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Der Pharmacia Lettre, 2018, 10 [10]: 45-50
[http://scholarsresearchlibrary.com/archive.html]

ISSN 0975-5071
USA CODEN: DPLEB4

Anti-diarrhoeal Activity of Ethanolic Extract of *Lagerstroemia speciosa* Leaves

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ABSTRACT

Lagerstroemia speciosa is locally known as jarul in Bangladesh. Nearly each part of *Lagerstroemia speciosa* possess diverse considerable biological function. Leaves avail anti-diabetic, antiulcer, antipyretic, analgesic, purgative, stimulant etc characteristics. Therefore the aim of the present study is to investigate Anti-diarrhoeal activity of ethanolic extract of *Lagerstroemia speciosa* leaves. Anti-diarrhoeal activity of leaves extract was evaluated using castor oil induced and magnesium sulphate induced method at 250 mg/kg and 350 mg/kg dose and compared with standard drug Loperamide at 3 mg/kg dose. Leaves extract of *Lagerstroemia speciosa* showed significant anti-diarrhoeal activity. In case of castor oil induced method, % inhibition of defaecation were 40% and 53.33% at the dose of 250 mg/kg and 350 mg/kg respectively and 60% inhibition was obtained at 3 mg/kg dose of Loperamide standard drug. In case of magnesium sulphate induced method, % inhibition were 41.67% and 58.33% at the dose of 250 mg/kg and 350 mg/kg respectively and 75% at the dose of 3 mg/kg of Loperamide. *Lagerstroemia speciosa* showed significant Anti-diarrhoeal activity and the present study supports the use of this plant parts to be used traditionally to treat diarrhoea.

Keywords: *Lagerstroemia speciosa*, Anti-diarrhoeal activity, Castor oil, Magnesium sulphate.

INTRODUCTION

World Health Organization accounts that about 80% populations rely on herbal medicines to treat various ailments [1]. Various home-bred plants are exercised as medicines in continents [2]. *Lagerstroemia speciosa* is a plant of *Lythraceae* family. It is grown in tropical and subtropical site including Bangladesh, India, Malaysia, Thiland, Indonesa and Japan [3]. It is not an evergreen plant, rather it is deciduous or semidecidous plant. *Lagerstroemia speciosa* is a plant of small to medium to large size which is 40 to 45 meter long [4]. It is locally known as Jarul in Bangladesh [5]. Nearly each part of the plant such as leaf, bark, flower, fruit, root etc., possess diverse considerable biological functions [3]. Leaves avail anti-diabetic, antiulcerative, antipyretic, analgesic, purgative, diuretic, stimulants etc. as characteristics [6]. It is also used to medicate kidney disease and heart disease [5]. It is also indicated to have antioxidant, anti-inflammatory and antimicrobial activity [7]. Leaves also exert thrombolytic activity. Roots and flower petals have hepatoprotective activity [8]. Bark of *Lagerstroemia speciosa* is used to treat diarrhea and abdominal pain. Besides treatment of various ailments such as cytotoxic, antidepressant, anti-oxidant, anti HIV, anti-inflammatory activity, flowers hold nutritional value [9]. Fruits avail alpha glucosidase inhibitory effect [10]. The goal of the investigation is to mete the Anti-diarrhoeal activity in castor oil induced as well as magnesium sulphate induced method, of ethanolic extract of *Lagerstroemia speciosa* leaves.

MATERIALS AND METHODS

Collection of leaves and preparation of extract

The *Lagerstroemia speciosa* leaves were collected on November, 2016 from the garden of Department of Botany, Jahangirnagar University, Savar, Dhaka. The leaves were ascertained by a taxonomist of Bangladesh National Herbarium, Dhaka. An acknowledgement slip has been entrusted in Bangladesh National Herbarium, Dhaka (Accession No 43543).

The leaves were shade dried for 5 days and powdered by the conduction of a blender and 90 g of powder of *Lagerstroemia speciosa* leaves was aspersed in a dry, clean container with 500 ml of ethanol. The Container was fastened with aliminium foil. After two days another 250 ml ethanol was added. The powder was soaked for 7 days and filtered with cotton and filter paper. The solvent was evaporated from the filtrate by using rotary evaporator. The mass of the gummy concentrate i.e., crude extract was 13.34 g which gives yield of 14.82%. The extract was conserved in a suitable staunch container in refrigerator.

Animals

Anti-diarrhoeal activity of crude ethanolic extract of *Lagerstroemia speciosa* leaves was meted on switch albino mice (22 -25 gm), procured from Animal Resource Branch of jahangirnagar University, Savar, Dhaka. The mice were fostered at constant room temperature (25.0 ± 2.0°C) and humidity 55-65% and exposed 12 hours photoperiod. Standard diet supplied by Jahangirnagar University was provided to the mice and audited for 3 days in the test laboratory condition of Department of Pharmacy, Primeasia University. No abnormalities were found. The mice were fasted for 12 hours before the study. Anti-diarrhoeal activity was meted in castor oil induced method and magnesium sulphate induced method by following a standard method mentioned in Akter with minute modification [11].

Chemicals

The chemicals that are used for the study were obtained from the following sources:

1. Castor oil (Well's Castor oil): Universal Packaging (Packed in Spain)
2. Magnesium sulphate heptahydrate: Eskayef Pharmaceuticals Limited
3. OR Saline-N: SMC Enterprise Ltd
4. Loperamide (Imotil): Square Pharmaceuticals Ltd.

Castor oil induced method

The mice exhibiting diarrhoea upon the administration of 0.5 ml castor oil were recherche for the study. The empirical mice were divided into control group, positive control group and two test groups of diverse concentration of crude extract of *Lagerstroemia speciosa* leaves having five mice in each group. The mice of the control group were conferred 10 ml/kg of 0.9% of orsaline, mice of the positive control group were orally conferred standard Loperamide Hydrochloride at a dose of 3 mg/kg body weight. The mice of the two test groups were conferred 250 mg/kg body weight and 350 mg/kg body weight of the extract. The standard Loperamide Hydrocloride and the extract were dissolved in 0.9% of saline solution. Afterward shifting of the mice of each groups into grate having lined floor with blotting paper individually and marked. 30 minutes of the initial treatments the mice of each groups were conferred 0.5 ml of castor oil orally. The entire number of excrement defecated during two hours of observation period were filed.

Magnesium sulphate induced method

For magnesium sulphate induced method an analogous protocol of castor oil induced method was mimicked. Here 2 gm/kg of magnesium sulphate extra pure (Heptahydrate) was conferred to the empirical mice orally to induce diarrhoea 30 minutes afterward conferring 0.9% saline solution to the mice of the control group orally, 3 mg/kg standard Loperamide Hydrocloride to the mice of the positive control group orally, 250 mg/kg and 350 mg/kg of the extract orally to the mice of the test groups. The magnesium sulphate heptahydrate, standard Loperamide Hydrocloride and also the extract were dissolved in 0.9% of saline solution. The entire number of excrement defecated during the two hours of observation period were filed.

RESULTS AND DISCUSSION

In castor oil induced diarrhoea, Leaves extract of *lagerstroemia speciosa* showed dose dependent Anti-diarrhoeal activity. The percentage inhibition of defaecation of *Lagerstroemia speciosa* leaves extract at the dose of 250 mg/kg and 350 mg/kg was 40% and 53.33% respectively. Whearas the percentage inhibition of defaecation of standard drug Loperamide was 60%.

Table 1: % Inhibition of defaecation of *L. speciosa as well as* Loperamide standard in castor oil induced method.

Treatment	**Dose (p.o.)**	**No. of faecal droppings in 2h**	**% Inhibition of defaecation**
Castor oil(Control)	0.5 ml/mouse	3 ± 0.3162	–
Loperamide	3 mg/kg	$1.2 \pm 0.3742^{a\,**}$	60
L. speciosa	250 mg/kg	$1.8 \pm 0.3742^{a\,ns}$	40
L. speciosa	350 mg/kg	$1.4 \pm 0.4000^{a\,*}$	53.33

The values are represented as mean ± S.E.M, (n=5) and statistical significance between treated and control groups was analyzed using of One way ANOVA, followed by Dunnett's test. $p<0.05^{*}$, 0.01^{**} and 0.001^{***} were considered statistically significant, ns=not significant. a=when compared with Castor oil control group.

Also in magnesium sulphate induced diarrhoea, leaves extract of *Lagerstroemia speciosa* showed dose dependent Anti-diarrhoeal activity. The percentage inhibition of defaecation of *Lagerstroemia speciosa* leaves extract at the dose of 250 mg/kg and 350 mg/kg was 41.67% and 58.33% respectively. The percentage inhibition of standard drug Loperamide was 75%.

Table 2: % Inhibition of defaecation of *L. speciosa as well as* Loperamide standard in $MgSO_4$ induced method.

Treatment	Dose (p.o.)	No. of faecal droppings in 2 h	% Inhibition of defaecation
$MgSO_4$	2 g/kg	2.4 ± 0.2449	_
Loperamide	3 mg/kg	$0.6 \pm 0.2449^{a\,**}$	75
L. speciosa	250 mg/kg	$1.4 \pm 0.2449^{a\,*}$	41.67
L. speciosa	350 mg/kg	$1 \pm 0.000^{a\,**}$	58.33

The values are represented as mean ± S.E.M, (n=5) and statistical significance between treated and control groups was analyzed using of One way ANOVA, followed by Dunnett's test. $p<0.05^{*}$, 0.01^{**} and 0.001^{***} were considered statistically significant, ns=not significant. a=when compared with $MgSO_4$ control group.

Ricinolic acid is the active metabolite of castor oil. It stimulates the peristaltic movement as well as changes the electrolyte permeability in small intestine. Endogenous prostaglandin is also released due to irritation and inflammation of the intestinal mucosa. An active intestinal secretion also results diarrhea. On the contrary, magnesium sulphate enhances the volume of intestinal content as it confines the reabsorption of water. Cholecystokinin is freed from the duodenal mucosa in large amount. The secretion and motility of small intestine is also increased which reduces reabsorption of sodium chloride and water. As a result diarrhoea is induced. The ethanolic extract showed significant anti-diarrhoeal activity both in castor oil induced as well as magnesium sulphate induced methods. Reduced number of frequency of feces and decreased wetness of feces was a testimony to this.

CONCLUSION

It may be concluded that the present study supports the traditional use of leaves of *Lagerstroemia speciosa* by traditional practitioners in the treatment of diarrhoea as it possesses significant Anti-diarrhoeal activity.

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