Chewing the leaves actually deadens the sense of sweet tastes and also the bitterness of bitter substances<sup>(3)</sup>. This property is believed to be due to a glycoside known as gymnemic acid. Gymnemic acid<sup>(4)</sup> a mixture of triterpene

For Correspondence:

**Shravan Kumar Dholi**

Department of Pharmacology,

Vaageswari Institute of Pharmaceutical Sciences

Karimnagar, Andhra Pradesh, India.

Email: [shravan21m@gmail.com](mailto:shravan21m@gmail.com)

Mobile: + (91) 8008961562

glucuronides, which was found in the leaves. The G.S was claimed to have general cardiotoxic activity and we decided to determine the same with the help of isolated frog heart assembly.

## MATERIALS AND METHODS <sup>(5)</sup>

**Drug:** Infusion of *Gymnema Sylvestre*

**Chemicals:** Digoxin, Ringer Solution

### Animal:

Frog of *Rana*

*tigrina* species were used for the study and those were maintained as per CPCSEA guidelines.

### Instruments:

Sherington Rotating Drum, Sterling's heart lever

### Preparation of infusion

Standardised alcoholic extract of *Gymnema Sylvestre* containing 25% gymnemic acid (Neocare

Naturals Pvt. Ltd, Hyderabad, India). 1gm of powder was mixed with 100ml distilled water

With the help of magnetic stirrer for half an hour. The material was filtered through Whatman

Filter paper no.40 and filtrate was collected. The prepared infusion was diluted with the

Help of distilled water in varying proportion and labeled as follows,

GS1-Undiluted filtrate

GS2-1:1 (filtrate: distilled water)

GS3-1:2 (filtrate: distilled water)

GS4-1:4 (filtrate: distilled water)

All the preparations were evaluated for their cardiotoxic activity by using isolated frog heart Assembly. The rate and force of heart contraction was determined.

### Preparation of digoxin solution

The marketed digoxin ampoules (Samarth life sciences Pvt Ltd.) Were obtained from local market. Various different dilutions were made with distilled water and labeled as follows, D1- 25 µg/ml, D2- 50 µg/ml. Above prepared samples were evaluated for their Cardio tonic activity and treated as standard.

### Preparation of hypo dynamic ringer solution <sup>(6)</sup>

Hypo dynamic ringer solution was prepared by using standard

Method. (Table-1)

**Table1: Composition of hypo dynamic ringer solution**

Sr.No	Ingredients	Quantity
1	Sodium chloride (NaCl)	6.5 gm
2	Potassium chloride (KCl)	0.14 gm
3	Calcium Chloride (CaCl <sub>2</sub> )	0.03 gm
4	Sodium bicarbonate (NaHCO <sub>3</sub> )	0.2 gm
5	Glucose	2 gm
6	Distilled Water	1000 ml

The frog of species *Rana tigrina* was pithed and pinned it to the frog board. A midline incision was given on the abdomen, the pectoral girdle was removed and the heart was exposed. The pericardium was carefully removed and put a few drops of hypo dynamic frog ringer over the heart. The inferior venacava was traced, put a thread around it and given a small c

ut in order to insert the venous cannula. The cannula was inserted in the vein and the thread was tied to assure the cannula in place which is in turn connected to a saline bottle containing hypo dynamic frog ringer solution. A small cut in one of the aorta was given for the ringer to come out. Heart was isolated and attached to the stand with moderate flow of ringer. A thin pin hook was

passed through the tip of the ventricle and with the help of a fine thread to the hook; it was tied to the free limb of the Sterling's heart

attached lever which was fixed to a stand. A proper tension was adjusted by altering the height of the lever. The normal heart rate was noted. All test samples that is GS1, GS2, GS3, GS4, D1, & D2, were administered in different doses viz. 0.1ml, 0.2ml, 0.3ml respectively. The rate and force of heart contraction<sup>(8)</sup> were noted as given in (Table 2-7). (Fig-1) (Fig-2).

All the dilutions of *Gymnema sylvestre* restore cardiac activity of Hypodynamic frog heart

i.e. it increases rapidly and force of contraction. It was found that undiluted sample showed better response as compared to other samples. It is interesting to know that G.S.

has rapid onset of action compared to Digoxin.

These preliminary studies confirm the better cardiotoxic activity of G.S. and it can stand as a better option for digitalis. Further studies can confirm the reduced toxicity & this will be the advantage of G.S. over digitalis.

## RESULTS AND DISCUSSION

**Table 2: Effect of different doses of GS1 on frog's heart**

Sr.No.	Drug	Dose(in ml)	Beats/min	Change in Force
1	-----	Normal	38	Normal
2	GS1	0.1	34	Rapid Increase
3	GS1	0.2	30	Increase
4	GS1	0.3	28	Increase

**Table 3: Effect of different doses of GS2 on frog's heart**

Sr.No.	Drug	Dose(in ml)	Beats/min	Change in Force
1	-----	Normal	34	Normal
2	GS2	0.1	32	Slight Increase
3	GS2	0.2	28	Slight Increase
4	GS2	0.3	29	Increase

**Table 4: Effect of different doses of GS3 on frog's heart**

Sr.No.	Drug	Dose(in ml)	Beats/min	Change in Force
1	-----	Normal	34	Normal
2	GS3	0.1	30	Rapid Increase
3	GS3	0.2	28	Increase
4	GS3	0.3	28	Slight Increase

**Table 5: Effect of different doses of GS4 on frog's heart**

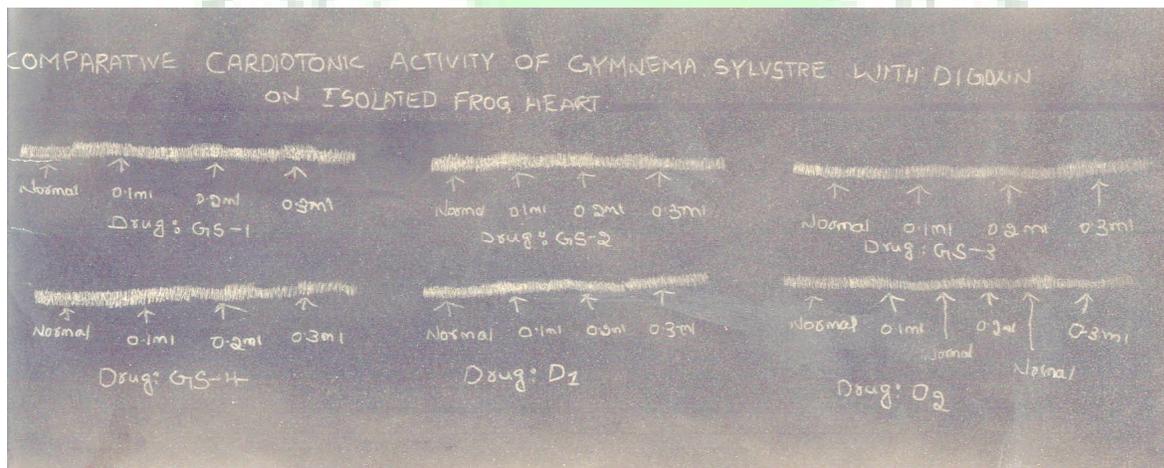
Sr.No.	Drug	Dose(in ml)	Beats/min	Change in Force
1	-----	Normal	32	Normal
2	GS4	0.1	30	Slight Increase
3	GS4	0.2	28	Slight Increase
4	GS4	0.3	29	No change

**Table 6: Effect of different doses of D1 on frogs heart**

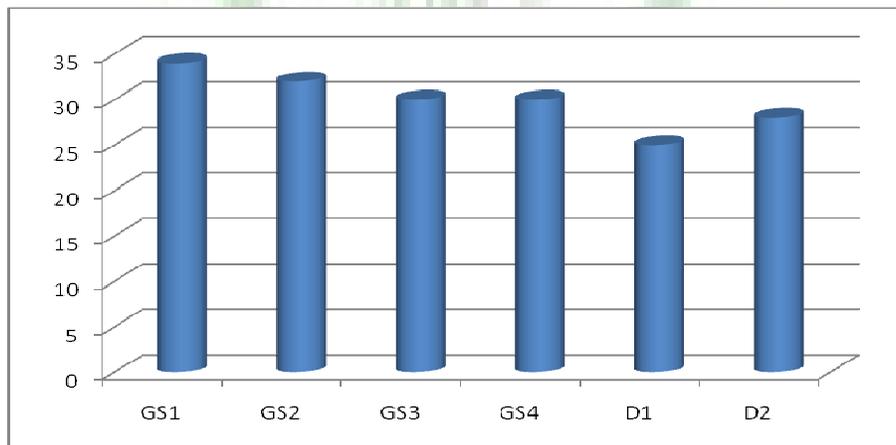
Sr.No.	Drug	Dose(in ml)	Beats/min	Change in Force
1	-----	Normal	30	Normal
2	D1	0.1	25	Increase
3	D1	0.2	24	Slight Increase
4	D1	0.3	26	Slight Increase

**Table7: Effect of different doses of D2 on frogs heart**

Sr.No.	Drug	Dose(in ml)	Beats/min	Change in Force
1	-----	Normal	32	Normal
2	D2	0.1	28	Increase
3	D2	0.2	25	Slight Increase
4	D2	0.3	22	Sudden Cardiac Block



**Figure-1: Kymograph Paper of Comparative Cardiotoxic Activity of Gymnema Sylvestre with Digoxin on Isolated Frog Heart**



**Figure-2: Comparison of Responses for Different Doses of G.S. And Digoxin**

## CONCLUSION

*Gymnema Sylvestre* (GS) is commonly used herb in Ayurveda. Chewing the leaves actually deadens the sense of sweet tastes and also the bitterness of bitter substances. This property is believed to be due to a glycoside known as gymnemic acid. Gymnemic acid, a mixture of triterpene glucuronides, which was found in the leaves. The G.S was claimed to have general cardio tonic activity and we decided to determine the same with the help of isolated frog

heart assembly. In conclusion, the leaves of G.S. acts as for alternative or complementary medicine as a cardio tonic agent.

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