ANALGESIC ACTIVITY OF BOILED *BRASSICA OLERACEA* L. VAR. *CAPITATA* (CABBAGE) LEAVES

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ABSTRACT

**Background.** The objective of this study was to evaluate the analgesic potential of leaves of *Brassica oleracea* L. var. *capitata* (cabbage), which are eaten in the cooked or boiled form in many parts of the world. **Methods.** Analgesic activity was determined through decreases by the methanol extract of boiled leaves in intraperitoneally administered acetic acid induced writhings in Swiss albino mice. **Results.** At doses of 50, 100, 200 and 400 mg per kg body weight, the methanol extract of boiled leaves dose-dependently reduced the number of acetic acid induced writhings by, respectively, 6.9, 17.2, 34.5, and 41.4%. The result obtained with the 50 mg/kg dose was not statistically significant, but the other doses gave significant reductions in the number of writhings. By comparison, a standard analgesic drug, aspirin, when administered at doses of 200 and 400 mg per kg reduced significantly the number of writhings by 24.1 and 51.7%, respectively. Thus at the two highest doses tested of the extract, the extract showed better analgesic activity than obtained with 200 mg/kg aspirin. **Conclusion.** Crude extract of boiled cabbage leaves are effective in alleviating pain.

**KEY WORDS:** Analgesic, *Brassica oleracea*, cabbage, Brassicaceae.
BACKGROUND

*Brassica oleracea* L. var. *capitata* is a widely cultivated Brassicaceae family crop cultivated for its edible leaves, which are partaken in the boiled form in salads or cooked and eaten as vegetable. In English, the plant is known as ‘cabbage’, while in Bangladesh it is more commonly known as ‘badhakopi’ or ‘shada badhakopi’. Cabbage leaves are a prized but affordable food item in Bangladesh; previously it used to be grown in the winter season but in recent years, cabbage is more or less cultivated throughout the year, although during the summer season, cabbages tend to be smaller in size.

Pain is a feeling triggered in the nervous system. Pain can be chronic or acute. Chronic pain can result from conditions like rheumatoid arthritis, cancer, or gout, while acute pain may arise suddenly from common causes as diverse as injury, sprain, stress or indigestion. People in rural areas of Bangladesh are dependent predominantly on agriculture, which necessitates hard work on a daily basis and often under inclement weather conditions. As such, a large number of rural people in Bangladesh suffer from pain on a daily basis. Even urban people suffer from pain on a daily basis, these people mainly having occupations as construction laborers, rickshaw pullers, and household helps.

Our research group has been focusing for the last few years on finding alternative and affordable means to mitigate diabetes and pain, both being common in Bangladesh. We have focused on medicinal plants as well as dietary plants or plant parts towards mitigating these two common ailments.\[1-17\] Rural and urban slum people often lack access to or cannot afford modern allopathic treatment and our research has mainly focused on providing these people with means in the form of plants or plant parts, which can be easily accessible to them and can be used with a considerable degree of safety. The objective of the present study was to evaluate the analgesic potential of cabbage leaves in intraperitoneally administered acetic acid induced pain model mice. Since cabbage leaves are taken in the boiled form, it was of interest to evaluate the analgesic potential of boiled cabbage leaves.

METHODS

*Plant material collection*

Cabbages were collected during February 2015 from a local market in Dhaka city.
Preparation of methanolic extract of cabbage leaves (MECL)

For preparation of boiled leaf extract, leaves were separated, sliced and steamed for 15 min, which is the average time in Bangladeshi households for boiling or cooking the leaves to make them soft and edible. Following steaming, the sliced boiled leaves were thoroughly dried in the shade and 70g of dried and powdered boiled leaf slices were extracted with methanol (w:v ratio of 1:5, final weight of the extract 19g).

Chemicals and Drugs

Aspirin was obtained from Square Pharmaceuticals Ltd., Bangladesh. All other chemicals were of analytical grade.

Animals

Swiss albino mice, which weighed between 14-18g were used in the present study. The animals were obtained from International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B). The animals were acclimatized for three days prior to actual experiments. The study was conducted following approval by the Institutional Animal Ethical Committee of University of Development Alternative, Dhaka, Bangladesh.

Analgesic activity evaluation through abdominal writhing test

Analgesic activity of extract was examined as previously described. Mice were divided into seven groups of five mice each. Group 1 served as control and was administered vehicle only. Groups 2 and 3 were orally administered the standard analgesic drug aspirin at doses of 200 and 400 mg per kg body weight, respectively. Groups 4-7 were administered MECL (boiled) at doses of 50, 100, 200 and 400 mg per kg body weight, respectively. Following a period of 60 minutes after oral administration of standard drug or MECL, all mice were intraperitoneally injected with 1% acetic acid at a dose of 10 ml per kg body weight. A period of 15 minutes was given to each animal to ensure bioavailability and onset of chemically induced irritation of acetic acid following a slight variation of an earlier described method following which period, the number of abdominal constrictions (writhings) was counted for 10 min. The percent inhibitions of abdominal constrictions were calculated according to the formula given below.

$$\text{Percent inhibition} = \left(1 - \frac{W_e}{W_c}\right) \times 100,$$

where $W_e$ and $W_c$ represents the number of writhings in aspirin or MECL administered mice (Groups 2-7), and control mice (Group 1), respectively.
**Statistical analysis**

Experimental values are expressed as mean ± SEM. Independent Sample t-test was carried out for statistical comparison. Statistical significance was considered to be indicated by a p value < 0.05 in all cases.\[8\]

**RESULTS**

Intraperitoneal administration of acetic acid to mice led to pain, which was manifested by abdominal constrictions or writhings in mice. Administration of methanol extract of boiled cabbage leaves (MECL) led to dose-dependent reductions in the number of writhings in mice. At doses of 50, 100, 200, and 400 mg MECL per kg body weight, MECL, respectively, decreased the number of writhings by 6.9, 17.2, 34.5, and 41.4%. While the result at 50 mg per kg was not statistically significant, the other doses gave statistically significant results. Administration of a standard analgesic drug, aspirin at doses of 200 and 400 mg, led to reductions in the number of writhings by 24.1 and 51.7%, respectively. Thus the two highest doses of MECL gave better analgesic activity results than obtained with 200 mg per kg aspirin. The results are shown in Table 1 and suggest that boiled cabbage leaves possess significant analgesic effect.

**Table 1: Analgesic effect of crude methanol extract of boiled cabbage leaves (MECL) in acetic acid-induced pain model mice.**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Dose (mg/kg body weight)</th>
<th>Mean number of abdominal constrictions</th>
<th>% inhibition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>10 ml</td>
<td>5.8 ± 0.37</td>
<td>-</td>
</tr>
<tr>
<td>Aspirin</td>
<td>200 mg</td>
<td>4.4 ± 0.40</td>
<td>24.1*</td>
</tr>
<tr>
<td>Aspirin</td>
<td>400 mg</td>
<td>2.8 ± 0.37</td>
<td>51.7*</td>
</tr>
<tr>
<td>(MECL) boiled</td>
<td>50 mg</td>
<td>5.4 ± 0.40</td>
<td>6.9</td>
</tr>
<tr>
<td>(MECL) boiled</td>
<td>100 mg</td>
<td>4.8 ± 0.37</td>
<td>17.2*</td>
</tr>
<tr>
<td>(MECL) boiled</td>
<td>200 mg</td>
<td>3.8 ± 0.20</td>
<td>34.5*</td>
</tr>
<tr>
<td>(MECL) boiled</td>
<td>400 mg</td>
<td>3.4 ± 0.24</td>
<td>41.4*</td>
</tr>
</tbody>
</table>

All administrations (aspirin and extract) were made orally. Values represented as mean ± SEM, (n=5); *P < 0.05; significant compared to control.

**DISCUSSION**

A number of compounds like △-sitosterol, caffeic acid, and chlorogenic acid have been reported to be present in cabbage leaves. \[20\] The anti-inflammatory and antinociceptive activity of △-sitosterol has been reported. \[21\] The ameliorative effect of caffeic acid against
inflammatory pain in rodents has also been described.\cite{22} Chlorogenic acid is also known to give anti-inflammatory and analgesic effects.\cite{23} Thus these compounds can act by themselves or in a synergistic manner to produce the observed analgesic effects.

A further interesting feature of the present study is that the phytochemical constituent(s) in cabbage leaves responsible for the analgesic effect retained their activities following boiling. Thus a person experiencing pain can instead of the extract, directly partake boiled leaves to get pain relief. This should be of considerable interest and benefit to persons suffering from both acute and chronic pain, that they can not only have an easily affordable and available vegetable in their hands which can provide pain relief but also reduce their dependency, if any, on allopathic pain relieving drugs like aspirin or paracetamol, which can produce adverse effects from overuse or overdosage. Notably, aspirin can produce gastric ulceration, while paracetamol can be hepatotoxic.

**CONCLUSION**

The results suggest that methanolic extract of boiled cabbage leaves is effective in relieving pain.

**Conflicts of interest**

The author(s) declare that they have no competing interests.

**REFERENCES**


