EUROPEAN JOURNAL OF BIOMEDICAL AND PHARMACEUTICAL SCIENCES
http://www.ejbps.com

ISSN 2349-8870
Volume: 8
Issue: 6
597-603
Year: 2021

ANTIULCER ACTIVITY OF AQUEOUS PULP AND PEEL EXTRACTS OF UNRIPE *MUSA PARADISIACA* (PLAINTAIN) AT DIFFERENT INCLUSION IN ULCER INDUCED WISTER ALBINO RATS.

Amaralam Eric C.[1], Joel Obinna M.[2], Ajah Obinna[3] and Nnaoma Ikenna E.[2]*

[1]Department of Biochemistry/Microbiology, Federal Polytechnic Nekede Owerri.
[2]Department of Pharmaceutical Technology, Federal Polytechnic Nekede Owerri.
[3]Department of Biochemistry, Michael Okpara University of Agriculture Umudike.

***Corresponding Author: Nnaoma Ikenna E.**
Department of Pharmaceutical Technology, Federal Polytechnic Nekede Owerri.

Article Received on 01/05/2021 **Article Revised on 21/05/2021** **Article Accepted on 11/06/2021**

ABSTRACT
Ulcer is a gastrointestinal disorder resulting due to mucosal membrane breach of the alimentary tract, which passes through the muscularis mucosa into the sub-mucosa to cause deeper peptic ulcer diseases. *Musa paradisiaca*, in addition to its folkloric use in the treatment of peptic ulcers, is also effective in the treatment of diarrhea and vomiting. This present study is aimed at assessing the antiulcer efficacy of unripe *Musa paradisiaca* (plantain) aqueous pulp and peel extracts at different inclusion in ulcer-induced Wistar albino rats. The plant was extracted using cold extraction method. Forty two Wistar albino rats weighing 105-115g was starved for 24 hours and grouped into seven groups (n= 6) according to their weights. Their abdomen was slightly opened under mild chloroform anaesthesia, and their pylorus carefully lifted and ligated, avoiding any damage to the vascular tissues. After ligation, the stomachs were quickly replaced and the abdomen sutured. Immediately after suturing, groups A, B, C and D received intraperitoneal injection of distilled water (2.0mg/kg body wt.), cimetidine (50.0mg/kg body wt.), pulp extract(100mg/kg body wt.), peel extract (100mg/kg body wt.) respectively, while group E, F and G received different inclusion of pulp extract and peel extract. Acute toxicity test, ulcer index (UI), gastric juice volume, gastric pH and gastric mucus were carried out employing standard methods. The result revealed that doses of the peel and pulp aqueous extract of *Musa paradisiaca* up to 5000mg/kg resulted to no behavioural changes and mortality to the experimental animals. The result also showed that 75 + 25mg/kg body weight of pulp and peel had the highest percentage ulcer Inhibition followed by 50mg/kg cimetidine, 100mg/kg body weight of pulp, 50 + 50mg/kg of pulp and peel and and 100mg/kg body weight of peel extract while 25+ 75mg/kg body weight of pulp and peel extract had the lowest percentage of ulcer Inhibition. The treated groups significantly reduced the gastric juice volume and pH of the experimental animals when compared to the untreated group except for 25+75mg/kg body weight of pulp and peel extract. Hence, a better reduction of gastric juice volume and pH was peculiar to 75+ 25mg/kg body weight of pulp and peel extract. However, the gastric mucus lowered in 75+ 25mg/kg body weight and 25+75mg/kg body weight of pulp and peel extracts respectively, when compared to other treated groups. This study demonstrates that Inclusion of pulp and peel extracts of *Musa paradisiaca* at 75+ 25mg/kg body weight exerts antiulcer activities and could be used as pharmaceutical ingredients in the synthesis of antiulcer agents.

KEYWORDS: Antiulcer, *Musa paradisiaca*, gastrointestine disorder, albino rats.

INTRODUCTION
Ulcers are actually lesions that penetrate the thickness of the mucosa of the gastrointestinal tract (Amandeep *et al*., 2012). When aggressive factors such as increased HCL and pepsin secretion, parietal cell mass, and gastric development outnumber protective factors (PGs, increased mucous cells, etc.) the etiology of gastro duodenal ulcer develops (Wallance, 2001). A peptic ulcer is a harmless lesion of the gastric or duodenal mucosa that develops when the mucosa epithelium is exposed to acid and pepsin. It occurs as a result of a mismatch between aggressive (acid-pepsin secretion, H. pyori, increased free radicals, and decreased antioxidants) and impaired mucosal resistance (Mucus bicarbonate secretion) prostaglandins, blood flow, and the mechanism of restriction and regeneration following cellular operation (Dhuley, 1999).

Antacids, H2 blockers, and proton pump inhibitors, among other drugs, work by reducing violent causes.

Various studies have shown that these widely used treatments for peptic ulcers have a risk of drug interaction, adverse effects, and increased relapses during ulcer therapy. Due to the problem of these agents being complex, costly, and toxic, efforts will be made to find a suitable curative agent for the treatment of peptic ulcer disease made from natural plant products that provides better protection and reduces the risk of relapse.

Medicinal plants are an essential component of herbal medicine, which is practiced all over the world, and they have made significant contributions to disease prevention and health maintenance. This is disease prevention and health conservation. This may be due to their accessibility, higher safety margin, and lower price. *Musa paradisiaca* is a crop belonging to the genus Musa, which is native to tropical and subtropical regions of the world. It has been cultivated for over 4000 years, and its various varieties are a staple food in tropical areas around the world (Imam and Akter, 2011). *Musa paradisiaca* is an important food in Africa's humid tropical region, and it is unquestionably one of the continent's oldest cultivated crops. The Igbos in Nigeria refer to it as Ayoko. Unripe plantains (*Musa paradisiaca*) are high in carbohydrate and potassium, as well as provitamin A. *Musa paradisiaca*, in addition to its folkloric use in the treatment of peptic ulcers, is also effective in the treatment of diarrhea and vomiting (Osifo *et al.*, 1989). Plantain leaf is known as a "green bandage" because it has soothing properties that can help with skin infections, wounds, and rashes. When used as an expectorant, unripe plantain aids in the removal of phlegm from the respiratory tract (Simon, 1998). It also has astringent properties, making it useful for treating urinary tract infections and hemorrhoids in folk medicine (David, 1995).

Herbal medicines primarily boost defense mechanisms including mucin secretion, mucosal blood flow, and cell turnover (Groel and Sairam, 2002). The findings of this study will aid in the development of an ulcer treatment that is readily available, affordable, has less side effects, and can improve the defense mechanisms of the gesture and duodenal mucosa. However, the current goal of this study is to assess the antiulcer efficacy of unripe *Musa paradisiaca* (plantain) aqueous pulp and peel extracts in ulcer-induced Wistar albino rats.

MATERIALS AND METHODS

Collection and preparation of plant

Freshly cut bunches of unripe plantain *(Musa paradisiaca*) was harvested from Ogwe, Ukwa East, Local Government Area of Abia State, Nigeria. The plant was identified and authenticated by Dr. Duru F. of the Department of Environmental Biology, Federal Polytechnic Nekede, Owerri, Imo Nigeria.

Preparation of the aqueous extract

The fresh unripe *Musa paradisiaca* fingers was washed with clean water and peeled the pulp (fruit) and the peels was cut into very small pieces. 1.0kg of the pulp and 2.0kg of the peels was boiled differently in distilled water at the ratio of 1.2 W/V for 2 hours. The extracts was filtered using cheese cloth and membrane filter paper of 47.0mm 598diameter and pore size approximately 0.45um, with the aid of a suction pump. The filtrate was concentrated using rotary evaporator and the extracts were stored in the refrigerator prior to use.

Animal

Healthy male Wistar albino rats weighing between 80-90g was used in this study. All the rats were purchased from the animal house of the college of natural sciences, Micheal Okpara University of Agriculture, Umudike, and was housed in standard animal cages in the Department of Science Technology (Microbiology/ Biochemistry option), Federal Polytechnic Nekede, Owerri, Imo State. The animals were fed a standard balanced diet and were given free access to water ad libitum for one week before experiments, to allow for acclimatization. All animals were fasted for 24 hours to ensure an empty stomach before use in the experimental (Mahmood *et al*., 2010).

Acute toxicity Study

Lorke (1983) method was adopted for the determination of the median lethal dose (LD 50) of the aqueous pulp and peel extract of *Musa paradisiaca*. In this study, nine male wistar rats weighting between 80 to 85g was used. The rats were randomly divided into three groups (A, B, and C) of three rats each and was administered pulp (fruit) extract of *Musa paradisiaca* intraperitonealy 10.0,100.0 and 1000.0mg1kg body weight respectively. The same treatment was given to peel extract of *Musa paradisiaca*. The animals were observed for behavioral changes and mortality for 24 hours. When no death is observed in 598any of the groups, five other groups (I to v) was given 1250, 1500, 2000, 2500 and 5000mg/kg body weight of the pulp and peel extract (i.p) and was monitored for 24 hours for changes in behavior and mortality.

The LD50 was usually calculated as the geographic mean of the least lethal dose that killed a rat highest dose that did not kill a rat.598

Anti ulcerative effect of the extract was also studied using the pyloric ligation method of Raju et al. (2009). Forty two male Wistar albino rats used were subjected to a 24 h – fast and grouped into seven groups A to G (n = 6). The A, B, C, D, E, F and G received intraperitoneal injections of distilled water (2.0ml/kg body weight.), cimetidine (50.0mg/kg body weight.), pulp extract (100mg1kg. body weight.) peel extract (100mg/kg body wt.), peel extract (100mg/kg body weight.), combined pulp and peel extract (50 + 50mg/kg body weight.), combined pulp and peel extract (75 +25mg/kg body weight.) and combined pulp and peel extract (25 +75mgkg body weight.) respectively. Distilled water and cimetidine will serve as negative and positive control

respectively. Four hours after treatment, the animals were anaesthetized with chloroform, their abdomen dissected and duodenal portion ligated. The stomachs were then opened along the line of greater curvature and gastric content extracted. Gastric volumes were determined after centrifuging the gastric content at 4000 rpm for 20 min. Ulcer scores were estimate as follows.

Normal stomach…….. 0
Spot ulceration…… 1.0
Haemorrhagic streaks……. 1.5
Ulcer -……. 2.0
Perforations …… 3.0

Calculation of ulcer index and percentage inhibition; Ulcer index (UI) = Mean of ulcer scores per rat.

Percentage ulcer inhibition =

$$\frac{UI\ (control) - UI\ (treated)}{UI\ (control)} \times 100$$

Determination of gastric juice volume and pH

The gastric contents was collected and centrifuged at 1000rpm for 10minutes. The volume of the supernatant was determined in ml. the pH of the supernatant was measured using a pH meter (Srivastava, 2010).

Assessment of gastric mucus

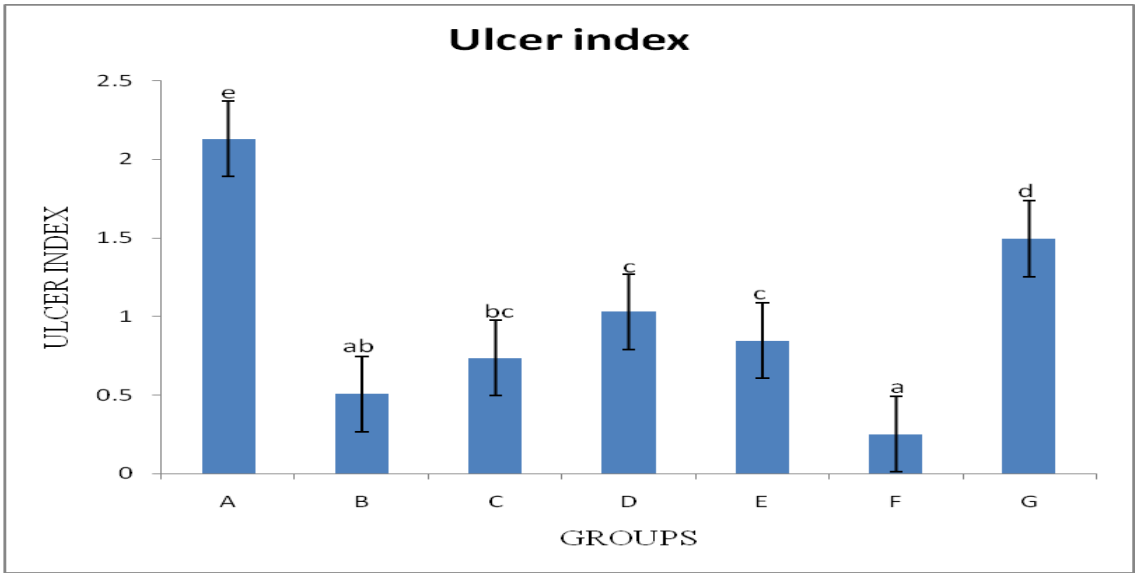
Alcian blue binding to gastric wall mucus was determined by a modified method of Corne (1974). The stomach of each rat was weighed and was transferred immediately to 10ml of 1% (w/v) alcian blue solution (in 0.16M sucrose solution, buffered with 0.05ml sodium acetate, pH 5) for 2hours at room temperature. After 2hours, the stomachs was removed, and rinsed with 0.25M sucrose solution to remove excess dye after 15 and 45 minutes, the dye complex with gastric wall mucus was extracted with 10ml of 0.5M MgCL2 solution and was intermittently shaken for 1minute at 30 minutes intervals for 2 hours. The stomach was removed and 5ml of each aliquot out of Mgcl2 solution containing the alcian blue elute from each stomach was shaken with 4ml of diethyl 599ether. The aqueous phase was separated out, and centrifuged at 4000xg for 16minutes, and the absorbance of the supernatant was measured at 580nm. The amount of Alcian blue bound per stomach in micrograms was determined using a standard calibration curve. (note: Alcian blue = standard compound).

Statistical analysis

All the data was presented as mean ± standard errors of means (SEM). Comparative analysis between the various groups was performed using analysis of variance (ANOVA).599

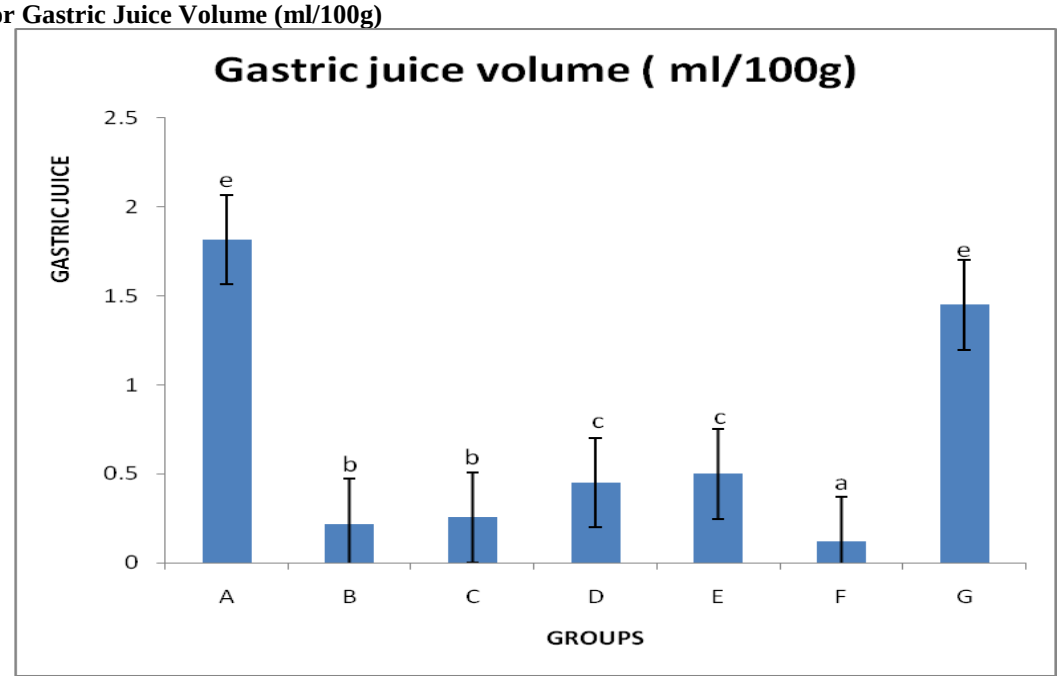
RESULT AND DISCUSSION

Result For Ulcer Index



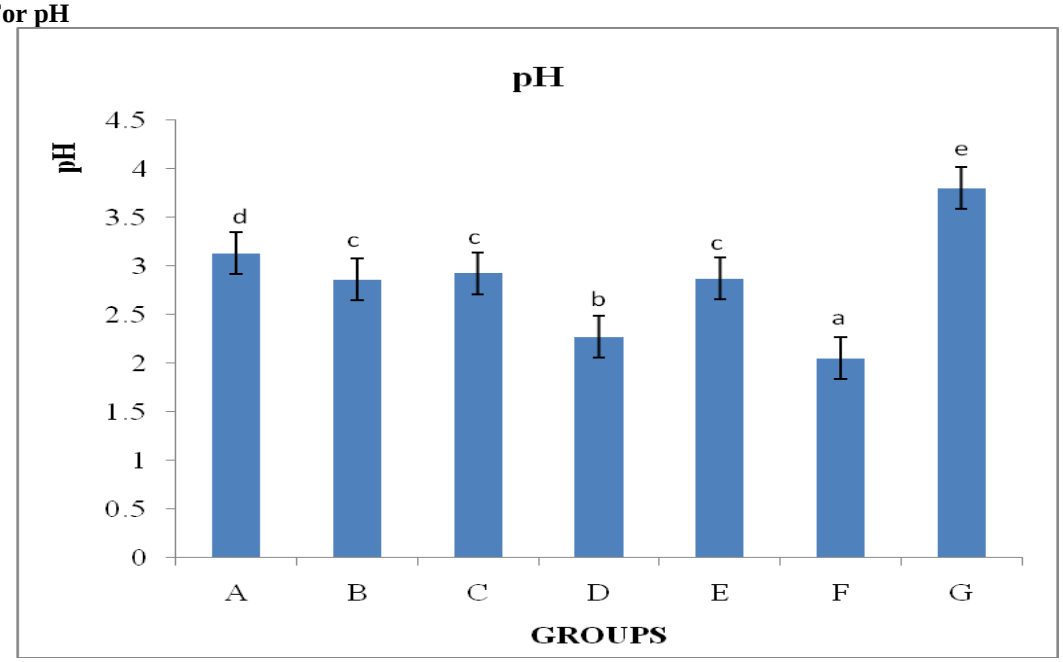
The results were expressed in mean±SEM, values with with different superscripts vary Significantly (P< 0.05), while values with the same superscript do not vary significantly.

Result For Gastric Juice Volume (ml/100g)



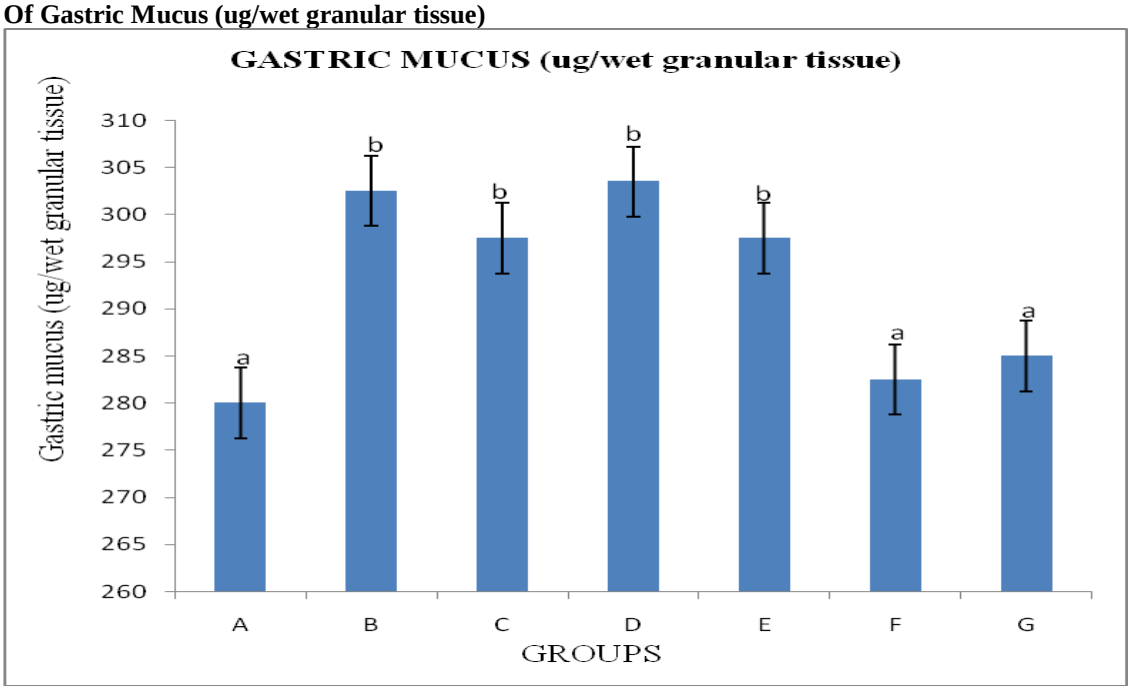
The results were expressed in mean±SEM, values with with different superscripts vary Significantly (P< 0.05), while values with the same superscript do not vary significantly.

Results For pH



The results were expressed in mean±SEM, values with with different superscripts vary Significantly (p less than 0.05), while values with the same superscript do not vary significantly.

Result Of Gastric Mucus (ug/wet granular tissue)



The results were expressed in mean±SEM, values with with different superscripts vary Significantly ($p < 0.05$), while values with the same superscript do not vary significantly.

DISCUSSION

Ulcer is a gastrointestinal disorder resulting due to mucosal membrane breach of the alimentary tract, which passes through the muscularis mucosa into the sub-mucosa to cause deeper peptic ulcer diseases. Generally duodenal ulcers occur when the linings of stomach are corroded by the acid-peptic juices (Bashir *et al*., 2014). Pylorus- ligated induced gastric ulcers occur because of an increase in acid-pepsin accumulation due to pyloric obstruction and subsequent mucosal digestion.

Pylorus ligation-induced ulcers are due to accumulation of gastric acid and pepsin which lead to autodigestion of gastric mucosa and breakdown of gastric mucosal barrier. The increase in the protein content of the gastric juice in untreated ulcer group indicates the damage to the gastric mucosa as a result of plasma proteins leak into the gastric juice (Kannappan *et al*., 2018). Mucus is secreted by the mucus neck cells and coats the gastric mucosa, thereby preventing physical damage and back diffusion of hydrogen ions (Goel and Bhattacharya, 1991). Consequently, any agent that possesses the capacity to restore the equilibrium by enhancing the activity of the cytoprotective agents or di-minishing the secretion of gastric acid could serve as an antiulcerative agent. Mbagwu *et al*. (2011).

This present study was designed to evaluate the antiulcer potential of pulp and peel extracts of plantain at different inclusion. Findings from the acute toxicity study showed that doses of the peel and pulp aqueous extract of *Musa paradisiaca* up to 5000mg/kg resulted to no behavioural changes and mortality to the experimental animals, this fact revealed that after 24hours monitoring, *Musa paradisiaca* peel and pulp aqueous extracts were not lethal to the rats.

From figure 1, it was deduced that all the animals in different groups developed ulcer induced by pylorus ligation and the ulcer index in group A was significantly higher than the treated groups showing that there was existence of ulcer in the rats. The inference of this is that all the lesions developed as regsrds to the disruption of the vascular tissues of the gastric mucosal endothelium (Nagaraju *et al.*, 2012).

The ulcer index in group F (administered with combined extract of 75mg/kg and 25mg/kg body weight of pulp and peel) significantly reduced when compared to all the groups including Group B (treated with cimetidine), therefore, 75+25mg/kg had a better reduction of ulcer index followed by Cimetidine 50mg/kg,100mg/kg pulp extract, 50+50mg/kg pulp and peel while 75+25mg/kg pulp and peel had the least ulcer index. This reveals that combination of pulp and peel at inclusion 75% and 25% had better percentage Inhibition when compared with other inclusions. Mahadeva *et al.*, 2016 reported that the skin extract of *Musa paradisiaca* showed antiulcer activity and also contains abundant flavonoids. Thus, this may have attributed to the antiulcer activity of pulp and peel extracts of plantain.

Ezekwesili *et al.*, 2014 reported that the aqueous peel extract of M. paradisiaca Linn. protected against ulcerative lesions induced by ethanol, aspirin and pyloric ligation and also *M. paradisiaca* peel extract mimics the actions of cimetidines in ameliorating ulcers in all the experimental models adopted. Group F (administered with 75% and 25% pulp and peel extract respectively)

significantly reduced the gastric juice volume when compared to other groups. Cimetidine 50mg/kg and 100mg/kg pulp significantly reduced gastric juice volume when compared to 100mg/kg peel and 50+50mg/kg pulp and peel extract, while group G(administered with 25% and 75% of pulp and peel respectively) had the highest gastric juice volume. Researcbes have proved that most medicinal plants that contain saponin possess antiulcer activity.

This present study also revealed that there was reduction in gastric pH in the treated groups when compared to untreated group (group A), except 25+75mg/kg pulp and peel. There was significant reduction in gastric pH in 75+25mg/kg pulp and peel extract followed by 100mg/kg peel, thus, cimetidine 50mg/kg, 100mg/kg pulp extract and 50+50mg/kg pulp and peel extract were insignificant in their gastric pH.

Mucus serves as the first line of defence against ulcerogenic agents. It is secreted by the mucous neck cells and shields the gastric mucosa. Mucus secretion is an essential factor in the protection of the gastric mucosa from the gastric erosions and has been regarded as a significant defensive entity in the gastric mucus barrier (Goel *et al.*, 1994). There was significant increase in gastric mucus in the treated groups when compared to the untreated group, except for 75+25mg/kg body weight of pulp and peel and 25+750mg/kg body weight pulp and peel extract that was insignificant when compared to the untreated group. Inclusion of pulp and peel extract at 75+25mg/kg body weight respectively exerted a better antiulcer activity when compared to other groups but not in terms of gastric mucus secretion.

CONCLUSION

Inclusion of pulp and peel extracts of *Musa paradisiaca* at 75+ 25mg/kg body weight exerts antiulcer activities and could be used as pharmaceutical ingredients in the synthesis of antiulcer agents.

ACKNOWLEDGEMENT

The authors would like to thank the Tertiary Education Trust Fund (TETFund) Nigeria for financial support which enabled the development of our research. We also want to acknowledge the Management of Federal Polytechnic Nekede Owerri for creating enabling environment for research.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

FUNDING

The research was funded by Tertiary Education Trust Fund (TETFund) Nigeria through the Institution Base Research (IBR) Project Grant 2020 (TETFUND/ DR&D/CE/POLY/NEKEDE/RP//Vol. I).

REFERENCES

1. Bashir, A., Hazarika, I. and Jaikumar, S. (2014). Anti-Ulcer Activity of Polyherbal Formulation-RO12 on Experimentally Induced Ulcer in Rats. International *Journal of Phytopharmacology, 5(6): 406–410p. 2. Goel RK, Sairam.*
2. Kannappan, N., Jaikumar, S., Manavalam, R. and Kotti Muthu, A. (2008). "Antiulcer activity of methanolic extract of Jatropa curcas (Linn.) on aspirin-induced gastric lesions in wistar rats," Pharmacologyonline, 1: 279–293.
3. Goel, R.K. and Bhattacharya, S.K. (1991). "Gastroduodenal mucosal defence and mucosal protective agents," Indian Journal of Experimental Biology, 1991; 29(8): 701–714.
4. Mbagwu, H., Jackson, C., Ekpo, M. Okopedi, E., Anah, V. and Ugwu, C. Gastroprotective effects of ethanolic leaf extract of Musa paradisiaca L. (Musaceae) in rats. *J. Chem. Pharm. Res*, 2011; 3(3): 322–327.
5. Ezekwesili C. N., Ghasi, S., Adindu, C.S. and Mefoh, N. C. (2014). Evaluation of antiulcer property o aqueous extract of unripe Musa paradisiaca Linn peel in Wistar albino rats.African *Journal of Pharmact and Pharmacology*, 8(39): 1006- 1012.
6. Amandeep, K., Robins S., Ramica, S. and Sunil, K. (2012). Peptic ulcer. *International Research of Journal of Phamacy*, 3(6): 34-38.
7. David, H. (1995). The new holistic herbal plant of medicinal use, 6(1): 19-27.
8. Dhuley, J.N. (1999). Protective effects of Rhinax, A herbal induced gastric and duodenal ulcer in rats. *Indian J pharmacol*, 31: 128-132.
9. Goel, R.K., Saram,.K. and Rao, C.V. (2001). Role of gastric antioxidant and anti-Helicobater pylon activities in antiulcerogenic activity of plantain babana (Musa saprentum var. paradisiaca), *Indian journal of experimental biology*, 39(7): 719-722.
10. Imam, M.Z. and Akter, S. (2011). *Musa paradisiaca L. and Musa sapientum L.:* a phytochemical and phsrmcological review. *J. Appel pharma Sci*, 14-20.
11. Osifo, B.O, Akinyika, O., Akinbemi, O. and Lukambi, F.A. (1989). A chemical trialon soya plantain food university college hospital Ibadan Nigeria.
12. Simon, T. M. (1998). The dictionary of modern herbalism, 6(1): 22-24.
13. Wallence, J. L. (2001). Measurement of protection and heating: Current knowledge and future research. *American journal of medicine*, 110: 19-28.
14. Raju, D., Ilango, K., Chitra, V. and Ashish, K. (2009). Evaluation of anti-ulcer activity of methanolic extract of Terminalia chebula fruits in experimental rats. *J. Pharm. Sci. Res*, 1(3): 101–107.
15. Corne, S. J., Morrisey, S.M. and Woods, K.J. (1974). A method for the quantitative estimation of gastric barriers mucus. *Journal of physiology*, 2452: 116-117.
16. Lorke, D.A. (1983). A new approach to practical

water toxicity testing. *Arch. Toxicol*, 54: 275-287.
17. David, H. (1995). The new holistic herbal plant of medicinal use, 6(1): 19-27.
18. Dhulay, J. N. (1999). Protective effect of Rhinax, A herbal formulation against physical and chemical factors induced gastric and duodenal ulcer in rats *Indian J. pharmacol*, 31: 128-153.
19. Mahmod, A., Mariod, A.A., Al -Bayaty, F. and Abdel – Wariab, S.I. (2010). Antiulcerogenic activity of Gynura procumbens leaf extract against experimentallyinduced gastric lesions in rats. *Journal of medical plants researc*h, 4(8): 685-691.
20. Goel, R. K., Maitri, R. N. and Mukobandhyay, K. (1994). *Indian Journal of Experimental Biology*, 32: 559 – 561.