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Evaluation of Anti-Diarrhoea Potential of Watermelon Seed (*Citrullus lanatus*) in Albino Rats

Nwachoko N[1] **and Oghale OV**[2*]

[1]*Department of Biochemistry, Rivers State University, Nkpolu-Oroworukwo, Port-Harcourt, Nigeria*

[2]*Department of Chemistry, Rivers State University, Nkpolu-roworukwo, Port-Harcourt, Nigeria*

***Corresponding author:** Oghale OV, Department of Chemistry (Biochemistry Option), Rivers State University, Nkpolu-roworukwo, Port-Harcourt, Nigeria, Tel: +234 903 885 8167; E-mail: Oghalevivian@gmail.com

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Abstract

Citrullus lanatus (watermelon) is a popular fruit consumed all over the world. This study was aimed at evaluating the effect of *Citrullus lanatus* seeds extract for its anti-diarrhoea potential. N-hexane was used for the extraction. 20 laboratory rats were used for this experiment, the animals where group in 5 groups of 4 in each group. Group 1 severed as the control which received normal feed and water, group 2, 3 and 4 severed as the treated which received 100, 200, 300 mg/kg of the seed extract respectively while group 5 severed as the standard which received 5 mg/kg of standard drugs (loperamide). The extract of *Citrullus lanatus* seed was administered to the animals for possible inhibition of castor oil induced diarrhoea. The result of this study showed that there was a significant decrease in the intestinal propulsion of charcoal meal in rats. There was also a significant loss of electrolytes shown in the control, compared with other groups. The study showed that the seed extract of *Citrullus lanatus* seed could possess anti-diarrhoea activity.

Keywords: Anti-diarrhoea; *Citrullus lanatus*; Gastrointestinal motility; Electrolytes

Introduction

In recent years, there has been a global trend towards the uses of natural phytochemicals present in natural products such as fruits, vegetables and their extracts for the treatment/management of various diseases. Some plants have been reported to have the activity against diarrhoea and act as very useful remedies for the alleviation of human illnesses [1,2] *Citrullus lanatus* belongs to the Cucurbitaceae family, it is commonly called watermelon which is a popular fruit in many parts of the world and it is notable for its high water content and attractive look. The fruit comes in various shapes, sizes and rind pattern [3]. Although the seed of watermelon is often discarded as waste; it contains various amounts of carbohydrates, phenol, flavonoids, protein, fibre, phosphorus and iron [4]. Proximate analysis of the seeds as reported by Oyeleke [5], revealed very high fat content (47.9%) followed by protein (27.4%) and carbohydrates (10.0%). Traditionally, the seeds of *Citrullus lanatus* is said to be medicinal because it can relieve inflammation/irritation; causes increased passing of urine and gives tonic effects [4,6]. Watermelon is thought to have originated in South Africa because it is found growing wild throughout the area, and reaches maximum diversities.

Diarrhoea can be defined as the increased frequency of bowel movements, accompanied by a loose consistency of stools [7]. Diarrhoea results from hyper peristalsis of the small intestine or colon large amount of Na^+, $K^+$and water are washed out of the colon and small intestine in diarrhea stools, causing dehydration, hyporolaemid and eventually shock and cardiovascular collapse. A more insidious complication of chronic diarrhoea, if fluid balance is maintained, is severe hypokalemia [8]. Diarrhoea patients may report frequent loose or watery stool, defecation usually more than three times a day, often accompanied by pain and abdominal cramping. The condition of diarrhoea is particularly dangerous in infants and young children because of the rapidity with which serious dehydration may occur. In recent years, emphasis on the treatment of diarrhoea has focused on oral rehydration therapy. However there is still need for a continuing search for effective anti-diarrhoea drugs without side effects and as adjunct to ORT [9].

Materials and Methods

Sample collection

The sample was dry seeds of *Citrullus lanatus*. The plant samples were bought from fruit garden market, D-line, Port Harcourt. Rivers State Nigeria. The plants seeds were identified using both botanical and local. The seeds were separated from the fruits manually, air dried, peeled and ground using blender to get a smooth surface area, and the plant powder was then extracted.

Sample extraction

The seeds extract were obtained using solvent extraction. 200 g of the powered sample were weighted and placed in the sample chamber of the soxhlet apparatus, 600 ml of N-hexane was poured in the solvent chamber (the round bottom flask) and the water bath was set at 700°C. This was allowed to extract and the extract was then concentrated at a reduced temperature 400°C using water bath to remove the N-hexane content from the extract.

Experimental animals

Wister Albino rats (120-150 g). A total of 20 albino rats were brought from the animal farm of the Department of Biochemistry University of Port Harcourt, and kept in the animal house of Rivers

State University. The rats were grouped into five groups of four animals in each metabolic cage. The rats were fed for one week with their normal feed and water for complete adaptation.

Extract administration

The effect of the extract on gastrointestinal motility was evaluated as described by Akuodor, twenty rats were randomly divided into five groups of four rats each andall the rats were made to fast for 18 hours prior to the test.

Group 1 (control) received 1 ml of distilled water

Group 2 received 100 mg/kg of seed extract

Group 3 received 200 mg/kg of seed extract

Group 4 received 300 mg/kg of seed extract

Group 5 received 5 mg/kg of seed extract of standard drug loperamide.

Induction of diarrhoea with castor oil

Anti-diarrhoea activity of the extract was evaluated using the castor oil-induced diarrhea model in rats as described by Akuodor [10,11]. One hour after the treatment, rats in all the groups were challenged with 1 ml of castor oil orally. One hour after diarrhoea induction, 1 ml of marker charcoal meal (10 g of activated charcoal in 20 ml of glycerol) was administered orally to all animals and thirty minutes later, animals were anesthetized by overdose of chloroform and sacrificed. The abdomen was cut off and the small intestine carefully removed, the distance travelled by the charcoal plug from pylorus to caecum was measured and expressed as a percentage of the total length of the small intestine. The blood and stool of each animal were taken for analysis.

Results

Group	Treatment	IL(CM)	CML (CM)	PI%	I%
1	control	103.5 ± 10.17	72.8 ± 6.3	71	
2	100 mg/kg	95.5 ± 4.94	53.1 ± 2.1	55	28
3	200 mg/kg	92.5 ± 1.89	45.5 ± 2.1	49	38
4	300 mg/kg	98.5 ± 2.33	45.5 ± 2.1	46	38
5	5 mg/kg Loperamide	96.0 ± 7.08	45.5 ± 2.1	47	38

Table 1: Effect of *Citrullus lanatus* seed extract on Intestinal Transit.

The above Table 1 showed the effect of the N-hexane seed extract of *Citrullus lanatus* on intestinal charcoal meal motility in rats. Results were expressed as mean ± standard error of mean (S.E.M.), n=4.

Group	Treatment	Na^+	K^+
1	control	83.8 ± 4.33^{bdth}	3.02 ± 0.10^{bdth}
2	100 mg/kg	$60 \pm 3.85^{*adth}$	$4.88 \pm 0.09^{*adet}$
3	200 mg/kg	$35.5 \pm 2.90^{*bcth}$	$3.95 \pm 0.17^{*bcfg}$
4	300 mg/kg	$21.5 \pm 6.69^{*bdeg}$	$4.82 \pm 0.13^{*adef}$
5	5 mg/kg Loperamide	$21.75 \pm 2.17^{*bdeg}$	3.5 ± 0.42^{befg}

Table 2: Effects of the seed extract on the electrolytes level

Table 2 showed the effect of the N-hexane seed extract of *Citrullus lanatus* on electrolytes levels in rats.

Discussion

Citrullus lanatus is a popular fruit in many parts of the world, although the seed is often discarded as waste; it contains various phytochemicals [12]. The phytochemical screening carried out on the seed revealed that it contains alkaloid, flavonoid, tannins, saponins, steroid and resins. These phytochemicals especially flavonoid and tannins which have anti-oxidant properties have been reported to have anti-diarrhoea properties [12].

Results from the gastrointestinal motility tests (Table 1) showed that the average distance moved by the charcoal plug was greater for the control (group 1) at 72.72 cm. The distance was 53.045 cm for the treated group (group 2), which received 100 mg/kg body weight of extract, while group 3, 4 (which received 200 and 300 mg/kg) and group 5 (which was given a standard drugs loperamide), the distance was 45.5 cm for each, this inhibition was observed to be high. Also the result agree with similar reports which have established reduction in gastric motility as being the mechanism by which many anti-diarrhoea agents act [13,14].

Table 2 showed that there was a significant loss at of electrolytes in the control compares with other groups at $p<0.05$. Castor oil contains ricinoleic acid which induces irritation and inflammation of the intestinal mucosa, leading prostaglandin release which, in turn, changes in mucosal fluid and electrolyte transport thereby preventing the reabsorption of NaCl and water which results in a hyper-secretory response and diarrhoea. Induction of diarrhoea by castor oil increased peristaltic activity and induced permeability changes in the mucosal membrane to electrolyte and water. The values of Na^+ revealed decrease in concentration as the concentration of extract administered increases.

Conclusion

In conclusion, the results of this investigation have showed that *Citrullus lanatus* may have anti-diarrhoea potential. Further studies should be carried out to purify and fractionate the extract in order to determine the specific molecule responsible for the anti-diarrhoea activity observed.

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