



Cardiotonic activity from the fruit juice of *Punica granatum*

Deorao. M. Awari*¹, V.M. Mute², B.B.Thube¹

*¹Sitabai Thite College of Pharmacy, Shirur Dist. Pune, India.

²MAEER's Maharashtra Institute Of Pharmacy, Pune, India.

For correspondence: Deorao M.Awari, Department of Pharmacology, Sitabai Thite College of Pharmacy, Shirur, At Post-Shirur-412210, Dist-Pune (M.S.), India

E-mail: dev_awari@rediffmail.com

Received on:15-09-2008; Accepted on :09-12-2008

ABSTRACT

The Pomegranate (*Punica granatum*) is a fruit-bearing deciduous shrub. Various parts of this plant is used in the treatment of dyspepsia, bronchitis, hypotensive, throat inflammation, worm etc. Pomegranate juice consumption inhibits serum angiotensin converting enzyme activity and reduces systolic blood pressure. In the present work fresh juice, dilution 1:1 (juice: distilled water), dilution 1:2 (juice: distilled water), dilution 1:4 (juice: distilled water) are used to evaluate cardiac activity on hypodynamic frog heart and are labeled as A1, A2, A3 & A4 respectively and compared with Digoxin (B1) as standard solution. It was found that sample A1 (Undiluted juice) showed better response as compared to the other samples. It has been also shown that *Punica granatum* has rapid onset of action compared to Digoxin. These preliminary studies confirm the better cardiotonic activity of *Punica granatum*.

INTRODUCTION

The cardiovascular system includes the spleen, lymphatic tissues, and vessels. The main function of this system is to maintain homeostasis by acting as a transportation system that carries needed materials to cells and removes waste materials from cells.^{1,2} The conduction system functions by Initiating the heart beat, Conducting messages around the heart, Coordinating beats between the atria and ventricles. Various diseases related to cardiovascular system are aneurysm, atherosclerosis, cardiac arrhythmia, congestive heart failure, hypertension, myocardial infarction (heart attack), phlebitis, rheumatic heart disease, varicose veins, angina pectoris etc.^{3,4,5}

The Pomegranate (*Punica granatum*) is a fruit-bearing deciduous shrub or small tree growing to 5–8 m tall. In the global functional food industry, pomegranate is included among a novel category of exotic plant sources called super fruits. the pomegranate shrub is much-branched, more or less spiny, and extremely long-lived The leaves are evergreen or deciduous, opposite or in whorls of 5 or 6, short-stemmed, oblong-lanceolate, Showy flowers are characterized by the thick, tubular, red calyx having 5 to 8 fleshy, pointed sepals, All parts of the tree have been utilized as sources of tannin . The trunk bark contains 10 to 25%, root bark 28%, and leaves has 11%, tannin content. The juice of wild pomegran-

ates yields citric acid and sodium citrate for pharmaceutical purposes. Pomegranate juice is used for treating dyspepsia and is also beneficial in leprosy. The bark of the stem and root contains several alkaloids including isopelletierine which is active against tapeworms. Dried, pulverized flower buds are employed as a remedy for bronchitis. Decoction of the flowers is gargled to relieve oral and throat inflammation. Leaves, seeds, roots and bark have displayed hypotensive, antispasmodic and anthelmintic activity in bioassay.^{6,7,8}

MATERIAL AND METHOD:

Drug : Juice of *Punica granatum*

Chemical : Digoxine, Ringer Solution

Animal : Frog

Instruments: Sherington Rotating Drum

Preparation of juice^{9,10}

The fresh fruit of *Punica granatum* (pomegranate) of Family Punicaceae were collected from local market and identified in department of Pharmacognosy at our Institute. The fruits were washed thoroughly to remove adhered material .The epicarp and mesocarp of fruit was removed and grind thoroughly in mixer .The material was filtered through Whatman filter paper no.40 and filtrate was collected .The prepared juice was diluted with the help of distilled water in varying proportion and labeled as follows,



D. M. Awari et al., Cardi tonic activity from the fruit juice of *Punica granatum*

Figure I: Effect of Undiluted Juice on Hypodynamic Heart

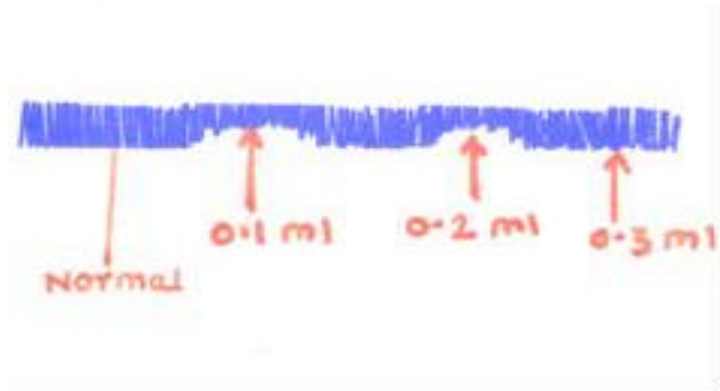


Figure II: Effect of Dilution-1:1(Juice: D.Water) on Hypodynamic Heart

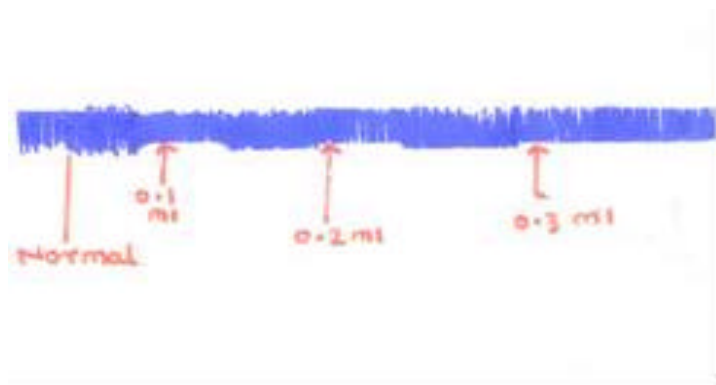


Figure III: Effect of Dilution-1: (Juice: D. Water) on Hypodynamic Heart

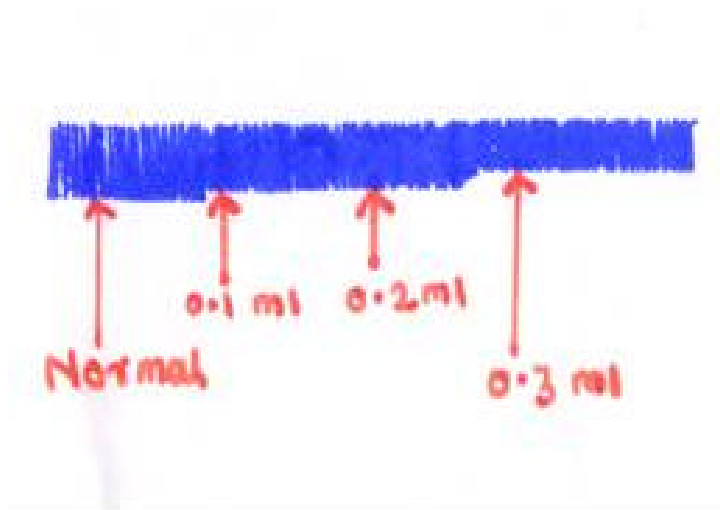


Figure IV: Effect of Dilution-1:2 (Juice: D. Water) on Hypodynamic Heart

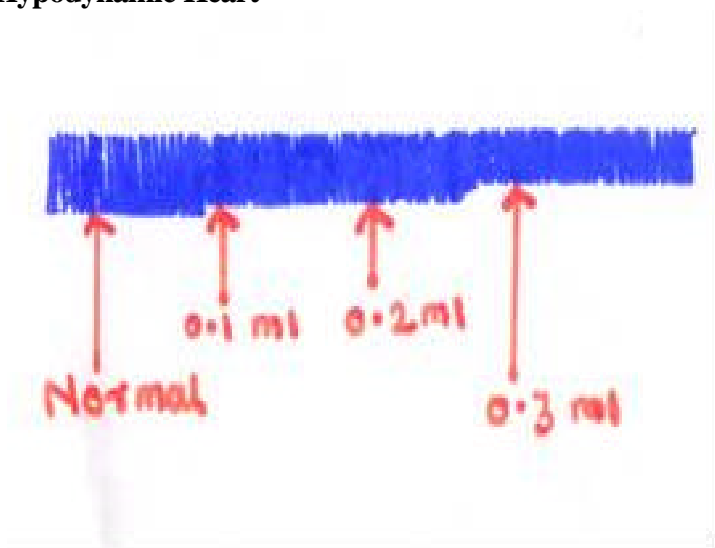


Figure V: Effect of Dilution-1:4 (Juice: D. Water) on Hypodynamic Heart

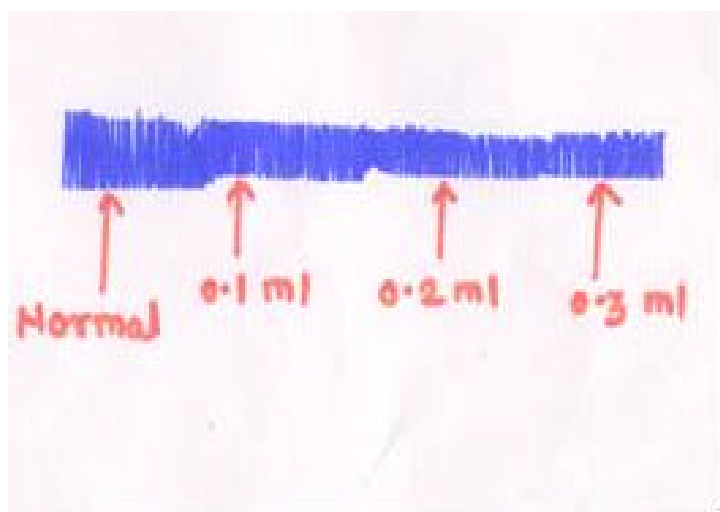


Figure VI: Effect of Standard B-1 Hypodynamic Heart

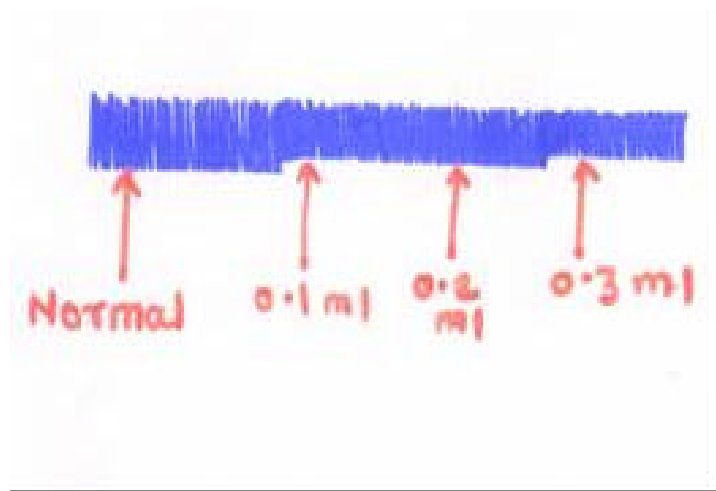




Figure VII: Comparative Graph Of Diluted & Undiluted Juice Of Drug With Digoxine

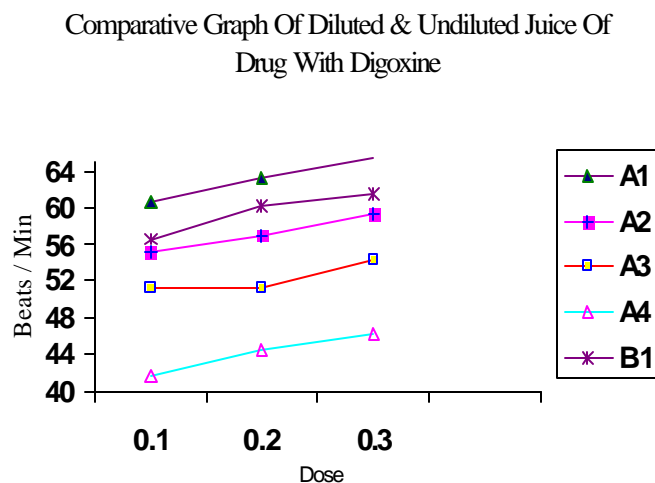


Table1:

Group	Std	A-1 (Undiluted)	A-2 (1:1)	A-3 (1:2)	A-4 (1:4)
Normal	34.00±1.065	34.00±1.065	34.00±1.065	34.00±1.06	34.00±1.065
0.1ml	56.67±1.256*	60.67±0.4944 **	55.17±0.8724 ^{b*}	51.17±0.7923 ^{c*}	41.83±0.7923 ^{d*}
0.2 ml	60.33±0.8819*	63.17±0.4773 **	57.00±0.9661 ^{b*}	51.17±1.014 ^{c*}	44.50±0.7638 ^{d*}
0.3 ml	61.50±0.7638*	65.50±0.6708 **	59.33±0.6667 ^{b*}	59.33±0.7149 ^{c*}	46.33±0.6667 ^{d*}

Values are expressed as mean ± SEM ,a- Value of significantly different from undiluted juice group on the respective frog heart ,b- Value of significantly different from 1:1 diluted juice group on the respective frog Heart ,c- Value of significantly different from 1:2 diluted juice group on the respective frog Heart,d- Value of significantly different from 1:4 diluted juice group on the respective frog Heart ,* - Statistically significant at P<0.0001

Table 2 Hypodynamic Heart (Undiluted Juice)

Sr.No.	Drug	Dose(in ml)	Beats/min.(mean)	Change in Force
1.	—	Normal	34.00	Normal
2.	A1	0.1	56.67	Rapid increase
3.	A1	0.2	60.33	Slight increase
4.	A1	0.3	61.50	Slight increase

Table 3 Hypodynamic Heart (Dilution-1:1 (Juice : Distilled Water)

Sr.No.	Drug	Dose (in ml)	Beats/min (mean)	Change in Force
1.	—	Normal	34	Normal
2.	A2	0.1	55.17	Slight increase
3.	A2	0.2	57.00	Slight increase
4.	A2	0.3	59.33	No change

Table 4 Hypodynamic Heart (Dilution-1:2 (Juice : Distilled Water)

Sr.No.	Drug	Dose (in ml)	Beats/min (mean)	Change in Force
1.	—	Normal	34	Normal
2.	A3	0.1	51.17	Slight increase
3.	A3	0.2	51.17	No change

Table 5 Hypodynamic Heart (Dilution-1:4 Juice: Distilled Water)

Sr.No.	Drug	Dose (in ml)	Beats/min.(mean)	Change in Force
1.	—	Normal	34	Normal
2.	A4	0.1	41.83	Increase
3.	A4	0.2	44.50	Increase
4.	A4	0.3	46.33	Slight increase

Table 6 Hypodynamic Heart (Standard B-1)

Sr.No.	Drug	Dose (in ml)	Beats/min (mean)	Change in Force
1.	—	Normal	34	Normal
2.	B1	0.1	60.67	No change
3.	B1	0.2	63.17	Slight increase
4.	B1	0.3	65.50	Increase



A1 - Undiluted juice

A2 - 1:1 (juice: distilled water)

A3 - 1:2 (juice: distilled water)

A4 - 1:4 (juice: distilled water)

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

Preparation of Reference solution (Digoxin solution)

The marketed digoxin ampoules were obtained from local market. and labeled as

B1- 25 µg/ml

Preparation of Hypodynamic Ringer solution¹⁰

Hypodynamic Ringer solution was prepared by using standard method.

Procedure:

1.Set up the perfusion of frog heart with normal frog Ringer solution 2.Record the effect of (0.1, 0.2, 0.4 and 0.5 ml) Digoxin and CaCl₂ (0.1, 0.2,0.4 and 0.5 ml) Note the dose that gives an adequate response. 3.Replace the perfusion fluid with ringer modified Ringer containing only 1/4th the calcium chloride as compared to that of normal Ringer. Note the change in the pattern of recording of the heart.4.When the heart is depressed markedly in presence of modified Ringer, administer digoxin (0.1,0.2,0.4 and 0.5 ml) and CaCl₂ (0.1, 0.2, 0.4 and 0.5 ml). Note the change in contractility.5.Fix the tracing and compare the responses of these drugs in normal and hypodynamic heart.

Evaluation of Cardiotoxic activity^{9,10}

Perfused frog heart assembly was set up by using Hypodynamic Ringer solution. The normal heart rate was noted. All test samples that is A1, A2, A3, A4, were administered in different doses viz. 0.1ml, 0.2ml, 0.3ml. The rate and force of heart contraction were noted and is given in Table-1

RESULT AND DISCUSSION:

All the dilutions of *Punica granatum* (pomegranate) restore cardiac activity of Hypodynamic frog heart i.e. it increases rapidly and force of contraction. It was found that sample A1 (Undiluted filtrate) showed better response as compared to other samples. It is interesting to know that *Punica granatum* (pomegranate) has rapid onset of action compared to Digoxin. These preliminary studies confirm the better cardiotoxic activity of *Punica granatum* (pomegranate),and it can stand as better option for digitalis.

Further studies can confirm the reduced toxicity & this will be the advantage of *Punica granatum* (Pomegranate) over digitalis. Thus, in future it will be interesting to isolate the active chemical constituents which are responsible for the cardiotoxic activity as well as to determine the possible mechanism of action. Figure-I ,II,III,IV, V, VI and Table -2,3,4,5,6.

REFERENCES:

1. Ross and Wilson "Anatomy and Physiology in Health and Illness" Anne Waugh Allison Grant, 9th edition 77
2. V. N. Sharma "Essential of Pharmacology", 2nd edition 2003,150-200
3. Harshmoan "The Pharmacology Basic of Therapeutics" Copy right 1996 International edition 9th edition 278-324
4. Goodman and Gillman "The Pharmacological Basis of Therapeutics".759-875
- 5.Bodhankar "Pathophysiology" Nirali Prakashan 1st edition.1-6 Barar F.S.K., "Essentials of Pharmacotherapeutics," 1st edition 1985, S.Chand Publications: 250-254
6. Charles W. Fetroo, Juan R. Avila "The Complete Guide To Herbal Medicines" 388.
- 7.Swami Brahmananda 1st Edition 2000.148
- 8.The Wealth Of India ,PUNICA GRANITUM (Punicaceae) Raw materials Volume-7,317-324.
9. Bertram G "Basic and Clinical Pharmacology"Katzung ,9th edition, Copy Right 2004.158-160
10. Remington: "The Science and Practice of Pharmacy," 19th Edition, Mack Publishing Company: 956.

Source of support: Nil, Conflict of interest: None Declared