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Anti-ulcer effects of aqueous extract of unripe plantain peels on male wister (albino) rats

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ABSTRACT

The anti-ulcer activities of aqueous extract of unripe plantain peels (*Musa paradisiaca*) were evaluated in this study using standard methods. Twenty-five male wistar (albino) rats were starved and randomized into five groups designated A,B,C,D and E. Groups A (positive control) and B (negative control) animals were administered with 2ml/kg and 50mg/kg body weight of distilled water and reference drug (cimetidine) respectively while 50mg/kg, 100mg/kg and 200mg/kg body weight of the extract were administered intraperitoneally to animals in groups C, D and E respectively and after four hours, 90% ethanol(1mg/kg body weight) was administered to the rats in all the groups. Then the animals were anaesthetized after two hours using chloroform, and their stomachs were dissected and hematological studies were carried out. The result showed that the ulcer index activity for group A (positive control) had a significant change ($P<0.05$) compared to groups B (negative control), C, D. and E respectively. The percentage cytoprotective effects were very high in group E, but significantly reduced in group A (positive control) ($P<0.05$). These results therefore confirm that the aqueous extract of unripe plantain peels (*Musa paradisiaca*) has anti-ulcer effects and as such could be useful in ethno-medicine for ulcer treatment.

KEYWORDS

Anti-ulcer;
Extract;
Unripe;
Plantain;
Peels.

INTRODUCTION

Over the last few decades, the role of medicinal plants as a primary tool in preservation of health and management of diseases has been realized mainly by using synthetic drugs molecules that produce harmful side effects, which are comparatively minimal in drugs of plants origin[1]. Current estimates suggest that, in many developing countries, a large proportion of the population relies heavily on traditional practitioners and medicinal plants to meet their primary health care needs. Although modern medicines may be available in these countries, herbal medicines (phytomedicines) have often maintained popularity for historical and cultural reasons[2]. Some of the drugs used today such as codeine, morphine, atropine, cocaine and ephedrine have origi-

nated from medicinal plants[1].

There are piles of scientific support on the efficacy of medicinal plants in the management of ulcer of different etiologies[3]. The medicinal properties of these plants are attributed mainly to the presence of flavonoids, but they may also contain other organic and inorganic compounds such as coumarins, alkaloids, terpenoids, tannins, phenolic acids and anti-oxidants; micronutrients like copper, manganese and zinc[4].

The exact pathogenesis of ulcer continues to elude scientists and medicinal researchers, but a common ground has been proposed[5]. Gastric ulcer is a break in the tissue lining of the stomach that can be cured without complication[6]. Peptic ulcer includes focal lesions of gastric or duodenal mucosa[3] or sore that forms in the lining of the stomach or duodenum[4].

The exact pathogenesis of ulcer is multi factorial and includes diverse factors such as stressful lifestyle, alcohol consumption, use of steroid and non-steroid anti inflammatory drugs (NSAIDs) and drugs which stimulate gastric acid and pepsin secretion, smoking, lower socio-economic status and family history[4].

The main therapeutic target in the management of ulcer is the control of gastric secretion using antacids, H_2 receptor blockers like ranitidine, cimetidine, famotidine, antocholinergics like pirezepin, telezipine or proton pump blockers like omeprazole, lansoprazole etc. The prevention or cure of peptic ulcer is one of the most challenging problems in medicine because gastric ulcer therapy faces drawbacks and most of drugs currently available in the market show limited efficacy against gastric diseases and is often associated with severe side effects[4].

Musa specie, a tropical plant, have been consumed since many years by mankind for nutritious and delicious fruits[7]. Different species of *Musaceae* have been discovered. These includes *musa paradisiaca (plantai*n) now called *Musa acumintum* (Banana), *Musa ornate, Musa aurantiaca* etc[1]. Plantain is one of the oldest and best known fruit of the world. It is a delicious and seedless fruit that is available in all seasons at a price which is within everybody's reach. It is a very hygienic fruit as it comes in a green proof package. Its thick covering (peels) provides an excellent protection against bacteria and contamination[6].

Generally, *Musa* species (including bananas and plantains) are herbaceous perennial plants[8]. *Musa paradisiaca* (family: *Musaceae*) commonly known as plantain is perennial tree-like herb widely distributed in the tropics[9], Their herbaceous nature is as a result of the plant not having woody part after ripening of the fruits. All *Musa* species range between 2 to 9 meters in height[8].

Different species of *Musa* genus (family: *Musaceae*), are native to the Asian, Indo-Malaysian and Australian tropics and are widely found throughout the tropical and subtropical areas[10], although, ethno botanists do not know exactly where the plant originated. The most generally accepted theory is that Indo-Malaysian is the main center of plant[7]. From its native southwestern pacific home, the plants spread to India by about 600BC and later on it spread into the Islands of the pacific and to the west coast of Africa as early as 200-300BC[11].

Plantain is used in herbal medicine to treat peptic ulcer disease. The usefulness of *Musa paradisciaca* in gastric mucosa is due to the multiple active compounds. A natural flavonoid from the unripe plantain pulp, lecucoyanidin, protects the gastric mucosa from erosion[11]. Dried unripe plantains have been shown to possess antiulcerogenic activity and were effective both as a prophylactic treatment and in healing ulcers induced by aspirin, although ripped plantains fruits were inactive[7].

Aqueous extract of unripe fruit peels and leaves of *Musa paradisiaca* has been reported to show antimicrobial activity against *Staphylococcus* and *Pseudomonas* species in dehydrogenase assay. In this assay, the fruit peel extract showed better activity against both bacteria than leaf extract. The peel extract was found to be more active against *Staphylococcus* (Gram-positive) than *Pseudomonas* species (Gram-negative)[11]. Plantain flakes have also been tested and found safe and cost-effective in the treatment for diarrhea in critically ill patients[11,7].

EXPERIMENTAL

Plant material procurement

Mature bunch of fresh unripe plantain was purchased from Eke Market in Afikpo North L.G.A, Ebonyi State, Nigeria was identified by Dr. M.C. Okafor,

the herbarium curator, Department of Science Laboratory Technology, Akanu Ibiam Federal Polytechnic, Unwana (AIFPU). The plantain was used fresh for the experiment. Peels from the plantain fingers only were used.

Experimental animals

Twenty-five Adult male Wistar (albino) rats were obtained from the animal house of the Faculty of Pharmaceutical Sciences, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria. The animals weighing 185-250g were kept on a sterile pellet diet with free access to water and at environmental temperature and humidity. All animals were housed in cages in their respective groups at the laboratory of Science Laboratory Technology (SLT) Department, Akanu Ibiam Federal Polytechnic Unwana, to acclimatize for fourteen (14) days before the experiment.

Extraction procedure

The peels were carefully removed from the washed plantain fingers and were cut into small pieces and boiled for about two hours with distilled water in the ratio of 1kg weight of peel to 5kg of water in order to solubilize the phytochemicals. The mixture was sieved with calico material and the liquid extract was filtered through a membrane filter using membrane filtration technique with suction pressure, and the filtrate was evaporated using rotary evaporator in other to concentrate the extract. The concentrate was stored in a refrigerator at 4^0C until the experimental analysis.

Experimental design

The method according to Raju *et al.*[12] was adopted. The animals were starved for 24 hours and their weights determined and recorded. The animals were grouped into five groups of five rats per group, and labeled A, B, C, D and E according to their weights. Each administration in the various groups was done intraperitoneally (IP) according to the specification below.

Group A (positive control)	Distilled water, 2ml/kg
Group B (negative control)	Cimetidine, 50mg/kg
Group C (experimental group)	Plantains extract, 50mg/kg
Group D (experimental group)	Plantain extract, 100mg/kg
Group E (experimental group)	Plantain extract, 200mg/kg

After four hours (4 hours), 2.0ml/kg body weight of 90% ethanol were administered to the experimental organisms. After another two hours (2hours), All the animals in the various groups were anaesthetized using chloroform and sacrificed after two hours (2 hours) of ethanol administration and their stomachs were dissected along the line of larger curvature for the hematological study.

The dissected stomachs were carefully washed and laid on the dissecting board in order to expose the mucosa linings of the organisms, and the ulceration areas were determined using a magnifying lens by counting of injuries, streaks and perforations that were recorded as the ulcer sores.

RESULTS AND DISCUSSION

The anti-ulcer activities evaluation for different groups of organisms revealed that group A (consisting of rats administered with 1ml/kg body weight of distilled water) has the highest mean ulcer index activity, while the group E (consisting of rats treated with 200mg/kg body weight of the plantain peel extract has the lowest mean ulcer index activity as shown in Figure 1. From the Figure 1, it is also observed that the ulcer index decreases as the concentration of the extract increases confirming the efficacy of the extract. The mean percentage cytoprotection obtained for the different groups as shown in Figure 2 revealed that group E organisms have the highest percentage cytoprotection activity while group A organisms (positive control) showed no cytoprotection activity at all. The remarkable antiulcer activity and cytoprotective properties of aqueous extract of unripe plantain peels(*Musa paradisiacal*) on the experimental organisms may be attributed to the phytochemicals; flavonoids, tannins, and saponins[13]. This cytoprotection activity of unripe plantain peels (*Musa paradisiaca*) is in good agreement with the work of Ajoy, *et al.* [1] and Swathi *et al.*[14] who reported protective effect of unripe plantain peels extract against aspirin induced erosions in gastric mucosa.

Plantain (*Musa paradisiaca*) are mainly grown in the tropical and subtropical countries and are widely used for its nutritional values all over the world. It is a

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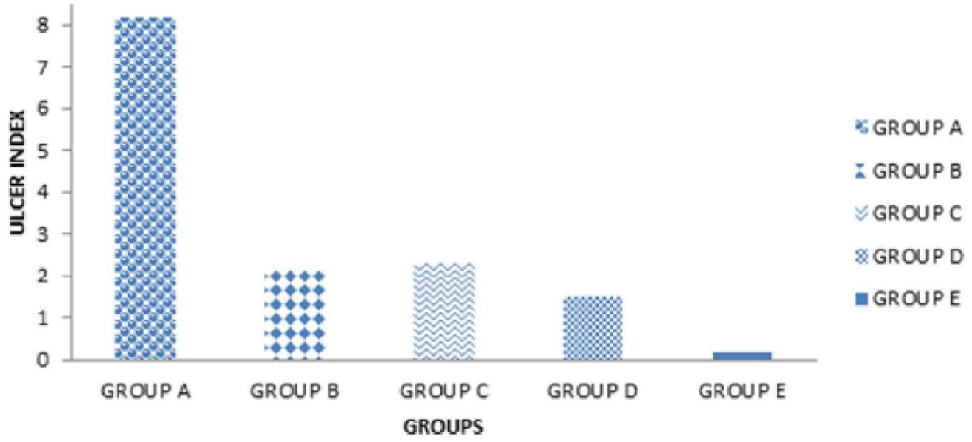

Figure 1 : The mean ulcer index activity of different groups

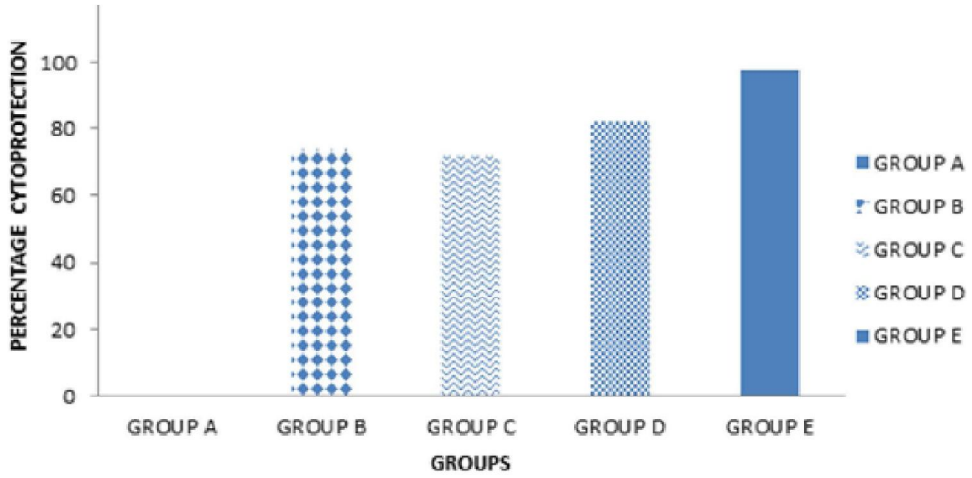

Figure 2 : The mean percentage cytoprotection activity of the different groups

delicious and seedless fruit and also available in all seasons. It is very hygienic fruit as it comes in a green proof package; its covering provides an excellent protection against bacteria and contermination[6]. Green unripe plantain peels have been reported to have medicinal value which includes antidiarrhoeal, antimicrobial, antioxidant, diuretic, wound healing, antiulcerative, antimalarial,antisnake venom, effect in atherosclerosis, and effect on muscle[11]. And some phytochemical have been isolated from the plant which includes beta-sitosterol, lucocyanidin, syringin, quercetin, L-tryptophan, 5-hydroxyptamine, 7, 8-dihydroxy-3-methyl isochroman-4-one, sitoindoside-II, pectin[11].

Ethanol induces gastric injury by the production of free oxygen radicals like superoxide (O_2^-), peroxide(H_2O_2) that causes the damage to cell-cell membranes due to lipid peroxidation[15]. Ethanol also produces gastric lesion formation due to cessation in gastric blood flow which contributes to the development of the haemorrhage and necrotic tissue injury[15].

Peptic ulcer is a common disorder of the entire gastrointestinal tract[16]. Peptic ulcer occur mainly at the stomach and the proximal duodenum; they can also occur at the esophagus jejunum and gastric anastamotic site[16]. The pathogenesis of gastric ulcers remains widespread, it is a multifactorial disease where diverse factors such as stressful lifestyle, alcohol consumption, use of sterodal and non-sterodal anti inflammatory drugs (NSAID) and drugs which stimulate gastric acid and pepsin secretion[17].

CONCLUSION

It can be concluded therefore from the findings in this prospective study that aqueous extract of unripe platain peels (*Musa paradisiaca*) has unti-ulcer properties and as such could be useful in ethno-medicine for treatment of ulcer.

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