INTRODUCTION
Indian cherry or Bahuvraka is common medicinal plant in southern India, botanically nomenclature as *Cordia dichotoma*. The plant has been used in traditional system of medicine for treatment of the bronchitis, irritation of urinary passages, as diuretic, antihelminitic, antipyretic, in inflammation of chest and throat, for dry cough, loss of voice etc. The literature indicates the plant extract of different parts like bark, leaf of *Cordia dichotoma* and its isolated compounds were studied for various biological activities like antihelminthic activity, hepatoprotective activity, wound healing activity, analgesic activity, and antipyretic activity. The present study was undertaken to evaluate the antulcer activity of ethanol and water extract of *Cordia dichotoma* against aspirin induced gastric ulcer and 4 h pylorus ligation ulcers in rats.

MATERIALS AND METHODS

Plant material
The ripe fresh fruits of *Cordia dichotoma* were collected from Gulbarga.

Preparation of extract
The fresh fruits were collected and mucilage was squeezed from it, and it was further extracted by maceration with ethanol and water for 72 h. The extract was dried (70°C for 2 h) to get the solid mass.

Animals
Wistar albino rats of either sex weighing between 180-210 g were procured from central animal house, M.R.Medical College, Gulbarga. The animals were acclimatized for one week. They were maintained in pathogen free, well aerated condition at room temperature. Air conditioned and controlled temperature in laboratory under standard feeding with standard pellet feed supplied by Hindustan lever co. Mumbai and water ad libitum throughout the course of study. The animals were fasted for 36 h prior to the experiment. Necessary permission for conduction of work was obtained from IAEC.

Acute oral toxicity studies
A safe oral dose of the extract was determined by acute oral toxic class method of organization of economic cooperation and development (OECD) as per 423 guidlines it falls in GSH 5 category.

Aspirin induced gastric ulcer model in rats
The Wistar albino rats of either sex weighing between 180-210 g were divided into four treatment groups containing six animals each. The animals were fasted for 36 h. Group I was kept as control, Group II was treated with standard drug ranitidine (50mg/kg IP) 10. Group III was treated with ethanalic extract of *Cordia dichotoma* (300mg/kg p.o.), and Group IV was treated with water extract of *Cordia dichotoma* (300mg/kg p.o.). After 1 h aspirin (50mg/kg p.o.) was administered orally to group I, II, III, and IV respectively to induce ulcers. After 4 h the animals were sacrificed, dissected and their stomachs were removed, opened along greater curvature and subjected to measurement of ulcer index. The gastric lesions were counted and the mean ulceration index was calculated 11.

4 h pylorus ligation ulcer model in rats

Gastric ulcer induction study
Gastric ulceration was induced in Wistar albino rats by the method of shay et al 1945 12. The gastric juice and gastric mucosa collected were subjected to different biochemical estimations.

Wistar albino rats of either sex were divided into four treatment groups containing six animals in each group. Group I was kept as control. Group II was treated with standard drug ranitidine (50mg/kg IP). Group III was treated with alcoholic extract of *Cordia dichotoma* (300mg/kg p.o.), and Group IV with water extract of *Cordia dichotoma* (300mg/kg p.o.). The drug was administered daily for 5 days at 10 am. On 5th day, the rats were fasted for 24 h before pyloric ligation with water ad libitum. At the end of 24 h starvation, the rats were anesthetized with anesthetic ether. Abdominal was opened by middle incision. The stomach was lifted out and ligature was placed at the pyloric end of stomach taking care not to include any blood vessels. The abdomen wall was then stitched into two layers and rats were left in a cage by application of 70% alcohol with false bottom of wire mesh to avoid coprophagy. Water was withheld 1 h before pyloroz ligation till the end of 4 h period for development of ulcers. The rats were sacrificed by overdosing with ether. Immediately the abdomen was cut open, cardiac end of the stomach was ligated and the stomach was cut off, then it was cut open along the greater curvature and the gastric juice was collected in centrifuge tubes. The gastric mucosa was then washed under running tap water. The ulcers were examined with help of magnifying glass (10 X). The gastric lesions were counted and mean ulcer index was calculated 12.

Gastric secretion studies
Collection of gastric juice and estimating their volume and pH
The gastric juice was collected 4 h after pyloric ligation and centrifuged for 5 min at 2000 rpm and the volume and pH was measured. The volume of supernatant was expressed as ml/100gm body weight and used for various biochemical estimations namely free acidity and total acidity.

Determination of free acidity and total acidity in gastric juice
1 ml of gastric juice was pipette into 100 ml conical flask, 2-3 drops of Topfer’s reagent was added and titrated with 0.01N sodium hydroxide which was previously standardized with 0.01 N oxalic acid until all traces of red color disappeared and the color of solution turned to tinge. The volume of alkali titrated was noted. This volume corresponds to free acidity. Then, 2-3 drops of phenolphthalein
indicator solution was added and titration was continued until a definite red tinge reappeared. Again the total volume of alkali added was noted. This volume corresponds to total acidity. Acidity was calculated by using the formula,

\[
    \text{Volume of NaOH} \times \text{Normality of NaOH} \times 100
\]

Acidity = \frac{\text{Volume of alkali used}}{\text{Volume of gastric juice}} \times 100 \text{ Meq/L}.

0.1

RESULT

Aspirin induced gastric ulcer model in rats

In this model ulcer index was reduced from 2.3 ± 0.380 to 0.583 ± 0.083, 0.583 ± 0.083 and 0.166 ± 0.086 (p<0.001), respectively (standard, alcoholic and water extract) when compared to control group. The result of water extract has been found to be more effective than alcoholic extract when compared to the standard ranitidine 50mg/kg. The statistical analysis of the result was carried using student ‘t’ test with P<0.001 indicating the results were highly significant and the percent protection is 92.78% as shown in Table I.

4 h pylorus ligation ulcer model in rats

In this model ulcer index was reduced from 2.8 ± 0.28 to 0.583 ± 0.083, 0.583 ± 0.083 and 0.166 ± 0.086. (p>0.001), respectively (standard, alcoholic and water extract) when compared to control group. The result of water extract has found to be more effective than alcoholic extract when compared to the standard ranitidine 50mg/kg. The statistical analysis of the result was carried using student ‘t’ test with P > 0.001 indicating the results were highly significant and the percent protection is 94.07% as shown in Table II.

Gastric Secretion study

Effect on volume of gastric juice

The volume of gastric juice was reduced from 4.73 ± 0.05 to 2.78 ± 0.04, 2.87 ± 0.09 ml and 4.38 ± 0.05 ml respectively (standard, alcoholic and water extract) when compared to control group as shown in Table III.

Effect on pH of gastric juice

The pH of gastric juice was reduced from 1.48 ± 0.03 to 2.56 ± 0.03, 2.58 ± 0.5 and 1.98 ± 0.3 respectively (standard, alcoholic and water extract) when compared to control group as shown in Table 3.

Effect on free acidity of gastric juice

The free acidity of gastric juice was reduced from 53.16 ± 0.654 Meq/L to 2.530.0 ± 0.577 Meq/L, 28.577 ± 0.5 Meq/L and 50.0 ± 0.577 Meq/L respectively (standard, alcoholic and water extract) when compared to control group as shown in Table 3.

Effect on total acidity of gastric juice

The total acidity of gastric juice was reduced from 69.5 ± 0.846 Meq/L to 48.50 ± 0.860 Meq/L, 48.33 ± 0.76 Meq/L and 65.17 ± 0.703 Meq/L respectively (standard, alcoholic and water extract) when compared to control group as shown in Table 3.

DISCUSSION

Peptic ulcer and duodenal ulcers pose a great difficulty in healing as they were exposed to acid. Food and other beverages also cause inflammation of ulcers along with stimulation of acid secretion. Ulcers can be due to H pylori infections, consumption of drugs like NSAIDs or consumption of spicy pungent food and alcohol also causes ulcers and their aggravation. Hence a suitable antulcer agent especially from natural source along with diet would help in healing the ulcers.

As per the literature survey no antulcer activity was reported for this fruit. The fruit is wild and seasonal one with no commercial value. It resembles berries in size and yellowish in color when fully ripe and generally appears in July- August. The fruit of *Cordia dichotoma* has thick mucilage and is edible; the mucilage is sweet in taste and contains carbohydrates, proteins. Due to its viscous and sticky nature it can form a protective coat in the stomach and on ulcer craters that is likely to heal ulcers. The mucilage is alkaline in nature that also contributes to this mechanism. Besides this, other mechanisms may also be involved and further investigation would reveal the same.

ACKNOWLEDGEMENT

The authors are thankful to Nice chemicals Pvt Ltd Cochin for providing gift sample of aspirin. They also wish to express their gratefulness to the principle, HKE’S’S College of Pharmacy Gulbarga for providing the necessary facilities for the study.

REFERENCES


**TABLE NO. I** ASPIRIN INDUCED GASTRIC ULCER MODEL IN RATS.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Dose (mg/kg)</th>
<th>Ulcer index ± SEM</th>
<th>Percentage protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Saline</td>
<td>2.3 ± 0.380</td>
<td></td>
</tr>
<tr>
<td>Ranitidine</td>
<td>50</td>
<td>0.583 ± 0.083</td>
<td>74.65</td>
</tr>
<tr>
<td>Alcoholic extract*</td>
<td>300</td>
<td>0.583 ± 0.083**</td>
<td>74.65</td>
</tr>
<tr>
<td>Water extract*</td>
<td>300</td>
<td>0.166 ± 0.086*</td>
<td>92.78</td>
</tr>
</tbody>
</table>

n = 6, p<0.001

**TABLE NO. II** 4 h PYLORUS LIGATION ULCER MODEL IN RATS.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Dose (mg/kg)</th>
<th>Ulcer index ± SEM</th>
<th>Percentage protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Saline</td>
<td>2.8 ± 0.28</td>
<td></td>
</tr>
<tr>
<td>Ranitidine</td>
<td>50</td>
<td>0.583 ± 0.083</td>
<td>79.17</td>
</tr>
<tr>
<td>Alcoholic extract***</td>
<td>300</td>
<td>0.583 ± 0.083</td>
<td>79.17</td>
</tr>
<tr>
<td>Water extract**</td>
<td>300</td>
<td>0.166 ± 0.086</td>
<td>94.07</td>
</tr>
</tbody>
</table>

n = 6, p<0.001, p<0.001, p***<0.05

**TABLE NO. III** GASTRIC SECRITION STUDY.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Treatment</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Volume of gastric juice</td>
<td>Control Saline</td>
<td>4.73 ± 0.05</td>
</tr>
<tr>
<td></td>
<td>Standard ranitidine</td>
<td>2.78 ± 0.04</td>
</tr>
<tr>
<td></td>
<td>Water extract 300mg/kg</td>
<td>2.87 ± 0.09</td>
</tr>
<tr>
<td></td>
<td>p.o.</td>
<td>4.38 ± 0.05</td>
</tr>
<tr>
<td>b) pH</td>
<td>1.48 ± 0.03</td>
<td>2.56 ± 0.03</td>
</tr>
<tr>
<td></td>
<td>2.52 ± 0.5</td>
<td>1.98 ± 0.3</td>
</tr>
<tr>
<td>c) Free acidity</td>
<td>53.16 ± 0.654</td>
<td>30.0 ± 0.577</td>
</tr>
<tr>
<td></td>
<td>28.0 ± 0.577</td>
<td>50.0 ± 0.577</td>
</tr>
<tr>
<td>d) Total acidity</td>
<td>69.5 ± 0.846</td>
<td>48.50 ± 0.860</td>
</tr>
<tr>
<td></td>
<td>48.33 ± 0.76</td>
<td>65.17 ± 0.703</td>
</tr>
</tbody>
</table>

n = 6, p<0.001
Fig: Gastroprotective and antiulcer effect of *Cordia dichotoma*

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