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ANTI-DIARRHEAL ACTIVITY OF *DODONAEA VISCOSA* ROOT EXTRACTS

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ABSTRACT

The anti-diarrheal activity of the alcohol and aqueous extracts of the roots of *Dodonaea viscosa* (Sapindaceae) was investigated by castor oil induced diarrhea in mice. The parameters of this study were number of diarrheal episodes and mean weight of stool of mice. The percentage protection in extract treated animals showing diarrhea was compared with castor oil treated and loperamide treated animals. The results revealed that the alcohol and aqueous extracts significantly reduced diarrhea in mice with reduction in weight of stools.

KEYWORDS

Dodonaea viscosa, anti-diarrheal activity, castor oil, loperamide

INTRODUCTION

Diarrheal diseases are one of the leading causes of morbidity and mortality in developing countries and are responsible for the death of millions of people each year[1]. There are large numbers of epidemiological and experimental evidence pertaining to worldwide acute diarrheal disease, which is one of the principal causes of death in the infants[2]. Despite immense technological advancement in modern medicine, many people in the developing countries still rely on the healing practices and medicinal plants for their daily health care needs[3]. Therefore, the World Health Organization encouraged studies for the treatment and prevention of diarrheal diseases depending on traditional medical practices[4]. India has a great environmental and biological diversity compared with the rest of the world. A range of medicinal plants with anti-diarrrheal properties has been widely used by the traditional healers; however the effectiveness of many of these anti-diarrheal traditional medicines has not been scientifically evaluated.

Dodonaea viscosa (L). Jacq., (Family: Sapindaceae) popularly known as *aliar* and *vilayati mehandi* in India[5], is an evergreen shrub abundantly growing in Western Ghats of Tamilnadu and distributed throughout of India. This plant, *D. viscosa* were used by indigenous people in India for the treatment of different ailments[6]. The infusion of leaves were used to treat rheumatism, gout, hemorrhoids, fractures and snake bites[7,8]. The experimental studies reported that the plant possesses local anesthetic and smooth muscle relaxant[9], antidiabetic[10], anti-ulcer[11], anti-inflammatory[12] and anti-microbial[13] activities. In spite of its abundant uses, the anti-diarrheal activity of *D. viscosa* roots has not been reported. Hence, the present study was aimed to evaluate the possible anti-

diarrheal activity of the root extract of *D. viscosa* to contribute in the long-run to the improvement of health care.

MATERIAL AND METHODS

Plant Material

The root of *D. viscosa* was collected from Western Ghats in the region of Srivilliputtur, Virudhunagar District, Tamilnadu and authenticated by Dr. Stephen, Department of Botany, American College, Madurai. A voucher specimen (No. AKCP/HB-111(6), 2009) was deposited in the departmental herbarium.

Preparation of Extract

D. viscosa root was dried in shade and made into fine powder. About 50 gm of *D. viscosa* root powder was extracted with 200 ml distilled ethanol and water separately by soxhlet extractor for 72 hours. The extracts were concentrated under reduced pressure[14]. The extracts were stored in desiccators until further use. Various concentrations of extracts were made by diluting in distilled water for the experimental purpose.

Animals

Male albino mice (20 - 25g) were used for this investigation and kept at the Laboratory Animal House of Arulmigu Kalasalingam College of Pharmacy. They were kept in well cross ventilated room at 27 ± 2^0, for 1 week before and during the experiments. Animals were provided with commercial rodent pellet diet and water *ad libitum*. The study protocol was approved by the animal ethical committee, Arulmigu Kalasalingam College of Pharmacy. All the experiments were performed according to current guidelines for the care of the laboratory animals and the ethical guidelines. The protocol was approved by IAEC No: (AKCP/IAEC-2009(g)/022). The standard orogastric cannula was used for oral drug administration.

Acute Toxicity Study

The acute toxicity study described by Miller *et al.*,[15] was employed in the determination of the LD_{50}. Alcohol and aqueous extracts were administered orally at a dose of 62.5, 125, 250, 500, 1000 and 2000 mg/kg to a group of 5 animals each. The general signs and symptoms of toxicity, intake of food and water and mortality were recorded for 48 h.

Anti-diarrheal Activity

The anti-diarrheal activity was performed by the method developed by Havagiray *et al.*, [16]. Animals were divided into nine groups of six animals in each group. Group I received 1% CMC suspension and served as control. Groups II and III received standard drug, (loperamide, 1 mg/kg and 2 mg/kg respectively) and served as standard[17]. Group IV-VI received alcohol extract of *D. viscosa* (100,200 and 400mg /kg respectively). Groups VII-IX received aqueous extract of *D. viscosa* (100, 200 and 400 mg /kg respectively). Diarrhea was induced in all the overnight fasted animals by administering 1 ml of castor oil orally. The test extracts and the standard drug were administered one hour prior to the treatment of castor oil. Each mouse was housed separately and observed for diarrheal episode, for a period of 4 hours. During that period, number and weight of diarrheal feces were taken and noted at every half an hour. The mean diarrheal episodes and percent protection was calculated. The anti-diarrheal activity was determined in terms of percentage protection. The data of stool weight was expressed as Mean ± SEM. All the results (Mean ± SEM) were statistically analyzed by students't' test[18] and tabulated in Table 1.

Table 1
Anti-diarrheal activity of various extracts of Dodonaea viscosa root and loperamide

Treatment (oral)	Dose	% protection	Weight of stools (g) (Mean ± SEM)
Castor oil	10ml/kg	0.0	1.1846 ± 0.029
Aqueous extract	100mg/kg	60.92%	0.463 ± 0.0314*
	200mg/kg	71.22%	0.341 ± 0.0293**
	400mg/kg	78.23%	0.258 ± 0.0258**
Alcohol extract	100mg/kg	53.24%	0.554 ± 0.0942*
	200mg/kg	76.54%	0.278 ± 0.0182**
	400mg/kg	90.55%	0.112 ± 0.0244**
Loperamide	1mg/kg	81.94%	0.214 ± 0.0232**
	2mg/kg	90.01%	0.117 ± 0.0642**

**P < 0.01 and *P < 0.05 statistically (Mean±SEM) significant from control group (n=6)

RESULTS AND DISCUSSION

The acute toxicity study showed that oral administration of alcohol and aqueous extracts of *D. viscosa* roots to the mice up to 2000 mg/kg dose neither showed mortality nor any visible clinical signs of general weakness in the animals. The aqueous extract of *D. viscosa* administered at the dose of 100, 200 and 400 mg/kg showed 60.92%, 71.22% and 78.23% diarrhea respectively. This reduction in diarrheal episodes is significant and maximum effect is observed at the dose of 400mg/kg similarly the alcohol extract of *D. viscosa* administered at the dose of 100, 200 and 400mg/kg showed 53.24%, 76.54% and 90.55% diarrhea respectively. This shows significant reduction in diarrheal episodes with maximum effect at 400mg/kg dose level. Where as the standard group, Loperamide a standard, anti-diarrheal drug treated animal at the dose of 1mg/kg and 2 mg/kg showed significant reduction in diarrhoeal episodes (81.94% and 90.91% respectively). The study reveals that the aqueous and alcohol extracts exhibited significant diarrheal activity. The remarkable anti-diarrheal effect of *D. viscosa* root extracts against castor oil-induced diarrhea model proves to its efficacy in an extensive range of diarrheal conditions.

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REFERENCES

1. Carlos CC and Saniel MC. Etiology and epidemiology of diarrhea. Phillips J Microbio Infect Dis, 19: 51-53, (1990).
2. Lutterodt GD, Inhibition of gastrointestinal release of acetyl choline by quercetin as possible mode of action of *Psidium guajava* leaf extracts in the treatment of acute diarrhoeal disease. J Ethnopharmacol, 25: 235-249, (1989).
3. 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: 601-608, (2004).
4. Atta AH and Mouneir SM, Antidiarrheal activity of some Egyptian medicinal plant extracts. J Ethnopharmacol, 92: 303-309, (2004).

5. Veerapur VP, Prabhakar KR, Vipan KP, Punit B, Srinivasan KK, Priyadarsini KI and Unnikrishnan MK, Antidiabetic, hypolipidaemic and antioxidant activity of *Dodonaea viscosa* aerial parts in streptozotocin-induced diabetic rats, Int J Phytomed, 2: 59-70, (2010).
6. Venkatesh S, Reddy YSR, Ramesh M, Swamy MM, Mahadevan N and B. Suresh, Pharmacognostical studies on *Dodonaea viscosa* leaves, African J Pharm Pharmacol, 2(4): 83-88, (2008).
7. Kirtikar KR and Basu BD, Indian Medicinal Plants, Vol. I, International Book Distributors, Dehradun, India, 641-643, (1995).
8. Nadkarni KM and Nadkarni AK, Indian Materia Medica, Vol. I, Bombay Popular Prakashan, Bombay, India, 457, (1982).
9. Rojas A, Cruz S, Ponce-Montr H and Mata R, Smooth muscle relaxing compounds from *Dodonaea viscosa.* Planta Medica, 62: 154-159, (1996).
10. Mushtaq A, Rahmatullah Q, Muhammad A, Mir AK And Muhammad Z, Traditional herbal remedies used for the treatment of diabetes from district Attock (Pakistan), Pakistan J Bot, 41(6): 2777-2782, (2009).
11. Arun M and Asha VV, Gastroprotective effect of *Dodonaea viscosa* on various experimental ulcer models, J Ethnopharmacol, 118(3): 460-465, (2008).
12. Khalil NM, Sperotto JS and Manfron MP, Anti-inflammatory activity and acute toxicity of *Dodonaea viscosa*, Fitoterapia, 77: 478–480, (2006).
13. Getie M, Gebre-Mariam T, Rietz R, Hohne C, Huschka C, Schmidtke M, Abate A and Neubert RHH, Evaluation of the anti-microbial and anti-inflammatory activities of the medicinal plants *Dodonaea viscosa*, *Rumex nervosus* and *Rumex abyssinicus*, Fitoterapia, 74: 139–143, (2003).
14. Mothana RAA, Salah AAA, Sidgi H, Faisal MNA, Sama AZA, and Ulrike L, Antimicrobial, Antioxidant and Cytotoxic Activities and Phytochemical Screening of Some Yemeni Medicinal Plants, eCAM, 7(3): 323–330, (2010).
15. Miller LC and Tainter ML, Estimation of ED_{50} and its error by means of logarithmic probit paper. Proc of Soc Exp Biol Med, 57: 261-264, (1944).
16. Havagiray RC, Ramesh C and Sadhna K, Studies on anti-diarrheal activity of *Calotropis gigantean* R.BR. in experimental animals, J Pharm Pharmaceut Sci, 7(1): 70-75, (2004).
17. Sunilson JAJ, Anandarajagopal K, Kumari A, Mohan S. Antidiarrhoeal activity of leaves of *Melastoma malabathricum* linn., Indian J Pharm Sci, 71: 691-695, (2009).
18. Kulkarni SK, Handbook of experimental pharmacology, Vallabh Prakashan, New Delhi, India, 172,(1999).