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RESEARCH ARTICLE

THE ANTI-DIARRHOEAL EFFECT OF ETHANOLIC-BARK EXTRACT OF STERCULIA SETIGERA IN MICE

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ABSTRACT

Sterculia setigera is a widely used plant for numerous herbal preparations. There are various folkloric claims for its use for the treatment of many diseased conditions. Examination of the anti-diarrhoeal effect of stem-bark ethanolic extract of *Sterculia setigera* was carried out. Results showed that extract has an inhibitory effect on castor oil diarrhoea-induced mice (*Mus musculus*), with 0.5ml/10g (9.01 ± 1.07) and 0.1ml/10g (1.83 ± 0.41) respectively. Inhibitory activity was characterized by steady decline in the diarrhoeal episode commencing at 56% thus, confirms *Sterculia setigera* as such with antidiarrhoeal activity.

INTRODUCTION

Need of thorough, continual and further studies on herbal preparations should always be in the front burner of medical and pharmaceutical research. All plants, including *Sterculia setigera* are differently used by various ethnic groups across the globe as knowledge the multipurpose use of medicinal plants are often transferred from generation to generation (Wouyo Atakpama et al., 2012 and Addisie and Yared, 2012). *Sterculia spp* are widely distributed in the tropic region of West African savannah region, growing up to 4ft high and 5ft girth. It is one of the economic trees in Senegal with emphasis on socioeconomic, agroforestry and regenerative value of its gum (Toure et al., 2009; Sene et al., 1994; Niang et al., 2010 and IgoLi et al., 2005) reported that a decoction of stem bark of *S. setigera Del. (Sterculiaceae)* also called Ufuru by the Igede people istaken 2 times daily as a multipurpose preparation (Adjanahoun et al., 1991; Igoli et al., 2003; Igoli et al., 2002 and Tor-Anyiin et al., 2003). *Sterculia* is traditionally used for the treatment of range of ailments /diseases/infections in man and animals including, TB, Epilepsy, boils, jaundice, malaria, whitlow, polio, dysentery etc. (IgoLi et al., 2005; Ibrahim et al., 2012; Almagboul et al., 1988 and Dalziel, 1937). Many different ways of approach may be rolled in search for plants and plants products for pharmacological and chemical interest. However, the various screening methods were entered to aid in selections of plants for further research.

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Usually, the screenings are carried out to ensure that these products are safe, reliable and potent, prophylactic or therapeutic agents (Fransworth, 1984). Antidiarrhoeal agents are such that decreases bowel movement frequency by way of controlling diarrhoea and texture of the symptoms that go along with texture of stool. Diarrhoea is not a disease but a symptom of some other problems which may be caused by eating or drinking food or water that is contaminated with bacteria, viruses, parasites or by eating something that is difficult to digest. People who have trouble digesting lactose (milk sugar) for example may get diarrhea if they eat dairy products. Diarrhoea may be associated with stress or by taking certain medications (www.drugs.com/drugclasses/gastrointestinalagents). Antidiarrhoeal agents are such that decreases bowel movement frequency by way of controlling diarrhoea and texture of the symptoms that go along with texture of stool. Antidiarrhoeal drugs works in several ways. Loperamide found in ((Linodium A- D), for example slows the passage of stool through the intestines, this allows more time for H₂O and salts in the stools to be absorbed back into the body. Absorbents such as (Attapulgate found in Kaopectate) pull diarrhoea causing substance from the GIT, however, they may also pull out substances that the body needs, such as enzymes and nutrients. Bismuth Subsalicylate, the ingredient in Pepto-Bismol, decreases the secretion of fluids into the intestine and inhibits the activity of bacteria. It also controls diarrhoea but relieves the cramps that accompany diarrhoea. These medicines come in liquid, tablets, caplets and chewable forms (Gale Encyclopedia of Medicine, 2008).

Aim and Objective

To examine the antidiarrhoeal effect of stem-bark ethanolic extract of *Sterculia setigera* using castor oil diarrhoea-induced mice.

Ethical issues: Authors are licensed to handle laboratory animals.

MATERIALS AND METHODS

Plant Preparation

Collection

Samples of *S. setigera* were collected from Tombo in Buruku Local Government Area of Benue State, Nigeria. The plant sample was Identified and authenticated by Dr. Okonkwo (Taxonomist) and Professor S.W Husseni (Botanist) respectively.

Extraction

80g of powdered plain bark was wrapped in a thimble and extracted via 350 ml of ethanol in the soxhlet extractor, while extract was allowed to stand for 48hrs. This was then evaporated to dryness after which 0.5g of the extract was weighed using the Metler balance and dissolved in 5ml distilled water to give 1×10^{-1} g/ml.

Reference Drug

Castor Oil—Bells, Sons and Co Druggists Ltd, Southport, England.

Animal Preparation

Twenty Four albino mice were weighed and divided into three groups of eight animals. These were allowed to acclimatize in cages for 48 hours.

The animals were also maintained in relaxed manner throughout the work to avoid anxiety. Each group was administered with castor oil to induce diarrhea and different concentration of *Sterculia setigera* extract:

- Group I (control) - 0.5ml castor oil *PO* via gastric tube.
- Group II -pretreated with *Sterculia setigera* extract (0.05ml/10g) *IP* based on body weight-30mins and later castor oil (0.5ml) *PO* via gastric tube.
- Group III -pretreated with *Sterculia setigera* extract (0.1ml/10g) *IP*, based on body weight-30mins and later castor oil (0.5ml) *PO* via gastric tube.

The animals in each group were placed on pieces of white tissue paper while onset and duration of diarrheal episodes were observed at each hour for a period of 4 hours in each case.

RESULTS

The determination of the onset and duration of diarrheal episodes as well as statistical analysis as confirmed in the mice are presented in the tables below:

(a) Tables of Onset of Diarrhoeal Episode
Table 1. Group I (control)

S/No	Weight (g)	1 Hr	2 Hrs	3 Hrs	4 Hrs
1	24.40	3.00	5.00	5.00	10.00
2	21.00	-	3.00	7.00	13.00
3	27.80	2.00	4.00	8.00	12.00
4	14.20	3.00	3.00	9.00	9.00
5	22.20	1.00	2.00	7.00	14.00
6	21.20	-	2.00	6.00	13.00
7	27.60	3.00	4.00	4.00	9.00
8	25.30	1.00	2.00	6.00	11.00

Table 2. Group II - *Sterculia setigera* extract (0.05ml/10g) + castor oil (0.5ml)

S/No	Weight (g)	Crude Extract (ml)	1 Hr	2 Hrs	3 Hrs	4 Hrs
1	26.90	0.13	-	1.00	2.00	6.00
2	21.40	0.11	-	2.00	2.00	5.00
3	28.30	0.14	-	-	3.00	5.00
4	24.30	0.12	-	2.00	4.00	7.00
5	28.50	0.14	-	-	2.00	4.00
6	23.30	0.12	-	1.00	1.00	3.00
7	25.20	0.10	-	2.00	4.00	6.00
8	23.10	0.12	-	1.00	1.00	5.00

Table 3. Group III - *Sterculia setigera* extract (0.1ml/10g) + castor oil (0.5ml)

S/No	Weight (g)	Crude Extract (ml)	1 Hr	2 Hrs	3 Hrs	4Hrs
1	16.60	0.17	-	-	-	2.00
2	19.90	0.22	-	-	-	-
3	22.50	0.23	-	-	-	2.00
4	19.50	0.19	-	-	-	-
5	21.50	0.22	-	-	-	-
6	23.20	0.23	-	-	-	3.00
7	20.20	0.20	-	-	-	1.00
8	21.60	0.22	-	-	-	2.00

b) Tables of Duration of Diarrhoeal Episodes

Table 4. Group I (control)

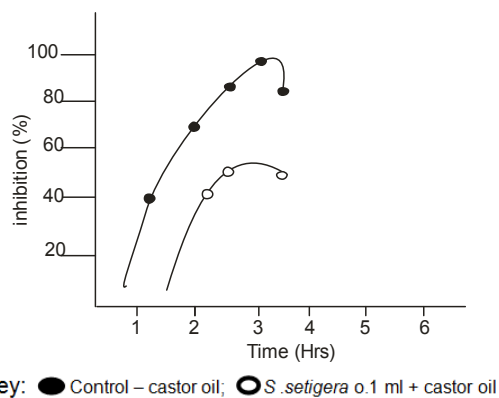
S/No	Weight (g)	Dose Extract (ml)	1 Hr	2 Hrs	3 Hrs	4 Hrs	5 Hrs	6 Hrs
1	26.60	-	2.00	2.00	5.00	8.00	11.00	16.00
2	21.90	-	-	3.00	6.00	9.00	10.00	14.00
3	21.90	-	2.00	5.00	5.00	7.00	12.00	13.00
4	19.30	-	1.00	1.00	5.00	5.00	11.00	18.00
5	18.70	-	-	1.00	5.00	10.00	13.00	17.00
6	21.00	-	-	2.00	4.00	8.00	10.00	15.00
7	23.20	-	-	2.00	2.00	6.00	9.00	14.00
8	20.40	-	3.00	3.00	6.00	8.00	13.00	16.00

Table 5. Group III - *Sterculia setigera* extract (0.1ml/10g) + castor oil (0.5ml)

S/No	Weight (g)	Dose Extract (ml)	1 Hr	2 Hrs	3 Hrs	4 Hrs	5 Hrs	6 Hrs
1	39.00	0.39	-	-	-	1.00	1.00	4.00
2	24.30	0.24	-	-	-	-	1.00	3.00
3	24.30	0.24	-	-	-	-	-	3.00
4	24.90	0.25	-	-	-	-	2.00	2.00
5	31.00	0.31	-	-	-	2.00	2.00	3.00
6	29.60	0.29	-	-	-	-	3.00	3.00
7	25.00	0.25	-	-	-	-	2.00	2.00
8	27.60	0.28	-	-	-	1.00	1.00	1.00

Table 6. Mean Diarrhoeal Episode: Mean + Sem_n = 24

Group	Treatment	No of Diarrhoeal Episode				Total
		1 Hour	2 Hours	3 Hours	4 Hours	
1	Castor Oil (0.5ml)	1.63 ± 0.58	3.13 ± 0.40	6.50 ± 0.57	11.38 ± 0.69	23.28 ± 2.05
2	<i>Sterculia setigera</i> (0.05 ml/10g)P.O	-	1.50 ± 0.2	2.38 ± 0.25	5.13 ± 0.45	9.01 ± 1.07
3	<i>Sterculia setigera</i> (0.1 ml/10g)P.O	-	-	-	1.25 ± 0.41	1.83 ± 0.41

Fig 1. Graph of activity of *Sterculia setigera* extract on Castor Oil-induced Diarrhoeal Episode in mice.

DISCUSSION

Group I (control) exhibited about 90% diarrhoeal episode (4-6 hours) as described by Joshi, *et al* 1987 "that on administration of castor oil induced diarrhea in mice (90% of animals) within 4hrs The pre- treatment of animals in groups II and III with crude extract of *S. setigera* (0.05ml/10g and 0.1ml/10g respectively) produced inhibitory effect on manifested diarrheal episodes. This effect was stronger in group III with a larger dose (0.1ml/10g) than in group II (0.5ml/10g), in other words, the higher the dose of extract, the stronger the inhibitory (antidiarrhoeal) effect. Inhibitory effect was evident in group II which was slight in the first hour only but subsequently resumed episode of diarrhoea, but group III

doses was able to inhibit the diarrhea episode to the fourth hour, as only 4 of the animals were able to get out episode of diarrhoea at the fourth hour. Results also ascertained the duration of diarrhoea episode *vis a viz* antidiarrhoeal activity of *S. setigera* on castor oil diarrhoea- induced mice with 0.5ml/10g (9.01± 1.07) and 0.1ml/10g (1.83 ± 0.41) respectively. Fig 1 showed a decline in diarrhoeal episode as *S. setigera* extract (0.1ml/10g) commenced inhibition at 56%.

Conclusion

Examination of the anti-diarrhoeal effect of stem-bark ethanolic extract of *Sterculia setigera* showed that the extract has an inhibitory effect on castor oil diarrhoea- induced mice, with 0.5ml/10g (9.01± 1.07) and 0.1ml/10g (1.83 ± 0.41) respectively. Inhibitory activity which was characterized by steady decline in the diarrhoeal episode commencing at 56% also confirms *Sterculia setigera* as such with antidiarrhoeal activity.

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Conflicting interest: No conflict of interest.

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