Phytochemical and pharmacological investigation of the plant *ocimum basilicum* with special reference to its anti ulceration property.

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**ABSTRACT**

**Objective:** The plant *Ocimum basilicum* belonging to family Lamiaceae is used in Skin disease, eye disease, fever and wounds. The present study was carried out to evaluate the effect of *Ocimum basilicum* whole plant (ethanolic and aqueous extract p.o.) on gastric and duodenal ulceration. 

**Materials and Methods:** The study was carried out on duodenal ulceration models such as cysteamine induced ulceration. The duodenal ulcers were induced by using Cysteamine hydrochloride. Ranitidine (20 mg/kg) was used as standard drug. 

**Results** Both the extracts of the plant *Ocimum basilicum* produced significant activity in Cysteamine induced duodenal ulceration. The aqueous extract showed potent activity than ethanolic extract. 

**Conclusion:** The plant *Ocimum basilicum* Linn. Increases healing of gastric ulceration and prevents the development of experimentally induced gastric and duodenal ulceration in rats.

**Keywords:** Cysteamine hydrochloride, buffered formaldehyde, paraffin, hematoxylin, eosin.

**INTRODUCTION**

The plant *Ocimum basilicum* belonging to family Lamiaceae acts principally on the digestive and nervous systems The leaves and flowering tops are antispasmodic, aromatic, carminative, digestive, stomachic, colds and influenza, poor digestion, nausea, abdominal cramps and tonic. Extracts from the plant are bactericidal and are also effective against internal parasites.

The plant contains chemical constituents such as Carbohydrate, Proteins, Tannins, Flavonoids, Saponins, Steroids, Alkaloids, Acetic compounds, Glycosides etc.

The present study was undertaken to evaluate the phytochemical constituents and pharmacological evaluation of the effect of the plant *Ocimum basilicum* on the healing of experimentally induced ulceration in rats.

**MATERIALS AND METHODS:**

**Plant material**

The whole part of plant *Ocimum basilicum* plant was collected from young matured plant from the rural belt of Balasore, Orissa during the month of Nov-Dec and identified by the botanist of Department of Botany, Utkal University, Bhubaneswar by comparing with the voucher specimen present in the herbarium. After authentication fresh plant materials were collected in bulk, washed under running tap water to remove adhering dust, dried under shade and pulverized in a mechanical grinder. The coarse powder was used for further studies.

**Experimental animals**

Male albino Wistar rats weighing between 180 to 250gm were used. The experimental protocol is approved by the institutional Animal Ethics committee I.A.E.C/U.D.P.S/990/2005-Vanivihar, Bhubaneswar. Following C.P.C.S.E.A guideline.

**Drugs and Chemicals**

Chemicals used in the study were of analytical grade and were procured from Merck specialties private limited, Mumbai, India. Cysteamine hydrochloride procured from Sigma Aldrich Pvt. Ltd. Hyderabad and Bangalore branch.

**Extraction of plant material and preparation of test dose**

About 200 gm of coarse dried powder of plant of the *Ocimum basilicum* was taken in the soxhlet apparatus and extracted successively using ethanol and finally with water. The extraction for each solvent was carried out for 18 to 24 hours. The extract was collected by evaporating the solvents by slow heat treatment. Total 2kg of...
Cysteamine induced duodenal ulcers respectively for further screenings. Dose 500 mg/kg of body weight for both aqueous and ethanolic experiments like rotarod, actophotometer time, reduction of spontaneous activity also determined using instruments like rotarod, actophotometer. [11]

After observing the animal behavior we had taken the same dose 500 mg/kg of body weight for both aqueous and ethanolic extract respectively for further screenings.

**Duodenal ulceration**

**Cysteamine induced duodenal ulcers** [12-17]

After 36 hours fasting duodenal ulcer was induced by the administration of Cysteamine hydrochloride (450mg/kg) in rats. Ranitidine and extracts of the plant were administered one hour prior to Cysteamine treatment. After 48 hours, all the animals were sacrificed and the duodenum is excised carefully. For histological evaluation, the stomach and duodenum are fixed in 10% aqueous buffered formaldehyde and paraffin-embedded sections are stained with hematoxylin and eosin. Ulcer index was measured by the following formula [18-19]

\[
\text{Ulcer Index} = \text{Ulcer Number} + \text{Ulcer Score} + \text{Ulcer Area} \times 10^{-1}
\]

Based on their intensity, the ulcers were given scores as follows: 0 = no ulcer, 1 = superficial mucosal erosion, 2 = deep ulcer usually with transmural necrosis, 3 = perforated or penetrated ulcer.

**Statistical analysis**

Results of all the estimations done were indicated in terms of mean ± SEM. Statistical significance of data were evaluated by analysis of variance (One Way- ANOVA), followed by comparison between different groups using Dunnet multiple comparison test. P<0.05 level of significance was considered. The control group was compared with the standard group and all the experimental treatment groups like Aqueous, and ethanol groups were compared with the control group.

**RESULTS:**

Both the extracts of the plant *Ocimum basilicum* produced significant reduction in the ulcer index, the ulcer area and ulcer score, when compared to control. The dose i.e. 500mg/kg of aqueous extract of the plant showed more significant (P<0.01) effect in ulcer area and ulcer, but in case of ethanolic extracts dose i.e. 500mg/kg showed less efficacy then the aqueous extract.

**DISCUSSION:**

The present study investigated the effect of the plant *Ocimum basilicum* on the gastric and duodenal ulceration. The plant showed significant effect on the healing of gastric and duodenal ulcers induced by Cysteamine induced duodenal ulceration.

Toxicological study revealed that the *Ocimum basilicum* leaves was showed toxic effect at 5000mg/kg b. wt. and does not alter normal physiological and behavioural activities even at lower dose level of 500mg/kg b. wt.

Cysteamine induced duodenal ulcer in rat resembles that of duodenal ulcer in humans, histopathologically and pathophysiologically. Cysteamine hydrochloride inhibits the alkaline mucus secretion from the Brunner’s glands in the proximal duodenum and stimulates the rate of gastric acid secretion. Gastric emptying is also delayed and serum gastrin concentration is increased. Both the extracts of the plant significantly reduced ulcer score and ulcer area along with ulcer index.

**Table 1: Phytochemical screening of aqueous extract of *ocimum basilicum***

<table>
<thead>
<tr>
<th>Phytochemicals</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbohydrate</td>
<td>+ve</td>
</tr>
<tr>
<td>Proteins</td>
<td>+ve</td>
</tr>
<tr>
<td>Tannins</td>
<td>+ve</td>
</tr>
<tr>
<td>Flavonoids</td>
<td>+ve</td>
</tr>
<tr>
<td>Saponins</td>
<td>+ve</td>
</tr>
<tr>
<td>Steroids</td>
<td>+ve</td>
</tr>
<tr>
<td>Alkaloids</td>
<td>+ve</td>
</tr>
<tr>
<td>Acetic compounds</td>
<td>+ve</td>
</tr>
<tr>
<td>Glycosides</td>
<td>+ve</td>
</tr>
</tbody>
</table>

However the exact constituents and mechanism by which the plant *Ocimum basilicum* reduced gastric and duodenal ulcer formation and increased gastric ulcer cannot be explained by present data.

The results of the present investigation suggests that consumption of aqueous extract of the plant *Ocimum basilicum* is beneficial for patients suffering from peptic ulcer disease. The plant may produce both gastric antisecretory and gastric cytoprotective effect,
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Table 2: The toxicity study of aqueous and alcoholic extract of Ocimum basilicum

<table>
<thead>
<tr>
<th>Group</th>
<th>Dose (mg/kg)</th>
<th>Route</th>
<th>Date/Total</th>
<th>Death %</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>100</td>
<td>Oral</td>
<td>00/07</td>
<td>0</td>
</tr>
<tr>
<td>II</td>
<td>500</td>
<td>Oral</td>
<td>00/07</td>
<td>0</td>
</tr>
<tr>
<td>III</td>
<td>1000</td>
<td>Oral</td>
<td>00/07</td>
<td>0</td>
</tr>
<tr>
<td>IV</td>
<td>1500</td>
<td>Oral</td>
<td>00/07</td>
<td>0</td>
</tr>
<tr>
<td>V</td>
<td>2000</td>
<td>Oral</td>
<td>00/07</td>
<td>0</td>
</tr>
<tr>
<td>VI</td>
<td>2500</td>
<td>Oral</td>
<td>00/07</td>
<td>0</td>
</tr>
<tr>
<td>VII</td>
<td>3000</td>
<td>Oral</td>
<td>00/07</td>
<td>0</td>
</tr>
<tr>
<td>VIII</td>
<td>3500</td>
<td>Oral</td>
<td>00/07</td>
<td>0</td>
</tr>
<tr>
<td>IX</td>
<td>4000</td>
<td>Oral</td>
<td>00/07</td>
<td>0</td>
</tr>
<tr>
<td>X</td>
<td>4500</td>
<td>Oral</td>
<td>00/07</td>
<td>0</td>
</tr>
<tr>
<td>XI</td>
<td>5000</td>
<td>Oral</td>
<td>00/07</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 3: Biochemical estimation of whole plant of Ocimum basilicum Linn. cysteamine induced duodenal ulcer model

<table>
<thead>
<tr>
<th>Group</th>
<th>Treatment</th>
<th>Dose</th>
<th>Number</th>
<th>Scoring</th>
<th>Area (mm²)</th>
<th>Ulcer Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Control</td>
<td>2 ml/ kg</td>
<td>3.83±0.80</td>
<td>2.35±1.38</td>
<td>36.76±9.35</td>
<td>17</td>
</tr>
<tr>
<td>II</td>
<td>Ranitidine</td>
<td>20mg/kg</td>
<td>0.98±0.33*</td>
<td>0.53±0.10***</td>
<td>7.39±1.42**</td>
<td>2</td>
</tr>
<tr>
<td>III</td>
<td>Aqueous Extract</td>
<td>500mg/kg</td>
<td>2.55±0.30*</td>
<td>0.62±0.13**</td>
<td>15.72±1.78**</td>
<td>2</td>
</tr>
<tr>
<td>V</td>
<td>Ethanol Extract</td>
<td>500mg/kg</td>
<td>3.73±0.65</td>
<td>2.20±0.42*</td>
<td>37.21±3.12*</td>
<td>7</td>
</tr>
</tbody>
</table>

The results are expressed in Mean ± SEM.  
* - P<0.05, ** - P<0.01, ***P<0.001

Fig.1: Duodenum of control group in Cysteamine induced duodenal ulceration

Fig.2: Duodenum of standard group in cysteamine induced duodenal ulceration

reported studies of anti bacterial and anti fungal activity on the plant, [20-22] it may produces inhibition of the growth of Helicobacter pylori, which may be one of the main causes of healing of gastric as well as duodenal ulceration. Studies on the effect of the plant Ocimum basilicum on the Helicobacter pylori infection have to be carried out to further support the beneficial effect of the plant in peptic ulcer.

Hence from all the results and discussion we finally come to the conclusion that aqueous and ethanolic extract were more or less effective towards both the gastric and duodenal ulcer. The aqueous extract of the plant Ocimum basilicum shows significant action on the ulceration. As in case of the ethanolic extract shows lower activity than aqueous extract. Overall all the extract shows protective property against gastric and duodenal ulcer. Hence we come to the conclusion that the plant Ocimum basilicum has protective effect against the peptic ulcer.

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