

Antiulcerogenic activity of *Elettaria cardamomum* Maton. and *Amomum subulatum* Roxb. seeds

*Anwar Jamal, Farah, ***Aisha Siddiqui, Mohd Aslam, **Kalim Javed & M A Jafri

*Unani Expert, TKDL, NISCAIR (CSIR), Near Pusa Gate, K S Krishnan Marg, N.Delhi 110 012;

Dept of Ilmu Advia (Pharmacology), Faculty of Medicine (U),

**Dept of Chemistry, Faculty of Science, Jamia Hamdard, New Delhi 110 062

***M D Scholar, Dept of Ilmu Advia, Ajmal Khan Tibbia College, A M U Aligarh 202002, Uttar Pradesh

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Small cardamom known as 'Heel Khurd' (fruits of *Elettaria cardamomum* Maton.) and large cardamom 'Heel Kalan' (fruits of *Amomum subulatum* Roxb.) are used in Unani System of Medicine to treat gastrointestinal disorders. These seeds are used as stomachic (*Muqavvi-e-Meda*), desiccant (*Mujaffif*), resolvent (*Muhallil*), digestive (*Hazim*) carminative (*Kasir-e-Riyah*), etc. Their essential oils and petroleum ether soluble fractions were studied in rats for their ability to inhibit gastric lesions induced by aspirin and ethanol, and results were compared. Both the fractions of drugs inhibited gastric lesions significantly. Fractions of small cardamom were found to be better than large cardamom.

Keywords: Antiulcerogenic Activity, Small cardamom, Large cardamom, Unani System of Medicine, Gastroprotective Activity

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Spices are commonly used in food, home remedies and Indigenous Systems of Medicine. Patients with peptic ulcer are generally advised against consuming spices least because they increase gastric acidity. On the other hand, a number of spices namely ginger (*Adrak- Zingiber officinale* Rosc.),¹ turmeric (*Haldi-Curcuma longa* Linn.),² large cardamom (*Bari Elaichi- Amomum subulatum* Roxb.),³ etc. have been shown to possess significant gastroprotective activity. In Unani System of Medicine, small cardamom and large cardamom have frequently been prescribed as *Muqavvi-e- meda* (stomachic), *Mujaffif* (desiccant), *Muhallil* (resolvent), *Hazim* (digestive), *Kasir-e-riyah* (carminative) and *Mane Qai* (anti-emetic) in the treatment of gastrointestinal disorders (*Hurqat -e-meda* /acid peptic disorders).⁴⁻⁷ Previous study with large cardamom (*Amomum subulatum* Roxb.) had exhibited significant gastroprotective activity on different fractions.³

In the present study, antiulcer activity of *Elettaria cardamomum* Maton. was evaluated. It has been reported that petroleum ether soluble fractions (PS) of methanolic extract, and essential oils (EO) showed significant antiulcerogenic effect in aspirin and ethanol induced ulcers, respectively⁸. Therefore, it

was considered worth while to do the comparative evaluation of essential oils of *Elettaria cardamomum* and *Amomum subulatum* ((Fig. 1-5) in ethanol induced experimental model and petroleum ether soluble fractions in aspirin induced experimental model to determine which fraction (s) is most active for inhibition of gastric ulcers.

Methodology

Dried fruits of *Elettaria cardamomum* and *Amomum subulatum* were procured from the local market (D D A Flats, Kalkaji, New Delhi) and authenticated by matching with the specimen available in pharmacognosy section, Department of Ilmu-Advia, Faculty of Medicine (Unani), Jamia Hamdard, New Delhi. A voucher specimen was also deposited in the department. These seeds were crushed thoroughly and were exhaustively extracted with methanol in Soxhlet's apparatus. The solvent was removed under reduced pressure. Total methanolic extract was treated with petroleum ether (60-80°C). Recovery of solvent under reduced pressure gave petroleum ether soluble fractions⁸. In a similar way, seeds of *A. subulatum* were also extracted with methanol. It was again fractionated to give petroleum ether soluble (PSA) fractions.³ Essential oils from dried seeds of *E. cardamomum* (EO) and *A. subulatum* (EOA) were obtained by steam

*Corresponding Author



Fig. 1 *Elettaria cardamomum* Maton plant



Fig. 2 *Elettaria cardamomum* Maton unripe pods



Fig. 3 *Elettaria cardamomum* Maton pods



Fig. 4 *Amomum subulatum* Roxb. pods



Fig. 5 *Amomum subulatum* Roxb. plant

distillation process using Klevenger apparatus separately.^{3,8}

Albino rats of Wistar strain weighing between 160-220 gm used in the study were obtained from central animal house, Jamia Hamdard. The animals were kept under standard laboratory conditions and fed diet supplied by Amrut Lab Animal-Feed, Pul Pehladpur, New Delhi. Water was allowed *adlibitum*.

Ethanol induced gastric ulcer in rats and its prevention by essential oils of *Elettaria cardamomum* and *Amomum subulatum*

Essential oils were tested in ethanol-induced gastric ulcer to determine which essential oils is most effective at a dose of 50 mg/kg (random dose). Three groups of adult albino rats having 6 animals each were fasted for 24 hrs following water *adlibitum*. The animals of two groups were given 50 mg/kg of essential oils suspended in the vehicle (1% CMC in distilled water) orally in a volume of 10 ml/kg. Animals of control group received the same volume of vehicle. After 30 minutes, experimental gastric lesions were induced by ethanol (96% v/v, 5 ml/kg). The animals were sacrificed after 1 hr of administration of ethanol⁹. The stomachs were removed and opened along their greater curvature, and ulcer indices were determined as follows.

Erosion	Score
I mm or less	1
1-2 mm	2
More than 2 mm	3

The over all score was divided by a factor 10, which was designated as the ulcer index.¹⁰

Aspirin induced gastric ulcer in rats and its prevention by petroleum ether soluble fractions of *Elettaria cardamomum* and *Amomum subulatum*

Petroleum ether soluble fractions of methanolic extract of *E. cardamomum* and *A. subulatum* were tested in aspirin induced gastric ulcer¹¹ to determine which fraction is most active at a dose of 12.5 mg/kg. Three groups of adult albino rats having 6 animals each were fasted for 36 hrs following water *adlibitum*. The animals of two different groups were given 12.5 mg/kg of PS and PSA of *E. cardamomum* and *A. subulatum* suspended in the vehicle (1 % CMC in distilled water) orally in a volume of 10 ml/kg, respectively. Same volume of vehicle was also given to control group. After 30 minutes, aspirin (500 mg/kg) suspended in 2% *gum Acacia* in distilled water was administered orally to all the animals, four

hours later the animals were sacrificed to determine the ulcer index as described earlier. All values are expressed as Mean \pm S E M Statistical significance was determined by student's t-test.

Observations and Results

Total methanolic extract yield of *Elettaria cardamomum* was 10% (w/w) and that of *Amomum subulatum* was 17.20% (w/w) in terms of the starting material. On fractionation, the yield of petroleum ether soluble fractions of methanolic extract of *Elettaria cardamomum* was 1% (w/w) and for *Amomum subulatum* was 2.62% (w/w) in terms of starting material. The yield of essential oils of *Elettaria cardamomum* was 4.8% (v/w) and of *Amomum subulatum* (EOA) was 1 % (v/w).

Ethanol induced gastric ulcer in rats and its prevention by essential oils of *Elettaria cardamomum* and *Amomum subulatum*

In a given dose of 50 mg/kg essential oils of each *Heel Khurd* and *Heel Kalan*, it was noticed that both suppressed ulcer formation significantly. However, essential oils of '*Heel Kalan*' (*Amomum subulatum*) inhibited ulcer formation by 60.91% (P<0.001). The inhibition of '*Heel Khurd*' (*Elettaria cardamomum*) was 76.36% (P<0.001), which showed that '*Heel Khurd*' has more potent effect (Table 1).

Aspirin induced gastric ulcer in rats and its prevention by petroleum ether soluble fractions of *Elettaria cardamomum* and *Amomum subulatum*

When PS and PSA were given in a dose of 12.5 mg/kg each, PS of '*Heel Khurd*' (*E. cardamomum*) showed 100% protection (P<0.001), whereas PSA of '*Heel Kalan*' (*A. subulatum*) inhibited ulcer formation by 45.45% (P<0.05) (Table 2).

Discussion

Ethanol produces necrotic lesions in the gastric mucosa by its direct toxic effect reducing the secretion of bicarbonates and production of mucus. The products of the 5-lipoxygenase pathway may also play a key role in the development of ulcer induced by irritant agent, ethanol. Essential oils are highly soluble in petroleum ether. To ascertain the role of the essential oils present in '*Heel Khurd*' (*Elettaria cardamomum*) and '*Heel Kalan*' (*Amomum subulatum*) in gastroprotection, essential oils were isolated by steam distillation method using Klevenger apparatus and essential oils of '*Heel Khurd*' and '*Heel Kalan*' in the same quantity (50 mg/kg each) were

Table 1—Ethanol induced gastric ulcer in rats and its prevention by essential oils of *Elettaria cardamomum* and *Amomum subulatum*

Group	Treatment	Dose (mg / kg B W)	Ulcer Index (mm) (Mean ± S. E. M.)	Inhibition (%age)
I	Control	—	1.83 ± 0.11	—
II	EO	50	0.43 ± 0.08***	76.36
III	EOA	50	0.72 ± 0.05***	60.91

N =6; Statistically significant: ***P<0.001 (in comparison with control)

Table 2—Aspirin induced gastric ulcer in rats and its prevention by petroleum ether soluble fractions of *Elettaria cardamomum* and *Amomum subulatum*

Group	Treatment	Dose (mg / kg B W)	Ulcer Index (mm) (Mean ± S. E. M.)	Inhibition (%age)
I	Control	—	0.73 ± 0.09	—
II	PS	12.5	0.00 ± 0.00***	100.00
III	PSA	12.5	0.04 ± 0.04*	45.45

N =6; Statistically significant: ***P<0.001, *P<0.05 (in comparison with control)

tested in ethanol induced gastric ulceration. Results obtained from experimental model of ethanol induced acute ulcer in rats showed 76.36% protection when 50 mg/kg essential oils of *E. cardamomum* were administered. When essential oils of *A. subulatum* are given in a same dose, it was 60.91% inhibition. Thus, it is concluded that the constituents responsible for gastroprotective action are of steam volatile nature and *E. cardamomum* is more potent in inhibiting gastric ulcer than *A. subulatum*.

Aspirin model was used considering its different mechanism by which it induces gastric ulceration. The reason being attributed principally to inhibition of biosynthesis of cytoprotective prostaglandin's (eg. PGE's and PGI₂), by inhibition of cyclooxygenase pathway of arachidonic acid metabolism resulting in over production of leukotriene and other products of 5-lipoxygenase pathway.¹² Petroleum Ether soluble fractions of *Elettaria cardamomum* and *Amomum subulatum* showed significant inhibition of ulceration by 100% and 45.45%, respectively. The results showed that PS is more potent than PSA, and it also suggests that the constituents other than essential oils present in petroleum ether soluble fractions of both the drugs are also involved in gastroprotective action.

On the basis of above findings it is further concluded that petroleum ether soluble fractions of methanolic extract and essential oils have inhibitory effect in over production of some products of 5-lipoxygenase pathways. In above experiments flattening of mucosal folds was observed which suggests that gastroprotective effect of both drugs may be due to a decrease in gastric motility. It is

reported that changes in gastric motility may play a role in the development and prevention of experimental gastric lesions.¹³⁻¹⁶ Relaxation of circular muscles may protect gastric mucosa through flattening of the folds. This will increase the mucosal area exposed to narcotizing agents and reduce the volume of gastric irritants on rugal crest. Such action has been postulated to play a role in cytoprotective effect of prostaglandin.¹⁴ Ethanol produces a marked contraction of circular muscles of rat fundic strip. Such a contraction can lead to mucosal compression at the site of the greatest mechanical stress ie. at the crests of mucosal folds leading to necrosis and ulceration.¹³

Conclusion

The present investigations suggest that gastro protective action of petroleum ether soluble fractions and essential oils of *Elettaria cardamomum* and *Amomum subulatum* is due to decrease in gastric motility and they have inhibitory effect in over production of some products of 5-lipoxygenase pathway. The effect of *Elettaria cardamomum* is more pronounced than *Amomum subulatum*.

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