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EFFECT OF *EREMOMASTAX SPECIOSA* ON EXPERIMANTAL DIARRHOEA.

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Abstract

This study investigated the anti diarrhoeal activity of the aqueous extract of dried ground leaves of *Eremomastax speciosa* (Hochst.) Acanthaceae. Diarrhea was induced in mice by the administration of 0.2 ml of castor oil, with the control group receiving water. The administration by oral garvage of 400 or 800 mg/kg body weight of *Eremomastax speciosa* extract reduced castor oil induced diarrheoa by reducing the number of wet stools by 42.50 and 48.35% respectively. This was as a result of the ability of the extract to stimulate the reabsorption of water from the intestinal lumen as well as significantly reducing the intestinal transit time and intestinal motility. This antidiarrhoeal property could be as a result of the tannins and flavonoids, which were found to be present in *Eremomastax speciosa.*

Key words: *Eremomastax speciosa,* antidiarrhoeal activity, castor oil, phytochemicals.

Introduction

Traditional medical practitioners play important roles in health care delivery in Cameroon. However, their claims are sometimes unsubstantiated with scientific facts. *Eremomastax speciosa* (Hochst.) has been used by traditional doctors for many years as a haematopoietic and antidiarrhoeal herb. The stem and the leaves are used in the treatment of dysentery and anemia, while the aerial parts are used in the treatment of irregular menstruation and spurious labour pains. The leaves are also used to treat fracture, hemorrhoids and urinary tract infection (Adjanohoun, et al., 1996). *Eremomastax speciosa* is a tropical stout erect multi-branched herb, which grows as a weed in secondary forests (Heine, 1966). It is however cultivated by many Cameroonians as a result of its numerous

medicinal properties. Tan et al., (1996) reported the anti-ulcerogenic activity of *Eremomastax speciosa*. The present study was designed to study the antidiarrhoeal property of leaves of *Eremomastax speciosa* in mice.

Materials and Methods

Plant material

Fresh leaves of *Eremomastax speciosa* were collected in Bonamoussadi-Yaounde, Cameroon. Botanic identification was performed at the Cameroon National Herbarium, Yaounde, Cameroon, and assigned voucher No. HNC/136984. The sample was air-dried in the laboratory (26 -28°C) and then ground to a powder.

Preparation of plant material

The powdered sample was soaked in boiling water for 30 minutes. The mixture was then allowed to cool and filtered using a glass funnel plugged with sieve cloth. The residue was further extracted twice with boiling water. The resulting filtrate was then concentrated using a rotary evaporator, and further dried in an oven at 40°C. The resulting material was then stored in a refrigerator at 4°C until when required.

Animals

Male mice (25-30g) obtained from the Animal Unit, Faculty of Medicine and Biomedical Science, University of Yaounde 1 were used for this study. Their use was in conformity with regulations concerning the use of animals for experimentation in the University of Yaounde 1.

Chemicals

Morphine (reference antidiarrhoeal drug), Castor oil (laxative agent), Charcoal Meal (10% activated charcoal in 5% Gum Acacia) were of pharmacological grade. All other reagents were of analytical grade and obtained from BDH.

Phytochemical screening

The freshly prepared extract of *Eremomastax speciosa* was quantitatively tested for the presence of chemical constituents. These were identified by characteristic colour changes using standard procedures (Trease and Evans, 1983).

Experimentally induced diarrhea

The method proposed by Galvez et al., (1993) was modified to suit experimental needs. Adult white mice fasted for 18 hours were divided into 5 groups (Group I – Group

V) of 6 animals each. The groups received the following treatment by oral garvage: Group I: Distilled water (0.2 ml), Group II: Morphine (25 mg/kg body weight), Group III: *Eremomastax speciosa* extract 400 mg/kg body weight, Group IV: *Eremomastax speciosa* extract 800 mg/kg body weight and Group V: Distilled water (0.2 ml). (In Groups III and IV, the extract was dissolved in 0.2 ml of distilled water). Thirty minutes after the treatments, castor oil (0.2 ml) was administered by garvage to groups II, III, IV and V.

Following the administration of castor oil, the animals were placed in separate wired cages for observation. The total number of faeces and the number of wet faeces passed was recorded over a period of 4 hours after the administration of castor oil. The percentage diarrhoea inhibition was calculated as a function of the castor oil control i.e.
% Inhibition = (control – test) x 100%/control.

Upper gastrointestinal transit

The method proposed by Aye-Than et al., (1989) was used in groups of eight mice each, using a 'charcoal meal' as a marker diet. The mice were given increasing doses of the extract re-dissolved in 0.2 ml of distilled water by garvage. The intestinal transit was calculated as a percentage of the distance travelled by the charcoal meal compared to the length of the small intestine.

Statistical treatment of the results

The results were expressed as means ± standard deviation (SD). Significance of the differences compared to the control groups was determined using the Student's t-test.

Table 1: Qualitative chemical analysis of *Eremomastax speciosa* leaf extract.

Constituents	Name of test	Observation	Inference
Alkaloids	Mayer's test	cream precipitate	present (+ve)
Glycosides	Fehlings solution	No brick-red precipitate	absent (-ve)
Cardiac glycosides	Salkowski test	no reddish-brown colour	absent (-ve)
Flavonoids	Ammonium test	Yellow colouration	present (+ve)
Saponin	Frothing test	persistent foam	present (+ve)
Tannins	Ferric chloride test	dark green colour	present (+ve)

Table 2: Effect of *Eremomastax speciosa* leaf extract and morphine on experimentally-induced diarrhea in mice.

Treatment	Total number of faeces	Number of wet faeces	Percentage of inhibition
Distilled water	16.80 ± 1.48	0.00 ± 0.00	
Castor oil (0.2 ml)	25.50 ± 2.50[a]	20.50 ± 3.69	0.00
Extract (400mg/kg) + Castor oil (0.2 ml)	11.80 ± 2.20[cb]	12.00 ± 1.40[c]	42.50
Extract (800 mg/kg) + Castor oil (0.2 ml)	12.00 ± 1.82[cb]	10.50 ± 1.84[c]	48.78
Morphine + castor oil (0.2 ml)	8.60 ± 4.20[cb]	0.00 ± 0.00[c]	100.00

Results = mean ± SD. [c]Significantly lower compared with castor oil group, [b]significantly lower compared to normal control, [a]Significantly higher than the control,
$P < 0.01$

Table 3: Effect of plant extract and morphine on upper gastrointestinal transit of standard charcoal meal in mice with castor oil induced diarrhoea.

Treatment	Intestinal transit (%)	% Inhibition
Distilled water control (0.2 ml)	61.72 ± 4.38	
Castor oil control (0.2 ml)	90.30 ± 7.82[a]	
Extract (100 mg/kg + castor oil (0.2 ml)	59.24 ± 6.76[c]	34.39
Extract (200 mg/kg + castor oil (0.2 ml)	56.64 ± 7.90[c]	37.28
Extract (400 mg/kg + castor oil (0.2 ml)	52.26 ± 4.36[c]	42.13
Extract (800 mg/kg + castor oil (0.2 ml)	49.58 ± 3.31[bc]	45.09
Morphine (25 mg/kg) + castor oil (0.2 ml)	16.03 ± 2.98[bc]	82.25

Results are means ± standard deviation. [a]Significantly different compared to normal control, [b]significantly lower compared to normal control, [c]significantly lower than castor oil control, $p < 0.01$.

Results and Discussion

Castor oil brings about changes in electrolyte and water transport and increases peristaltic activity (Luderer et al., 1980; Capasso et al., 1986). These changes are associated with prostaglandins that contribute to the patho-physiological functions in the gastro intestinal tract (Bennet and Sanger, 1982). Release of prostaglandins is also a major cause of arachidonic acid-induced diarrhoea (Luderer et al., 1980). This is characterized by an increase in the secretion of water and electrolytes, an increase in intestinal transit time and an increase in wet faeces.

Table 4: Preventive and curative study of morphine and *Eremomastax speciosa* extract in castor

oil induced diarrheal mice.

Treatment	Intestinal transit (%)	% inhibition
Castor oil (control, 0.2 ml)	90.30 ± 7.82	
Morphine (25 mg/kg) 30 min. before castor oil	16.03 ± 2.98[c]	82.25
Morphine (25 mg/kg) 15 min after castor oil	20.00 ± 3.18[c]	77.85
Extract (400 mg/kg) 30 min before castor oil	52.26 ± 4.36[c]	42.13
Extract (400 mg/kg) 15 min after castor oil	58.21 ± 7.70[c]	35.54
Extract (800 mg/kg) 30 min before castor oil	49.58 ± 3.31[c]	45.09
Extract (800 mg/kg) 15 min. after castor oil	51.34±2.45[c]	43.10

Results are means ± SD. [c]Significantly lower compared to castor oil control, $P < 0.01$

The aqueous extract of *Eremomastax speciosa* leaves showed significant antidiarrhoeal activity ($P<0.01$) against castor oil induced diarrhoea in mice. It reduced the number of wet faeces produced by castor oil administration from 20.50 ± 3.69 to 12.00±1.40 (42.50**%**) and 10.50 ± 1.84 (48.75**%**) when experimental animals were respectively administered 400 and 800 mg/kg plant extract (Table 2). The plant extract thus stimulates the reabsorption of water from the intestinal lumen, resulting to the normalisation of the deranged water transport across the mucosal cells which are seen in the type of faeces produced.

Administration of castor oil to experimental animals stimulated small intestinal transit of 90.30 ± 7.82. Administration of *Eremomastax speciosa* demonstrated a significant ($P < 0.01$) dose related reduction of this intestinal transit (Table 3) with 800 mg/kg being more effective than the lower dose of extract. This activity is probably due to the ability of the extract to inhibit intestinal motility.

Administration of the *Eremomastax speciosa* extract and morphine, 30 minutes before (preventive) or 15 minutes after (curative) castor oil administration, significantly ($P < 0.01$) decreased the intestinal transit time (Table 4). The reduction of the intestinal transit following administration of the *Eremomastax speciosa* extract before and after the onset of castor oil-induced gut movement demonstrated the ability of the extract to protect the gut from the adverse effect of diarrhoea and the ability to suppress established gut motility respectively. Morphine (25 mg/kg) was more effective as an antidiarrheal agent than the plant extract even when experimental animals were administered an 800 mg/kg dose of the plant extract. Morphine is a prototypical antidiarrhoeal drug, which acts on the gastrointestinal tract, and mediates both central and local effects (Galligan and Burks, 1983; Megens, 1990). It stimulates the net absorption of water and electrolytes in the small and large intestine in several species of animals, including man (Couper, 1987). Similar results were obtained in our study in which morphine (25 mg/kg) stimulated the reduction of the intestinal transit time and brought about a complete (100%) inhibition of the onset of diarrhoeal faeces (Tables 2, 3, 4). Phytochemical screening of the crude extract of *Eremomastax speciosa* revealed the presence of tannins and flavonoids (Table 1), which

have been shown to possess antidiarrhoeal activity (Galvez et al., 1991, 1993). Thus, tannins and flavonoids may be responsible for the antidiarrheal activity of *Eremomastax speciosa* by stimulating the normalization of the deranged water transport across the mucosal cells and the reduction of the intestinal transit, which have more useful therapeutic effects than any action on intestinal motility and propulsion.

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