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Evaluation of Antiulcer Activity of *Commiphora africana* (A. Rich) Engl. (Burseraceae) Stem-bark Extracts Using Ethanol Induced Ulcer Model in Albino Rats

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A B S T R A C T

This study was designed to evaluate the antiulcer activity of *Commiphora africana* stem-bark extracts using ethanol induction model in laboratory rats and to identify phytochemical constituents of the extracts responsible for the observed activity. *C. africana* stem-bark was extracted with n-hexane, ethyl acetate and methanol gradient wise in a soxhlet apparatus at 50ºC. The extracts were subjected to qualitative phytochemical analysis, toxicity experiment and anti- ulcer evaluation using ethanol – induced gastric ulcer in laboratory rats. A standard anti-ulcer agent, omeprazole was used as reference standard. The data were analyzed by one-way Analysis of Variance with significant level at ($p<0.05$). The percentage yield from the gradient extraction of *C. africana* stem-bark showed methanol to be the highest. Thin Layer Chromatographic analysis visualized with specific reagents confirmed the presence of steroids/triterpenes, phenolic compounds and flavonoids in the stem-bark of *C. africana*. LD_{50} was above 5000 mg/kg and did not cause mortality in all the tested rats. Ethanol triggered severe gastric ulcers with mean ulcer index (12.8 ± 0.97 mm) and pretreatment with *C. africana* stem-bark n-hexane, ethyl acetate and methanol extracts at (250, 500 and 1000 mg/kg) and Omeprazole (20 mg/kg) produced a significant ($p<0.05$) dose dependent anti-ulcer activity with increase in percentage ulcer inhibition of (9.38%, 43.75% and 57.81%) for CAHE, (59.38%, 68.75% and 85.94%) for CAEE and (65.63%, 73.44% and 90.63%) for CAME respectively. Omeprazole had 68.75% ulcer inhibition. This study demonstrated that *C. africana* has anti-ulcer potential and it justified the traditional uses of the stem-bark in ulcer treatment.

Introduction

Peptic ulcer is one of the most common, chronic gastrointestinal disorders in this modern era. Now it has become a common global health problem affecting a large number of people world-wide and also still a major cause of morbidity and mortality (Chan, 2002; Soll, 1998). It is now considered to be one of the modern age epidemics affecting nearly 10% of world population (Zapata-Colindres *et al*., 2006).

About 6,000 die of ulcer related complication. Peptic ulcer causes significant morbidity which is mainly related to pain and hospitalization for complication (Buger *et al*., 2000). Many studies indicate that plant products are potential agents for healing ulcers and largely preferred because of the absence of unwanted side effects and their effectiveness (Jhasnsi *et al*., 2010).

Commiphora africana (A. Rich) Engl. is a species in the family Burseraceae. The plant is called “dashi” in Hausa, “badadi” in Fulfulde and “kabi” in Kanuri languages of Nigeria (Dalziel, 1937; Keay, 1989). It is a bush shrub or small tree mainly found in the savannah woodland and drier parts of tropical Africa (Ekarika *et al*., 2012). It is traditionally used for the treatment of a number of ailments including the treatment of typhoid, wound healing, relieve pain, dysentery, heart burn, snake-bites, as anti-malaria, as a plaster and spasms (Lewis and Elvin-Lewis, 1977, Hanus *et al*., 2005). The ethanolic leaf Extract was found to have lipid profile activity in laboratory rat and antimicrobial activity (Adebayo *et al*., 2006; Goji *et al*., 2009). The stem-bark was reported to have hypoglycaemia effect in laboratory animals (Aliyu *et al*., 2002). Traditionally, the powdered stem-bark of the plant taken with banana has been used for the treatment of ulcer (Mal. Zakir Abdulhamid, Personal communication). This study was designed to evaluate the antiulcer activity of *C. africana* the stem bark and to identify phytochemical constituents of the extracts responsible for the observed activity.

Materials and Methods

Collection Identification and Preparation of the Plant Material

The plant material was collected at “Yankarfi” village, Sabo Gari Local Government Area of Kaduna State, in May, 2015. The plant was taxonomically authenticated at the Herbarium unit, Department of Biological Sciences, Ahmadu Bello University Zaria, Nigeria with Voucher specimen number 2848. The stem-bark was dusted, cleaned and all foreign matter removed, it was then air-died and comminuted to powder form, stored in an air-tight container for subsequent use.

Preparation of Extracts from *Commiphora africana* Stem-bark

The solvents used during the course of this study were of analytical grade. Powdered sample (1kg) was extracted with n-hexane, ethyl acetate and methanol (JHD, Lobal Chem, India) gradient wise in a soxhlet apparatus at 50ºC. The plant material was exhaustively extracted with hexane (2 L) until the solvent became clear and the same procedure was applied consecutively to ethyl acetate and methanol. The gradient extracts obtained with each solvent were concentrated on a rotary evaporator and finally dried to a constant weight after which it was stored in an air-tight container for subsequent use (Kokate, 2003) with modification. The extracts were subsequently coded as CAHE (*C. africana* Hexane Extract), CAEE (*C. africana* Ethyl Acetate Extract) and CAME (*C. africana* Methanol Extract). The percentage yield was calculated using the formula:

Percentage Yield of extracts:

$$(\text{w/w}) = \frac{\text{Weight of total extract}}{\text{weight of powdered material}} \times 100$$

Phytochemical Analysis

Preliminary phytochemical screening of hexane, ethyl acetate and methanol extracts was carried out for the detection of steroids/triterpenes, flavonoids, saponins, tannins, cardiac glycosides, alkaloids and anthraquinones using standard chemical tests (Harborne, 1992; Evans, 2002 and Sofowora, 1993).

Thin Layer Chromatographic Profile

Thin layer chromatographic analysis was performed on pre coated silica gel plates with silica gel 60 F_{254} (Merck, Germany) using the one way ascending technique. Hexane: ethyl acetate (3:2) and n-butanol: acetic acid: water (6:1:1) were used as the mobile phase. Developed plates were visualized using general detecting reagent (anisaldehyde/H_2SO_4) and specific detecting reagents (Gennaro, 2000).

Experimental Animals

Male albino rats weighing 150–180 g were obtained from the animal house of the Department of Pharmacology and Therapeutics, Ahmadu Bello University, Zaria. The animals were maintained under standard conditions (12 hours light /12 hours dark cycle, temperature of 37 ± 2ºC, 35–60% humidity). The rats were fed with standard (grower) mash (Vital feed, Jos, Nigeria) and water *ad-libitum*. Animals were procured two weeks before the experiments to acclimatize with the laboratory environment. Ethical rules guiding the use of animals for experimentation were strictly adhered to (DHHS, 1985).

Acute Toxicity Study

The acute toxicity of the *C. africana* stem-bark extract was determined by method of Lorke (1983). The study was carried out in two phase. The first phase consist of nine rats divided into three groups of three rats each and were treated with the n-hexane extract at doses of 10, 100 and 1000 mg/kg body weight orally. They were observed for 24 hr for signs of toxicity. In the second phase, nine rats divided into three groups of three rats each were treated with the n-hexane extract at doses of 1600, 2900 and 5000 mg/kg body weight orally. The oral median lethal dose (LD_{50}) was calculated as the geometric mean of the minimum toxic dose and maximum tolerated dose using the second phase. This procedure was repeated for ethyl acetate, and methanol extracts.

Anti-Ulcer Activity

Ethanol-induced ulcer, were evaluated in albino rats as described by modified method of Nwafor *et al*., (2000). The rats were fasted for 48 hours to produce significant effect of the drug. Fifty five adult albino rats were weighed, marked and randomly assorted into 11 groups (1-11) of five rats each. The separated groups were pretreated with 10 ml/kg distilled water as negative control, standard drug (Omeprazole 20 mg/kg) as positive control, *C. africana* stem-bark n-hexane, ethyl acetate and methanol extracts (250, 500, 1000 mg/kg) orally using an orogastric cannula. After 45 minutes, gastric lesion was induced in all the groups with absolute ethanol at a dose of 1 ml, administered by orogastric intubation. After an interval of one hour the rats were sacrifice by cervical dislocation and their stomach were carefully removed. Each stomach was cut open through the greater curvature with a scissor and rinsed, stretched lightly and spread on a filter paper for proper viewing and assessment of ulcers.

Measurement of Ulcer Index

The stomachs were examined for ulcer macroscopically. The extent of the mucosal damage were measured by using a calibrated meter rule (in millimeters) and the ulcer indices measurement was done from left to right of each tissue. The average mucosal damage was determined and the ulcer index (U.I) was calculated (Okasha *et al*., 2008). The effectiveness of the extract and drugs was calculated using the following formula (Kayode and Kayode, 2009).

$$\% \text{ ulcer inhibition} = \frac{\text{U.I.(Ulcer control)} - \text{U.I.(Treated)}}{\text{U.I.(Ulcer control)}} \times 100$$

Statistical Analysis

The results were presented in tables and expressed as mean ± standard errors of the mean (SEM) for all values. The data was statistically analyzed using one-way ANOVA followed by Dunnett's *post hoc.* Results were considered to be significant at ($P<0.05$).

Results and Discussion

Preparation of the Extract

Percentage yield of the stem-bark of C. africana is given in the Table 1. The percentage yield from the gradient wise extraction of *C. africana* stem-bark showed methanol to be the highest which was followed by *n*-hexane and finally ethyl acetate. These could be attributed to the ability of highly polar solvents to attract more of the phytochemical constituents present in a plant material.

Phytochemical Screening

The results of preliminary phytochemical screening of the *C. africana* stem-bark extracts had revealed the presence of some secondary metabolites namely alkaloids, tannins, flavonoids, cardiac glycosides, saponins, steroids/triterpenes and anthraquinones (Table 2). These secondary plant metabolites are known to posses various pharmacological effects and may be responsible for various action of *C. africana.* This result is in agreement with the findings of (Ezekiel *et al*., 2010).

Thin Layer Chromatographic Profile

Thin layer chromatographic analysis of n-hexane, ethyl acetate and methanol extracts from *C. africana* stem bark in different solvent systems in different ratios gave various degrees of separations. The *n*-hexane (A) and ethyl acetate (B) extracts developed in hexane: ethyl acetate (6:4) and visualized with *p*-Anisaldehyde revealed twelve (12) clear and distinct spots for both extracts, while methanol (C) extract revealed eleven (11) clear spots in butanol: acetic acid: water (6:1:1) visualized with *p*-Anisaldehyde and with their R_f values (Plate 1). The chromatogram of hexane extract was positive to Liebermann-Buchard reagent which revealed the presence of steroids/triterpenes (Plate 2) and it was negative to both ferric chloride and aluminum chloride reagent. The chromatogram of ethyl acetate extract was positive to Liebermann-Buchard, ferric chloride and aluminum chloride reagent (which was observed under UV light at 254nm after spraying the plate) which revealed the presence of steroids/triterpenes, phenolic compounds and flavonoids respectively (Plate 3). Methanol extract was positive to Liebermann-Buchard, ferric chloride and aluminum chloride reagent which revealed the presence of steroids/triterpenes phenolic compounds and flavonoids respectively on TLC (Plate 4). The yellow fluorescence of aluminum chloride reagent (which was observed under UV light at 254nm after spraying the plate) was faint which would be as a result of the degree of concentration of the compound in the methanol extract. The successful separation of bio-molecules by chromatographic technique depends upon suitable solvent system which needs an ideal range of partition coefficient (k) for each target compounds (Ito, 2005). The solvent system, hexane: ethyl acetate (3:2) gave a better separation for n-hexane and ethyl acetate extracts in this study. For methanol extract, butanol: acetic acid: water (6:1:1) was a good solvent combination for TLC of *C. africana* stem-bark. Furthermore, chromatograms from the extracts confirmed the presence of steroids/triterpenes, phenolic compounds and flavonoids on TLC. The presence of these compounds supports the traditional use of the plant in treatment of ulcer. Thin layer chromatographic analysis is a simple and cheap method for detection of plant active constituents due to its good selectivity and sensitivity of detection providing convincing results (Patra *et al.*, 2012).

Table.1 Mass and Percentage Yield for the Crude Extracts of *C. africana*

S/No.	Extract	Mass (g)	Percentage Yield (w/w)
1.	CAHE	24.12	2.41
2.	CAEE	18.54	1.85
3.	CAME	112.98	11.30

CAHE = *C. africana* hexane extract, CAEE = *C. africana* ethyl acetate extract, CAME = *C. africana* methanol extract

Table.2 Preliminary Phytochemical Screenings of Extracts of *C. africana* Stem-bark

Phytoconstituents	**CAHE**	**CAEE**	**CAME**
Saponins	-	-	+
Steroids/Triterpenes	+	+	+
Flavonoids	-	+	+
Tannins	-	+	+
Alkaloids	-	+	+
Cardiac glycosides	-	+	+
Anthraquinones	-	+	+

Key: Present (+), Absent, (-)

Table.3 Effect of *C. africana* Stem-bark N-hexane, Ethyl Acetate and Methanol Extract on Ethanol Induced Gastric Ulcer

Treatment	**Dose**	**MUI (mm) ± SEM**	**UI (%)**
Ethanol	1ml	12.80 ± 0.97	
Omeprazole	20 mg/kg	4.00 ± 0.71*	68.75
CAHE	250 mg/kg	11.60 ± 0.40	9.38
CAHE	500 mg/kg	7.20 ± 0.37*	43.75
CAHE	1000 mg/kg	5.40 ± 0.40*	57.81
CAEE	250 mg/kg	5.20 ± 0.37*	59.38
CAEE	500 mg/kg	4.00 ± 0.32*	68.75
CAEE	1000 mg/kg	1.80 ± 0.58*	85.94
CAME	250 mg/kg	4.40 ± 0.51*	65.63
CAME	500 mg/kg	3.40 ± 0.24*	73.44
CAME	1000 mg/kg	1.20 ± 0.20*	90.63

Key: MUI-mean ulcer index, SEM-standard error mean, UI- ulcer inhibition, (-) - negative, (+) - positive. *: values are statistically significant ($p<0.05$) with negative control

Fig.1 Mean Ulcer Indices of Various Groups

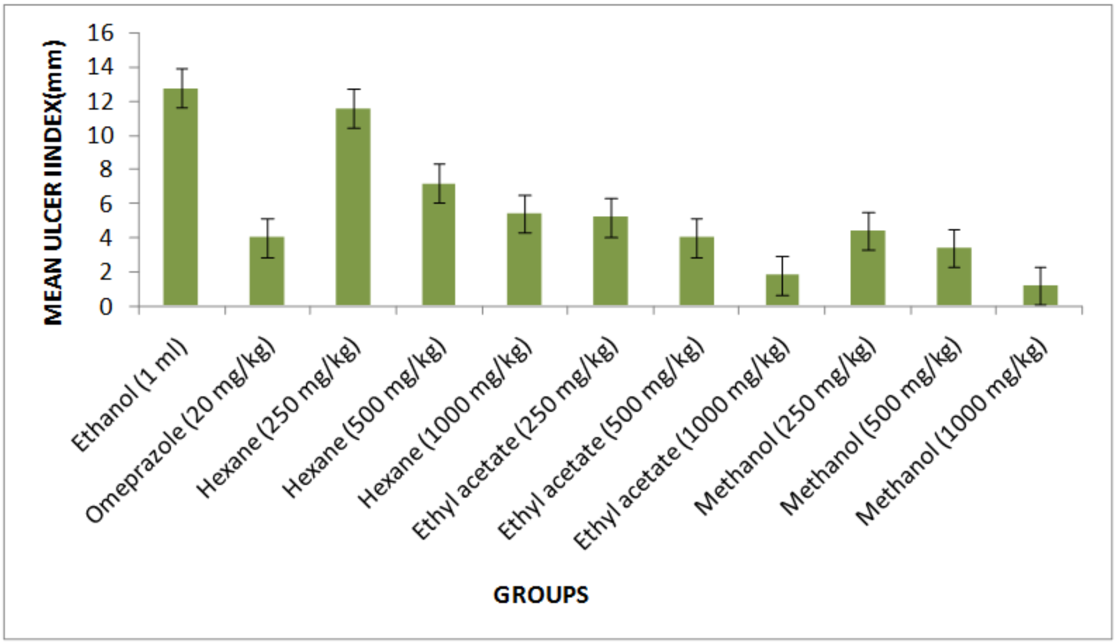


Fig.2 Percentage Ulcer Inhibition of Various Groups

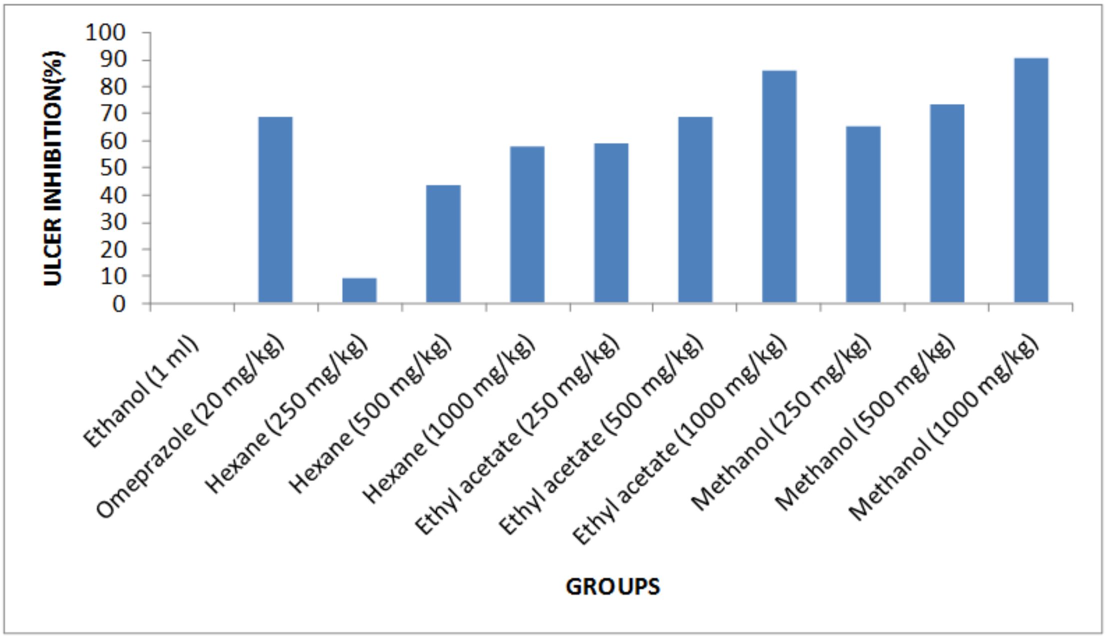


Plate.1 Chromatogram of Hexane (A), Ethyl Acetate (B) and Methanol (C) Extracts Sprayed with *P-Anisaldehyde*/H2so4 with Rf Values

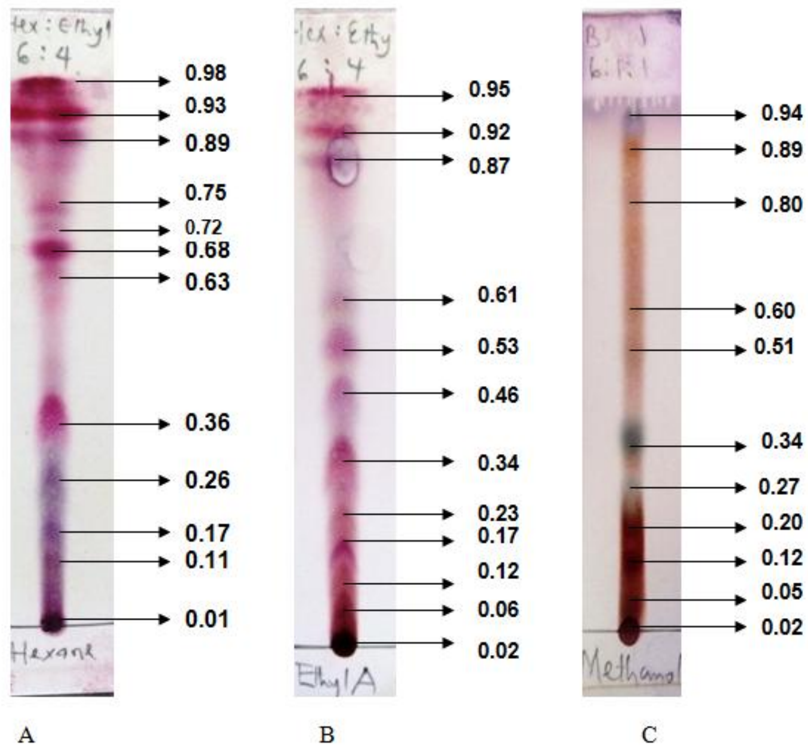


Plate.2 Chromatogram of Hexane Extract in Hexane: Ethyl Acetate (3:2) Spray with (LB) Lieberman-Buchard Reagent and its Rf Values

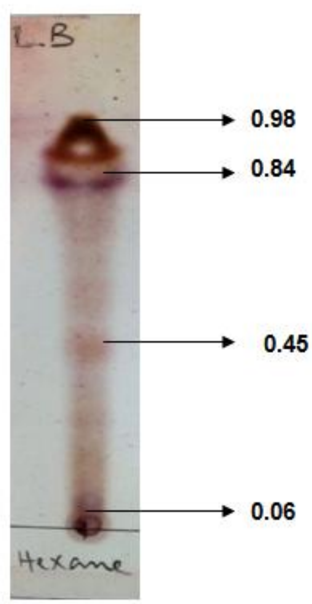


Plate.3 Chromatogram of Ethyl Acetate (EA) Extract in Different Spraying Reagent (AlCl3-Aluminium Chloride (A), FeCl2- Ferric Chloride (B) and LB-Lieberman-Buchard (C) with Rf values

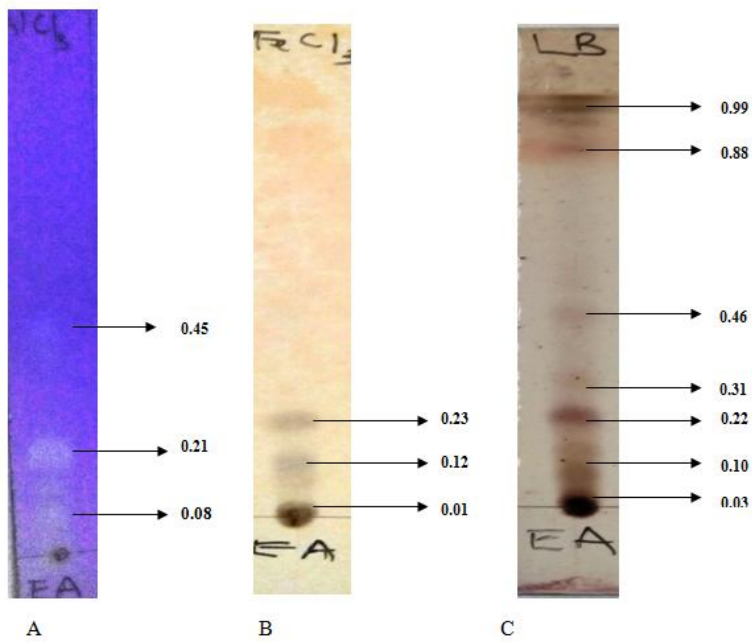
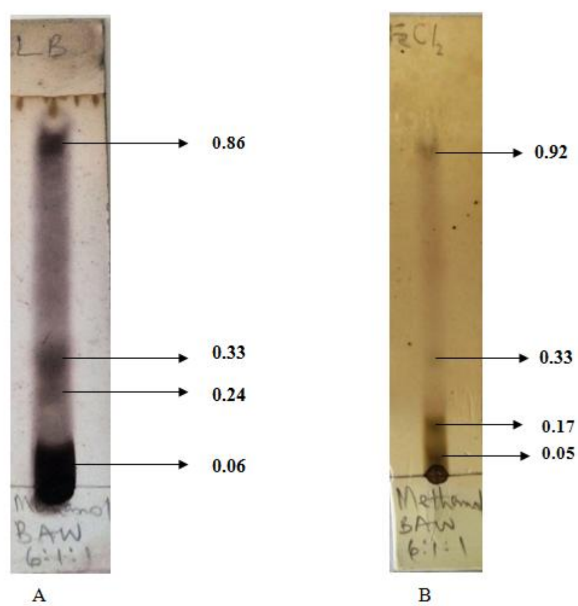


Plate.4 Chromatogram of Methanol Extract in Different Spraying Reagent (LB-Lieberman-Buchard (A) and FeCl2- Ferric Chloride (B) with Rf Values



Acute Toxicity

The Acute toxicity (LD_{50}) of the extracts (hexane, ethyl acetate and methanol) of the stem bark of *C. africana* was carried out orally in rats. The LD_{50} was found to be greater than 5000 mg/kg when administered orally in rats. These studies showed that *C.*

africana stem bark is practically non-toxic when administered using the oral route. Based on the toxicity classification by Loomis and Hayes (1996), substances with LD_{50} values of 5000 to 15,000 mg/kg body weight is practically non-toxic.

Antiulcer Evaluation

Commiphora africana stem-bark extracts produced significant dose- dependent antiulcer activity at all the doses tested. The least percentage ulcer inhibition was observed in n-hexane extract while methanol extract recorded the highest percentage ulcer inhibition (Table 3). Hexane extract of *C. africana* at dose 250 mg/kg did not show significant ($p>0.05$) reduction in the mean ulcer index (11.60 ± 0.40) after pretreatment. For ethyl acetate and methanol extracts all the doses tested showed significant ($p<0.05$) reduction in the mean ulcer index. Ethanol triggered severe gastric ulcer with mean ulcer index (12.80 ± 0.97 mm) and pretreatment with *C. africana* stem-bark of n-hexane, ethyl acetate and methanol extracts at (250, 500 and 1000 mg/kg) showed a dose dependent decrease in mean ulcer index. This result is in agreement with the finding of Al-Harbi and coworkers who report *Commiphora molmol* (oleo-gum resin) pretreatment at doses of 250, 500 and 1000 mg/kg provided dose-dependent protection against the ulcerogenic effects of different necrotizing agents used (Al-Harbi *et al*., 1997).

Both Methanol and ethyl acetate extracts at 1000 mg/kg showed better gastro – protective effect over omeprazole (20 mg/kg). The increase in the antiulcer activity of ethyl acetate and methanol extracts could be attributed to the presence of flavonoid, steroids/triterpenes and phenolic compound in the extracts. Mahran *et al*., (1991) have reported that plant drugs containing saponins, terpenoids or amino acid have anti-ulcer activity. Flavonoids have anti-inflammatory activity and protect the gastric mucosa against a variety of ulcerogenic agents in different mammalian species (Harborne and Williams, 2000). Tannins are known to ‘tan’ the outermost layer of the mucosa and to render it less permeable and more resistant to chemical and mechanical injury or irritation (Asuzu and onu, 1990). Several plants containing high amounts of saponins have been shown to possess anti-ulcer activity in several experimental ulcer models (Izzo *et al*., 2000), this may have accounted for the highest activity observed in methanol extract compared to other extracts (Table 2). Therefore *C. africana* stem-bark extracts possesses strong gastro-cytoprotective properties against ethanol-induced gastric ulcer. Various phyto-chemicals like flavanoids, tannins, saponins, terpinoids showed their anti-ulcer activity due to their cytoprotection, antisecretory and antioxidant property (Sen *et al*., 2009). Some phytochemical compounds such as flavonoid groups may prevent or suppress ulcerogenic process. This is in agreement with previous reports which shown that *Cassia singueana* leaf has flavonoid compound which exhibit a gastro protective effect against ethanol – induced stomach ulcers (Ode and Asuzu, 2011). Ethanol is widely used to induced ulcers (Kayode and Kayode, 2009). This are done by suppressing the protective action of the mucus secreted by mucus membrane the increased synthesis of mucus can be explained as the probable cytoprotective mechanism in this case (Cho and Ogle, 1992).

In conclusion, Stem-bark extracts of *C. africana* exhibited a significant anti-ulcer activity in experimental rats. The results support the traditional claim of the plant in treatment of ulcer.

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References

Adebayo, A.H, Aliyu, R., Gatsing, K. 2006. The effects of *Commiphora africana* (Burseraceae) on serum lipid profile in rats. *Int. J. Pharmacol.*, 2(6): 618–622.

Al-Harbi, M.M., Quereshi, S., Raza, M., Ahmed, M.M., Afzal, M., Shah, A.H. 1997. Gastric antiulcer and cytoprotective effect of *Commiphora molmol* in rats. *J. Ethnopharmacol.*, 55: 141–150.

Aliyu, R., Catsing, D., Umar, H.S. 2002. Antimicrobial activity and phytochemical screening of the leaves of *Commiphora africana*. *W. Afr. J. Bio. Sci.*, 13: 75–80.

Asuzu, I.U., Onu, O.U. 1990. Anti-ulcer activity of the ethanolic extract of *Combretum dolichopetalum* root. *Int. J. Crude Drug Research*, 28: 27–32.

Buger, O., Ofek, I., Tabak, M., Weiss, E.I., Sharon, N., Neeman, I. 2000. A high molecular mass constituent of cranberry juice inhibits *Helicobacter pylori* adhesion to human gastric mucus. *FEMS Immu. Med. Microbio*., 29(4): 295–300.

Chan, F.K.L., Leung, W.K. 2002. Peptic-ulcer disease. *The Lancet*, 360: 933–41.

Cho, C.H., Ogle, C.W. 1992. The pharmacological differences and similarities between stress and ethanol-induced mucosal damage. *Life Science*, 51: 1833–1842.

Dalziel, J.M. 1937. Crown Agent for Oversea Governments and Administrations, London. *Useful Plants of W. Trop. Afr*., pp: 316–317.

DHHS. 1985. Guide for the care and use of laboratory animals. Institute of Laboratory Animal Resources Commission on Life Sciences, National Research Council. National Academy, Washington, D.C.

Ekarika, J., Manash, C., Eseyin, O.A., Udobre, A.S. 2012. Pharmacological studies of the bark of *commiphora africana* (burseraceae). *J. Pharmacol. Toxicol.*, 7: 52–57.

Evans, W.C. 2002. Trease and Evans pharmacognosy, 15th edn. W.B. Saunders Ltd., London. pp. 191–393.

Ezekiel, I., Mabrouk, M.A., Ayo, J.O., Goji, A.D.T., Okpanachi, A.O., Mohammed, A., Tanko. Y. 2010. Study of the effect of hydro-ethanolic extract of *commiphora africana* (stem-bark) on sleeping time and convulsion in mice. *Asian J. Med. Sci*.. 2(3): 85–88.

Gennaro, A.R. 2000. Remington- Sci. Prac. Pharm., 20th edn., vol. 1. Lippincott Williams and Wilkins, Maryland, U.S.A. pp. 606–609.

Goji, A.D.T., Dikko, A.A.U., Bakari, A.G., Mohammed, A., Ezekiel, I., Tanko, Y. 2009. Effect of aqueous-ethanolic stem bark extract of *commiphora africana* on blood glucose levels on normoglycemic wistar rats. *Int. J. Ani. Vet. Adv.*, 1(1): 22–24.

Hanus, L.O., Rezanka, I., Dembitsky, V.M., Moussaieff, A. 2005. Myrrh-commiphora chemistry. *Biomed. Papers*, 149: 3–28.

Harborne, J.B. 1992. A guide to modern technique of plant analysis. Chapman and Hill, London. *Phytochem. met*., 279.

Ito, Y. 2005. Golden rules and pitfalls in selecting optimum conditions for high-speed counter current chromatography. *J. Chromatography*, 1065: 145–168.

Izzo, F.B., Di Carlo, G., Mascolo, N., Autore, G., Capasso, F. 2000. The plant Kingdom as a source of Antiulcer Remedies. *Phytotherapy Research*, 14: 581-591.

Jhasnsi, R.M., Mohana, I.S., Saravana, K.A. 2010. Review on herbal drug for anti-ulcer property. *Int. J. Bio. Pharm.*

Research, 20–26.

Kayode, A.A.A., Kayode, O.T., Odetola. 2009. Anti- Ulcerogenic activity of two extracts of *Parquetina nigrecens* and their effects on mucosal antioxidants defence system on ethanol- induced ulcer in rats. *Research J. Med. Pl*., 3(3): 102–108.

Keay, R.W.J. 1989. *Trees of Nigeria*. 1st Edition, Clarendon Press, Oxford, ISBN: 978–0198545606, pp: 288–298.

Kokate, C.K. 2003. Vallabh Prakashan, New Delhi, India. 4. Prac. Pharmacog., pp. 107–111.

Lewis, W.H., Elvin-Lewis, M.P.E. 1977. Plants affecting mans health. John Wiley and Sons, USA. Medi. Bot., pp. 261–340.

Loomis, T.A., Hayes, A.W. 1996. 4th Edition, California, academic press. Loomis Essen. Toxicol., pp: 208– 245.

Lorke, D. 1983. A new approach to practical acute toxicity testing. Arc. Toxicol., 54: 275–287.

Mahran, G.H., Kadry, H.A., Isaacz, G., Thabet, C.K., Al–Azizimm, El –Olemy M.M. 1991. Investigation of diuretic drug plants, phytochemical screening a pharmacological evaluation of *Anothum graveolens* L., *Apium graveolens* L., *Daucus carota* L., Eruca sativa mill. Phytotherapy, 5: 169–172.

Nwafor, P.A., Okwuasaba, F.K., Binda, L.G. 2000. Antidiarrhoeal and antiulcerogenic effect of methanolic extract of *Asparagus pubescens* root in rats. *J. Ethnopharm*., 72(3): 421–427.

Ode, O.J., Asuzu, O.V. 2011. Investigation of *cassia singueana* leaf extract for anti-ulcer effects using ethanol induced gastric ulcers model in rats. *Int. J. Pl. Ani. Envi. Sci*., 1: 1.

Okasha, M.A., Magaji, R.A., Abubakar, M.S., Fatihu, M.Y. 2008. Effect of ethyl acetate portion of *syzygium aromaticum* flower bud extract on indomethacin – induced gastric ulceration and gastric secretion. *Euro. J. Sci. Research*, 20(4): 905 – 913.

Patra, J.K., Gouda, S., Sahoo, S.K., Thatoi, H.N. 2012. Chromatography separation, ^{1}HNMR analysis and bioautography screening of methanol extract of *excoecaria agallocha* l. from Bhitarkanika, Orissa, India. *Asi. Paci. J. Trop. Biomed*., S50–S56.

Sen, S., Chakraborty, R., De, B., Mazumder, J. 2009. Plants and phytochemicals for peptic ulcer. *overview pharmacoG. Rev*., 3(6) pp 270–279.

Sofowora, E.A. 1993. University of Ife Press, Nigeria. *Medi. Pl. Trad. Reme. Afr*., 66–79.

Soll, A.H., Sleisenger, M., Feldman, M., Scharschmidt, B.F. 1998. Philadelphia: saunders company; gastrointestinal and liver disease. *Peptic ulcer and its complications*. 620.

Zapata-Colindres, J.C., Zepeda-Gómez, S., Montaño-Loza, A., Vásquez-Ballesteros, E., de Jesús Villalobos, J., Valdovinos-Andraca, F. 2006. The association of *Helicobacter pylori* infection and nonsteroidal anti-inflammatory drugs in peptic ulcer disease. *Cana. J. Gastroentero*., 20(4): 277–280.

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