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Anti-ulcerogenic activity of Ethanolic Extract of *Cucumis sativus* L. against NSAID (Aspirin) induced Gastric Ulcer in wistar albino rats.

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ABSTRACT

Peptic disorders like GERD, gastritis, peptic ulcer, duodenal ulcer, etc., are the common in today's life style. This may be due to stressful life style, or improper balance diet. The pathology behind these disorders may be discrepancy between offensive and defensive mechanisms either by excess secretion of acid and pepsin or diminished ability of the gastro-duodenal mucosal barrier to protect against stomach acid–pepsin secretion. Hence this present experiment is designed to evaluate the anti-ulcer activity of *Cucumis sativus* ethanolic extract in wister albino rat model. Pretreatment with ethanolic extract cucumber shows significant ulcer protective effect. Thus, it can concluded that ethanolic extract of cucumber possesses significant antiulcer activity.

Key words: *Cucumis sativus L.*, Gastric ulcer, NSAID (Aspirin).

1. Introduction

Peptic ulcer is an excoriated area of stomach caused principally by the digestive action of gastric juice, upper small intestinal secretions. It is basically an inflamed break in the skin or the mucus membrane lining the alimentary tract [1]. Prolonged use of Non-steroidal anti-inflammatory drugs (NSAIDs) and *Helicobacter pylori* infection are two major factors that can disrupt the mucosal resistance [2, 3]. Cucumbers, *Cucumis sativus* belongs to family Cucurbitaceae, is most widely cultivated vegetable crop all over the world. *Cucumis sativus* is native to the Indian subcontinent [4]. The cucumber is a creeping vine that roots in the ground and grows up trellises or other supporting frames, wrapping around supports with thin, spiraling tendrils. It has monoecious, bearing staminate and pistillate flower on the same plant. The plant has large leaves that form a canopy over the fruit. The fruit is roughly cylindrical, elongated with tapered ends, and may be as large as 60 centimeters long and 10 centimeters in diameter [5]. The plant is better adapted to low temperatures. *Cucumis sativus* have been evaluated for a wide spectrum of activity including diuretic, antihyperglycemic, antioxidant, amylolytic, anticancer and analgesic activities using various in-vitro and in-vivo models [6-12]. Hence, the objective of the present investigation is to evaluate the anti-ulcer activity of *C. sativus* against NASAID (Aspirin) induced gastric ulcer in wister albino rat model.

2. Material and method

2.1 Preparation of extract of plant material

The fresh cucumbers were collected from rural areas of Berhampur, Odisha in the month of December 2012. The 4kg plant materials sliced into small circular pieces and were shade dried for 6 days. The dried pieces subjected for grinding to coarse powder. The coarse powder was macerated with ethanol for 24hrs followed by Soxhlet extraction for 24-36hrs. The alcoholic layer was concentrated in rotavapor to get a dark brown color semisolid ethanolic extract. The extractive value found to 8.9 %.

2.2 Preliminary Phytochemical Screening
The preliminary phytochemical screening of the ethanolic extract of cucumber was performed for the qualitative analysis of alkaloid, flavonoid, glycoside, steroid, polyphenols, saponin, reducing sugar, and tannin [13, 14].

2.3 Animals
Healthy adult wistar albino rats (120-150gm) were obtained from the National Institute of Biological sciences, Pune, India. The animals were housed in a 6 groups and kept in solid bottom polypropylene cages. They were maintained at (22±1) °C, with relative humidity of 47-55 % and 12:12 h dark/light cycle. The animals were acclimatized for a period of two weeks and were kept under pathogen free conditions. The animals had free access to standard pellet chow which composing of Protein-20.12 %, Total oil-4.38 %, Dietary fiber 3.65 %, Moisture-8.0 % (Pranav Agro industries Ltd., Sangli, India) throughout the experimental protocol, with the exception of overnight fasting before induction of the ulcer. The animals were provided with filtered distilled water.

2.4 Acute Toxicity Testing
Acute oral toxicity in wistar albino rats was performed according to OECD guidelines using AOT 425 software. Graded doses of the ethanolic extract dissolved in distilled water were administered orally and the animals were observed for 2 week following administration. Body weight, food consumption, fluid intake and psycho-motor activities were recorded daily.

2.5 Dosages of Ethanolic Extract and Standard Drugs Used
The ethanolic extract of cucumber in the three different dosages (100 mg/kg, 200 mg/kg and 400 mg/kg) were administered to animals orally for 6 day. On 7th day, the ulcer was induced by Aspirin. The drug treatment was continued even after administration of Aspirin. Standard drug used for comparison was Ascorbic acid. Ascorbic acid was not given as pretreatment. It was given on the day of Aspirin administration. Ascorbic acid was given in a dose of 50mg/kg/day orally in rats as suspension containing 0.5 % of sodium carboxy methyl cellulose [15].

2.6 Induction of Gastric ulcer
The study comprised 6 groups each containing 6 animals each as follows:

- **Group I-** (served as Control): Received 2 ml of distilled water for 9 days.
- **Group II-** (served as Standard): Received 2 ml of (20mg/ml) Aspirin (once, orally) and 2 ml of distilled water for 9 day.
- **Group III-** Drug treated animals: Received 6 day pretreatment with ethanolic extract of cucumber (100 mg/kg) and 2 ml of (20mg/ml) Aspirin solution, orally on 7th day and this treatment continued till 9th day.
- **Group IV-** Drug treated animals: Received 6 day pretreatment with ethanolic extract of cucumber (200 mg/kg) and 2 ml of (20mg/ml) Aspirin solution, orally on 7th day and this treatment continued till 9th day.
- **Group V-** Drug treated animals: Received 6 day pretreatment with ethanolic extract of cucumber (400 mg/kg) and 2 ml of (20mg/ml) Aspirin solution, orally on 7th day and this treatment continued till 9th day.
- **Group VI-** Ascorbic acid treated animals: Received ascorbic acid (50mg/kg, for 6 day) and 2 ml of (20mg/ml) Aspirin solution once, orally. Ascorbic acid and Aspirin treatment was started on the same day.

On the 9th day the animals were sacrificed, stomachs were isolated and then dissected out through opening along the greater curvature pyloric section, inspected internally for ulcer index [16].

2.7 Determination of ulcer index and % protection
The evaluation of ulcer index was calculated by adding the total number of ulcers per stomach and the total severity of ulcers per stomach (Table no. 1).

Severity of gastric ulcer score

0 = no ulcers

1 =changes limited to superficial layer of the mucosa with no congestion.

2 = half the mucosal thickness shows necrotic changes.

3 = more than 2/3rd of the mucosal thickness shows necrotic changes.

4 = complete destruction of the mucosa with hemorrhage.

The Ulcer Index (UI) is calculated as given below [17, 18]:

$$UI = Un + Us + (Up * 10^{-1})$$

Un = average number of ulcers per animal

Us = average number of severity of scores

Up = percentage of animals with ulcers.

$$\% \text{ Protection} = (C\text{-}T/C) \text{ X } 100$$

Where C= ulcer index in control group, T= ulcer index in treated group (Table no. 2).

Table 2: Ulcer index and % Protective (Healing properties) of different groups

Groups	Ulcer Index(UI)	% Protection
Group 1(control)	0	0
Group 2Aspirin(dose)	13.16	0
Group 3(cucumber extract 100 mg/kg)	6.46	50.91
Group 4(cucumber extract 200 mg/kg)	5.28	59.87
Group 5(cucumber extract 400mgkg)	3.51	73.32
Group 6(Ascorbic acid 50 mg/kg)	2.5	81.00

2.8 Statistical Analysis

The interpretation of the results was done after subjecting the data obtained from various studies to statistical analysis which included one way ANOVA followed by test like Dunnett and Tukey. $P<0.05$ is considered as statistically significant (Table no 3) [19].

Table 3: Anova Table

Anova Table	Sum of squares	Degree of freedom	MS	F Value
Treatment(between columns)	52.83	5	10.57	42.27
Residual(with in columns)	4.500	18	0.25	-
Total	57.33	23	-	-

3. Results

3.1 Acute toxicity testing

Acute toxicity studies of the ethanolic extract shows no signs and symptoms such as restlessness, respiratory distress, diarrhea, convulsions and coma and it was found safe up to 5000 mg/kg.

3.2 Preliminary Phytochemical Screening

The ethanolic extract of cucumber was screened through various chemical tests as per the reported methods and was found to contain alkaloids, flavonoid, glycoside, steroids, polyphenols, saponin, and tannins.

3.3 Effect of Ethanolic Extract on Ulcer Index

At the end of the study, the stomach was isolated and washed with saline, it was then observed for ulceration and ulcers were scored, Ulcer index and percentage protection against ulcers was calculated. The mean ulcer index of Aspirin (Group-2) was (3.6±0.289) showed high ulcerogenic effect. Pretreatment with ethanolic extract of dose (400 mg/kg) gives mean value of 1.1±0.289 and with the Ascorbic acid gives mean value 0.33±0.25 (Table no 1).

Table 1: Ulcer Index of different Groups

Groups	Un	Us	Up	UI	Mean± SEM
Group 1 (Control)	0	0	0	0	0±0.00
Group 2 (Aspirin dose)	28	3.6	100	13.16	3.6±0.289
Group 3(Cucumber extract 100mg/kg)	12	2.6	50	6.46	2.6±0.289
Group 4 (Cucumber extract 200mg/kg)	6	1.8	45	5.28	1.8±0.289
Group 5 (Cucumber extract 400mg/kg)	4	1.1	30	3.51	1.1±0.289
Group 6 (Ascorbic acid 50mg/kg)	0	0.33	25	2.5	0.33±0.25

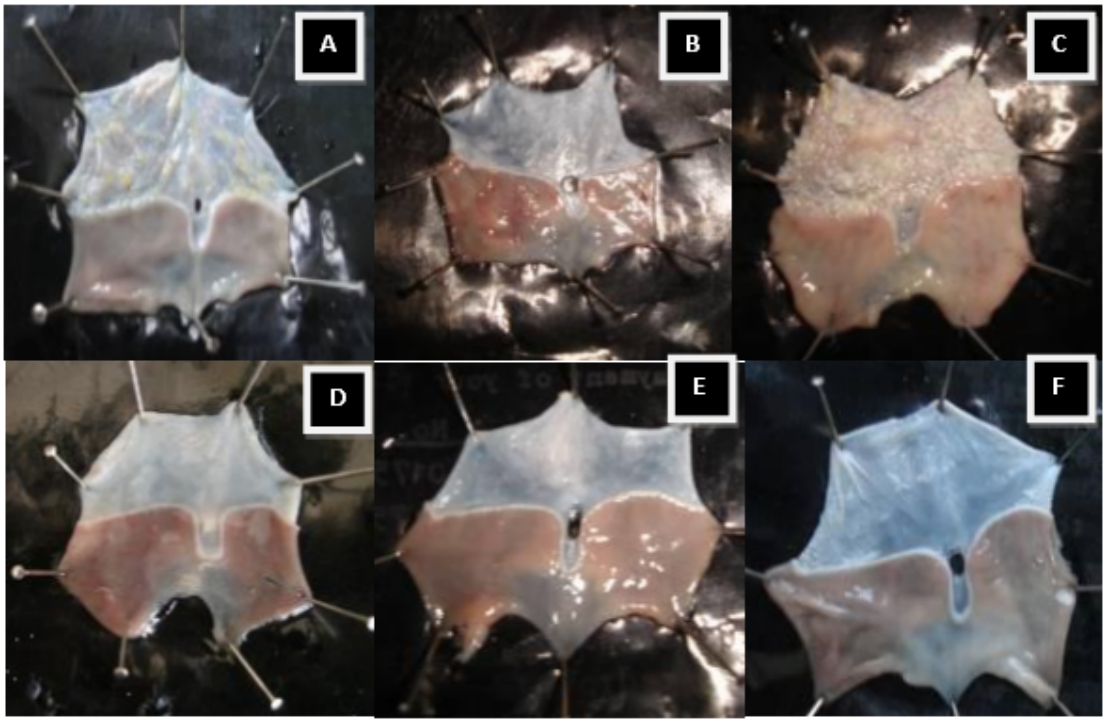

Fig 1: Morphological representation of pyloric portion treated with distilled water, Aspirin, extract of Cucumber, and Ascorbic acid.

A. roup1 (Control)
B. Group2 (Aspirin dose)
C. Group 3 (100 mg /kg Ext + Asp)
D. Group 4 (200 mg /kg Ext + Asp)
E. Group 5 (400 mg /kg Ext + Asp)
F. Group 6 (Ascorbic acid + Asp)

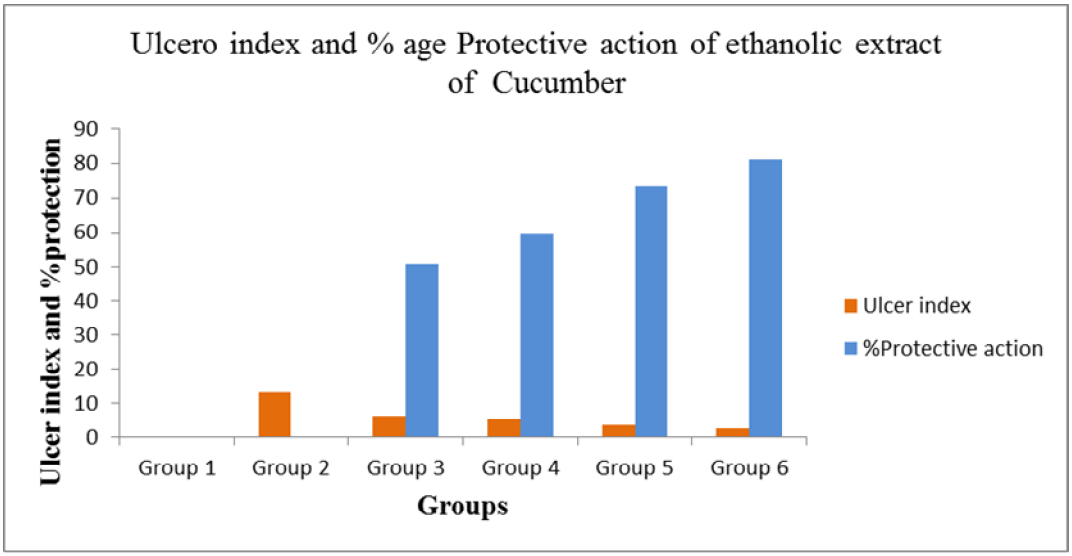

Fig 2: Effect of Ethanolic extract of Cucumber on the Aspirin induced gastric ulcer

4. Conclusion

The current study showed that ulcer index in the group 5 received 400 mg/kg body weight of the ethanolic extracts of cucumber showed a significant less ulcer index when compared to control. Aspirin causes mucosal damage by interfering with prostaglandin synthesis [20-21], increasing acid secretion and back diffusion of H^+ ion [22-25]. Overall, ethanolic extract of 400mg/kg body weight has shown a substantial and significant protection against gastric ulcers in all the models. The ulceroprective activity of cucumber may be backed by presence of alkaloids, steroids, flavonoid, polyphenols [26-28] have been proven reduction of gastric acid volume, free acidity, total acidity, antioxidant, anti-inflammatory and immunimodulatory activity [29,30]. These phytoconstituents of *C. sativus* may have synergistically contributed to the attenuation of peptic ulcer. However, further studies need to be carried out to isolate the desire bioactive phytoconstituents, and underline the full proof of mechanism of action of *Cucumis sativus* against Gastric ulcer.

5. Conflict of interest statement

We declare that we have no conflict of interest

6. Reference:

1. Okwuosa CN, Okoi ER, Achukwu PU, Onuba AC, Azubuike NC. Gastro-protective effect of crude hexane leaf extract of Sesamum Indicum in Rabbits. Nig J Physiol Sci 2011; 26:49-54.
2. Tripathi KD. Gastrointestinal Drugs. Essentials of medical pharmacology Edn 6, Jaypee India, 2009, 627-638.
3. Jamal A, Siddiqui A, Tajuddin, Jafri MA. A review on gastric Ulcer remedies used in Unani system of medicine. Natural product radiance 2006; 5(3):153-159.
4. Paris HS, Daunay MC, Janick J, Occidental diffusion of cucumber (Cucumis sativus) 500–1300 CE: two routes to Europe. Annals of Botany 2011;1-10.
5. Yeboah MA, Xuehao C, Feng CR, Liang G, Gu M, A genetic linkage map of cucumber (Cucumis sativus L) combining SRAP and ISSR markers. African Journal of Biotechnology 2007; 6(24):2784-2791.
6. Gill NS, Bajwa J, Sharma P, Dhiman K, Sood S, Sharma PD *et al*. Evaluation of antioxidant and antiulcer activity of traditionally consumed Cucumis melo seeds. J Pharmacol Toxicol 2011; 6:82-89.
7. Chu YF, Sun J, Wu X, Liu RH. Antioxidant and antiproliferative activities of common vegetables. J Agric Food Chem 2002; 50(23): 6910-6916.
8. Pellegrini N, Serafini M, Colombi B, Del RD, Salvatore S, Bianchi M *et al*. Total antioxidant capacity of plant foods, beverages and oils consumed in Italy assessed by three different in vitro assays. J Nutr 2003; 133:2812-2819.
9. Repka V, Fischerova I, Induction and distribution of amylolytic activity in Cucumis sativus L. in response to virusinfection. Acta Virologica 1999; 43(4):227-235.
10. Villasenor IM, Simon MK, Villanueva AM, Comparative potencies of nutraceuticals in chemically induced skin tumor prevention. Nutr Cancer 2002; 44(1):66-70.
11. Patil MK, Kandhare AD, Bhise SD. Pharmacological evaluation of ameliorative effect of aqueous extract of *Cucumis sativus* L. fruit formulation on wound healing in Wistar rats. Chron Young Sci 2011; 2:207-213.
12. Nadkarni AK, Nadkarni KM. Indian Materia Medica. Bombay Popular Prakashan 2005; 403-404.
13. Khandelwal KR. Practical pharmacognosy, technique and experiments, Edn 8, Nirali Prakashan, Pune, 2007, 149-153.
14. Patil MVK, Kandhare AD, Bhise SD, Anti-arthritic and antiinflammatory activity of Xanthium *srtumarium* L. ethanolic extract in Freund's complete adjuvant induced arthritis, Biomed Aging Pathol 2012; 2:6-15.
15. Patil MVK, Kandhare AD, Bhise SD. Anti-inflammatory effect of Daucus carota root on experimental colitis in rats. Int J Pharm Pharm Sci 2012; 4(1):337-343.
16. Mascolo N, Izzo A, Autore G, Maiello F, Di Carlo G, Capasso F, Acetic acid-induced colitis in normal and essential fatty acid deficientrats, J Pharmacol Exp Ther 1995; 272:469-475.
17. sDengiz GO, Gursan N. Effects of *Momordica charantia* L, (Cucurbitaceae) on indomethacin-induced ulcer model in rats. Turkish J Gastroenterol 2005; 16(2):85-88.
18. Kandhare AD, Raygude KS, Ghosh P, Bodhankar SL, The ameliorative effect of fisetin, A bioflavonoid, on ethanol-induced and pylorus ligation-induced gastric ulcer in rats. Int J Green Pharm 2011; 5:236-243.

19. Shaw RG, Olds MT. Anova for Unbalanced Data: An Overview. Ecology 1993; 74:1638–1645.
20. Vane JR. Inhibition of prostaglandin synthesis as a mechanism of action of aspirin-like drugs. Nat N Biol 1971; 231:232-235.
21. Soll AH, Weinstein WM, Kurata J, McCarthy D. Non-steroidal anti-inflammatory drugs and peptic ulcer disease. Ann Intern Med 1991; 114:307-319.
22. Kauffman G, Aspirin-induced gastric mucosal injury: lessons learned from animal models, Gastroenterology. 1989; 96(2):606-14.
23. Holt KM, Hollander D. Acute Gastric Mucosal Injury: Pathogenesis and Therapy. Annual Review of Medicine 1986; 37:107-124.
24. Hawthorne AB, Mahida YR, Cole AT, Hawkey CJ. Aspirin-induced gastric mucosal damage: prevention by enteric-coating and relation to prostaglandin synthesis. Br J Clin Pharmacol July1991; 32(1):77–83.
25. Wallace JL. Prostaglandins, NSAIDs, and Gastric Mucosal Protection: Why Doesn't the Stomach Digest Itself? Physiol Rev 2008; 88(4):1547-1565.
26. Heloina d, Sousa Falcao *et al*. Gastric and Duodenal Antiulcer Activity of Alkaloids: A Review. Molecules 2008; 13:3198-3223.
27. Vinothapooshan G, Sundar K. Anti-ulcer activity of Mimosa pudica leaves against gastric ulcer in rats. Research Journal of Pharmaceutical Biological and Chemical Sciences 2010; 1(4):606-614.
28. Mota KS *et al*. Flavonoids with gastroprotective activity. Molecules 2009; 14(3):979-1012.
29. Parmar NS, Shikha P. Anti-ulcer potential of flavonoids. Indian J Physiol Pharmacol 1998; 42 (3):343-351.
30. Patel MA, Patel PK, Patel MB. Aqueous extract of *Ficus bengalensis* Linn. Bark for inflammatory bowel disease. J Young Pharm 2010; 2(2):130-136.