



International Journal of Pharmacy and Natural Medicines

Journal Home Page: www.pharmaresearchlibrary.com/ijpnm



Research Article

Open Access

Anti diarrheal activity of ethanolic extract of the Memecylon Edule leaves in castor oil induced diarrhea model in mice

U. Venkatesh^{1*}, Sri Rama Radha¹, P. Suresh¹, G. Sravan Reddy²

¹St John's College of Pharmacy, Yemmiganur, Kurnool, Andhra Pradesh

²Hi-Q Herbals, Kothapet, Hyderabad, Telangana

ABSTRACT

Diarrhoeal disease is often a leading source of mortality and morbidity, especially among children in developing countries causing a major healthcare problem. As per suggestion of WHO, treatment of diarrhoea with traditional medicine is the main focus of our present studies. The present study is designed to evaluate the anti-diarrhoeal activity of crude methanol extract of *Memecylon edule*. Crude methanol extracts are obtained by *in vacuo* methods and its fractionating is done by Kupchan partitioning method. The anti-diarrhoeal activity is screened by castor oil-induced diarrhoea, castor oil-induced enteropooling and gastrointestinal motility test. Alcoholic extract of the leaves of *Memecylon edule* was reduced castor oil-induced diarrhea significantly ($P < 0.05$) and showed the dose dependent inhibition of diarrheal defaecation of 22.41% to 56.89% respectively at the dose of 200mg/kg and 400mg/kg body weight compared to control. It is concluded that, leaves of *Memecylon edule* contains bioactive natural substances with anti-diarrhoeal properties. These attributes may give a justification for your use of *Memecylon edule* in diarrhoea management by traditional healers.

Keywords: Memecylon edule, Castor oil, Loperamide, Anti-diarrhoeal activity

ARTICLE INFO

CONTENTS

1. Introduction	15
2. Materials and Methods	16
3. Results and Discussion	16
4. Conclusion	19
5. References	19

Article History: Received 15 January 2017, Accepted 25 February 2017, Available Online 15 June 2017

*Corresponding Author

U. Venkatesh
St John's College of Pharmacy,
Yemmiganur, Kurnool, Andhra Pradesh
Manuscript ID: IJPNM3334



PAPER-QR CODE

Citation: U. Venkatesh, et al. Anti diarrheal activity of ethanolic extract of the Memecylon Edule leaves in castor oil induced diarrhea model in mice. *Int. J. Pharm. Natural Med.*, 2017, 5(1): 15-20.

Copyright© 2017 U. Venkatesh, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

1. Introduction

Diarrhoeal disease is often a leading source of mortality and morbidity, especially among children in developing countries causing a major healthcare problem.

microorganisms including *Shigella flexneri*, *Staphylococcus*

aureus, *Escherichia coli*, *Salmonella typhi*, *Aeromonas hydrophila*, *Plesiomonas shigelloides* are only to be major causative agents of diarrhoea in humans. *Candida albicans* has also been recognised to cause diarrhoea in humans.^{1,2} It was reported that, in fact, due to diarrhoea, that 50% of deaths attributed to diarrhoea combined with respiratory disease were due to diarrhoea, and that one-third of deaths due to combined measles with diarrhoea or respiratory disease were due to diarrhoea. With these assumptions, using the most recently available national verbal autopsy data, diarrhoea accounted for 5.4 deaths per 1,000 children in Bangladesh^{3,4}.

The sickness is characterised by a discharge of semi-solid or watery fecal matter on the bowels three or even more times every day.⁵ It requires a rise in the fluidity, volume and frequency of going number two or three, abdominal pain associated with increased secretion and decreased absorption of fluid thereby losing water and electrolytes. In India the fundamental is utilized just as one external application for lumbago.^{6,7} It's for reproductive purposes in the Pacific, Trinidad and Tobago, China and India for specific human problems of both the genders. It is just a popular diuretic in Assam, and in addition used as an abortifacient.

In Philippines, the fundamental is considered as emollient, refrigerant and maturant; the leaves are prescribed in inflammation on the intestines and also the bladder. A decoction of dried root is utilized in enteritis, dysentery, rheumatic pains and tonsillitis.^{7,8} Anyway, some view the rose like a medicinal plant, some deem a weed, but others utilize its fiber (Aramina fiber) for assorted purposes in Madagascar, Nigeria and Western Sudan, Chad, Central African Republic, Zaire and Gabon, which is told proof against damage by termites and water. However, house elevators its biological activity on diarrhoea remains to be scanty. For this reason the flower was considered for your investigation of its anti-diarrhoeal activity.^{8,9,10}

2. Materials and method

Collection of plant material:

The fresh leaves of memecylon edule were collected in the month of November in the tirumala tirupathi hills and were authenticated by Assistant professor. K. Madhava chetty Department of Botany, S.V. University, Tirupathi, Andhra Pradesh. And collected plants were immediately sprayed with alcohol to cease the enzymatic degradation of secondary metabolites. The plant material was kept under shade for drying for about seven days, air dried plant material is pulverized and stored for further used.

Preparation of extract:

The air dried powdered plant material was extracted in Soxhlet assembly successively with petroleum ether, benzene, chloroform, and ethanol. Finally the drug was macerated with water. Each time before extracting with the next solvent the powdered material is dried in hot air oven below 50°C. Each extract is concentrated by distilling off the solvent and then evaporated at a temperature of not more than 50°C. The extract obtained with each solvent is

weighed. The percentage is calculated in terms of air dried weight of the plant material. The colour and consistence of the extract were noted.¹¹

Preliminary Phytochemical Screening: The preliminary Phytochemical Studies were performed

Procurement of animals and maintenance:

Male albino rats of body weight 150-250gms were procured from Sri Venkateswara Enterprises, Bangalore. Animals were maintained as per guidelines of NIN animal user manual. Animals are acclimatized for 10 days to our animal house, maintained at temperature of 22°C to ±2°C. The animal was regulated by a 12 hours light, 12 hours dark schedule. Five animals were housed per cage sized 41cm length, 28cm width and height of 14cm. Paddy husk was used for bedding and on very alternative day bedding was changed and washed thoroughly with water along with Domex, a disinfectant and detergent. The rats were fed on a standard pellet diet purchased from Sai Durga Feeds and Foods, Bangalore.¹²

Acute toxicity studies:

The test was carried out as suggested by Swiss albino mice of either sex weighing between 25-30mg were divided into different groups of six animals each. The control received normal saline (2ml/kg,p.o). The other groups received 100,200,300,600,800,1000,2000,3000mg/kg of AEM respectively through oral route immediately after dosing the animals were observed continuously were then kept under observation up to 14 days after drug administration to find out the mortality if any.¹³

Drugs and Chemicals:

Petroleum ether, benzene, chloroform, alcohol and castor oil were procured from S.D. fine chemical Ltd, Mumbai India. Loperamide was Gift sample from Chandra labs Kukatpally, Hyderabad. Chemicals utilized were of analytical grade.

Anti-diarrhoeal activity:

Castor oil induced diarrhea:

Rats fasted for 12h were randomly allocated to four groups of six animals each. Group I received 1% CMC (10ml/kg) group II received 200mg alcoholic extract of memecylon edule, the group III was given 400mg of alcoholic extract of memecylon edule and Group IV received loperamide (3mg/kg p.o.) after 60 min each animal was given with 2 ml of castor oil by orogastric cannula, and placed in a separate cage and observed for 4h defecation. Transparent plastic dishes were placed beneath each cage and the characteristic diarrhoeal droppings were noted.¹⁵

3. Results and Discussion

The present study reported the effect of alcoholic extract of Memecylon edule on castor oil- induced diarrhea in rats.

Acute toxicity:

When administered orally the alcoholic extract of leaves of Memecylon edule was found to be non-toxic up to the maximum dose of 2000mg/kg body weight. In acute toxicity study there was no mortality and no behavioural changes at any of the tested doses till the end of 14days of observation period.

Castor oil-induced diarrhea: The results of the present study strongly confirms the antidiarrheal efficacy of

alcoholic extract of the leaves of Memecylon edule in Castor oil- induced diarrhea in mice.

Alcoholic extract of the leaves of Memecylon edule was reduced castor oil-induced diarrhea significantly (P<0.05) and showed the dose dependent inhibition of diarrheal defaecation of 22.41% to 56.89% respectively at the dose of 200mg/kg and 400mg/kg body weight compared to control. Among the all treated groups (castor oil, AEM, standard), standard drug i.e. Loperamide was reduced significantly(P<0.05) and inhibition was 69.8% respectively in castor oil- induced diarrhea in rats.

Discussion:

Evaluation of the effect of alcoholic extract of leaves of Memecylon edule on experimentally induced diarrhoea by castor oil in mice showed that it markedly reduced the frequency of defecation, number of diarrhoea stools and wetness of the faecal droppings.^{16,17} The castor oil-induced diarrhoea model in mice allows the observation of measurable changes in the number of stools. The diarrhoea lasts for at least 8hr and is a consequence of the action of

ricinoleic acid liberated from castor oil by lipase enzymes.¹⁸ The free ricinoleic acid irritates the intestinal mucosa causing inflammation and release of prostaglandins and nitric oxide, which stimulate gastrointestinal secretion, motility, epithelial permeability and edema of the intestinal mucosa thereby preventing the re-absorption of sodium, chloride and water.¹⁹ Active intestinal secretion is driven predominantly by net secretion of chloride or bicarbonate, inhibition of net sodium absorption, or increase in luminal osmotically active molecules (osmotic pressure) ' which can all give rise to diarrhoea where the secretory component predominates.²⁰ Although we do not know the precise mechanism of hyper-secretion affected by AEM the reduction in faecal wetness strongly suggests it may inhibit gastrointestinal hyper-secretion.²¹ Tannic acid and tannins present in many plants and they denature the proteins forming protein tannate which make the intestinal mucosa more resistant and reduces secretion. The tannin present in the plant extract may be responsible for anti-diarrheal activity.²²

Table 1: Preliminary Phytochemical screening of extracts of memecylon edule :

Test	Petroleum ether	Benzene	Chloroform	Ethanol	Water
Alkaloids	-	-	-	-	-
Steroids	+	+	+	+	-
Triterpenoids	+	+	+	+	-
Tannins	-	-	-	+	+
Flavonoids	-	-	-	-	-
Saponins	-	-	-	+	+
Glycosides	-	-	-	+	+
Carbohydrates	-	-	-	+	+
Proteins	-	-	-	+	+

The presence of steroids, triterpenoids, tannins, Saponins, glycosides, carbohydrates and amino acids were detected on preliminary Phytochemical screening of the dried extract of the leaves of Memecylon edule.

Table 2: Consolidated Table Showing the Effect of Loperamide & EME on Onset of time for castor oil-inducing diarrhea

S.No	Control	Loperamide	EME 200mg/kg	EME 400mg/kg
1	30	78	55	80
2	39	85	60	60
3	39	90	60	70
4	39	80	50	70
5	43	78	55	60
MEAN ±SEM	38±0.89	83.25±2.41	56.25±2.14	65±2.58

Values are presented as mean ±S.E.M.(n=5); **P<0.05, Dunnet test as compared to control.

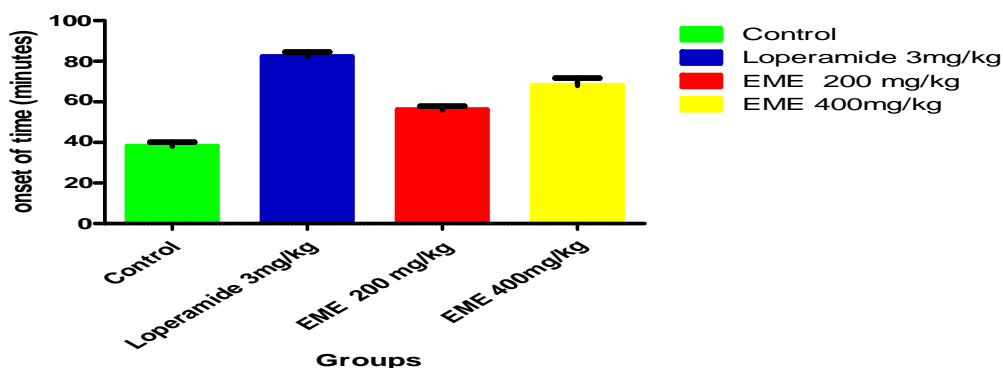


Figure 1

Table 3: Consolidated Table Showing the Effect of Loperamide & EME on total number of faeces in 4 hours.

S.No	Control	Loperamide	EME 200mg/kg	EME 400 mg/kg
1	6	3	9	6
2	4	6	5	5
3	10	3	7	5
4	13	3	8	4
5	8	3	9	6
MEAN ±SEM	8.2±1.69	3.75±0.67	7.25±0.76	5±0.36

Values are presented as mean ±S.E.M.(n=5); **P<0.05,Dunnet test as compared to control.

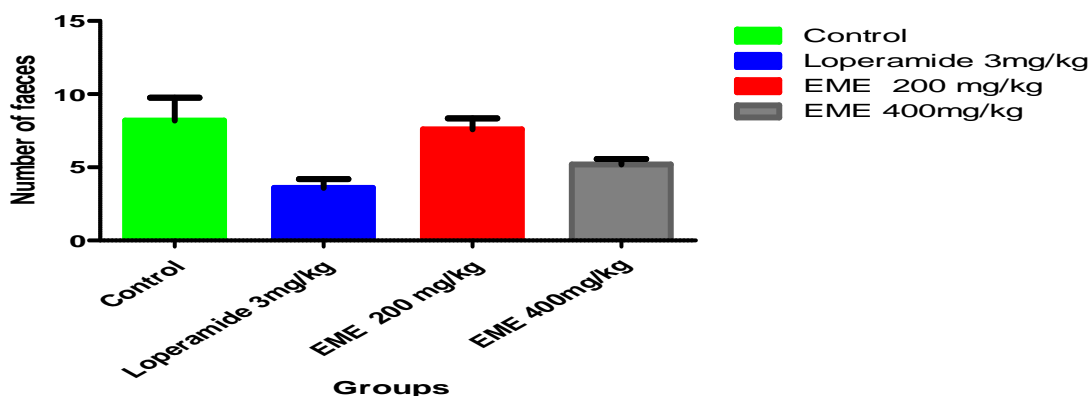


Figure 2

Table 4: Consolidated Table Showing the Effect of Loperamide & EME on total number of wet faeces in 4 hours.

S.No	Control	Loperamide	EME 200mg/kg	EME 400 mg/kg
1	5	1	4	3
2	3	2	3	1
3	6	1	5	2
4	9	3	6	4
5	6	1	4	3
MEAN ±SEM	5.8±1.09	1.75±0.42	4.5±0.578	2.5± 0.578

Values are presented as mean ±S.E.M.(n=5); **P<0.05,Dunnet test as compared to control.

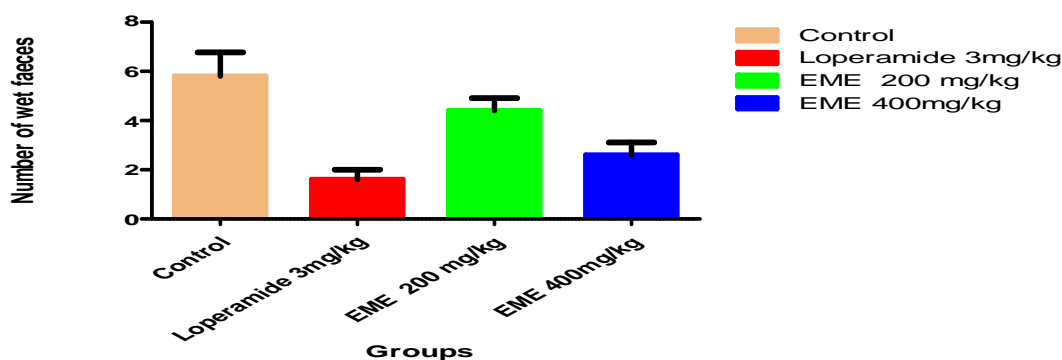


Figure 3

Table 5: Consolidated Table Showing the Effect of Loperamide & EME on % inhibition of diarrhea.

S.NO	Groups	Percentage of inhibition of diarrheal faeces
1	Control	-
2	Loperamide	69.80
3	EME 200mg/kg	22.41
4	EME 400 mg/kg	56.89

Values are presented as mean ±S.E.M.(n=5); **P<0.05,Dunnet's t -test as compared to control

4. Conclusion

The leaves of the Plant *Memecylon edule* Roxb is being used as divine material at temples at Tirupathi region. It is being supplied as "Prashadam" at temples and thus it is being chewed by the people in their daily life. *Memecylon edule* is used as anti-diarrheal from ancient times in Ayurveda.²³ Now it is scientifically proved that the alcoholic extract of the leaves of *memecylon edule* has shown antidiarrhoeal activity. Our results support the antidiarrheal property of the extract at the dose of 200, 400mg/kg body weight in rats.²⁴ Our results suggested that *Memecylon edule* has beneficial effect in controlling diarrhea upon tested on animal models like castor oil-induced diarrhea. Anti-diarrheal property may be due to the tannins present in the extract.

5. References

- [1] Field M (2003). Intestinal ion transport and the pathophysiology of diarrhea. *J.Clin. Invest.* 111: 931-943 (2003).
- [2] Armstrong D, Cohen J. *Infectious diseases*, Vol. 1, Section 2. Mosby, Spain, pp. 35.1-35.70(1999).
- [3] Snyder JD, Merson M. The magnitude of the global problem of acute diarrhoeal disease: a review of active surveillance data. *Bull. World Health Organ.* 60: 605-613 (1982).
- [4] Bhandari N, Nahl R, Mazumdar S, Martinez J, Black RE, Bahn MK Effect of community-based promotion of exclusive breastfeeding on diarrhoeal illness and growth: a cluster randomised controlled trial. *Lancet* 361: 1418-1423. (2003).
- [5] Velazquez C, Calzada F, Torres J, González F, Ceballos G Antisecretory of plants used to treat gastrointestinal disorders in Mexico. *J. Ethnopharmacol.* 103: 66-70 (2006).
- [6] Adachi JA, Jiang ZD, Mathewson JJ, Verenkar MP, Thompson S, Martinez-Sandoval F, Steffen R, Ericson CD, DuPont HL Enteroaggressive *Escherichia coli* as a major etiologic agent in traveler's diarrhea in 3 regions of the world. *Clin. Infect. Dis.* 32: 1706-1709 (2001)
- [7] Parimala B, Boominathan R, Mandal SC Evaluation of anti-diarrheal activity of *Cleome viscosa* L extract in rats. *Phytomedicine* 9: 739-742. (2002)
- [8] Mukherjee PK, Das J, Balasubramanian R, Saha K, Pal M, Saha BP Anti-diarrhoeal evaluation of *Nelumbo nucifera* rhizome extract. *Indian J. Pharmacol.* 22: 262-264. (1995)
- [9] Salud Pérez Gutiérrez, Miguel Angel Zavala Sánchez, Cuauhtemoc Pérez González and Lucina Arias García Antidiarrhoeal activity of different plants used in traditional medicine *African Journal of Biotechnology*, Vol. 6, No. 25, 28 December, 2007, pp. 2988-2994
- [10] Heinrich, M; Heneka, B; Ankli, A; Rimple, H; Sticher, O; Kostiza, T. Spasmolytic and antidiarrheal properties of the Yucatec mayan medicinal plant *Casimora tetrameria*. *J. Pharm Pharmacol.* 57(9): 1081 – 1085 (2005)
- [11] Audu, R; Umilabug, S.A; Renner, J.K; Awodiji Diarrhea Management. *J. Nigeria Infection Control Assoc.* 3: 15 (2000)
- [12] Abdullahi, I.A; Azbo, M.O; Amos, S; Gamaniel, K San dWambebe, C Anti-diarrheal activity of the aqueous extract of *Terminalia avicinoides* root *Phytother. Res.* 51: 431-434 (2001)
- [13] Black R.E., Brown, K.H., becker, S., Yunus, M. Longitnal studies of infectious diseases and physical growth of children in rural area of Bangladesh. *American Epidemiol.* 115:305-314. 1982
- [14] Mukharjee, P.K., Saha, K., Murugesan, T., Mandal, S.C., Pal, M., Saha, B.P. Sreening of antidiarrheal profile of some medicinal plant extract of a specific region of West Bangal, India. *J. Ethnopharmacol.* 60:85-89. (1998)
- [15] Syder JD, Merson MH The magnitude of the global problem of acute diarrhoeal disease: a review of active surveillance data. *Bulletin of the World Health Organization.* 60: 605-613. (1982)
- [16] Lutterodt GD Inhibition of gastrointestinal release of acetylcholine by quercetin as possible mode of action of *Psidium guajava* leaf extracts in the treatment of acute diarrhoeal disease. *Journal of Ethnopharmacology.* 25: 235-249 (1989)
- [17] Agunu, A., S. Yusuf, G.O. Andrew, A.U. Zezi and E .M . Abdulrahman, Evaluation of five medicinal plants used in diarrhoeal treatment in Nigeria. *J. Ethnopharmacol.*, 100: 27-30. 2005
- [18] Chitme HR, Chandra R, Kaushik S. Studies on anti-diarrheal activity of *Calotropis gigantean* in experimental animals. *J Pharmacol Pharm Sci* 7:70 – 75. 2004
- [19] Carlos CC, Saniel MC. Etiology and epidemiology of diarrhea. *Phillips J Microbio Infect Dis.*; 19: 51-53. 1990
- [20] Ojewole JAO. Evaluation of antidiarrheal, anti-inflammatory and antidiabetic properties of *Sclerocarya birrea* (A. Rich.) Hochst. stem bark aqueous extract in mice and rats. *Phytotherapy Res.*; 18: 601-08. doi:10.1002/ptr.1503 PMID:15476310 2004
- [21] DS Ravindra Babu, V Neeharika, V Pallavi, Madhava B Reddy Antidiarrheal activity of *Cynodon Dactylon*. *Pers Volume : 5 | Issue : 19 | Page : 23-27* 2009
- [22] Inayathulla, shariff w. r., karigar asif . sikarwar mukesh s evaluation of anti- diarrhoeal activity of *crataeva nurvala* root bark in experimental animals *International Journal of Pharmacy and Pharmaceutical Sciences* Vol 2, Suppl 1, 2010
- [23] Anup Maiti, Saikat Dewanjee, Subhash C Mandal In Vivo Evaluation of Antidiarrhoeal Activity of the Seed of *Swietenia macrophylla* King (Meliaceae) *Tropical Journal of Pharmaceutical Research*, June; 6 (2): 711-716 2007

- [24] Gandhimathi R., Saravana Kumar A., Senthil Kumar K.K., Kusuma Praveen Kumar, Uma Maheswari J. Pharmacological studies of anti-diarrhoeal activity of *Guettarda speciosa* (L.) in experimental animals /J. Pharm. Sci. & Res. Vol.1(2), 2009,61-66.