APPENDIX-B: LIST OF PUBLICATIONS

Research paper:


Abstracts:


**Down To Earth Magazine:** “Pumpkin a day”, Keeps ulcer at bay- written by Megha Prakash

**Blog:** Sciencebase Science Blog by David Bradley
OTHER PUBLICATIONS

Paper


Abstracts:


Effect of ripe fruit pulp extract of *Cucurbita pepo* Linn. in aspirin induced gastric and duodenal ulcer in rats

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Received 16 April 2007; revised 17 June 2008

A significant decrease in alkaline phosphatase (AP) activity and mucosal thickness and increase in ulcer index (UI) was observed in aspirin treated stomach and duodenum of albino rats. However, pretreatment with *C. pepo* fruit pulp extract for 14 consecutive days showed increase in AP activity and mucosal thickness along with decrease in UI, suggesting gastro-duodenal protective and anti-ulcerogenic properties of *C. pepo*.

**Keywords:** Alkaline phosphatase, Aspirin, *Cucurbita pepo*, Gastric and Duodenal ulcer, Mucosal thickness, Ulcer index

**Materials and Methods**

Animals—Inbred Holtzman strain adult albino rats (180-200g) of either sex were obtained from Indian Institute of Chemical Biology, Jadavpur, Kolkata, West Bengal and housed individually in a room (28°C; 60% RH with 12:12 hrs L:D cycle) and both the control and experimental rats were maintained on a daily schedule of standard laboratory diet. Drinking water was supplied *ad libitum*. Food intake (g/day/rat) and body weight of the rats were recorded daily and maintained throughout the experimental period. Experiments were carried out after the approval of the experimental design by the Animal Ethical Committee of the institute.

Preparation of extract—The ripe fruit of *C. pepo* was purchased locally and its identity was authenticated by the Botanical Survey of India, Howrah, West Bengal. The fruit kept at room temperature (28°C). During extraction, the outer surface of the ripe fruit was washed with distilled water, the bark was discarded and seeds were removed. The pulp (1 kg) was cut into pieces, sun dried and ground with the help of an electrical grinder to get a free flowing powder. This powder was subjected to extraction with water (1:3) at room temperature for 48 hrs then filtered through Whatman No.1 filter paper and vacuum dried in a lyophilizer at 40°-50°C. A viscous and sticky substance was obtained. It was kept in cold (4°C) and dissolved in

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*Cucurbita pepo* Linn. (*Cucurbitaceae*)¹, commonly known as pumpkin is available throughout India and consumed as vegetable in various parts of the world. Different parts of the plant have been used as medicine in Ayurveda. The pulp of ripe fruit of *C. pepo* is used to relieve intestinal inflammation or enteritis, dyspepsia² and stomach disorders³. Its pulp is used as dietary supplements for vitamin-A⁴ and is also used to treat liver disorder such as jaundice⁵.

Extensive pharmacological investigation led to isolation of several active compounds from *C. pepo* e.g. phenolic compound such as syringic acid⁶, cucurbitane and hexanocucurbitane glycoside such as cucurbitacin L 2-O-β-D-glucopyranoside and cucurbitacin K 2-O-β-D-glucopyranoside, 2, 6-dihydroxy-22, 23, 24, 25, 26, 27-hexanorcucurbit-5-en-11, 20-dione 2-O-β-D-glucopyranoside and 16-hydroxy-22, 23, 24, 25, 26, 27-hexanorcucurbit-5-en-11, 20-dione 3-O-α-L-rhamnopyranosyl-(1, 2)-β-D-glucopyranoside respectively⁷, β-carotene⁸, provitamin A carotenoids⁹, vitamins A¹⁰, vitamin E¹¹, vitamin C¹² and alkaloid such as tannin¹³. Some of these compounds have been reported to have a role in protection against gastric mucosal damage.

The present study has been undertaken to evaluate the role of the ripe fruit pulp of *Cucurbita pepo* against aspirin induced ulcer model as evidenced by alteration of the AP activity, mucosal thickness and ulcer index in aspirin induced gastric and duodenal ulcer in rats.
double distilled water for future use. The final yield was 29.3% (w/w).

**Animal treatment**

**Schedule I:** Preliminary studies were done for the selection of effective dose (ED) of ripe fruit pulp of *C. pepo* extract by evaluating the ulcer index (UI). Rats (42) were divided into 7 groups of 6 rats each. The control rats (group I) were fed orally with distilled water for 14 days and the experimental rats (groups II-VII) were treated with 200, 300, 350, 400, 450 and 500 mg/kg body weight of aqueous extract of *C. pepo* respectively, orally by orogastric cannula once daily for 14 consecutive days at a particular time (10:30-11:30 hrs every day). On the 14th day, after feeding the extract, the food was withdrawn but rats had free access to water. On the 15th day, aspirin (German-Remidies Ltd) was dissolved in distilled water and given to all groups of rat at a dose of 500 mg/kg body weight orally. After 4 hrs the experiment was terminated and rats were sacrificed by an overdose of thiopentone sodium (NEON, Laboratories Ltd, India).

**Ulcer scoring**—The stomach and duodenum were collected, opened along the greater curvature to expose the mucosal surface, stretched on a flat paraffin bed and washed with normal saline to remove the food particles to note the distribution of ulcers. The ulcer scoring was performed by the method of Szabo et al.

<table>
<thead>
<tr>
<th>Severity score</th>
<th>Ulcer type</th>
<th>Length of ulceration (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>no pathology</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>small ulcer</td>
<td>1-2</td>
</tr>
<tr>
<td>2</td>
<td>medium ulcer</td>
<td>3-4</td>
</tr>
<tr>
<td>4</td>
<td>large ulcer</td>
<td>5-6</td>
</tr>
<tr>
<td>8</td>
<td>larger ulcer</td>
<td>&gt;6</td>
</tr>
</tbody>
</table>

The sum of the total severity scores in each group of rats divided by the number of rats was expressed as the mean ulcer index (MUI).

**Dose selection**—The group which showed the lowest ulcer index (UI) was selected as the effective dose (ED) of *C. pepo*. In the present experiment, the dose of 400 mg/kg body weight showed the lowest UI after aspirin treatment and therefore all experiments were carried out with this dose.

**Schedule II:** Twenty four rats were divided into four groups of 6 rats each. Gr I animals comprised control group. Group II was *C. pepo* extract treated Group III was aspirin treated and Group IV was *C. pepo* pretreated and aspirin treated.

The dry extract was dissolved in distilled water for future use. Group I rats were given distilled water orally with approximately same volume of *C. pepo* extract. Group II and group IV rats were treated with select dose of *C. pepo* extract (400 mg/kg body weight) 1 orogastric cannula once daily for 14 consecutive days at a particular time (10:30-11:30 hrs) in every day. The 14th day, after feeding the extract, food was withdrawn from rats of group III and group IV but rats had free access to water. On the 15th day, aspirin (German-Remedies Ltd) was dissolved in distilled water and given at a dose of 500 mg/kg body weight orally and waited for 4 hrs, then procedure of the schedule I was followed for ulcer scoring as per the method of Szabo et al.

**Staining of alkaline phosphatase (AP) enzyme**—The stomach and duodenum tissues were processed for routine paraffin sections. The paraffin sections were stained by the modified calcium method of Gomori for AP activity.

**Mucosal thickness**—For determination of mucosal thickness 5 μm thick transverse sections of stomach and duodenum tissues were taken. The sections were stained with H & E. At least 10 determination of mucosal thickness was made on at least two sections from each specimen. The mucosal thickness of bo tissues was measured by a stage micrometer. Sections were examined with objective 10× (visual field diameter, 2.5mm) and eyepiece 5× (with scale b inserted).

**Statistical analysis**—All results were expressed as mean±SE. Comparisons of groups were evaluated by one-way ANOVA. The results were considered statistically significant when *P*<0.05.

**Results**

**Schedule I:**

**Ulcer index**—Aqueous extract of ripe pulp of *C. pepo* (200, 300, 350, 400, 450 and 500 mg/kg body weight) dose dependently decreased the ulcer index (Table 1). At lower doses of extract (200, 300 at 350 mg/kg body weight) the decrease was not statistically significant compared to aspirin treated group but at higher doses (400, 450 and 500 mg/kg body weight) it decreased the UI in the stomach as
duodenum tissues. The dose of 400 mg/kg body weight of *C. pepo* extract was most effective and thus this dose was selected for the following experiments.

**Schedule II:**

*Ulcer index*—Aspirin treated rats showed a significant increase in ulcer index as compared to control group but pretreatment with *C. pepo* pulp extract (400 mg/kg body weight) for 14 days in aspirin treated group showed a significant decrease in the UI as compared to aspirin treated group (Table 2).

**Alkaline phosphatase (AP) activity in stomach and duodenum**—Distribution of AP activity along the mucosal brush border of control stomach and duodenum tissues is shown Fig. 1 and Fig. 5 (arrows).

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**Table 1**—Effect of different dose of *C. pepo* extract on ulcer index of stomach and duodenum (Schedule I)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Stomach</th>
<th>Duodenum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group-I (Distilled water+ aspirin, 500 mg/kg)</td>
<td>41.19±0.69</td>
<td>31.55±1.07</td>
</tr>
<tr>
<td>Group-II (<em>C. pepo</em>, 200 mg/kg)+ aspirin (500 mg/kg)</td>
<td>27.76±0.24</td>
<td>20.76±0.25</td>
</tr>
<tr>
<td>Group-III (<em>C. pepo</em>, 300 mg/kg)+ aspirin (500 mg/kg)</td>
<td>14.76±0.23</td>
<td>10.86±0.28</td>
</tr>
<tr>
<td>Group-IV (<em>C. pepo</em>, 350 mg/kg)+ aspirin (500 mg/kg)</td>
<td>7.03±0.25</td>
<td>5.75±0.23</td>
</tr>
<tr>
<td>Group-V (<em>C. pepo</em>, 400 mg/kg)+ aspirin (500 mg/kg)</td>
<td>1.27±0.35*</td>
<td>1.58±0.51*</td>
</tr>
<tr>
<td>Group-VI (<em>C. pepo</em>, 450 mg/kg)+ aspirin (500 mg/kg)</td>
<td>1.25±0.30*</td>
<td>1.55±0.40</td>
</tr>
<tr>
<td>Group-VII (<em>C. pepo</em>, 500 mg/kg)+ aspirin (500 mg/kg)</td>
<td>1.20±0.10</td>
<td>1.35±0.35</td>
</tr>
</tbody>
</table>

Statistical analysis was done using one way ANOVA multiple comparison /-tests. P<0.05, when compared to *(Distilled water+ aspirin) in which maximum ulceration was produced.

**Figs 1 and 2**—1, Alkaline phosphatase activity (arrow) of mucosal brush border of glandular part of control stomach tissues (x100). 2, Epithelial lining of glandular part of *C. pepo* extract treated stomach tissues [arrow shows an increased AP activity at luminal brush border as compared with control group] (x100).

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**Table 2**—Effect of *C. pepo* extract on ulcer index and mucosal thickness of stomach and duodenum tissues (Schedule II)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Ulcer index</th>
<th>Mucosal thickness (μm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stomach</td>
<td>Duodenum</td>
</tr>
<tr>
<td></td>
<td>Stomach</td>
<td>Duodenum</td>
</tr>
<tr>
<td>Group I (Control, distilled water)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Group II (<em>C. pepo</em>, 400 mg/kg)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Group III (aspirin, 500 mg/kg)</td>
<td>41.16±0.65*</td>
<td>31.00±1.06*</td>
</tr>
<tr>
<td>Group IV (<em>C. pepo</em>, 400 mg/kg) + aspirin (500 mg/kg)</td>
<td>1.16±0.30°</td>
<td>1.5±0.50°</td>
</tr>
</tbody>
</table>

*Statistical analysis was done using one way ANOVA followed by multiple comparison /-tests. P<0.05, when compared to *(Distilled water+ aspirin) in which maximum ulceration was produced.*

*One way ANOVA; *, # significantly different from group I (control) and group III (aspirin) respectively at P<0.05.*
Figs 3-8—3, Epithelial lining of glandular part of aspirin treated stomach tissues that decreased AP activity at luminal brush border as compared with control group (arrow) (x100). 4, Epithelial lining of glandular part of *C. pepo* aspirin treated stomach tissues [arrow shows the decreased AP activity at luminal brush border as compared with control group (x100)]. 5, AP activity of mucosal brush border of normal duodenum tissues (arrow) (x100). 6, Epithelial lining of *C. pepo* extract treated duodenum tissues [arrow shows an increased AP activity at luminal brush border as compared with control group] (x100). 7, Epithelial lining of aspirin treated duodenum that decreased AP activity at luminal brush border as compared with control group (arrow) (x100). 8, Epithelial lining of *C. pepo* aspirin treated stomach tissues [arrow shows the decreased AP activity at luminal brush border as compared with control group] (x100).
respectively. Black color reaction products were precipitation of cobalt sulfide (CoS).

After C. pepo extract (400 mg/kg body weight) treatment both the stomach (Fig. 2) and duodenum (Fig. 6) showed increased AP staining reaction products throughout the epithelial layer as compared to control stomach (Fig. 1) and duodenum (Fig. 5) respectively.

The AP activity diminished along the mucosal brush border in the aspirin treated stomach (Fig. 3) and duodenum (Fig. 7) tissues as compared to control stomach (Fig. 1) and duodenum (Fig. 5). A small amount AP reaction product was found in both aspirin treated stomach (Fig. 3) and duodenum (Fig. 7) tissues.

After C. pepo treatment, aspirin treated stomach (Fig. 4) and duodenum (Fig. 8) also showed the endogenous AP staining reaction products though less as compared to only C. pepo treated stomach (Fig. 2) and duodenum (Fig. 6) respectively.

Mucosal thickness—Treatment with C. pepo extract (400 mg/kg body weight) increased the mucosal thickness of both stomach and duodenum tissues as compared to control but the increase was not statistically significant. Aspirin treated group showed a significant decrease of mucosal thickness as compared to control group. But after pretreatment with C. pepo for 14 days, aspirin showed a significant increase of mucosal thickness as compared to aspirin treated group (Table 2).

Discussion

Analysis of the results showed that aspirin produced extensive increase in ulcer index (UI), decrease in mucosal thickness (MT) and decrease in alkaline phosphatase (AP) activity in rat stomach and duodenal tissues. The decrease of AP activity seems to be a general property of all chemicals which are known to provoke severe ulcer. The activity of AP may be relevant to duodenal ulcer pathogenesis or healing19. The pathophysiology of experimental peptic ulcer formation is not well known20 but is believed to be multifactorial21. Factors like increase in acid secretion, reduction of gastric mucosal blood flow, inhibition of prostaglandin synthesis, disruption of mucosal barrier, inhibition of mucus and bicarbonate secretion in the gastro-duodenal mucosa have been suggested22.

The pathogenesis of ulcer disease is believed to reflect an imbalance between increased aggressive factors and decreased protective factors24. The decreased AP activity imbalances are one of the first lines of defense protecting the gastro-duodenal mucosa and the mucus bicarbonate barrier overlaying the epithelium25. The increase in UI, decrease in MT and decrease in AP activity observed in the present study after aspirin may be due to failure in gastro-protective and repair mechanisms leading to disrupted mucosal barrier26.

Pretreatment with C. pepo (200, 300, 350, 400, 450 and 500 mg/kg body weight) showed that 400 mg/kg body weight dose was the most effective dose and significantly decreased UI, increased MT and AP activity in all rats treated with aspirin. The ability of gastric mucosa to resist injury by ingested irritants (aspirin) is attributed to number of factors that have been referred to collectively as mucosal defense27. The gastric mucosal lesions induced by necrotizing agents such as aspirin, ethanol and strong alkalis are due to depression of this defense mechanism27.

The protective activity such as decrease in UI, increase in MT and increase in AP activity of C. pepo may be associated with correction or normalization of the altered balance between aggressive activity and defensive gastric mucosal activity. Gastric adherent mucus is thought to play an important role as a defensive factor against mucosal damage28.

In the present investigation, C. pepo caused a significant enhancement of gastric adherent mucus which plays an important role as a defensive factor against mucosal damage, thus confirming the ability of C. pepo to prevent the effects of damaging agents. These findings indicate that C. pepo pulp extract strengthens the gastric mucosal defense factors in experimental rats.

The chemical constituents of ripe fruit pulp of C. pepo responsible for its anti-ulcer activity are not known. However, pharmacological investigations have suggested the presence of several major groups of active compounds in C. pepo pulp such as syringic acid8, cucurbitane-type triterpenes and hexanocucurbitane glycoside such as cucurbitacin L and cucurbitacin K7, beta-carotene8, pro-vitamin A carotenoids5, vitamins A10, vitamin E11 and vitamin C12 and alkaloid such as tannin13. Some of these components including vitamin E31, triterpenes and...
glycosides have been reported to have a role in protection against gastric mucosal damage.

Vitamin E and C play an important role in the reduction of pathogenesis of ulcer formation by probably reducing the ischemia. The deficiency of dietary vitamin E reduces the synthesis of arterial prostaglandin significantly which may trigger ulcer formation.

Thus, it may be suggested that pre-treatment of C. pepo may prevent the gastric mucosal damage by aspirin increasing PGE2 level or by reducing the ischemia which may be due to the presence of vitamin E and C in the pulp of C. pepo.

However, various antioxidant phenolic compounds such as tannin, vitamin C and E, triterpenes and glycosides have been identified as free radicals or active oxygen scavengers present in C. pepo which may be responsible for reduced UI and increase in MT.

Both clinical observations on humans and experimental studies on animals suggest a protective action of vitamin A against gastric ulcer induced either by stress or by well-known gastric-offensive agents like non-steroidal anti-inflammatory drugs (NSAIDs). The ability of C. pepo to protect the mucosa against lesions induced by aspirin (NSAIDs) as seen by the decreased in UI is likely by maintaining the structural integrity of gastric epithelium and balance of aggressive factors and inherent protective mechanism. Further, the mucus gel and its bicarbonate gradient together with the alkaline environment maintained by AP activity seem to be an important first line defense against harmful stimuli.

The exact mechanism by which C. pepo acts is not definitely known. It may be that vitamins C and E in C. pepo may reduce the local ischemia and may modulate the prostaglandin synthesis hereby increasing the mucosal defense mechanism. The AP present in the gastric mucosa and duodenal mucosal brush border may hydrolyze the phosphate ions (PO$_4^{2-}$) from the ATP molecules. The phosphate ions (PO$_4^{3-}$) thus liberated may activate the P$_2$ receptors to secrete more bicarbonate ions (HCO$_3^-$) thus alkalizing the microclimate surrounding the AP and increasing its activity. The increased alkaline microclimate helps in the rapid regeneration of the denuded mucosal barrier and decreases the UI and increases the MT and AP activity.

In conclusion, C. pepo pulp extract exhibits a potential protective activity possibly by increasing the mucosal defensive mechanism by the presence of vitamin A, C and E or through the triterpenes, glycosides and tannin which exhibit antioxidant activity.

Acknowledgement

Thank are due to Rajiv Gandhi National Foundation (RGNF) for Rajiv Gandhi National Fellowship to Sentu Sarkar.

References

3. Lanz C, Comparison of plants used for skin and stomach problems in Trinidad and Tobago with Asian ethnomedicine, J Ethnobiol Ethnomed, 3 (2007) 3.


Alteration of alkaline phosphatase activity of gastric tissue following pretreatment of *Cucurbita pepo*

Sentu Sarkar & Debjani Guha.

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Alkaline Phosphatase (AP) is an enzyme localized in the cell membranes of intestine, stomach, kidney and other tissues. This enzyme, a maker of mucosal bicarbonate (HCO$_3^-$) transport mechanism is also an indicator of the cell activity of the tissues. The changes of AP activity is a general property of all chemicals which are known to provoke severe ulcers. In the present study the effect of aqueous extract of *Cucurbita pepo* (CP) pulp (400mg/kg body wt/P.O.) was studied on aspirin induced gastric ulcer of Holtzman-strain adult albino rats of either sexes. Histomorphological study of AP activity (Gomori-1952) in control rats was compared with that of aspirin, CP and CP+aspirin treated rat stomach. Results showed that aspirin destructed the mucosal brush border a significant fall of AP activity whereas pretreatment with CP showed a marked increase of AP activity in the mucosal brush border. However pretreatment with CP in aspirin treated stomach also showed an increase of AP activity though less compared to CP alone. Thus suggesting a cytoprotective effect of *Cucurbita pepo* in the aspirin induced gastric ulcer.

Key words: Aspirin, ulcer, *Cucurbita pepo*, Alkaline phosphatase.
12. Cytoprotection of Asprin Induced Gastric Ulcer by *Cucurbita pepo*

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Kolkata-700 020.

**Key words:** Aspirin, Cytoprotection, Cucurbita pipo, Gastric ulcer

The cytoprotective effect of *Cucurbita pepo* pulp extract (400 mg/kg body weight, p.o) was studied using aspirin induced gastric ulcer in adult albino rats (Holtzman strain) of either sexes. The gastric ulcer score, changes of the mucosal layer, EC cells count and estimations of stomach serotonin levels were made using standard methods. The gastric lesions were mainly observed in the glandular portion of the stomach in aspirin treated animals. Aspirin destructed the mucosal lining of the gastric tissue together with a decrease in the EC cell count and 5-HT content of the stomach. On the other hand pre-treatment with extract the ulcer index significantly decreased and the EC cells and 5-HT content of gastric tissues increased in aspirin treated animals. Thus suggesting a protective effect of C.P in aspirin treated animals possibly by modulating the EC cells and the serotonin level of the gastric tissues.
GASTROPROTECTIVE EFFECT OF FRUIT PULP OF *Cucurbita pepo* ON ASPIRIN INDUCED ULCERATED MUCOSAL THICKNESS AND ULCER INDEX.

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The mucosal thickness is the measurement of the length of mucosal layer of stomach tissue from muscularis mucosa to the tip of the mucosal brush border of the epithelial layer. The reduction of mucosal thickness causes gastric ulcer. In the present study, the effect of fruit pulp of *Cucurbita pepo* (mg b.w.) was studied on aspirin induced gastric ulcer. Holtzman strain adult albino rats of either sex were used to study the changes of ulcer index and mucosal thickness. Histomorphological parameters of ulcer index and mucosal thickness in control rats were compared with that of aspirin, *C. pepo* and *C. pepo* + aspirin treated rat stomach. Results showed that aspirin destructed the mucosal brush border of the epithelial layer as well as significantly increased the ulcer index and significantly decreased the mucosal thickness whereas treatment with *C. pepo* extract for 14 consecutive days showed a significant decrease of ulcer index and concomitantly a significant increase of the mucosal thickness. Pretreatment with *C. pepo* in aspirin treated stomach showed a reduction of ulcer index and an increase of the mucosal thickness though less as compared to *C. pepo* alone. This suggests that the extract of fruit pulp of *C. pepo* may act as Gastroprotective and antiulcerogenic.

Key words: *Cucurbita pepo*, aspirin, ulcer index, mucosal thickness.
Pumpkin a day

Megha Prakash

Keeps ulcer at bay

PEOPLE suffering from stomach ulcers may now look for a cure in their kitchen garden. Scientists at the S N Pradhan Centre for Neurosciences, University of Calcutta, say pumpkin (Cucurbita pepo) has medicinal properties that protect against peptic ulcers.

Excessive acid secretion often damages mucosal lining of the digestive tract, particularly of stomach and duodenum, resulting in ulcers. Drugs used to treat the ailment are considered the best sellers in the market.

Various systems of traditional medicine claim the use of pumpkin seeds and pulp for treating liver and gastric disorders like inflammation and dyspepsia. The vegetable is also rich in vitamins A, B, C and E and its anti-oxidant property is well established.

Debjani Guha and her colleagues tried to find out how these protective properties of pumpkin also help increase the defensive mechanism of mucosal lining and heal ulcerated tissues. To evaluate the properties, the team tried ripe pumpkin pulp extract on rats. The scientists fed them with the extract for 14 days and then gave aspirin to induce ulcer. The stomach lining of the rats that fed on pumpkin pulp extract showed fewer ulcers. The team observed that the extract triggered the activity of alkaline phosphatase—a key enzyme in the mucosal lining that slows down in the presence of ulcer-inducing chemicals. The scientists also reported less acid secretion in the digestive tract and thickening of the mucosal lining in the Indian Journal of Experimental Biology (volume 46) in September.

“To treat peptic ulcers, we prescribe acid suppressant drugs to patients, with supplements of vitamins A, B and C. Any drug or food product that helps in thickening of the mucosal lining may help in healing ulcers,” said G C Singhal, former physician at Ram Manohar Lohia hospital, New Delhi.

The findings are important, said Guha, because a widely consumed vegetable like pumpkin has been found effective in protecting from a common ailment like ulcer.

Halloween pumpkin seeds health benefits

Posted in Health, Science at 6:35 pm by David Bradley -- 5 Comments; add your comment

Wondering what to do with all those seeds hacked from the orange flesh of your halloween pumpkin? You could try eating them, especially if you're on a low-protein diet or likely to be exposed to the organic solvent carbon tetrachloride (tetrachloromethane)?

According to researchers in South Africa, pumpkin seeds can protect the liver from the harmful effects of protein deficiency and exposure to hepatotoxins such as carbon tet.

The seeds of the pumpkin (Cucurbita pepo) contain a protein that is a potent antioxidant according to SE Terblanche and colleagues at the University of Zululand in KwaDlangezwa.

The researchers tested the effects of protein isolate on blood plasma levels of certain enzymes including catalase, superoxide dismutase, and glutathione peroxidase, and on total antioxidant capacity in the liver of rats fed a low protein diet that were exposed to carbon tetrachloride.

They report that, "From the results of the present study it is concluded that pumpkin seed protein isolate administration was effective in alleviating the detrimental effects associated with protein malnutrition and carbon tetrachloride intoxication." Terblanche and colleagues explain that this indicates that pumpkin seed protein isolate has powerful antiperoxidative properties.

Details of the research appears in the November issue of the journal Phytotherapy Research, 2006, 20(11), 935-940.

Of course, swallowing a handful of pumpkin seeds is not really going to provide adequate protection against...
Halloween pumpkin seeds health benefits — Sciencebase Science Blog

Ingestion of carbon tetrachloride, so please don’t make it a Halloween chaser.

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- Disney Coupons
- Brain protein unlocked
- Expanding proteins

Newsfeed

5 Responses to “Halloween pumpkin seeds health benefits”

5 Beatrice Says:
November 26th, 2008 at 7:34 pm

Is it true that Halloween Pumpkin Seeds contains antioxidants? Then it must be a good news for those people who are pro-anti aging.

4 David Bradley Says:
October 31st, 2008 at 5:29 pm

A paper just out in the journal Indian J Exp Biol. 2008 Sep;46(9):639-45 entitled “Effect of ripe fruit pulp extract of Cucurbita pepo Linn. in aspirin induced gastric and duodenal ulcer in rats.” by Sarkar S, Buha D. of the S.N. Pradhan Centre for Neurosciences, University of Calcutta 244B, A.J.C. Bose Road, Kolkata 700 020, India, claims benefits in stomach ulcer of C. pepo

“A significant decrease in alkaline phosphatase (AP) activity and mucosal thickness and increase in ulcer index (UI) was observed in aspirin treated stomach and duodenum of albino rats. However, pretreatment with C. pepo fruit pulp extract for 14 consecutive days showed increase in AP activity and mucosal thickness along with decrease in UI, suggesting gastroduodenal protective and anti-ulcerogenic properties of C. pepo.”

3 David Bradley Says:
October 31st, 2008 at 5:24 pm

I prefer acorn squash, myself ;-

2 Kim Woodbridge Says:
October 31st, 2008 at 5:16 pm

We wash them, let them dry out and then roast them in the oven. Delicious!!

1 sciencebase Says:
October 30th, 2006 at 8:34 pm

Antioxidative Role of Aegle marmelos in Peptic Ulcer

The extracts of leaves of AM exhibited cardiac stimulant action on frog's heart (Harvey, 1968). Marmelosin, isolated from the bael plant possesses anthelmintic and antibacterial activity (Haider et al., 1991). The bael plant extract is found to have remedial use in snakebite (Mhaskar and Cains, 1931). Aqueous fruit extracts of AM have anti hyperlipidaemic and antioxidative activity in streptozotocin induced diabetes in rats (Kamalakkannan et al., 2005). The hydroalcoholic extract of leaves of AM are found to be effective in inducing biotransformation enzyme system and protects against free radical mediated damage in mice (Singh et al., 2000).

Therefore, the present study was conducted to evaluate the anti ulcerogenic effect of aqueous extract of ripe fruit pulp of AM in terms of its antioxidant status on aspirin induced peptic ulcer.

MATERIALS AND METHODS

Plant Material

Ripe fruit pulp of AM was identified and authenticated by the Botanical Survey of India, Howrah. The pulp was taken out and strained through wire-mesh, sun dried and powdered in an electric grinder. The crushed powder was then soaked in distilled water for 24 hours. The extract obtained was filtered through Whatman filter paper and vacuum dried at 4°-50°C to get a dry powder and it was stored at -4°C for further use.

Chemicals

Aspirin and mercaptoethanol were purchased from SRL, India. 5, 5'-Di thio bis (2-nitrobenzoic acid) (DTNB) was purchased from Sigma, USA. Trichloroacetic acid (TCA) and H2O2 were obtained from Ranbaxy Fine Chemicals Ltd., India. All other chemicals were obtained from Merck, India.

Animals

Holtzman strain male adult albino rats weighing 175-210g were used throughout the experiment. They were maintained under standard laboratory conditions (22°-28°C, 60-70% relative humidity, 12 hour light/dark cycle) with standard pellet diet (Mis. Hindustan Lever Ltd., India) and water ad libitum. Body weights of the rats were recorded everyday and maintained throughout the experimental period. The experiments were carried out as per the regulation of the Institutional Animal Ethical Committee.

Experimental Protocol

Schedule I: This forms the preliminary study for the standardization of dose. Animals were divided into control (Group 1) and experimental (Group 2, 3, 4, 5, 6, 7 and 8) Group of 6 rats each. Rats of Group 1 were treated with distilled water (2ml/kg) for a period of 14 days. Group 2, 3, 4, 5, 6, 7 and 8 rats received the aqueous extract of AM ripe fruit pulp (50, 100, 200, 250, 300, 350, 500 mg/kg body weight, respectively) once daily for 14 consecutive days orally by orogastric cannula between 10:30am - 11:30am. The animals were kept fasting for 48 hours prior to the experiment but water was permitted ad libitum. On the 15th day aspirin (SRL, India) at a dose of 500-mg/kg body weight was given orally (Bose et al., 2003). The rats were sacrificed after 4 hours and ulcers were scored (Szabo et al., 1985). This study showed prevention of aspirin induced gastro-duodenal ulceration by the ripe fruit pulp extract of AM (dose-dependently), maximum prevention being at a dose of 250mg/kg. Thus, this preliminary study in Schedule I suggested that aqueous extract of ripe fruit pulp of AM at a dose of 250 mg/kg body weight given orally for 14 days appears to be more effective in preventing aspirin induced gastroduodenal lesion. Therefore, this dose was chosen as optimum dosage for further studies in Schedule II.
Schedule II: The rats were divided into six groups of 6 animals each. The animals were kept fasting for 48 hours prior to the experiment but water was permitted ad libitum.

Group A: Normal Control (No treatment)

Group B: Sham Control (distilled water 2ml/kg body weight for 14 days)

Group C: Animals received aqueous extract of ripe fruit pulp of AM. at a dose of 250mg/kg-body weight/day orally for 14 consecutive days

Group D: Animals received aspirin 500mg/kg body weight (suspended in 2ml distilled water) orally

Group E: Animals received aspirin 500mg/kg body weight (suspended in 2ml distilled water) orally + pretreatment with aqueous extract of ripe fruit pulp of AM. at a dose of 250 mg/kg body weight/day orally for 14 consecutive days

Group F: Animals received aspirin 500mg/kg body weight (suspended in 2ml distilled water) orally + pretreatment with ranitidine (50 mg/kg body weight)

Dosage and Treatment

Animals were given aqueous extract of ripe fruit pulp of AM at a dose of 250mg/kg, once daily for 14 consecutive days orally by using an orogastric cannula between 10:30 am-11:30 am. Ranitidine was used as reference drug. Animals of reference group received ranitidine at a dose of 50 mg/kg-body weight (Ajaikumar et al. 2005) for 14 consecutive days.

Preparation of ulcer model

After the experimental period, animals were fasted for 24 hours and were given aspirin (500mg/Kg body weight) dissolved in distilled water orally by an orogastric cannula (Bose et al. 2003). The rats were sacrificed after 4 hours of aspirin administration.

Evaluation of ulcer status

Measurement of Mean ulcer index:

After sacrificing the rats, stomach and duodenum were removed and opened along the greater curvature. The stomach and duodenum were washed in saline and the severity of the hemorrhagic erosions in the acid secreting glandular mucosa was assessed on a scale of 0 = normal, 1 = small ulcer (1-2mm), 2 = medium ulcer (3-4mm), 4 = large ulcer (5-6mm), 8 = large ulcer (>6mm) (Szabo et al. 1985).

Determination of percentage protection:

Protection by AM ripe fruit pulp extract is determined using the following formula (Njir et al. 1995):

\[
\% P = \left(\frac{UI_{Asp} - UI_{Extract treated}}{UI_{Asp}}\right) \times 100
\]

Biochemical Estimation

For biochemical estimation, stomach and duodenal tissues were taken separately, weighed and homogenized in ice-cold phosphate buffer (pH 7.4) and prepared for biochemical estimation.

Lipid peroxidation (LPO):

Stomach and duodenal tissues were homogenized separately in 5 ml cold phosphate buffer and then taken for estimation of LPO spectrophotometrically in terms of thiobarbituric acid reactive species (TBARS) (Rehncrona et al. 1980).
Reduced glutathione (GSH) level:
Stomach and duodenal tissues were homogenized separately in phosphate buffer in cold condition and taken for the estimation of reduced glutathione spectrophotometrically following the reduction of DTNB (Ellman, 1959).

Superoxide dismutase (SOD): Stomach and duodenal tissues were homogenized separately in cold phosphate buffer. 0.1 ml-homogenized samples were taken for estimation of SOD spectrophotometrically (Marklund and Marklund, 1974)

Catalase (CAT): Stomach and duodenal tissues were homogenized separately in 5 ml cold phosphate buffer and processed for the estimation of Catalase spectrophotometrically following decomposition of H$_2$O$_2$ (Aebi, 1974).

Statistical analysis
Students-t test was done for statistical evaluation of the data and for the determination of level of significance in various groups of animals. The values given in the Table are Mean ± SEM. Values were considered significant at the level p<0.05.

RESULTS

Effect of AM on Ulcer index
Ulcer induced by aspirin (NSAIDs), was protected by oral administration of aqueous extract of ripe fruit pulp of AM at a dose of 250 mg/kg body weight daily, for 14 consecutive days, compared to the ulcerated group (Table 1). The extract treatment, showed significant reduction in the ulcer index (2.67±0.67 in stomach and 1.33±0.49 in duodenum) and also protected the ulcer (93.09% in stomach and 81.86% in duodenum).

Effect of AM on LPO
The level of lipid peroxide (TBARS) was reduced significantly (Tables 2 and 3) in the gastro-duodenal tissue, on oral administration of ripe fruit pulp extract of AM for 14 consecutive days to the ulcerated group of rats compared to the aspirin induced ulcerated group.

Effect of AM on SOD
SOD activity in gastro-duodenal tissue was reduced significantly in aspirin induced ulcerated group. However, oral administration of aqueous extract of AM ripe fruit pulp to the experimentally ulcerated group increased (Tables 2 and 3) the SOD activity (4.51±0.29 units/mg protein in stomach and 2.17±0.19 units/mg protein in duodenum).

Effect of AM on CAT
Tables 2 and 3 show that oral administration of AM for 14 days (250 mg/kg body weight) to the experimental group of rats significantly increased the Catalase activity (5.04±0.34 μmole H$_2$O$_2$/mg protein in stomach and 2.17±0.22 μmole H$_2$O$_2$/mg protein in duodenum) compared to the untreated ulcerated group.
ANTIOXIDATIVE ROLE OF Aegle marmelos IN PEPTIC ULCER

Effect of AM on GSH level

A significant (p<0.05) increase in the level of reduced Glutathione in stomach and duodenal tissue was observed (Tables 2 and 3) in the group of rats treated with AM for 14 days compared to the untreated ulcerated group.

TABLE - 1
Effect of AM on gastro-duodenal lesion

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Mean ulcer index</th>
<th>% P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stomach</td>
<td>Duodenum</td>
</tr>
<tr>
<td>Group A (Control)</td>
<td>No lesion</td>
<td>No lesion</td>
</tr>
<tr>
<td>Group B (Sham)</td>
<td>No lesion</td>
<td>No lesion</td>
</tr>
<tr>
<td>Group C (AM)</td>
<td>No lesion</td>
<td>No lesion</td>
</tr>
<tr>
<td>Group D (Asp)</td>
<td>38.67±2.74</td>
<td>7.33±0.98</td>
</tr>
<tr>
<td>Group E (Asp + AM)</td>
<td>2.17±0.67***</td>
<td>1.83±0.49***</td>
</tr>
<tr>
<td>Group F (Asp + Ran)</td>
<td>3.33±0.6***</td>
<td>2.5±0.43***</td>
</tr>
</tbody>
</table>

Ulcer index values are Mean ± SEM, n=6

*** p <0.05 when compared with Asp group

IND. J. PHYSIOL. & ALLIED SCI, 2008
TABLE-2
Effect of aqueous extract of ripe fruit pulp of AM on stomach tissue

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Group A (Control)</th>
<th>Group B (Sham)</th>
<th>Group C (AM)</th>
<th>Group D (Asp)</th>
<th>Group E (Asp + AM)</th>
<th>Group F (Asp + Ran)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPO (nmole TBARS/g tissue)</td>
<td>4.05±0.14</td>
<td>4.57±0.26*</td>
<td>4.25±0.32</td>
<td>8.9±0.51*</td>
<td>6.02±0.35**</td>
<td>5.26±0.81&quot;</td>
</tr>
<tr>
<td>SOD (units/mg protein)</td>
<td>4.85±0.61</td>
<td>4.99±0.36*</td>
<td>5.01±0.44*</td>
<td>2.75±0.37&quot;</td>
<td>4.51±0.29&quot;</td>
<td>4.3±0.29&quot;</td>
</tr>
<tr>
<td>CAT (μmole H₂O₂/mg protein)</td>
<td>3.97±0.13</td>
<td>3.68±0.38*</td>
<td>4.11±0.19*</td>
<td>2.09±0.18*</td>
<td>5.04±0.34**</td>
<td>5.34±0.20&quot;</td>
</tr>
<tr>
<td>GSH (nmole/g tissue)</td>
<td>4.84±0.49</td>
<td>4.41±0.39*</td>
<td>4.68±0.52*</td>
<td>2.67±0.31*</td>
<td>4.49±0.38**</td>
<td>4.34±0.26**</td>
</tr>
</tbody>
</table>

Values are Mean ± SEM, n=6
* p<0.05 when compared with Control group
** p<0.05 when compared with Asp group
# Non-significant when compared with Control group

Vol. LXII, No. 1. 11
Effects of aqueous extract of ripe fruit pulp of Aegle marmelos in duodenal tissue

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Group A (Control)</th>
<th>Group B (Sham)</th>
<th>Group C (AM)</th>
<th>Group D (Asp)</th>
<th>Group E (Asp + AM)</th>
<th>Group F (Asp + Ran)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPO (nmole TBARS/g tissue)</td>
<td>2.14±0.11</td>
<td>2.35±0.13*</td>
<td>2.18±0.16*</td>
<td>4.52±0.28*</td>
<td>3.01±0.17**</td>
<td>2.62±0.41**</td>
</tr>
<tr>
<td>SOD (units/mg protein)</td>
<td>2.42±0.19</td>
<td>2.37±0.34*</td>
<td>3.06±0.28*</td>
<td>1.73±0.15*</td>
<td>2.14±0.19**</td>
<td>2.91±0.33**</td>
</tr>
<tr>
<td>CAT (μmole H2O2/mg protein)</td>
<td>2.42±0.21</td>
<td>2.49±0.35*</td>
<td>2.61±0.19*</td>
<td>1.51±0.12*</td>
<td>2.17±0.22**</td>
<td>2.62±0.25**</td>
</tr>
<tr>
<td>GSH (nmole/g tissue)</td>
<td>3.04±0.15</td>
<td>2.97±0.17*</td>
<td>3.05±0.15*</td>
<td>1.23±0.12*</td>
<td>2.56±0.34**</td>
<td>2.59±0.52**</td>
</tr>
</tbody>
</table>

Values are Mean ± SEM. * p<0.05 when compared with Ctrl group. ** p<0.05 when compared with Asp group. # Non-significant when compared with Control group

DISCUSSION

Aspirin induces the reactive oxygen metabolites in animal models, which may contribute to mucosal injury (Alindon et al, 1996). ROS decreases the levels of endogenous antioxidants, such as GSH, alpha-tocopherol and ascorbate and make the mucosa more prone to oxidative damage (Phull et al, 1995). A large number of reports have demonstrated that most of the injury of gastric mucosa can be reduced by pretreatment with scavengers of reactive oxygen species (Goel et al, 2001). In the present study, Aegle marmelos extract treated group showed a significant reduction in ulcer index as compared to aspirin induced ulcerated group and the recovery was found to be about 93.09% in stomach and 81.86% in duodenum, thus revealing the protective role of ripe fruit extract of AM against gastric mucosal lesions in aspirin induced ulceration in rats.
Antioxidative Role Of Aegle marmelos In Peptic Ulcer

NSAIDs inhibit gastric peroxidase and increase mucosal H$_2$O$_2$ and OH$^-$ level to cause oxidative mucosal damage (Banerjee, 1990). This OH$^-$ causes lipid peroxidation and increases gastric lesions induced by aspirin (Pihan et al., 1987). These lipid peroxidations cause decrease in the levels of GSH in the gastric mucosa. Pretreatment with the extract of ripe fruit pulp of Aegle marmelos decreased the lipid peroxidation level in gastro-duodenal tissue as evidenced from the results. Thus, the extract protects the gastro-duodenal tissue against aspirin induced ulcer possibly by blocking lipid peroxidation and scavenging the ROS formation. It has been reported that extracts of Aegle marmelos reduce blood glucose, plasma thiobarbituric acid reactive substances, hydro peroxides, ceruloplasmin and alpha-tocopherol and elevates plasma reduced glutathione and vitamin C (Karnalakkannan et al., 2003). SOD and CAT enzymes are highly specific in their catalytic mode of actions and it decreases the gastric mucosal damaging effect of aspirin (Haliwall and Gutteridge, 1983). The protective effect of the extract may also be due to the increase in SOD and CAT activity as is revealed by the experimental observation. The extracts of leaves of Aegle marmelos effectively induce the activity of antioxidant enzymes-SOD and CAT in forestomach (Singh et al., 2000). This clearly suggests the antioxidant activity of aqueous extract of ripe fruit pulp of Aegle marmelos as one of the important defensive factors involved in its ulceroprotective effect.

Moreover, excessive peroxidation causes increased glutathione consumption (Banerjee et al., 1994). Pretreatment with the extract to the ulcerated rats maintained the normal level of reduced glutathione in the tissue. This may be another mechanism to decrease lipid peroxidation. It has been suggested that free radical scavenging and antioxidant activities play an important role in prevention of free-radical related diseases, including aging and ulcer (Packer, 1995; Harman, 2001). The observed cytoprotective and antioxidative activity of the extract is attributed to the presence of biologically active phytoconstituents having antioxidative nature. In the present study, AM extract treated group of animals showed a significant decrease in lipid peroxidation levels and an increase in SOD, CAT and GSH activities. Thus, from the study it is evident that the aqueous extract of ripe fruit pulp of Aegle marmelos exerts its therapeutic action on aspirin induced peptic ulcer by its antioxidant property.

ACKNOWLEDGEMENT

Purnima Singh was the recipient of NTRF fellowship and Sentu Sarkar was the recipient of Radha Rani Das fellowship during the preparation of the manuscript.

REFERENCE


Antioxidative Role of Aegle marmelos in Peptic Ulcer


ANTIOXIDATIVE ROLE OF AEGLE MARMELOS IN PEPTIC ULCER


Vol. LXII, No. 1.
Effect of Oral Administration of *Moringa oleifera* Root Extract on Blood Glucose Level of Experimental Diabetic Rats

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Although modern medicines may be available, due to socio-economical, cultural and historical reasons, herbal medicines have maintained their importance. Diabetes mellitus is a disorder of impaired carbohydrate metabolism with varied systemic effects. It is one of the most prevalent chronic diseases in the world affecting nearly 25% of the population. The present investigation was undertaken to evaluate the hypoglycemic effects of an aqueous extract of *Moringa oleifera* roots, an indigenous plant used in Ayurvedic medicine in India. Oral administration of the extract of *Moringa oleifera* (350mg/kg) caused a significant reduction in blood sugar level of alloxan induced diabetic rats. Thus *Moringa oleifera* has the hypoglycemic activity on the alloxan induced diabetic rat.

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**Gulnar Farsi (Punica granatum abortive Flower) in Classical Literature of Unani System of Medicine**

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Unani system of medicine plays an important role in health care of masses in India and abroad. There are many plant derived drugs which are being used in treatment of diabetes. Gulnar (*Punica granatum abortive flower*) is one of them. The details of its efficacy will be described.
I. NEUROSCIENCE

1. Modification of Apomorphine—Induced Behaviour by *Acorus calamus* and Interaction with Brain Dopamine Level

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Effect of *Acorus calamus* root extract (200mg/kg body weight, p.o.) on apomorphine induced stereotype behaviour and brain dopamine (DA) level were studied in Holtzman strain adult albino rats of either sexes. The stereotype behaviours were scored by the method of Dey *et al* (1992) and studied by the open field experiment. The estimation of brain DA was done by the modified method of Amar *et al* (1982).
The results showed that Acorus calamus significantly (p<0.05) decreased the apomorphine-induced stereotype behaviour together with a significant decrease (p<0.01) in the DA level in the cerebral cortex, midbrain, cerebellum and caudate nucleus. Horvitz and Eyery (2000) reported that reduction in brain DA activity produce reduction in movement. The increased locomotor activity and stereotype behaviour is generally attributed to the interaction of apomorphine with DA receptors located in discrete areas of brain. Apomorphine has a direct action on D_1 and D_2 receptors agonist. DA acts as an inhibitory neurotransmitter in various parts of the brain especially in basal ganglion region. For motor control, the basal ganglia and the cortico-spino-cerebellar system should work in tandem. For optimal control, interaction of the basal ganglion with the motor cortex, thalamus, caudate nucleus, putamen, brain stem and cerebellar circuitry is essential. Thus, the motor stimulant effect of apomorphine was inhibited by Acorus calamus and the response may be mediated by activation of DA in the discrete areas of brain and in the pre-synaptic areas resulting in inhibition of synthesis and release of DA at the synaptic cleft. It can be concluded that Acorus calamus modulates the stereotype behaviour by influencing the brain dopaminergic system.

2. Central Inhibitory Effect of Moringa oleifera Root Extract

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