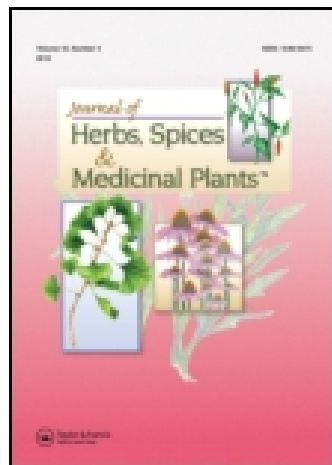


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Anti-Ulcerogenic and Gastric Antisecretory Effects of *Corchorus olitorius* Extract in Male Albino Rats

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Anti-Ulcerogenic and Gastric Antisecretory Effects of *Corchorus olitorius* Extract in Male Albino Rats

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Anti-ulcerogenic and gastric anti-secretory activity of aqueous extract of Corchorus olitorius was investigated in HCl/ethanol and indomethacin-induced gastric lesions in male albino rats. Pre-treatment with aqueous extract (50, 100, or 200 mg.kg⁻¹) orally for 2 weeks reduced ulcer formation, except those pre-treated with 50 mg.kg⁻¹ in the indomethacin model. In both models, the decrease in gastric acid production was dose-dependent.

KEYWORDS Gastric acid, indomethacin

INTRODUCTION

Peptic ulcer is a common gastrointestinal disorder in clinical practice for which indigenous drugs are recommended in treatment (2). *C. olitorius* (Tiliaceae), commonly called Jute Mallow and known as *Ewedu* in the Yoruba language, is noted for its important contribution to diet by supplying nutrients and rendering food more palatable (9). *C. olitorius* is a known demulcent, deobstruent, diuretic, lagtagogue, purgative, and tonic. The plant is a folk remedy for aches and pains, dysentery, enteritis, fever,

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pectoral pains, and tumors (8,11). Ayurvedic practitioners use the plant for ascites, pains, piles and tumors, dysuria, cystitis, fever, and gonorrhoea (13). Zakaria et al. (21) validated the use of *C. olitorius* as an anti-inflammatory and antipyretic agent. In this study, the anti-ulcerogenic effect of aqueous extracts of *C. olitorius* plant on HCl/ethanol and indomethacin-induced ulcer on male albino rats was investigated.

MATERIALS AND METHODS

Plant Materials and Extract Preparation

C. olitorius leaves were collected at Oja Oba, Ilorin, air-dried, reduced to a powdery form (759 g), and extracted with 7.5 L of distilled water for 2 days. The solvent from the filtrate was removed at 45°C in a water bath to give a brown solid extract (37.2 g) that was refrigerated until use in the experiment.

MATERIALS AND METHODS

Plant Materials and Extract Preparation

Adult male albino rats weighing 200 to 270 g were bred and housed in cages at room temperature in the animal house of the Faculty of Basic Medical Sciences of University of Ilorin, Ilorin. They were fed with growers pellet from Bethel Feeds, Umar Saro Road, beside Ilorin Grammar School, Ilorin, Nigeria.

Pepsin-Binding Activity

Briefly, 50 mL of the aqueous extract of *C. olitorius* was added to 1 mL of pepsin solution (2 mg.mL⁻¹) in a test tube (18) followed by the addition of 4 mL of 0.2 N HCl buffered with 1 mL of 0.2 N sodium citrate solutions. Then 1 mL of bovine serum albumin (5 mg.mL⁻¹) was added to treat the excess pepsin except for the control test tubes. The value was expressed as percentage binding of pepsin.

HCl/Ethanol-Induced Ulcers

After a 2-week administration of 50, 100, or 200 mg.kg⁻¹ of plant extracts, 100 mg.kg⁻¹ of cimetidine, and 1 mL.kg⁻¹ of normal saline to the animals in the three test groups, reference group, and the control group, respectively, all were administered orally. All the groups had their food withdrawn for 24 h with free access to water. Afterwards, 1 mL of HCl/ethanol mixture

containing 0.15N HCl in 70% v/v ethanol was administered orally. The rats were sacrificed 4 h later by cervical dislocation, and the stomachs were removed and observed for lesion(s) in the glandular portion. Ulcers were scored by two observers as 0 = no ulcer (normal stomach); 1 = up to 5 petechial hemorrhages; 2 = up to 5 petechial hemorrhages with erosions of depth 1 mm; 3 = up to 10 petechial hemorrhages with erosions of depth 1 mm; and 4 = up to 10 petechial hemorrhages with erosions of depth above 1 mm (17).

Indomethacin-Induced Ulcer

Animals used for this study were grouped into five groups (as in HCl-ethanol-induced models) and received the same dosage of extract, standard drug, and normal saline. At the end of the 2 weeks of administration, they were fasted for 24 h with free access to water. Then 100 mg.kg⁻¹ of indomethacin was administered orally. The rats were sacrificed 4 h later by cervical dislocation, and the stomachs were removed and observed for lesions in the glandular portion.

Measurement of Gastric Acidity

The gastric juice collected by washing the stomach dissected with 10 mL normal saline was centrifuged at 2,000 rpm for 10 min. Then 7 mL of the supernatant was titrated against 0.05 M of NaOH. In order to determine the concentration, which was expressed as meq.L⁻¹ (19), the acidity was calculated as

$$N_a V_a = N_b V_b$$

Where N_a = concentration of the acid;

V_a = volume of the acid;

N_b = concentration of the base; and

V_b = volume of the base.

This was done for both models used in this study.

Measurement of Mucus Secretion and Histology of the Stomach

The gastric mucus production was determined as given earlier (7).

Routine histology of the stomach was carried out in parts of the isolated gastric tissues obtained from animals in each group. The tissues were fixed in 10% formalin solution, dehydrated in ascending grades of alcohol, and embedded in paraffin. Then 5- μ m-thick sections were taken, stained with

hematoxylin and eosin (H & E), and examined by a histopathologist under light microscopy.

Statistical Analysis

Data are mean ± SD compared by using Student’s *t*-test (*p* < 0.05).

RESULTS

Pepsin-Binding Activity

The *in-vitro* binding activities of aqueous extract of *C. olitorius* caused 99.96% pepsin binding capacity. No noticeable binding was seen in the standard tube.

Anti-ulcer Studies

Animals pre-treated with normal saline in the HCl/ethanol-induced model had mean ulcer score of 2.83 ± 0.31 and an ulcer index of the same value (Table 1). Pre-treatment of animals with aqueous extracts (50, 100, or 200 mg.kg⁻¹) reduced the formation of ulcers induced by HCl/ethanol mixture, the percentage inhibition being 35.33%, 47.00%, and 53.00%, respectively. Cimetidine afforded 58.66% protection on ulcer.

Animals pre-treated with normal saline had a mean ulcer score of 1.47 ± 0.07 and an ulcer index of the same value (see Table 1). However, pre-treatment of animals with aqueous extract (50, 100 or 200 mg.kg⁻¹) reduced formation of ulcers induced by indomethacin by 33.33%, 37.03%, and 55.56%, respectively. Cimetidine in this model afforded 51.85% protection on ulcer.

TABLE 1 Effect of Aqueous Extracts of *Cochorus olitorius* on Gastric Lesion Induced by HCl/Ethanol (A) and Indomethacin (B) in Male Albino Rats (*n* = 6)

Group	Dose	Ulcer Score (A)	Ulcer Score (B)
I	1 mLkg ⁻¹ (normal saline)	2.83 ± 0.31	2.7 ± 0.42
II	50 mg.kg ⁻¹ (extract)	1.83 ± 0.31*	1.8 ± 0.60
III	100 mg.kg ⁻¹ (extract)	1.50 ± 0.22*	1.7 ± 0.49*
IV	200 mg.kg ⁻¹ (extract)	1.33 ± 0.21*	1.2 ± 0.31*
V	100 mg.Kg ⁻¹ (cimetidine)	1.17 ± 0.31*	1.3 ± 0.33*

Note: Data are mean ± SD. Means compared with the control (group I) using Student *t*-test.

**p* < 0.05.

TABLE 2 Effect of Aqueous Extracts of *Cochorus olitorius* on Gastric Acid Secretion Rats Induced by HCl/ethanol and Indomethacin in Male Albino Rats ($n = 6$)

Treatment	Dose	HCl/ethanol-induced		Indomethacin-induced	
		Gastric acidity (Meq.L ⁻¹)	pH	Gastric acidity (Meq.L ⁻¹)	pH
Control	1 mL.kg ⁻¹	0.008 ± 0.001	2.11 ± 0.05	0.036 ± 0.007	1.47 ± 0.07
Extract	50 mg.kg ⁻¹	0.003 ± 0.001*	2.60 ± 0.14*	0.027 ± 0.006	1.61 ± 0.09
Extract	100 mg.kg ⁻¹	0.016 ± 0.011*	2.30 ± 0.29*	0.023 ± 0.011*	1.82 ± 0.17*
Extract	200 mg.kg ⁻¹	0.002 ± 0.002*	2.83 ± 0.19*	0.007 ± 0.001*	2.18 ± 0.09*
Cimetidine	100 mg.kg ⁻¹	0.003 ± 0.001*	2.59 ± 0.11*	0.004 ± 0.0004*	2.39 ± 0.04*

Note: Data are mean ± SD. Means compared with the control (group I) using Student *t*-test.

* $p < 0.05$.

Gastric Acid Secretion

The administration of aqueous extract of *C. olitorius* caused a dose-dependent decrease in gastric acid secretion except for the group treated with 50 mg.kg⁻¹ of extract in the indomethacin model (Table 2).

Histological Examination of Gastric Tissue

Light micrographs of the control group showed eroded mucus layer compared to groups treated with *C. olitorius* and cimetidine (Figure 1). The photomicrograph of stomachs of the group treated with 200 mg.kg⁻¹ and

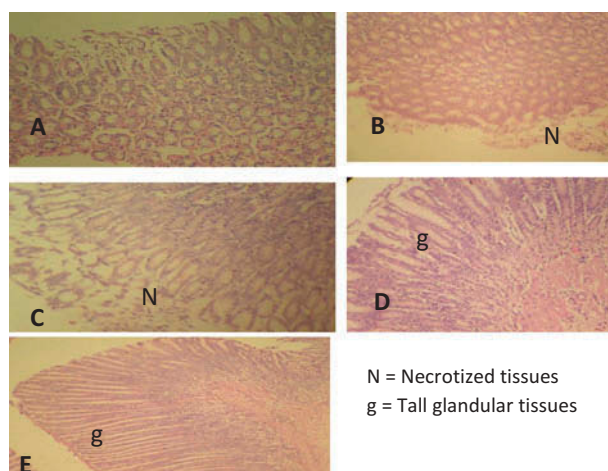


FIGURE 1 Photomicrographs of gastric tissues from control and treated groups (H & E × 200). A = control; B = treated with 50 mg.kg⁻¹ aqueous extract of *Cochorus olitorius*; C = treated with 100 mg.kg⁻¹ aqueous extract of *C. olitorius*; D = treated with 200 mg.kg⁻¹ aqueous extract of *C. olitorius*; E = treated with 100 mg.kg⁻¹ cimetidine.

cimetidine showed normal mucosal outline with tall glandular disposition and no areas of mucosal necrosis, while those that received 50 or 100 mg.kg⁻¹ showed necrotized tissues in their mucosal layer.

DISCUSSION

The present study showed that pre-treatment of animals with the aqueous extract of *C. olitorius* plant extracts reduced the HCl/ethanol- and indomethacin-induced ulcer in male albino rats as evidenced by the reduction in the ulcer index and decrease gastric acid secretion. Oral administration of HCl/ethanol produced necrotizing lesions in the gastric mucosa that are more severe than those caused by absolute ethanol, mainly due to a reduction in the protective layer of mucus and an increase in peptic acid secretion (10). Like ethanol, ethanol/HCl caused oxidative stress, increased the release of histamine and pepsin, and reduced the levels of DNA, RNA, and proteins in the tissue, which resulted in tissue injury (4). The results obtained with aqueous extract of *C. olitorius* in these two models of acute ulcer presented cytoprotective ability, with a possible increase in the release of endogenous protection factors, such as bicarbonate and antioxidant agents. The result showed that the aqueous plant extract did not have an effect on mucus production, suggesting that the protection offered by the plant extract is not *via* mucus production but may be due to their ability to mimic the standard drug (cimetidine), which is a potent hydrogen pump inhibitor.

Since nonsteroidal anti-inflammatory drugs like indomethacin cause gastric mucosal damage by decreasing prostaglandin (PG) levels through inhibition of PG synthesis (6), the aqueous extract of *C. olitorius* was quite effective in protecting the gastric mucosa against indomethacin induced ulcer at 100 to 200 mg.kg⁻¹ in a dose-dependent manner. Among other factors, oxidative stress has been implicated for the induction and pathogenesis of the indomethacin-mediated gastroduodenal injury (20). Antioxidants may be effective not only in protecting against gastric mucosal injury but also in inhibiting progression of gastric ulcer (5). The flavonoids present in *C. Olitirius* may serve as a potent anti-ulcer agent (1,14).

The reduction of lesion in this model may be due to its antioxidant property (12) or stimulation of PG synthesis. The high *in-vitro* pepsin-binding activities of the extract may suggest a possible *in-vivo* binding to substrate proteins by a non-specific hydrophobic interaction to form complexes that are less vulnerable to peptic hydrolysis (15). The results are in agreement with earlier reports of antiulcer and gastric anti-secretory effects of extracts from *Landolphia owariensis* (15), *Nelsonia canescence* (16), and *Eruka sativa* (3).

REFERENCES

1. Adebayo-Tayo, B. C., and A. A. Adegoke. 2008. Phytochemical and microbial screening of herbal remedies in Akwa Ibom state, South Southern Nigeria. *J. Med. Plants Res.* 2(11):306–310.
2. Akhtar, M. S., A. H. Akhtar, and M. A. Khan. 1992. Antiulcerogenic effects of *Ocimum basilicum* extracts, volatile oils and flavonoid glycosides in albino rats. *Int. J. Pharm.* 30:97–104.
3. Alqasoumi, S., M. Al-Sohaibani, T. Al-Howiriny, M. Al-Yahya, and S. Rafatullah. 2009. Rocket “*Eruca sativa*”: A salad herb with potential gastric anti-ulcer activity. *World J Gastroenterol.* 15(16):1958–1965.
4. Batista L. M., A. B. Almeida, M. L. Pietro, W. Toma, T. R. Calvo, W. Vilegas, and A. R. Souza Brito. 2004. Gastric antiulcer activity of *Syngonanthus arthrotrichus* SILVEIRA. *Biol Pharm Bull.* 27(3):328–332.
5. Adhikary, B., S. K. Yadav, S. K. Bandyopadhyay, and S. Chattopadhyay. 2011. Role of the COX-independent pathways in the ulcer-healing action of epigallocatechin gallate. *Food Funct.* 2:338–347.
6. Brodie, D., P. Cook, B. Bauer, and G. Dagle. 1970. Indomethacin-induced intestinal lesions in the rat. *Toxicol. Appl. Pharmacol.* 17:615–624.
7. Corne, S. J., S. M. Morrissey, and R. J. Woods. 1974. A method of quantitative estimation of gastric barrier mucus. *J. Physiol.* 242:116P–117P.
8. Duke, J. A., and K. K. Wain. 1981. Medicinal Plants of the World: Computer Index with More Than 85,000 Entries. Vol. 3, Longman Group Ltd., UK.
9. Grubben G.J.H. 1997: Predicting Irrigation needs Irrigation of Agricultural Land. R.M. Hagon et al eds. Am. Soc. Of Agronomy, Madison Wisc. Monograph 11: 577–604.
10. Mizui, T., and M. Douteuchi. 1983. Effect of polyamines on acidified ethanol gastric-lesions in rats. *Jpn. J. Pharmacol.* 33:939–945.
11. Negm S., O. El-Shabrawy, M. Arbid, and A. S. Radwan. 1980. Toxicological study of the different organs of *Corchorus olitorius* L. plant with special reference to their cardiac glycosides content. *Zeitsc. Ernaehrungsw.* 19(1):28–32.
12. Oboh, G., H. Raddatz, and T. Henle. 2009. Characterization of the antioxidant properties of hydrophilic and lipophilic extracts of Jute (*Corchorus olitorius*) leaf. *Int. J. Food Sci. Nutr.* 1:124–134.
13. Okoegwale, E. E., and G. O. Olumese. 2001. Folk medicine practices in Nigeria: Some medicinal plants of Esan people in Edo State Nigeria. *Niger. J. Appl. Sci.* 4:2350–2358.
14. Olaleye, S. B., and E. O. Farombi. 2006. Attenuation of indomethacin and HCl/ethanol-induced oxidative gastric mucosa damage in rats by kolaviron (*Garcinia biflavanones*). *Phytother. Res.* 20:14–20.
15. Olaleye, S. B., B. V. Owoyele, and A. O. Odukanmi. 2008. Antiulcer and gastric anti secretory effects of *Landolphia owariensis* extracts in rats. *Nig. J. Physiol. Sci.* 23(1-2):23–26.
16. Owoyele, B. V., Y. Y. Oloriegbe, E. A. Balogun, and A. O. Soladoye. 2005. Analgesic and anti-inflammatory properties of *Nelsonia canescens* leaf extract. *J. Ethnopharmacol.* 99:153–156.

17. Rao, V. N. S., F. A. Santos, T. T. Sobreira, M. F. Scuza, C. L. Melo, and E. R. Silveira. 1996. Investigation on the gastroprotective and antidiarrhoeal properties of tematin, a tetramethoxyflavone from *Egletes viscose*. *Planta Med.* 63:146–149.
18. Rifatu-uz-Zaman, M., S. Aktar, and M. S. Khan. 2002. Evaluation of acid buffering and pepsin binding properties of ispaghula (*Plantago ovate*, Forsk) and its extracts. *Hamdard XLV*:32–36.
19. Shay, H., S. A. Komarov, S. S. Fels, D. Meranze, M. Gruenstein, and H. Siplet. 1945. A simple method for the uniform production of gastric ulceration in rats. *Gastroenterology* 5:43–61.
20. Utsumi, H., K. Yasukawa, T. Soeda, K. Yamada, R. Shigemi, T. Yao, and M. Tsuneyoshi. 2006. Non-invasive mapping of reactive oxygen species by in vivo electron spin resonance spectroscopy in indomethacin induced gastric ulcers in rats. *J. Pharmacol. Exp. Therapeutics* 317(1):228–235.
21. Zakaria, Z. A., M. R. Sulaiman, H. K. Gopalan, Z. D. Abdul Ghani, R. N. Raden Mohd Nor, A. M. Mat Jais, and F. C. Abdullah. 2007. Antinociception and anti-inflammation properties of *Corchorus capsularis* leaf chloroform extract in experimental animal models. *Yakugaku Zasshi* 127(2):359–365.