Antidiarrhoea activities of aqueous extract of aframomum chrysanthum seed in albino rats

Article · January 2016

CITATIONS
2

READS
186

1 author:

Ndidi Nwachoko
Rivers State University of Science and Technology
53 PUBLICATIONS **98** CITATIONS

SEE PROFILE

ENRICH JOURNALS
www.enrichjournals.com

INTERNATIONAL JOURNAL OF ORIGINAL RESEARCH Volume : 2 | Issue : 2 | 2016

ARTICLE : MEDICAL SCIENCE

Antidiarrhoea activities of aqueous extract of aframomum chrysanthum seed in albino rats

Authors: Nwachoko N[1], Essien E.B.[2], Aylogu E.O.[2]

[1]Department of Chemistry (Biochemistry Unit), Rivers State University of Science and Technology, Nkpolu-Oroworukwo,

[2]Department of Biochemistry, University of Port Harcourt, Choba, Rivers State.

ABSTRACT

Diarrhoea is one of the leading causes of morbidity and mortality in children under the age of 5 years. Due to this problem, the World Health Organization has encouraged studies that will bring about the desired treatment and prevention of diarrhoea. Aframomum chrysanthum seed (AC) is used in some tribes of Nigeria for food. In this study, the antidiarrhoea activities of the aqueous extract of Aframomum chrysanthum seed was investigated with experimental animals. The degree of gastrointestinal movement and wet fecal product were measured. Like the standard drug (5mg/kg loperamide hydrochloride), the extract (500, 1000 and 2000) mg/kg showed a decrease in the gastrointestinal motility. The charcoal meal motility was inhibited by the extract. There was also an observed delay to the onset of diarrhoea, reduction in the degree of frequency of defecation and production of diarrhoea stool. Decrease in intestinal fluid electrolyte (Na+ and K+) concentrations were noted in the treated groups except for Na+ concentration of group 3 in table 1. The result obtained showed that aqueous extract of AC may contain some pharmacologically active substance with antidiarrhoea properties.

Key words: Diarrhoea, Aframomum chrysanthum, castor oil, loperamide hydrochloride, gastrointestinal transit

Article ID: IJOR10607MS

Corresponding Author: Nwachoko N, Department of Chemistry (Biochemistry Unit), Rivers State University of Science and Technology, Nkpolu-Oroworukwo.

Citation: Nwachoko N, Essien EB, Aylogu EO. Antidiarrhoea activities of aqueous extract of aframomum chrysanthum seed in albino rats. Int J Original Res 2016; 2(3):172-177.

Conflict of Interest: None

INTRODUCTION

Diarrhoea is derived from a Greek word dia (through) and rrhoea (flow), meaning flowing through (Ahlquist, 2001; www.medterm.com, 2012). It is defined as the passage of abnormal liquid or unformed stool at an increased frequency (Ahlquist, 2001). It is a condition of having three or more loose or liquid bowel movement per day. It has long been recognized as one of the most important health problem in developing countries. It is also associated with increased bowel movement and is characterized by increased frequency of wet stool and abdominal pain (WHO, 1999; WHO, 2005). The passage of loose or watery stools is usually at least three times in a

24 hour period. However, it is the consistency of the stools rather than the number that is most important. Frequent passage of formed stools is not diarrhoea. Babies fed only breast milk often pass loose, pasty stool and is not diarrhoea (WHO, 1999; WHO, 2005). Causes of diarrhoea include infectious agents, certain medications, plant and animal toxins, gastrointestinal tract (GIT) disorders and substances that increase GIT secretions. It is also caused by the ingestion of poorly absorbable materials or inflammatory and dysmotility problems of the GIT (Ahlquist, 2001). In Nigeria, diarrhoea resulting from infection is one of the known killer diseases among children under 5 years (Audu et al., 2000). This may not be unconnected to the fact that toddlers are at times left to play in an unhygienic environment. Such exposure can lead to bacterial and viral infections, which can cause diarrhoea. Diarrhoea is also associated with some terminal illness like AIDS and Ebola virus infection and contribute to quick death of such patients. Diarrhoea accounts for about 4-5 million deaths annually, of these, 8% have been reported to be from developing countries, putting a heavy burden on the country's health budget (Syder and Merson, 1982; WHO, 2011). WHO has encouraged studies for treatment and prevention of diarrhoea with plants, since patients who cannot afford the cost of treatment with orthodox medicines, resort to the use of herbs for management and possible cure (WHO, 1978, 1999, Cynthia et al., 2008).

Aframomum chrysanthum (AC) is a native to tropical Africa. It is called Urioma by Ika people in Delta State (Nwachoko et al., 2015). It is rarely cultivated in other tropical regions and commonly use in making pepper soup. AC is a leafy shoots of 3-4 feet tall; it is rapidly spread by superficial rhizomes to form a sense clump and base flowers. Aframomum is a genus in the ginger families which are used as spices in food and drinks, they are represented by approximately 70 species where chrysanthum is included. It is larger than other general in the family (Tane et al., 2011).

This work is aimed at the determination of antidiarrhoea properties of the extract of Aframomum chrysanthum seed.

MATERIALS AND METHODS

Plant Material

Aframomum chrysanthum seeds (AC) was obtained from Ekuku-Agbor in Ika South Local Government of Delta State, Nigeria. The plant was identified by Dr. O.B. Green in the Department of Applied and Environmental Biology, Rivers State University of Science and Technology, Nkpolu-Oroworukwo, Port Harcourt, Nigeria. The sample was air dried and ground to powder form prior to analysis.

Experimental Animals

Albino rats of weighing between 150 – 200g, were obtained from the Animal House of the Department of Biochemistry, University of Port Harcourt, Choba, Nigeria. The animals were acclimatized for one week prior to the commencement of the experiment. The animals were housed under standard laboratory conditions, light and dark cycles of 12 hours and were provided with rodent pellet food and water ad libitum.

Drugs

Castor oil (finest cold drawn castor oil), loperamide hydrochloride (Aaron Healthcare

and Export PVT Ltd, Uttarahand, India), activated choarcoal and gum acacia (Sigma, USA)

TEST FOR ANTIDIARRHOEA ACTIVITY

Castor oil induced gastrointestinal transit:

Rats of either sex (150–200 g) fasted for 18 hours were randomly allocated into six groups. Group 1 (control) received 10ml/kg of distilled water, group 2 (normal) received no form of pre-treatment, group 3, 4 and 5 received 500, 1000 and 2000 mg/kg of AC extract, group 6 received 5mg/kg loperamide. After 1 hour of treatment with extracts, distilled water and standard drug, diarrhoea was induced by administration of 1ml of castor oil orally to each of the animals. 1 hour later, 1 ml of charcoal meal (10% charcoal suspension and 5% gum acacia) was given to each of the animals. After 1 hour of the meal administration, the animals were sacrificed. The distance traveled by the charcoal meal from the pylorus to the caecum were measured and expressed as a percentage of the total length of the intestine from the pylorus to the caecum of each animal (Mascolo et al., 1994; Mukherjee et al., 1995; Rani et al., 1999).
PI - LM/LSI x 100%. PI = Peristalic index, LM – Length of charcoal meal,
LSI – Length of small intestine, % inhibition : (control – test)/control x 100

Castor oil induced diarrhoea in rats and faecal count:

Castor oil-induced diarrhoea was determined by the method of Awoutes et al., (1978). Rats weighing between 150 – 200g fasted for 18 hours were randomly distributed into five groups. The administration procedure was as described above. The times taken for onset of diarrhoea and faecal droppings were recorded. Percentage inhibition was calculated (Izzo et al., 1992; Mukherjee et al., 1995; Karim et al., 2010). % inhibition: (control – test)/control x 100.

RESULTS

Table 1: Effect of aqueous seed extract of AC on castoroil induced diarrhoea in wistar albino rats.

Group	Treatment	IL (CM)	CML (CM)	PI (%)	I (%)	Na+ (mmol/l)	K+ (mmol/l)
1	Control	84.0 ± 7.0	47.3 ± 2.5	56.3	-	25.7±4.6	6.3±2.0
2	Normal	86.3 ± 3.8	21.0 ± 7.5	24.3	-	10.0±0.0	3.6±0.5
3	500mg/kg	96.7 ± 4.2	33.0 ± 7.5	34.1	30.2	29.0±10.4	3.2±0.6
4	1000mg/kg	90.7 ± 4.2	36.7 ± 2.9	40.5	22.4	18.7±15.0	3.9±1.0
5	2000mg/kg	91.7 ± 10.5	29.0 ± 7.0	31.6	38.7	24.7±25.4	3.1±0.7
6	5mg/kg	89.0 ± 8.9	27.7 ± 9.7	31.1	41.4	18.7±15.0	4.6±1.7

Key: IL = Intestinal length, CML = Charcoal meal length, PI = Peristatic Index, I = Inhibitor, AC = Aframomun chrysanthum

The table above showed the result of percentage inhibition of aqueous extract of AC against charcoal meal motility and electrolytes concentration in castor oil-induced diarrhoea albino rats.

Table 2: Effect of aqueous extract of AC seed on the faecal count of castor oil-induced diarrheoa in albino rats

Group	Treatment	OD (MN)	MWF	% I
1	Control	30	1.5 ± 2.0	-
2	500mg/kg	30	0.7 ± 0.4	53.3
4	1000mg/kg	60	0.8 ± 0.7	46.7
4	2000mg/kg	90	0.8 ± 0.7	46.7`
5	5mg/kg	240	0.3 ± 0.0	80.0

Key: OD = Onset of diarrheoa, MWF = Mean wet faeces after 6 hours, I = Inhibition

Table 2 shows the result of percentage inhibition of aqueous extract of AC against the mean wet faecal count of castor oil-induced diarrhea in albino rats

DISCUSSION

Diarrhoea is a condition described as having at least three loose or liquid bowel movement each day (WHO, 2013). Castor oil was used in this study to induce diarrhea. It is well documented that castor oil produces diarrhoea because of its most active metabolite-ricinoleic acid by hyper-secretory response, which stimulates peristaltic activity in the small intestine, leading to changes in the electrolyte permeability of the intestinal mucosa (Zavala et al., 1988; Hardman and Limbird, 2001; Bakare et al., 2011). Action of ricinoleic acid also stimulates the release of endogenous prostaglandins E and F, which cause stomach cramps and diarrhoea (Galvez et al., 1993; Saito et al., 2002). Also loperamide hydrochloride which at present is one of the most efficacious and widely employed antidiarrhoea drug was used as standard drug (Niemegeers et al., 2011). The inhibition of charcoal meal movement and the reduction in faecal output by a substance is the basis of the pharmacological evaluation of a potential antidiarrhoea agent (Watson and Gordon, 1962; Ammon and Thomas, 1974). In this research, there was a reduction in the incidence and severity of diarrhoea stool produced in the experimental animals pretreated with Aframomun chrysanthum seed (AC) aqueous extract. Table 1 showed the inhibitory effect of the aqueous extract of AC seed on castor-oil induced gastrointestinal transit in albino rats. The result showed percentage inhibition of 30.2, 22.4 and 38.7 for groups 3, 4 and 5 respectively. Group 6 had percentage inhibition of 41.4. Comparing the values of the groups pretreated with AC with standard drug, AC extract showed inhibitory activity to castor-oil induced diarrhea. The result showed that both AC and standard drug treatment slowed down the propulsion of charcoal meal through the gastrointestinal tract. The table also showed the decrease in the intestinal fluid electrolyte (Na+ and K+) concentration as a result of treatment with AC extract except for Na+ concentration of rats in Group 3. Diarrhoea state is associated with increase in intestinal fluid electrolyte concentration, thus reduction of these electrolytes in the treated groups confirm antidiarrhoea potentials of AC extract.

Table 2 showed the inhibitory effect of aqueous extract of Aframomun chrysanthum seed on the wet faecal count of castor-oil induced diarrhoea in albino rats. The result showed a dose dependent delay to the onset of diarrhoea with the groups pretreated with AC extract showing percentage inhibition of 53.3, 46.7 and 46.7 for groups 2, 3 and 4 respectively. The Group (5), pretreated with standard drug, showed percentage inhibition of 80.0.

Reports have shown that plant's phytochemical components (tannins and flavonoids, etc) are capable of evoking antidiarrhoea effect since these components may

precipitate proteins, reduce peristaltic movement and intestinal secretion (Okudo et al., 1989; Galvez et al., 1993; Mukherjee et al., 1998). Preliminary study on the phytochemical composition of AC seed showed that flavonoids and tannins make up to 44 percent of the total phytochemical components (Nwachoko et al., 2015). Thus these phytochemicals may be responsible for the antidiarrhoea activity of AC seed.

REFERENCES

1. Ahlquist, D.A. (2001). Constipation and diarrhoea. In: Principles of internal medicins. McGraw Hill Medical Publishing Division, New York, pp 241-247.
2. Ammon, P. J. and Thomas, P. S. (1974). Effect of Oleic and Recinoleic Acid Net Jajunal Water and Electrilyte Movement. Journal of Clinical Investigation, 53: 374 – 379.
3. Audu, R., Umilabug, S.A., Renner, J.K. and Awodiji, J.A. (2000). Diarrhoea management. Journal of Nigerian Infection Control Association, 3:15.
4. Awouters, F., Niemegers, C. J. E., Lenaerts, F. M. and Janseen, P. A. (1978). Delay of castor oil diarhocea in rats: A new way to evaluate inhibitors of prostaglandin biosynthesis. Journal of Pharmaceutical Pharmacology, 30: 4 – 45.
5 Bakare, R.I., Magbagbeola, O.A., Akinwande, A.I., Okunowo, O.W. and Green, M. (2011). Antidiarrhoeal activity of aqueous leaf extract of Momordica charantia in rats. Journal of Pharmacognosy and Phototherapy, 3(1): 1-7.
6. Cynthia, B.P., Lana, V. and Kenji, S. (2008). Estimating child mortality due to diarrhoea in developing countries: A meta-analysis review. Bull. WHO, 86(9): pp. 710-717.
7. Di-Carlo, G., Autore, G. and Izzo, A. A. (1994). Inhibition of intestinal motility and secretion by Havonoids in mice and rats. Structural activity relationship. Journal of Pharmaceutical Pharmacology, 45: 1054 – 1059.
8. Galvez, T., Zarzuelo, A. andCreapo, M. lE. (1993). Antidiarrhoea Activity of Euphrbia bita Extract and Isolation of an Active Flavonoids Constituent. Planta Med., 333 – 336.
9. Hardman, J. G. and Limbird, L. E. (2001). Drugs Affecting Gastrointestinal Function. In: Grodman, L. S. and Gilman, A. (Eds.), The Pharmacological Basis of Therapeutics. 10thf Edn. Macgraw. Hill, New York, pp: 1023 -1024.
10. Izzo,, A. A., Nicholetti, M., Giamathasis, B. and Capasso, F. (1992). Antidiarrhoea activity of Ferminalia servicea Burchex DC Extract in: Capasse, F. and Mascolo, N. (Eds), National Drug and Digestive Tract. EMSI, Rome, 223 – 230
11. Karim, A. H., Maklfia, A., Zigyat, A. L. and Bnouham, M. (2010). Antidiarrhoea activity of crude aqueous extract of Rubia Tinctorum L. Roots in rident. Journal Smooth Muscle Resource, 46(2): 119 – 123.
12. Mascolo, N., Izzo, A. A., Antore, F. B. and Capasso, F. (1994). Nitric oxide and castor oil induced diarrhea. Journal of Pharmacological Experiment, 128: 291 – 293.
13. Mukherjee, P. K., Saha, K. and Murugeban, T. (1998). Screening of Antidiarrhoea Profile of Some Plant Extracts of a Specific Region of West Bengal, India. Journal of Ethnopharmacology, 60:85 – 89.
14. Niemegeers, C. I. L., Lenaerte, F. M. and Janseen, P. A. J. (1974). Loperamide (R-18553): A Novel Type of Antidiarrhoea Agent Past I. In: Vitro Drab Pharmacology and Acute Toxicity Comparing with Morphine, Codeine and Difenoxine. Atzoeimittel forsch, 24:1633 – 1636.
15. Nwachoko, N., Essien, E. B. and Ayalogu, E. O.(2015). Proximate and quantitative phytochemical analysis of Aframomum chrysanthum. Open Access Library Journal, 2: e1529.
16. Rani, S. N., Ahamed, N., Rajaram, S. and Saluja, R. (1999). Atidiarrhoea evaluation of Clerodendrum phlomides linn leaf extract in rats. Journal of Ethno-Phamacology, 68: 315 – 319.
17. Snyder, J.D. and Merson, M. (1982). The magnitude of global problem of acute diarrhoea disease: a review of active surveillance data. Bull. WHO, 60: 605-613.
18. Soito, T., Mizutani, F., Iwanaga, Y. Morikawa, K. and Kato, H. (2002). Laxative and Anti-diarrhoeal Activity of Polycharbophil in Mice and Rats. Japanese Journal of Pharmacology, 98: 133- 141.
19. Tane, P., Tatsimo, S.D., Ayimele, G.A. and Connolly, J.D. (2011). Broactive metabolites from Atramemum species, 11th Edition, Symposium Book of Proceedings, 55(2): 214-223.
20. Watson, W. C. and Gordon, R. (1962). Studies on the Digestion, Absorption and Metabolosm of Castor oil. Biochemical Pharmacology, 11: 229 – 236.

21. WHO (1978). Alma Ala Declaration. Primary Health Care, Health for all Series No 1.
22. Who, (2013). Diarrhoea disease. Wikipedia the free encyclopedia.
23. www.gastroenterology.org, 2011.
24. www.medterm.com, 2012)
25. Zarala, M. A., Perez, S, Perez, C., Vargal, R. and Perez, R.M. (1998). Antidiarrhoea Activity of Waltheriaomericana, Commelins cuelestric and Alternanthra repens. Journal of Ehnopharmacology, 61:41–47.