Research Article

Pharmacological Investigations of Aqueous Extract of Seeds of Indian Traditional Plant- Carum copticum

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Abstract

Carum copticum commonly known as ‘Ajwain’ is distributed throughout India and is mostly cultivated in Gujarat and Rajasthan. Traditionally the fruit possesses action against cholera, colic, diarrhoea, dyspepsia, hypertension, asthma and hepato-biliary complications. Although Carum copticum has long been used in traditional system of Indian medicine, there are very few scientific literature references for it. In this work we have done various phytochemical investigations on aqueous extract of seeds of this plant. After that the extract was evaluated for analgesic, anti-inflammatory and antipyretic activity. The extract has shown promising activities.

Keywords: Carum copticum; Ajwain; Analgesic; Anti-inflammatory and Antipyretic

1. Introduction

The World Health Organization (WHO) has estimated that about 80% of World’s population relies on traditional medicines for primary health care. India is the richest source of medicinal and aromatic plants. Herbal drugs are gaining popularity again day by day in the World since last decades because of its efficacy and lower toxicity as compared to allopathic drugs.

Carum copticum (Apiaceae) [Vernacular Names: Hindi –Ajwain; English - Bishop’s weed] is an annual herbaceous plant bearing the greyish brown fruits or seeds. It is an erect, glabrous or minutely pubescent, branched, annual, up to 90 cm tall, plant cultivated almost throughout India (Chatterjee and Chandraprakashi, 1995). Carum copticum seeds are used as a common household remedy for cholera, colic, diarrhoea, dyspepsia, hypertension, asthma and hepato-biliary complications. The plant is known to possess antiallergic, antibacterial, anthelmintic, antifungal, hypocholesteraeemic, bronchodilator and cholinergic activities. It is also a native of Egypt and is cultivated in Iraq, Iran, Afghanistan, and Pakistan (Agrawal1986).

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It has been reported to possess various phytochemical constituents like derivatives of terpene, thymol and some glycosides (Mohagheghzadeh, 2007; Gang, 1980; Yahara, 1993; Ishikawa, 2001; Gonzalez, 1988; Zcan, 2007; Duke 1992). Although the plant is very popular in India under traditional system of medicine, but its review of literature shows not much of documentation of its pharmacological data. Hence this project was taken up to investigate few of the pharmacological profiles of the seeds of this plant based on its traditional use and to document the scientifically evaluated results.

2. Material and Methods

2.1 Plant Material and Authentication

All the drugs were purchased from and authenticated by Plant Taxonomist (IAAT: 357), at Department of Botany, Sri Venkateswara University, Tirupati, India.

2.2 Extraction Procedure

Extraction of *Carum copticum* seeds was done by maceration process. Maceration was done by placing moderately coarse powder in a closed vessel and adding the water. The system was allowed to stand for seven days, with occasional shaking. The water was then strained off and the marc, was pressed to recover as much occluded solution as possible. The strained and expressed liquid thus obtained is mixed and clarified by filtration. The expressed liquid was cloudy with colloidal and small particles, and sufficient time (several weeks) were given for coagulation and settling. The settled matter was filtered through a filter press.

2.3 Test for Phytochemical Analysis

The extracts were analyzed for the presence of various phytochemical constituents and was found to contain-alkaloids, terpenoids, reducing sugars, saponins, tannins, carbonyls, flavonoids, phlobatannis and steroids (Adetuyi et al., 2001; Trease and Evans, 1989; Sofowora, 1982).

2.4 Pharmacological activity

The extract was evaluated for various pharmacological activities like analgesic, anti-inflammatory and antipyretic. All the experimental protocols were duly approved by institutional animal ethical committee vide letter No. KCP/IAEC-007/2013-14.

2.4.1 Analgesic activity by acetic acid induced writhing in mice (Vogel, 2002)

Albino mice weighing 25-30 g were previously screened with 0.6 %v/v acetic acid at the 0.3 ml/mice intraperitonially for writhing ranging from 10-25. The animals were divided into group of six each and were dosed orally. One group received the standard drug aspirin as suspension, prepared in water with sufficient quantity of sodium CMC; second group received the aqueous extract, and third group was given a combination of standard and extract. After 60 minutes of administration of test compounds and aspirin (standard), the mice were given intraperitonial injection of 0.3 ml of
0.6% v/v acetic acid. Mice were observed for total number of writhes for 10 minutes from the 5 minutes after the acetic acid injection. The mean value for each group were calculated and compared with control.

2.4.2 Anti-inflammatory activity (Ghosh, 1972)

*Carrageenan induced rat paw edema method*

The aqueous extract was evaluated for anti-inflammatory activity by winter *et al.* (paw edema method). The extract was evaluated by examining their ability to diminish or prevent the edema. Wistar albino rats weighing 150-180 g were of either sex were divided into 12 different groups of six animals and they were numbered individually. To control group injected Carrageenan 0.1 ml 1% w/v in the planter aponeurosis region of right paw. Diclofenac was used as standard for this experiment. The aqueous extract and standard were given orally to respective group. After 60 minutes 0.1 ml 1% w/v Carrageenan was injected in the planter aponeurosis region of the test and standard drug treated groups. The paw volume of the all groups of rats before injection of Carrageenan for 0 minutes and at the end of 1, 2, 3 hours after Carrageenan challenge was evaluated. The percentage of inhibition of inflammation in the drug treated animals was recorded and calculated using formula:

\[
\% \text{Inhibition} = \frac{\Delta V_c - \Delta V_t}{\Delta V_c} \times 100
\]

where \(\Delta V_c\) is arithmetic mean of the increase in paw volume in the control group, \(\Delta V_t\) is arithmetic mean of the increase in paw volume in the treated group

2.4.3 Antipyretic Activity (Abignente, 1979)

Antipyretic Activity was evaluated by the yeast induced fever test. Hyperthermia in rats was induced by s.c injection of 20% suspension of dried yeast (10mL/kg). After 16 h the animals were divided into groups of six each. Indomethacin (standard), extract and combination of standard and extract was administered to these groups. Rectal temperature was measured before yeast injection, and after 1, 2 and 3 h after dosing.

3. Results and Discussion

The aqueous extract of *Carum copticum* seeds was taken and preliminary phytochemical investigations were done. The extract was found to contain terpenoids, steroids, alkaloids, glycosides, tannins and saponins.

The extract was then subjected to various pharmacological investigations including analgesic, anti-inflammatory and antipyretic activity.

*Analgesic activity:* Analgesic activity was measured by acetic acid induced writhing in mice. The intraperitoneal injections were given in various concentrations and aspirin was used as standard.
The results of analgesic activity are shown in Table 1. As evident from the results the extract has shown 20% more inhibition of writhing as compared to the standard. Hence it has better analgesic property than aspirin.

**Table 1** Analgesic activity by acetic acid induced writhing method

<table>
<thead>
<tr>
<th>GROUPS</th>
<th>No. of writhes in 10 min after treatment (Mean ± SEM)</th>
<th>% inhibition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>36.1±1.57**</td>
<td>0</td>
</tr>
<tr>
<td>Standard (Aspirin)</td>
<td>25± 1.1**</td>
<td>30.74</td>
</tr>
<tr>
<td>Extract</td>
<td>18.03±0.79**</td>
<td>50.05</td>
</tr>
<tr>
<td>Combination (Std+ Extract)</td>
<td>24.04±1.05**</td>
<td>33.4</td>
</tr>
</tbody>
</table>

All the value are in Mean ± SEM where (n=6) and **P<0.01.

**Anti-inflammatory activity:** The anti-inflammatory activity was done by using Carrageenan induced paw-oedema method on Wistar albino rats using diclofenac as standard. The results are given in Table 2. The extract has shown almost comparable results as the standard. The combination of the standard and extract has also shown a similar kind of results upto 3 h. Thus the aqueous extract has the capability to reduce the inflammation to a similar amount as the standard drug diclofenac.

**Table 2** Paw Volume and % of inhibition of compound after 1 hour

<table>
<thead>
<tr>
<th>Groups</th>
<th>0 HOUR</th>
<th>AFTER 1 HOUR</th>
<th>AFTER 2 HOUR</th>
<th>AFTER 3 HOUR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean Paw Volume (ml) ± SEM</td>
<td>Mean Paw Vol. (ml)± SEM</td>
<td>% inhibition</td>
<td>Mean Paw Vol. (ml)± SEM</td>
</tr>
<tr>
<td>Control</td>
<td>0.52± 0.02***</td>
<td>1.22± 0.05***</td>
<td>0</td>
<td>1.34± 0.05***</td>
</tr>
<tr>
<td>Standard (Diclofenac)</td>
<td>0.52± 0.03***</td>
<td>0.59± 0.04**</td>
<td>51.63</td>
<td>0.68± 0.04***</td>
</tr>
<tr>
<td>Extract</td>
<td>0.46± 0.02***</td>
<td>0.71± 0.04**</td>
<td>41.8</td>
<td>1.04± 0.14**</td>
</tr>
<tr>
<td>Combination</td>
<td>0.5± 0.03***</td>
<td>0.68± 0.04***</td>
<td>44.26</td>
<td>0.63± 0.04***</td>
</tr>
</tbody>
</table>

All the values are in Mean ± SEM where N=6 and **P<0.01, ***P<0.001.
Antipyretic activity: Antipyretic activity was evaluated by the yeast induced fever test in rats. Indomethacin, extract and combination (Indometacin + aqueous extract) was administered orally to the different group of animals. Rectal temperature was measured. The results are given in table 4. As evident from the table the aqueous extract of the seeds of Carum copticum lowered down the elevated blood temperature to the normal like the standard indomethacin. The combination of the aqueous extract and standard has shown lesser antipyretic activity when compared with both them independently. This shows that this combination is counteracting each other’s effect and hence not compatible with each other.

Table 3 Antipyretic activities of the extract at various time intervals.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>GROUPS</th>
<th>Value of Rectal Temp In (°C) At Following Time After Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0 Hour</td>
</tr>
<tr>
<td>1</td>
<td>Control</td>
<td>37.7</td>
</tr>
<tr>
<td>2</td>
<td>Yeast induced fever (control)</td>
<td>38.9</td>
</tr>
<tr>
<td>3</td>
<td>Standard (indomethacin)</td>
<td>38.2</td>
</tr>
<tr>
<td>4</td>
<td>Extract</td>
<td>38.4</td>
</tr>
<tr>
<td>5</td>
<td>Combination</td>
<td>37.9</td>
</tr>
</tbody>
</table>

4. Conclusion

As evident from the results the aqueous extract of the seeds of Carum copticum posses significant analgesic, antipyretic and anti-inflammatory properties. It can be hence proved that the traditional basis of usage of this plant has scientific background with proof, which was known to our ancestors since time long. Thus there are a lot of avenue for all the traditional and folklore medicines for modern science to look into and proven them right or wrong with proof. As far as Carum copticum is concerned more activities can be explored for it.

Acknowledgements

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References


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