

## Ameliorative effect of *Chromolaena odorata* on aspirin induced ulcer in male Wistar albino rats

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### ABSTRACT

Ulcer remains one of the gastrointestinal disorders that have affected many people worldwide over the centuries with over 5-10% of the world population generally affected. The aim of this study was to determine the efficacy of ethanolic extract of *Chromolaena odorata* against ulcer using male wistar albino rats. The albino rats were divided into five groups and acclimatized for two weeks water *ad libitum*. Group A was neither induced nor treated. Groups B to E rats were induced with ulcer using 30 mg/kg of aspirin. When tested with *C. odorata* extract against the ulcer suppress ulceration indices from 68.0000 ± 7.6mmol/L in group B to 25.0000 ± 5.33mmol/L in group E, the rats were significantly protected from the aspirin induced ulceration ( $p < 0.05$ ) under high dosage of extract, with highest percentage in group E 60.8515 ± 7.92 mean value. The gastric pH increased from 2.9150 ± 0.53mmol/L in group B to 5.0750 ± 1.35mmol/L high dosage of *C. odorata* extract. The extract also increased the mucosa acidity from 2.6000 ± 0.67mmol/L in group B to 4.4150 ± 0.96mmol/L in group E, at  $p < 0.05$  there was no significant difference across the groups studied. The leaf extract of *C. odorata* possesses gastroprotective properties on ulcer. This justifies the folklore uses of the plant in ulcer disease.

Keywords: *Chromolaena odorata*, aspirin, ulcer and albino rats

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### INTRODUCTION

Ulcers are sores on the lining of your stomach or small intestine. Peptic ulcer disease has evolved as a major cause of morbidity and mortality throughout the 20th and 21st centuries, with more than six million people affected each year in the Nigerian alone [1,2,3,4]. Ulcers are reported as the most common cause of hospitalization for upper gastrointestinal bleeding and remain an important clinical problem due to the increasingly widespread use of nonsteroidal anti-inflammatory drugs (NSAIDs) and aspirin, which are known to induce ulcers [5,6,7,8]. The most common ulcers associated with ulcer disease arise in the stomach, duodenum, and jejunum, with gastric ulcers presenting most frequently [9,10,11,12]. Although ulcers are widely diagnosed and recognized, asymptomatic ulcers remain a pressing problem and may lead to long-term damage to the gastrointestinal tract [13,14,15]. While the risk of symptomatic ulcers with aspirin is well defined, the association between aspirin and asymptomatic ulcer formation remains less clear [16,17]. Aspirin

originated as a medication to treat pain and inflammation, but due to its antiplatelet properties, it has evolved into a drug commonly used to prevent cardiovascular disease [18]. The treatment for peptic ulcers depends on the cause. Usually treatment will involve killing the *H. pylori* bacterium if present, eliminating or reducing use of NSAIDs if possible. The medication for ulcer depends on the following;

i Medication targeted at killing *H. pylori* such as Amoxicillin, metronidazole, tinidazole, tetracyclin and lavofloxacin.

ii Medication that block acid production and promote healing. These medications are otherwise called proton pump inhibitors (PPIs). The mechanism of this antibiotics entails blocking reaction of the part of cells that produce acids. Examples of these medications include; Omeprazole, Lansoprazole, Rebeprazole, Esomeprazole and Pantoprazole.

iii Medications that reduce acid production; This medication is also

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referred to as acid blockers or histamine blockers. The mode of action of this medication entails; reducing the amount of stomach acid released into digestive tract, which relieves ulcer pain and encourages healing [18,19,20]. Of all these drugs that has been approved for the treatment of ulcer, yet they aren't effective. Orthodox drugs are injurious to the body and above all it is expensive and unaffordable especially in Africa e.g. Nigeria. The foregoing necessitated the quest for the use of alternative traditional medicine for this research. There has been an upsurge in the use of medicinal plants in recent times due to their purported potencies in traditional medical practice [21,22,23]. Although most botanical products are probably safe under normal doses, some are however known to be toxic at high doses, while others have the potential for adverse side effects [24]. *Chromolaena odorata* has been used in various parts of the world for medicinal [25] and nutritional purposes [26]. *C. odorata* is known to remediate metals [27]. These substances can therefore be readily transferred from plant through the food chain to herbivores that feed on them. Those at high risk are mainly people who rely on *C. odorata* for medications. An in depth understanding of the toxicological profile of *C. odorata* is considered worthwhile. Furthermore, connection between man and the search for drugs in nature dates from far past

#### Main Objectives of the Study

The objective of the study was to evaluate the effect of *Chromolaena odorata* on

Edoga and Nwogu [8]. Ever since ancient times people looked for drugs in nature. The beginning of medicinal plant use was instinctive as is the case with animals [13]. Awareness to medicinal plant use is due to many years of struggles against illness in which man learned to pursue drugs in barks, seeds, fruits and other plant parts (Biljana, 2012). Plant components used in therapeutics are termed phytochemicals and they represent naturally occurring chemical compounds present in plants that produce health benefits other than those attributed to micronutrients and macronutrients [9]. *C. odorata* is a rapidly growing perennial herb with multi stemmed shrub and grows up to 2.5 m in open areas [10]. Its common name is Siam weed. It has many local names depending on the tribe; Obu inenawa (Igbo), Akwokko akpa (Ibibio), Bienqua (Ijaw), Ewe Akintola (Ijebu). In Nigeria *Chromolaena odorata* is commonly called independent plant or Awolowo plant or Elizabeth plant [12]. *C. odorata* leave decoction have been used in folk medicine for wound healing, stoppage of bleeding, and even in some communities where it was reported to be used in pile ailment (Egunjobi, 1969). Moreso, it has acquired the reputation of medicinal herb for variety of ailments including malaria, dysentery, toothache, and fever [19]. However, their haemostatic properties have been reported *in vivo* and *in vitro* study [8].

male wistar albino rats induced with aspirin.



Plate. 1 showing *C. odorata* plant  
Source: keyserver.lucicentral.org 2016

#### MATERIALS AND METHODS

##### Procurement of Animals

About 25 adult male wistar rats of both sexes with body weight of 150-200g was used for this study. They were purchased from Ogbette main market Enugu town, Enugu state and transported to Applied Biology and Biotechnology laboratory. The rats were housed in the laboratory plastic cages for two weeks under normal laboratory conditions (temperature  $28 \pm 31^{\circ}\text{C}$  and relative humidity of  $50 \pm 55\%$

with 12 h light/dark cycle) before the commencement of the study and they were allowed to have access to rat chow and water ad libitum. All the animals were receiving good care according to the criteria outlined in the 'Guide for the Care and Use of Laboratory Animals' prepared by the National Academy of Science (NAS) and approved by Institutional Research Committee.

##### Plant extraction

The methanol extract of *Vernonia amygdalina* (VA) leaves was extracted as described by Oyedeji *et al.* (2013). Fresh *C. odorata* leaves were air-dried and pulverized using laboratory blender. The

pulverized specimen of *C. odorata* (1.7 kg) was soaked in 70% methanol and shaken for 72 hours using an electric shaker. The mixture was filter with Wetman No.1 filtered paper. The filtered

extract was allowed to evaporate under reduced pressure using rotary evaporator. The resulting concentrate was freeze dried using a lyophilizer to yield final product called methanolic extract of *C.*

Methanol extract of *C. odorata* leaves (MECO) was prepared at graded doses of 200, 300 and 400 mg. Two gramme (2 g) of MECO was dissolve in 20 mL of propylene glycol to obtain a sample preparation (stock solution) for 200

A total of 25 rats were divided into 5 groups (5 animals per group). Group A was normal control, Group B induced with 30 mg/kg of aspirin. Group C was induced with 30 mg/kg of aspirin and treated with 20 mg/kg of known standard drug, Omeprazole. Group D was induced with 30 mg/kg of aspirin and was treated with low dosage of *C. odorata* extract.

The anesthetized rat (ketamine 100 mg/kg and xylazine 5 mg/kg) was placed on its back with its tail to face toward the investigator. The abdominal cavity was opened with a V-cut made through the abdominal were starting at the base of the abdomen and proceeding diagonally across each side to the dorsolateral edge of the thorax. The skin flap was allowed

Cleaned stomach was pinned on a corkboard and ulcer was scored using dissecting microscope with square-grid eye piece based on grading on a 0-5 scale (depicting severity of vascular congestions and lesions/hemorrhagic erosions). Areas of mucosal damage were expressed as a percentage of the total surface area of the glandular stomach

The results obtained was expressed as mean ± Standard Errors of Mean (SEM). Data were analyzed using One-way Analysis of Variance (ANOVA) followed by post-hoc

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*odorata* (MECO). The sample obtained as a product of freeze drying was weighed to calculate for the percentage yield of the plant extract. % yield = yield of MECO (g) ÷ weight of pulverized leaves × 100

mg/kg of MECO. From the stock solution, the rats receive 0.2 mL/100 g/day of the extract orally. Stock solutions for 300 and 400 mg/kg of MECO was prepared by dissolving 3g and 4g of MECO in 20 mL of propyleneglycol, respectively.

Group E was induced with 30 mg/kg of aspirin and treated with high dosage of Methanol extract of *C. odorata* leaves (MECO) respectively for 28 consecutive days.

- i. Percentage inhibition
- ii. Ulceration index
- iii. Mucosa acidity
- iv. Gastric pH

to move onto the chest and the stomach was located. The antrum cardiacum and pylorus of the stomach was ligated. An incision to the stomach wall was made, and gastric juice pH was measured with a pH meter S2K712. The pH meter was previously calibrated at two points using standards solutions of pH 4.0 and pH 7.0 [10].

estimated in square millimeters. Mean ulcer score for each animal was expressed as ulcer index (U.I) and the percentage of inhibition against ulceration was determined using the expressions: U.I. = [Ulcerated area/total stomach area] × 100. % Ulcer inhibition = [U.I. in control - U.I. in test] × 100/U.I. in control.

test using SPSS and P value less than 0.05 was considered statistically significant.

RESULTS

Ameliorative effect of *Chromolaena odorata* on percentage inhibition of Male wistar albino rats induced with aspirin

The Ameliorative effect of *Chromolaena odorata* on percentage ulcer inhibition of male wistar albino rats induced with aspirin shown in table 1 below with highest percentage at group C having

Table 1: Ameliorative effect of *Chromolaena odorata* on percentage ulcer inhibition of male wistar albino rats induced with aspirin

77.6740 ± 8.68 % while the least was found with group D 38.2555 ± 5.36%, while group E had 60.8515 ± 7.92mmol/L percentage infection rate. In addition groups A and B had no percentage, in all at p<0.05, there was no significant difference among all the groups as shown in table 1 below.

Groups	Percentage Inhibition (%)
A	0 <sup>a</sup>
B	0 <sup>a</sup>
C	77.6740 ± 8.68 <sup>d</sup>
D	38.2555 ± 5.36 <sup>b</sup>
E	60.8515 ± 7.92 <sup>c</sup>

In a column, mean values with different letter as superscript are significantly different (p<0.05)

Ameliorative effect of *Chromolaena odorata* on ulceration index of male wistar albino rats induced with aspirin

The Ameliorative effect of *Chromolaena odorata* on ulceration index of male wistar albino rats induced with aspirin shown in table 2 below. Group A serves as a control group of albino rats, without induced nor treated, while group B had highest ulceration index with 68.0000± 7.67mmol/L was induced with aspirin without treatment, however, group C with 21.5000 ± 3.33mmol/L was induced and treated with standard ulcer drug and

group D with 64.5000 ± 5.00mmol/L was induced and treated with low dosage of *Chromolaena odorata* extract which shown a reduction of ulceration when compared with group B induced but untreated, although group E had a significant reduction of ulceration 25.0000 ± 5.33mmol/L as shown in table 2 below in there was no significant difference statistically at p <0.05.

Table 2: Ameliorative effect of *Chromolaena odorata* on ulceration index of male wistar albino rats induced with aspirin

Groups	Ulceration Index
A	0 <sup>a</sup>
B	68.0000 ± 7.67 <sup>c</sup>
C	21.5000 ± 3.33 <sup>b</sup>
D	64.5000 ± 5.00 <sup>c</sup>
E	25.0000 ± 5.33 <sup>b</sup>

In a column, mean values with different letter as superscript are significantly different (p<0.05)

Ameliorative effect of *Chromolaena odorata* on gastic pH of Male wistar albino rats induced with aspirin

Ameliorative effect of *Chromolaena odorata* on gastic pH of male wistar albino rats induced with aspirin were illustrated in table 3 below. As shown ulceration is due to decrease in gastric mucosa. Group A as normal control had 5.9450 ± 1.28mmol/L, while group B induced without treatment had a decrease gastric pH of 2.9150 ± 0.53mmol/L. The group C was induced and treated with a

standard drugs and increase gastric pH of 5.1350 ± 1.08mmol/L was observed, while in group D treated with low dosage had a little increase of gastric pH 4.5200 ± 0.94Mol/L and in group E treated with extract of *Chromolaena odorata* high dose had 5.0750 ± 1.35Mol/L and it proved the efficacy of *C. odorata* against gastric pH as shown in table 3 below.

Table 3: Ameliorative effect of *Chromolaena odorata* on gastric pH of male wistar albino rats induced with aspirin

Groups	Gastric pH
A	5.9450 ± 1.28 <sup>d</sup>
B	2.9150 ± 0.53 <sup>a</sup>
C	5.1350 ± 1.08 <sup>c</sup>
D	4.5200 ± 0.94 <sup>b</sup>
E	5.0750 ± 1.35 <sup>c</sup>

In a column, mean values with different letter as superscript are significantly different (p<0.05)

Ameliorative effect of *Chromolaena odorata* on mucosa acidity of male wistar albino rats induced with aspirin

Ameliorative effect of *Chromolaena odorata* on mucosa acidity of Male wistar albino rats induced with aspirin shown in table 4 below. Group A was normal control had 5.2850 ± 1.05mmol/L which is normal mucosa acidity, Group B was induced but untreated recorded a very low mucosa acidity of 2.6000 ± 0.67mmol/L and in group C was induced and treated with standard drug

accoutered a recovery value of 4.7400 ± 0.33mmol/L. Group D was induced and treated with low dosage of *C. odorata* extract had 3.4500 ± 0.3mmol/L, while high dosage of *C. odorata* extract had 4.4150 ± 0.96mmol/L in group E. Among all the groups there was no significant difference at p < 0.05 as shown in table 4 below.

Table 4: Ameliorative effect of *Chromolaena odorata* on mucosa acidity of male wistar albino rats induced with aspirin

Groups	Mucosa Acidity
A	5.2850 ± 1.05 <sup>d</sup>
B	2.6000 ± 0.67 <sup>a</sup>
C	4.7400 ± 0.33 <sup>c</sup>
D	3.4500 ± 0.33 <sup>b</sup>
E	4.4150 ± 0.96 <sup>c</sup>

In a column, mean values with different letter as superscript are significantly different (p<0.05)

#### DISCUSSION

As a result, herbal medicines have been considered as having healthier cultural acceptability and having less harmful and less antagonistic effects [4]. In this study, the percentage of ulceration inhibition by *C. odorata* extract is significant high when compared with induced and treated with standard drugs. This work is line with [3] who stated that presence of phytometabolite constituents in of plant suppresses ulceration index and increase percentage of healing with high dose. This research has provided information with evidence that the ethanolic leaf extract of *C. odorata* possesses biologically active constituents with anti-ulcerogenic properties. It was observed that *C. odorata* extract significantly supresses the ulceration index with high dosage. This result is in agreement with research conducted by [5] who stated that extract of *C. odorata* possess bioactive content

capable treating gastric ulcer at high dose. This work disagreed with the work conducted by Valkhoff *et al.* (2019) in the treatment of ulcer with plant extract is dose dependent and above 350 mg/kg causes liver cirrhosis in rat. Gastric pH was another parameters used to test ability of *C. odorata*. It was observed that gastric pH was increased when compared with normal control. This shows that extract of *C. odorata* has the ability to increase gastric pH of albino rats, which is always used to test level of ulcer in patients. According to [8] suggested that suppression of gastric pH depends on level of ulcer which can be express as ulceration index. This finding was in agreement with work conducted by [13] who reported that infects of ulcer decreases gastric pH as it progress. In mucosa acidity, the *C. odorata* extract significantly suppress the action of ulcer

by increasing mucosa acidity when compared with control, this also same as

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gastric pH in this research.

#### CONCLUSION

These results affirmed that the leaf of *C. odorata* possesses antiulcer activity. This anti-ulcer activity is probably mediated

by some active compounds in *C. odorata*. The use of the plant for the treatment of gastric ailments by traditional medical.

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