



Evaluation of *Swietenia macrophylla* King's (Meliaceae) Seed's Antidiarrheal Activity in Vivo

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Abstract

Objective: Traditional medicine uses the seeds of *Swietenia macrophylla* to alleviate diarrhea. To support a folktale, the anti-diarrhea effect of petroleum ether extract from *Swietenia macrophylla* (Meliaceae) seeds was studied in Wister albino rats.

Methods: In castor oil-induced diarrhea, the anti-diarrheal efficacy of petroleum ether extract of this plant's seeds was evaluated at graded dosages (25, 50, and 100 mg/kg body weight) based on the decrease in the rate of defecation and the consistency of faeces. Its impact was further assessed on intestinal transit and castor oil-induced intestinal fluid buildup (enteropooling) in order to comprehend the mechanism of its antidiarrheal action.

Results: The extract exhibited exceptional antidiarrheal efficacy at different dosages (25, 50, and 100 mg/kg body weight), as demonstrated by a decrease in the pace of defecation and a decrease in the consistency of faeces.

The outcomes are similar to those of diphenoxylate, a common medication (50 mg/kg body weight). Diarrhea severity was significantly reduced after taking 100 mg/kg body weight of *Swietenia macrophylla* extract orally once. The extract strongly blocked enteropooling generated by castor oil and created a dramatic reduction in intestinal transit (4.45 - 34.60%). These effects were equivalent to those of intraperitoneal injections of standard medicine atropine sulphate at dosages of 0.1 mg/kg body weight and 3 mg/kg body weight, respectively.

In conclusion: According to experimental results, *Swietenia macrophylla* seed petroleum ether extract has strong anti-diarrheal properties and might one day be a powerful source of anti-diarrheal medication.

Key words: atropine sulfate, castor oil, anti-diarrheal action, and *Swietenia macrophylla*.

INTRODUCTION

Wet stool, increased frequency of bowel movements, and abdominal discomfort are the hallmarks of diarrhea. 1. It is now the world's biggest cause of malnutrition and mortality among children in underdeveloped nations; 2. Despite several attempts by governments and international organizations to contain the illness, the annual incidence rate remains high at around 7.1 million.

3. There are several synthetic medicines available for the treatment of diarrhea, such as diphenoxylate, loperamide, and antibiotics, but they come with certain adverse effects. Natural medications are utilized as antidiarrheal medications, albeit they don't necessarily have no side effects. 4. As a result, one of the major areas of ongoing research has been the hunt for safer and more effective agents. Based on traditional medicine, diarrhea has long been treated orally using a variety of medicinal herbs or their preparations.

Swietenia macrophylla, a gorgeous, tall, evergreen tree in the Meliaceae family, is indigenous to tropical

America, Mexico, and South America. It typically reaches heights of 30 to 40 meters and widths of 3 to 4 meters. 5. *Swietenia macrophylla* seed has been shown to have anti-inflammatory, antimutagenicity, and antitumor properties 6. Swietenine, swietenolide 7, swietemahonin, khayasin, andirobin, augustineolide, 7-deacetoxy-7-oxogedunin, 6-deoxy swietenine, proceranolide, 6-O-acetyl swietenolide, and 2-hydroxy swietenine have been isolated from the seeds of this plant 8. Local healers in East Midnapore, West Bengal, India, have traditionally used *Swietenia macrophylla* seed to treat diarrhea. The goal of the current research was to assess the antidiarrheal potential of a petroleum ether extract of *Swietenia macrophylla* seeds in rats that were both normally acclimated to diarrhea and those that were induced by castor oil.

MATERIALS AND METHODS

Plant material



of December and January, seeds of *Swietenia macrophylla* King (Family: Meliaceae) were gathered from the villages of Midnapore (E), West Bengal, India. The Botanical Survey of India certified the plant. For future reference, a voucher specimen number CNH/1-1(64) was deposited at our institution.

Making an extract

Using a Soxhlet apparatus, 600 g of powdered *Swietenia macrophylla* seeds were extracted using petroleum ether. The resultant extract was vacuum-evaporated (Yield = 12.42%) and kept for further use in desiccators. Before the experiment, the crude extract was diluted in 2% Tween 80 and utilized.

Animals

For the tests, 150–180 g Swiss albino rats of either sex were used. Prior to the trial, the animals were given two weeks to acclimate to our laboratory setting. The animals were kept in standard laboratory conditions in polypropylene cages with four animals per cage. The temperature was kept at 25±2°C with 35–60% humidity. The animals were fed standard rat pellet diet (Hindustan Liver Ltd., Mumbai) and were given unlimited access to water. Throughout the experiment, we adhered to the guidelines provided by our institution's animal ethics committee and the standards of laboratory animal care (NIH, 1985).

Reagents and Chemicals

The following ingredients were used: charcoal meal (10% activated charcoal in 5% gum acacia), castor oil (a laxative agent), normal saline solution (0.9% NaCl), standard reference antidiarrheal medications, atropine sulfate and diphenoxylate, and vehicle (2% v/v Tween 80 in distilled water). Diphenoxylate was bought from Maiden Pharma Pvt. Ltd. in Delhi, India, while atropine sulphate was obtained from Samarth Pharma Pvt. Ltd. in Mumbai, India.

caused by castor oil diarrhea

Rats were split into five groups, each with six animals, and fasted for eighteen hours. All animal groups were administered castor oil orally at a dosage of 1 ml/animal to induce diarrhea.

9. The first group (control group) got vehicle (0.5% v/v Tween 80 in distilled water) thirty minutes after castor oil administration, whereas the second, third, and fourth groups received petroleum ether extract orally at dosages of 25, 50, and 100 mg/kg body weight, respectively. The reference medication, diphenoxylate (50 mg/kg body weight), was given to the fifth group. 10.

Each set of animals was given its own cage with filter paper lining it. Every hour, the filter papers were replaced, and for six hours, the intensity of the diarrhea was evaluated every hour. During a six-hour period, the total quantity of voided feces and their total weight were recorded and compared with the control group. The control group's total number of diarrheal feces was regarded as 100%. The findings were presented as a percentage of diarrhea inhibition.

11. Test for intestinal motility

The diet marker 12 for this trial was charcoal meal. Before the experiment, the rats were split up into five groups of six animals each, and they were given an eighteen-hour fast. The first group, known as the control group, received the vehicle (0.5 percent Tween 80 in distilled water) orally. Petroleum ether extract was given orally to the second, third, and fourth groups at dosages of 25, 50, and 100 mg/kg body weight, respectively. The fifth group was administered intraperitoneally with 0.1 mg/kg body weight of atropine sulfate, the typical medication. Each animal received 1 cc of charcoal meal (10% activated charcoal in 5% gum acacia) orally after 30 minutes. The charcoal supper was given to each animal, and thirty minutes later they were all slaughtered. As a proportion of the entire distance from the pylorus to the caecum, the length of the intestinal charcoal meal was measured¹³.

RESULTS

Table 1 illustrates the effectiveness of petroleum ether extract at varying dosages of 25, 50, and 100 mg/kg body weight in treating castor oil-induced diarrhea in experimental rats. In Wistar albino rats, a single oral dosage of 100 mg/kg body weight of *Swietenia macrophylla* extract resulted in a considerable reduction in the severity of diarrhea as measured by the rate of defecation and consistency of feces. The % inhibition for both wet mass and quantity of wet feces shows that the extract has antidiarrheal action when compared to the control group. According to the experimental findings, the action is most noticeable at a dosage of 100 mg per kilogram of body weight. At 100

mg/kg body weight, the percentage of inhibition of both the quantity of wet feces and the wet mass was found to be 67.23% and 69.46%, respectively.

DISCUSSION

An imbalance between the digestive tract's secretory and absorptive systems, along with haste, causes diarrhea by causing an excessive amount of fluid to be lost in the stools. Certain types of diarrhea are mostly secretory, while hypermotility is a defining feature of other types of diarrhea 14. Due to its active metabolite ricinoleic acid 15, 16, which increases peristaltic activity in the small intestine and alters the intestinal electrolyte permeability, castor oil induces diarrhea.

Table 1 shows how various dosage levels of *S. macrophylla* seed petroleum ether extract affect castor oil-induced diarrhea.

Group	Total number of faeces (g)	Total number of diarrhoeal faeces	Inhibition (%)	Total weight of faeces (g)	Inhibition (%)
Castor oil (1ml) + vehicle (0.5% Tween 80)	24.2 ± 1.49	18.0 ± 0.71	0.00	9.76 ± 0.34	0.00
Diphenylate (50 mg/kg) + castor oil (1ml)	7.8 ± 0.37***	5.2 ± 1.30***	71.12	1.76 ± 0.57***	81.97
Petroleum ether extract (25 mg/kg) + castor oil (1 ml)	23.8 ± 1.59	17.8 ± 0.84	1.20	6.98 ± 1.87	29.46
Petroleum ether extract (50 mg/kg) + castor oil (1 ml)	16.68 ± 0.67*	6.3 ± 0.84***	66.00	4.76 ± 1.47*	51.29
Petroleum ether extract (100 mg/kg) + castor oil (1 ml)	18.0 ± 0.71**	5.9 ± 1.30***	67.23	2.98 ± 0.58**	69.46

Values are expressed as mean ± S.E.M. (n=8). *p < 0.05, **p < 0.01, ***p < 0.001 when compared with vehicle-control

Table 2: Effect of the petroleum ether extract of *S. macrophylla* seeds at different dose levels on charcoal-induced gut transit changes.



Group	Distance traveled by charcoal meal (%)	Inhibition (%)
Vehicle (0.5% Tween 80) (control)	73.23 ± 8.75	0.00%
Atropine sulphate (0.1 mg/kg)	41.24 ± 5.32*	43.68%
Petroleum ether extract (25 mg/kg)	69.97 ± 7.89	4.45%
Petroleum ether extract (50 mg/kg)	63.78 ± 6.86	12.90%
Petroleum ether extract (100 mg/kg)	47.89 ± 5.53	34.60%

Values are expressed as mean ± S.E.M. (n=6). *p < 0.05 when compared with vehicle-control.

mucosa. Additionally, it acts to promote endogenous prostaglandin 17 release. It has been observed that castor oil causes diarrhea by blocking the reabsorption of water, therefore increasing the amount of intestinal contents. Prostaglandin 18 is released when intestinal mucosa becomes inflamed and irritated due to the production of ricinoleic acid.

Swietenia macrophylla seed ether extract had a notable antidiarrheal effect that was dose-dependent. The degree of diarrhea was similar to the response to the conventional medication, diphenoxylate (50 mg/kg). Charcoal meal transit motility decreased considerably, indicating that petroleum ether extract also dramatically lowered intestinal transit. This might be because, as shown by the reduction in intestinal transit caused by charcoal meal, the extract may promote the reabsorption of water by reducing intestinal motility. Additionally, on castor oil-induced enter pooling, the extract significantly decreased the weight and volume of the intestinal contents.

The aforementioned findings imply that the extract, when taken in progressively higher dosages, prevents diarrhea by blocking the processes of peristalsis, gastrointestinal motility, and enter pooling caused by castor oil. It works just as well to avoid diarrhea as to treat it.

Steroids (Libermann-Burchard test and Salkowski test both yielded positive findings) and triterpenes (Libermann-Burchard test and Noller test yielded positive results) were detected by phytochemical screening in petroleum ether extract. In addition to being effective in treating diarrhea, steroids may improve the intestinal absorption of water and Na + 19, 20. Therefore, it's possible that steroids are causing the antidiarrheal effect.

CONCLUSION

The investigation's findings, in summary, showed that petroleum ether extract includes one or more pharmacologically active substances with antidiarrheal qualities. This explains why traditional healers utilize Swietenia macrophylla seed extract as an anti-diarrheal medication. To determine the chemical causing the reported anti-diarrheal effect, further study must be done to fractionate and purify the extract.

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