

CARDIOTONIC ACTIVITY OF *PORTULACA OLERACEA* ON ISOLATED FROG HEARTJAYANT S. BIDKAR<sup>1,\*</sup>, DHANAJI D. GHANWAT<sup>1</sup>, MADHURI D. BHUJBAL<sup>1</sup>, GANESH Y. DAMA<sup>1</sup><sup>1</sup> Department of Pharmacognosy, Sharadchandra Pawar College of Pharmacy, Dumberwadi (Otur), Tal. Junner, Dist. Pune, 410504, Maharashtra, India. Email: jayantbidkar@yahoo.co.in, dhanaji\_ghanwat@rediffmail.com

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## ABSTRACT

*Portulaca oleracea* (Linn.) family Portulacaceae commonly known as Brihalloni, Gholika, Lona, Lonamla, Loni, Lonika & Lunia. The juice was claimed to have general cardiotoxic activity. Present study was carried out to determine the same by using fresh juice of aerial part *Portulaca oleracea* with different dilutions & compared with cardiotoxic activity of digoxin-the life saving cardiotoxic.

The activity was tested by using isolated frog heart assembly. The present preliminary studies confirm the better cardiotoxic activity of *Portulaca oleracea* than digoxin. Further studies can confirm the reduced toxicity & this will be the advantage of *Portulaca oleracea* over digitalis. Thus, in future it will be interesting to isolate the active chemical constituents which are responsible for the cardiotoxic activity.

**Keywords:** *Portulaca oleracea*, Isolated frog heart, Cardiotoxic activity, Digoxin.

## INTRODUCTION

Cardiovascular Diseases (CVD) are the secondary cause of deaths in many parts of the world, although modern drugs are effective in preventing the disorders, their use is often limited because of their side effects and adverse reactions. A wide array of plants and its active principles, with minimal side effects, provide an alternate therapy for Ischemic heart disease. Cardiac glycosides & catecholamine have been used as main therapeutic agent in the treatment of congestive cardiac failure<sup>1</sup>. But cardiac glycosides (e.g. digoxin) have narrow therapeutic index & hence cause many a times intoxication. Despite of the advancement of knowledge in understanding the basic pharmacology of cardioactive drugs glycosides still have its adverse effects in terms of toxication<sup>2</sup>. Hence there is a need for new drug research with wide therapeutic index & good cardiac activity, & hence, the present study is aimed to evaluate cardiotoxic activity of *Portulaca oleracea*.

*Portulaca oleracea* (Linn.) family Portulacaceae is commonly known as Brihalloni, Gholika, Lona, Lonamla, Loni, Lonika and Lunia. It is a common Purslane, also called as Verdolaga, Pigweed, Little Hogweed/ Pusly, is an annual succulent, which can rich annual succulent which can rich 40cm in height. It is a native of India and the Middle East, but is naturalized elsewhere & in some regions is considered an invasive used<sup>3</sup>.

The herb is considered to possess cooling, antiscorbutic, aperients & diuretic properties, the diuretic property probably due to its high content of potassium salts. The fresh leaf juice is considered an effective thirst-quencher, leaves and tops are used in anti-haemorrhagic poultices<sup>4</sup>. It exhibits a wide range of pharmacological effects, including antibacterial<sup>5</sup>, analgesic and anti-inflammatory<sup>6</sup>, skeletal muscle relaxant<sup>7, 8</sup>, wound healing<sup>9</sup>, and antiulcer activities<sup>10</sup>. It is also consumed as a vegetable and has been reported to be rich in  $\alpha$ -linolenic acid,  $\beta$  carotene & omega-3 fatty acids<sup>11, 12</sup>. In addition to flavonoids, coumarins<sup>13</sup> monoterpene glycoside<sup>14</sup> and alkaloids have also been reported to be important chemical constituents of this plant<sup>15</sup>.

## MATERIALS AND METHODS

## Chemicals and Standard

The marketed digoxin ampoules (Sunpharma Ltd.) were obtained from local market. Various different dilutions were made with distilled water and labeled as follows, D1- 25  $\mu$ g/ml, D2- 50  $\mu$ g/ml. above prepared samples were evaluated for their cardiotoxic activity and treated as standard. Sodium chloride, Potassium chloride, calcium chloride, sodium bicarbonate, glucose and other solvents used were of analytical grade available commercially.

## Animal

Frog (*Rana tigrina*)

## Instruments

Sherington Rotating Drum, Sterling's heart lever.

## Plant material

The aerial parts of *Portulaca oleracea* were collected from Satara district of Maharashtra, India. The plant was authenticated by Mr. P. G. Diwakar Deputy Director Botanical Survey of India (BSI), Koregaon Road, and Pune. The voucher specimen was deposited in BSI, Pune.

## Preparation of juice

The fresh aerial parts of *Portulaca oleracea* L (Portulacaceae), were washed thoroughly to remove adhered material. It was grind thoroughly in mixer. The material was filtered through Whatman filter paper no.41 and filtrate was collected. The prepared juice was diluted with the help of distilled water in varying proportion and labeled as follows,

**P1** - Undiluted juice

**P2** - 1:1 (juice: Sterile water)

**P3** - 1:2 (juice: Sterile 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 hypodynamic ringer solution<sup>17,18</sup>

Hypodynamic ringer solution was prepared by using standard method (Table-1).

Evaluation of cardiotoxic activity<sup>17,18</sup>

1. The frog of species *Rana tigrina* was pithed and pinned it to the frog board.
2. A midline incision was given on the abdomen, the pectoral girdle was removed and the heart was exposed.
3. The pericardium was carefully removed and put a few drops of hypodynamic frog ringer over the heart.
4. The inferior vena cava was traced, put a thread around it and given a small cut 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 hypodynamic frog ringer solution. A small cut in one of the aorta was given for the ringer to come out.

5. Heart was isolated and attached to the stand with moderate flow of ringer.
6. A thin pin hook was passed through the tip of the ventricle and with the help of a fine thread attached to the hook; it was tied

to the free limb of the Sterling's heart 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 P1, P2, P3, D1 and D2 were administered in different doses viz. 0.1ml, 0.2ml, 0.3ml respectively. The rate and force of heart contraction were noted as given in (Table 2, 3, 4, 5, 6. Figure 1, 2, 3, 4, 5.).

**Table 1: Composition of Hypodynamic 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.



Fig. 4: Effect of Sample (D1) on Frog heart

Table 5: Hypodynamic Heart (Standard D-1)

Sr. No.	Drug	Dose( in ml)	Beats/min(Mean)	Change in force
1	-	Normal	38	Normal
2	P1	0.1	32	Slightly increase
3	P2	0.2	26	Slightly increase
4	P3	0.3	22	Rapidly increase

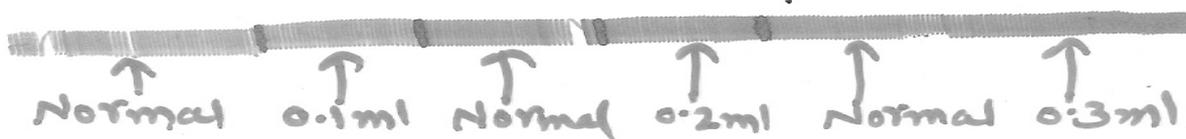


Fig. 5: Effect of Sample (D2) on Frog heart

Table 6: Hypodynamic Heart (Standard D-2)

Sr. No.	Drug	Dose( in ml)	Beats/min(Mean)	Change in force
1	-	Normal	37	Normal
2	P1	0.1	27	Slightly increase
3	P2	0.2	23	Slightly increase
4	P3	0.3	20	Sudden cardiac block

## RESULTS AND DISCUSSION

The cardiotoxic activity was determined by Hypodynamic frog heart. Results showed that all the dilutions of test solutions of fresh aerial part juice of *Portulaca oleracea* L (Portulacaceae) produced positive inotropic (increase in height of force of contraction) on Hypodynamic frog heart. From the observations, it was revealed that the test solution P1 (undiluted juice) showed significant response as compared to other test solutions (figure 1, 2, 3, 4, 5). The graph obtained indicates that at lower dose of undiluted juice had significant action as compared to Digoxin. These preliminary studies confirm the better cardiotoxic activity of *Portulaca oleracea*, and it can stand as better option for digitalis. Further studies can confirm the reduced toxicity & this will be the advantage of *Portulaca oleracea* over digitalis. Further investigation is necessary for isolation of active phytochemical constituents which are responsible for cardiotoxic activity and to determine the possible mechanism of action.

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