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Gastro-Protective Effect of Ex-Maradi Okra Fruits (*Abelmoschus esculentus*) on Ethanol- Induced Gastric Mucosal Damages in Albino Rats

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Introduction

- Peptic ulcer is the most prevalent gastrointestinal disorder ever known, accounting for an estimated 15 mortality out of every 15,000 complications yearly in the world. It has a worldwide prevalence of about 40% in the developed countries and 80% in the developing countries (Adinortey *et al.,* 2013).

- It occurs mainly in the stomach (Gastric Ulcer) and or in the proximal duodenum (Duodenal Ulcer) due to persistent imbalance between the offensive (gastric acid secretions) and defensive (gastric mucosal integrity) factors (Kelly *et al;* 2009).

- Besides, stress, smoking, nutritional deficiencies, prolonged ingestion of non steroidal anti-inflammatory drugs (NSAIDs), and Helicobacter pylori infection are all relevant etiological factors for the development of gastric ulcer (Da-Silva *et al.,* 2015).

- Okra fruit, due to its superior fiber, mucilaginous and polyphenolic compounds with important biological properties as it plays vital role in human diet and health is fast gaining reputation as 'super food' for people with or at risk of diabetes, ulcer, digestive diseases etc. (Indha, 2011).

Objectives

- The main goal in the treatment of ulcer diseases is targeting the potentiation of the gastro-intestinal defensive system, preventing ulceration by inhibiting acid secretion, increase epithelial cell proliferation and stop apoptosis for effective ulcer healing process (Bandhopadhyay *et al.,* 2002).

- However, gastric ulcer therapy nowadays faces a major drawback because most of the drugs currently available show limited efficacy against gastric diseases and are often associated with severe side effects (Rao *et al.,* 2004).

- The aim of this study is to evaluate and compare the gastro-protective effect of fresh okra fruits mucilage (OM) and that of the dry okra fruits powder (WO) of Ex- maradi okra variety on ethanol- induced gastric mucosal damages in albino rats for possible development of Okra based antiulcer nutraceutical formulation.

- The Specific Objectives are to evaluate the effect of oral administration of OM and WO of Ex-maradi okra fruit on the levels of Ulcer Index (UI), Percentage Inhibition (PI), Gastric Volume, Gastric pH and Total Acidity on ethanol induced ulcer rats as well as carrying out histopathological examinations of the rats stomachs tissues.

Methodology

- Ex- maradi Okra Sample was collected, authenticated and a voucher specimen number (UDUH/ANS/0066) was given.
- Peptic ulcer disease (PUD) was induced in the albino rats by using the Ethanol-Induced Ulcer Model as described by Almasaudi *et al.,* (2016).
- Antiulcerogenic activity of the Okra fruit (OM and WO) was evaluated in Ethanol-induced ulcer rats. Cimetidine 20 mg/kg (Ulcer protectants) was used as the standard drug.
- The ulcer score, ulcer index, and % inhibition were determined as reported by Ugwah *et al.,* (2013); Almasaudi *et al.,* (2016); Wasagu and Shehu, (2016).
- Measurement of Gastric Volume and total acidity was done as reported by (Okasha *et al*., 2014).
- Histological Examination of the stomach tissues was carried out as reported by Almasaudi et al., 2016.

Experimental Setting

GROUPS	TREATMENTS
1: Normal Control (NC)	Rats in this group received 1ml / 200 g bw distilled water for seven days in addition to their diet and water. No induction of ulcer.
2: (Ulcer Control) (UC)	Rats in this group received 1ml / 200 g bw distilled water for seven days in addition to their diet and water before the induction of ulcer.
3: Drug Control (DC)	Rats in this group received Cimetidine at a dose of 20 mg/kg body weight for seven days in addition to their diet and water before the induction of ulcer.
4 & 5: Okra Mucilage (OM_{200} OM_{400})	Rats in this group received the Okra fruit mucilage at a dose of 200 and 400 mg/kg body weight respectively for 7 days in addition to their normal diet and water before the induction of ulcer.
6 & 7: Whole Okra (OW_{200} OW_{400})	Rats in this group received whole okra fruit at a dose of 200 and 400 mg/kg body weight respectively for 7 days in addition to their diet and water before the induction of ulcer.

Data Analysis

The data obtained were presented as mean ± standard error of the mean. Results obtained were analyzed statistically by ANOVA followed by postHoc, Duncan test using SPSS software. A *p*-value < 0.05 was considered statistically significant.

Results and Discussion

Table 1.0: Effect of Administration of the Okra fruit Mucilage or Whole Okra fruit on Ulcer Index and Percentage Inhibition in the Ethanol-induced Ulcer Rats

Group	UN	US	UP (%)	UI=UN+US +UPx10^{-1}	PI (%)	Gastric Vol. (ml)	Gastric pH	Total Acidity (mEq/L)
NC	0.00±0.00^{a}	0.00±0.00^{a}	0.00±0.00^{a}	0.00±0.00^{a}	100^{d}	4.25±0.08^{a}	4.32±0.06^{c}	31.30±0.72^{a}
UC	4.40±0.05^{e}	4.36±0.08^{d}	88.00±1.15^{e}	9.67±0.15^{d}	0.00^{a}	7.48±0.16^{c}	2.17±0.12^{a}	122.57±1.09^{f}
DC	1.23±0.08^{b}	1.00±0.01^{b}	24.66±1.76^{b}	2.69±0.18^{b}	72.82^{c}	4.05±0.03^{a}	5.35±0.09^{e}	34.09±0.62^{b}
OM_{200}	2.06±0.08^{d}	2.00±0.02^{c}	41.33±1.76^{d}	4.54±0.18^{c}	54.13^{b}	4.45±0.06^{b}	3.42±0.15^{b}	48.31±0.06^{e}
OM_{400}	2.30±0.11^{d}	2.00±0.01^{c}	39.33±7.05^{d}	4.36±0.70^{c}	55.90^{b}	4.02±0.01^{a}	3.63±0.11^{b}	40.73±0.29^{d}
WO_{200}	1.53±0.14^{c}	1.00±0.01^{b}	30.66±2.90^{c}	3.32±0.30^{b}	66.45^{c}	4.06±0.03^{a}	4.17±0.11^{c}	39.26±0.59^{c}

Values are expressed as mean ± S.E.M., Mean values having different superscript letter in the same column are significantly ($P<0.05$) different .

Key: UN: Average of number of ulcer per animal; US: Average of severity score; UP: Percentage of animal with ulcer; UI: Ulcer index; PI: protective inhibition; NC: Normal Control, UC: Ulcer Control, DC: Drug Control, OM and WO: Okra fruit Mucilage and Whole Okra fruit, while the Subscripts 200 and 400 denotes the doses in mg/kg body weight respectively.

Results and Discussion

Effect of Administration of the Okra fruit Mucilage or Whole Okra fruit on Histopathological Examination of Stomach Tissues of the Ethanol-induced Ulcer Rats

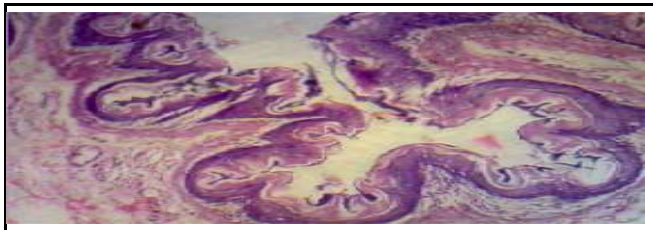


Plate 1: Micrograph of Normal rat stomach showing normal and continues epithelial surface

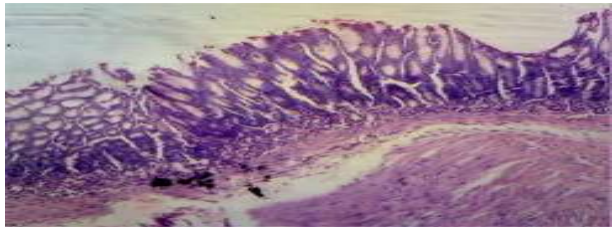


Plate 2: Micrograph of the ulcer control rat stomach showing severe ulcer lesions and discontinues epithelium surface due to ethanol administration.

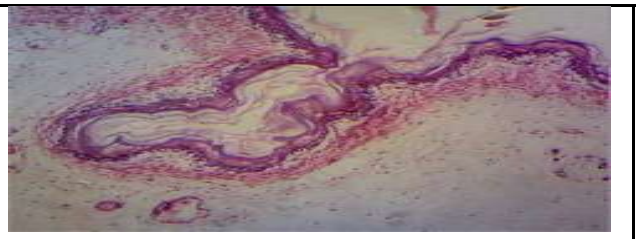
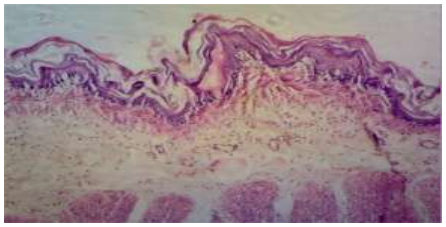


Plate 3: Micrograph of Ulcer rats stomach showing protected epithelium Due to 20mg/kg Cimetidine treatment.



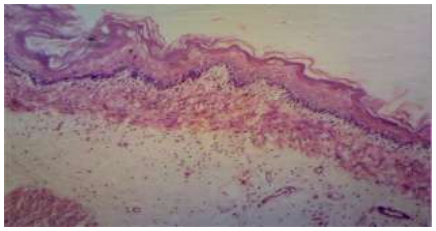
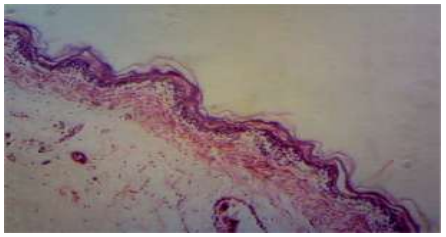


Plate 4 & 4: Micrograph of ulcer rats' stomachs showing protected epithelium due to WO_{200} and WO_{400} treatments.



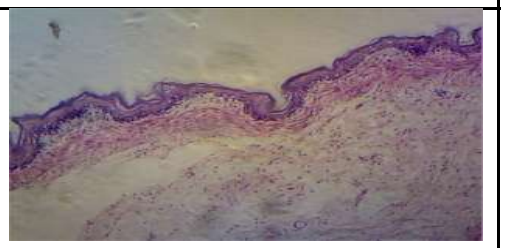


Plate 5 &5: Micrograph of ulcer rats' stomachs showing protected epithelium due to WO_{200} and WO_{400} treatments.

Conclusions & Recommendations

- On the basis of the present results, it can be concluded that the gastro-protective effect elucidated by Ex-Maradi okra fruit (*Abelmoschus esculentus)* in ethanol induced ulcer rats could be due to the modulation of defensive factors through improvements in gastric cytoprotection and partly due to reduction in gastric acid secretion.

- Based on these findings, we suggest that, Ex- Maradi okra fruit; especially the WO is more potent and effective than OM in suppressing gastric damage and it may be a useful therapeutic antiulcer agent.

- It is recommended that effort should be made to investigate other bioactive principles and possible mechanism of anti ulcer effect of Ex-maradi Okra fruit.

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Thank You