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Evidence based medicinal plant possessing anti-diarrhea activity: A review

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Abstract
Diarrhea has been one of the most important health problems in developing countries. Diarrhea is characterized by increased frequency of bowel movement, wet stool and abdominal pain. Majority of diarrhea cases are due to bacterial enter pathogens, diarrheagenic *Escherichia coli*. In developing countries they are the most common causes of morbidity and mortality. The various drug treatments available for diarrhea include the conventional drugs like loperamide, bismuth, subsalicylate and diphenyxolate. Various side effects (abdominal discomfort, dry mouth, nausea, constipation and headache) attributed to these synthetic drugs have stimulated a rapid and continuous growth of interest towards the use of herbal medicine for the treatment of diarrhea. Despite lack of adequate dosing and scarce report of toxicities of medicinal plants, availability and anecdotal report of efficacy have made them important alternative treatment of diarrhea. This review emphasizes on some herbal medicinal plants with their extracts for their anti-diarrhea potential, fifteen extract possessing anti-diarrhea action were sought, the plant decreased the frequency of defecation, reduced the severity of diarrhea in rats, decreased the volume of intestinal fluid accumulation, the distance travelled by charcoal meal in intestinal transit time was also reduced, increased the number of dry faeces, reduced number of wet faeces, decrease in the levels of castor oil-induced diarrhea, enter pooling, and intestinal transit time (anti-motility test), charcoal meal, magnesium sulfate and arachidonic acid-induced diarrhea in animal experimental models were the employed. Accordingly, this review demonstrates the importance of herbal medicine in the treatment of diarrheal thus preventing its further complication.

Keywords: diarrhea; enteropooling; castor oil-induced; plant

Introduction

Diarrhea Infection is spread through contaminated food or drinking water, or from person to person as a result of poor personal hygiene. Diarrhea can also be caused by food intolerance, food poisoning or as a side effect of certain medications [1]. Despite different pathophysiological changes in different types of diarrhea, there are four major mechanisms responsible for pathophysiology in electrolyte and water transport that is, increased luminal osmolarity, increased electrolyte secretion, decreased electrolyte absorption and accelerated intestinal motility causing decreased transit time [2]. Diarrheal illnesses are one of the main reasons for morbidity and mortality in developing nations and are accountable for the death of hundreds of thousands of people every year [3]. A report in 2015 demonstrated that diarrhea is one of the main killers of children that accounts for 9% of all deaths among kids below the age of 5 years worldwide [4]. According to this report, sub- Saharan Africa and southern Asia were recorded as the regions that experienced the highest child death toll as a result of diarrhea [5]. In Ethiopia, diarrhea disease is a major public health problem, and it is also one of the top 15 countries in which nearly three-fourths of child deaths occur due to diarrhea [6]. Overall, the prevalence of the diarrhea disease still stays high no matter how much the attempts were made via many governments and worldwide groups to reduce it. Irrespective of great technological development in modern medicine, 80% of human beings in the growing nations rely on healing practices and medicinal plants for their daily health care needs.[7] Similarly, plants have traditionally been used as a supply of drugs in Ethiopia since a long time to manipulate several illnesses afflicting human beings and their livestock [8]. The use of herbal medicine is getting popularized in developing and advanced nations because of its natural origin and lesser adverse effects [9]. Natural products have additionally been a success in drug development and over 50% of the best-selling prescription drugs in use at this time derived from herbal products [10]. Therefore, the World Health Organization (WHO) encouraged researches for the treatment and prevention of diarrhea illnesses depending on traditional medical practice [11]. The use of traditional medicines to combat the consequences of diarrhea has been employed by WHO in its Diarrhea Control Program [12]. Adverse effects related to opioid-like anti- motility drugs are limiting their uses and pushing researchers to search for new antidiarrhea compounds with diverse chemical systems and novel mechanisms of action. Therefore, researchers are increasingly turning their attention to folk medicine, searching out new leads to broadening options of drugs toward diarrheal diseases [13,14].

Pathophysiology of diarrhea

Diarrhea is the result of reduced water absorption by the bowel or increased water secretion. A majority of acute diarrheal cases are due to infectious etiology. Chronic diarrhea is commonly categorized into three groups; watery, fatty (malabsorption), or infectious. Another way of

classifying the pathophysiology of diarrhea is into secretory and osmotic forms of diarrhea. Lactose intolerance is a type of watery diarrhea that causes increased water secretion into the intestinal lumen. Patients typically have symptoms of bloating and flatulence along with watery diarrhea. Lactose is broken down in the intestine by the enzyme lactase. The by-products are readily absorbed by the epithelial cells. When lactase is decreased or absent, lactose cannot be absorbed, and it remains in the gut lumen. Lactose is osmotically-active, and it retains and attracts water leading to watery diarrhea.

Common causes of fatty diarrhea include celiac disease and chronic pancreatitis. The pancreas releases enzymes that are necessary for the breakdown of food. Enzymes are released from the pancreas and aid in the digestion of fats, carbohydrates, and proteins. Once broken down, the products are available for uptake in the gut. Patients with chronic pancreatitis have insufficient enzyme release leading to malabsorption. Symptoms often include upper abdominal pain, flatulence, and foul-smelling, bulky pale stools due to malabsorption of fats [15]. In the secretory form of diarrhea, bacterial and viral infections are the common causes. In this instance, the watery stool is the result of injury to the gut epithelium. Epithelial cells line the intestinal tract and facilitate the absorption of water, electrolytes, and other solutes. Infectious etiologies cause damage to the epithelial cells which leads to increased intestinal permeability. The damaged epithelial cells are unable to absorb water from the intestinal lumen leading to loose stool.

Medicinal plant with anti-diarrheal action

1. *Myrtus communis Linn*

Myrtus communis L. (Myrtaceae) is the only species of the genus found in the Northern Hemisphere. It is an aromatic evergreen perennial shrub native to Southern Europe, North Africa and West Asia. *Myrtus*, the Greek name for *Myrtle* and *communis* means a common plant growing in groups. In Ethiopia, it has several vernacular names such as Ades (Amharic, Guragegna, Tigregna); Haddus (hararegna), Addisaa, coddoo (Afan Oromo). It is one of the most important drugs being used in Urinary system of medicine since ancient Greece. It has also been frequently used for various ailments like gastric ulcer, diarrhea, dysentery and rheumatism, moreover, the leaves of *Myrtus communis L*. are traditionally used as vasodilator activities [16].

Results obtained showed that 80% methanol extract (80ME) at 200 mg/kg ($p < 0.05$) & 400 mg/kg ($p < 0.01$) as well as the chloroform fraction (CF) and methanol fraction (MF) at 400 mg/kg ($p < 0.05$) significantly delayed the onset of diarrhea. Besides, the 80ME (at all tested doses) and both of these fractions (at 300 & 400 mg/kg) significantly decreased the frequency and weight of fecal outputs. Results from the charcoal meal test revealed that the 80ME, at all doses, ($p < 0.001$) as well as the CF and MF at 300 mg/kg ($p < 0.05$) & 400 mg/kg ($p < 0.001$) produced a significant anti-motility effect. Similarly, in the entero-pooling test, the 80ME (at all tested doses) ($p < 0.01$) as well as the CF and MF (at 300 & 400 mg/kg, $p < 0.05$) produced a significant decline in the weight and volume of intestinal contents, whereas the CF revealed significant effect ($p < 0.05$) at dose of 800 mg/kg only [17].

2. Sclerocarya birrea

Sclerocarya birrea. A Family of Anacardiaceae, Common names: marula (Eng.); morula (Northern Sotho); mufula (Tshivenda); ukanyi (Tsonga). The edible fruits and the multiple uses associated with almost all parts of the marula, make it one of southern Africa's most valued trees. The marula is a medium-sized to large deciduous tree with an erect trunk and rounded crown. It is one of the plants that played a role in feeding people in ancient times. If a pregnant woman wishes to have a girl, she will take a preparation from the female plant and for a boy she will use the male plant. Traditional healers use the hard nut in their divining dice. A decoction of the bark treats dysentery, diarrhea, rheumatism and has a prophylactic effect against malaria. The bark is an excellent remedy for haemorrhoids, as laxatives, gonorrhoea [18].

Result revealed that *Sclerocarya birrea* extract administered at doses of 300, 400 and 800 mg/kg BW has a percentage of protection of 40, 80 and 100% respectively against castor oil induced diarrhea, The results obtained showed that the aqueous extracts of *Sclerocarya birrea* significantly reduced castor oil induced diarrhea. The antidiarrheal action of aqueous extracts may be due to the inhibition of the increase in water secretion that occurs in all acute diarrhea. Similar results with a percentage of protection of 40 and 60% at the respective doses of 300 and 500 mg/kg BW were obtained with extract of *Sclerocarya birrea* on castor oil induced diarrhea as reported by [19].

3. Psidium guajava (Guava, Linn.),

Psidium guajava (Guava, Linn). A member of *Myrtaceae* family, is a common tropical plant with a long history of traditional usage. An added advantage is that cultivation of guava is relatively easy as it thrives in a variety of soils and adapts to different climatic conditions; the fruits are also borne fairly in a short period. It is used not only as food but also as folk medicine, and various parts of this plant have a number of medicinal properties ranging from antimicrobial activity to anticancer property [18].

The result of the study showed that the extract of *Psidium guajava* administered at the same doses of 300, 500 and 800 mg/kg body weight of plant extract was given to mice had a protection percentage of 60, 80 and 100% respectively, The results obtained showed that the aqueous extracts of *Psidium guajava* significantly reduced castor oil induced diarrhea [20].

4. Dodonaea viscosa L.

Dodonaea viscosa (Sapindaceae) has different names in Ethiopia according to local languages spoken in the country: kitkita (in Ahmaric), itacha (in Afan Oromo), kerara (in Age- wugna), itancha (in Sidamagna), den or hayramat (in Soma- ligna), and geregetwa (in Wolaytegna). The plant is traditionally used in folk medicine to treat various ailments afflicting human beings. Accordingly, the plant leaves demonstrated antidiabetic effects against alloxan-induced diabetes in rabbits and rats. The plant extract has also exhibited antiulcer as well as an antidiarrheal, antimalarial activities [21].

[22] reported that different doses of 80% methanolic leaf extract of *D viscosa* (100, 200, and 400 mg/kg) were evaluated for their anti-diarrhea activities using castor oil–induced diarrhea, gastrointestinal transit, and enteropooling models in Swiss albino mice. At all test doses, the plant

extract showed significant (P<.05) inhibition in the frequency of defecation of wet feces and total fecal output as compared to the control group. Similarly, at all dose ranges used the plant extract demonstrated significant (P<.05) reduction in an intra-luminal fluid accumulation as compared to the untreated group. Besides, at higher doses, the plant extract also indicated significant (P < .05) antimotility activity in comparison with the control.

5. *Lantana camara*

Lantana camara is a flowering ornamental plant belonging to family Verbenaceae. In Nigeria, *L. camara* has local names *"Ewonadele"* in Yoruba, *"Kimbamahalba"* in Hausa, and *"Anya nnunu"* in Igbo. *Lantana camara* is the most widespread species of this genus, which grows productively at elevations up to 2000m in tropical, sub-tropical and temperate regions. It is a medium sized aromatic shrub with tetra-angular stem. Studies revealed that *Lantana camara* has been proven to have activities against diarrheal causing microorganisms including antimalarial, antiulcerogenic, and anti-leishmaniasis activities [23].

Result showed that the extracts were evaluated for castor oil-induced diarrhea and enteropooling as well as intestinal transit in rats. The ethanol stem extract produced significant (P < 0.05), at a dose of 400 mg/kg and 600 mg/kg, while the ethanol leaf extract produced significant (P < 0.01) effect in a dose dependent protection on rats against castor oil induced diarrhea. The stem extract inhibited intestinal transit time and caused significant (P< 0.05), while leaf extract caused significant (P < 0.01) dose related inhibition of castor oil induced enteropooling in rats, comparable to the standard drugs [24].

6. *Allamanda neriifolia (AN)*

Allamanda neriifolia Belong to the family Apocynaceae. *A. neriifolia*, locally known as yellow bell which is native to the old world tropics, but now pan-tropical. It was possibly domesticated in India and southern China and is now found naturalized in almost all tropical and subtropical regions. Locally it is pounded with oil and applied to relief insect bites pain in-vitro thrombolytic, anti-inflammatory and antimicrobial activities of the crude methanolic extracts of both *A. neriifolia* [25].

[26] reported different parts of *Allamanda neriifolia* (AN), are used in folk medicine to treat diarrhea. Anti-diarrheal activities of extracts were evaluated at three doses (100 mg/kg, 200 mg/kg and 400 mg/kg) and compared with Loperamide in a castor oil-induced diarrhea and charcoal meal test model in the Swiss albino mice. Results: The aqueous extract of AN administered at the dose of 100, 200 and 400 mg/kg showed 55.97%, 74.84% and 74.84% diarrhea inhibition.

7. *Crinum latifolium (CL)*

Crinum latifolium Local Name is Sukhdarshan, belongs to the Family Amaryllidaceae, is genus of about 180 specie comprising of various beautiful perrenial plants, they are good for decoration, gardens, bouquet. Is a tropical plant growing in Asia, south east Asia, Australia, pacific ireland and spread up to carribean, florida, it is used in treatment of ear infection, lice and other parasite (scabis).

The aqueous extract of *C. latifolium* administered at doses of 100, 200 and 400 mg/kg showed 0%, 24.5%, 62.26% diarrhea inhibition. This reduction in diarrhea episodes is significant, and maximum effect was observed at the dose of 400 mg/kg similarly in the alcohol extracts of CL. The aqueous extracts of AN, were able to increase the percentage inhibition of the charcoal meal movement [26].

8. *Bruguiera cylindrica (BC)*

Bruguiera cylindrica local name is Bakau Putih (Oriya) and belongs to the Rhizophoraceae is a small tree growing up to 20 metres (66 ft) tall but often grows as a bush. The bark is smooth and grey, with corky raised patches containing lenticels which are used in gas exchange and the trunk is buttressed by roots. The roots (lower part) absorb water and become heavier and after a few weeks the propagules float vertically and are ready to root into the substrate. *Bruguiera cylindrica* is found in tropical Asia, from India and Sri Lanka through Malaysia, the Philippines, Thailand, Vietnam, Indonesia and New Guinea to Queensland, Australia. It is one of the commonest mangroves in Singapore. It is medically used as haematinic, antihypertensive and ulcer.

Result revealed that the aqueous extract of *Bruguiera cylindrica* administered at doses of 100, 200 and 400 mg/kg showed 5.66%, 37.11%, and 62.26% diarrhea inhibition. This reduction in diarrhea episodes is significant, and maximum effect was observed at the dose of 400 mg/kg similarly in the alcohol extracts of BC. The aqueous extracts of BC were able to increase the percentage inhibition of the charcoal meal movement [26].

9. *Anogeissus leiocarpus*

Anogeissus leiocarpus (DC.) Guill. and Perrot, belonging to the Combretaceae family, the plant common names are African birch, Bambara: ngálăma is a deciduous tree species up to 15 to 18 m tall and up to 1 m in diameter. It grows in dry forests and the forest gallery. *Anogeissus leiocarpus* is used for the treatment of malaria, helminthiasis.

Castor oil-induced diarrhea was significantly inhibited (P <0.01) by 59.93%; 69.39%; 68.88%; 67.60% and 75.00%, respectively in the animals treated with the aqueous extract of the leaves of *Anogeissus leiocarpus* at doses of 25 mg/kg, 50 mg/kg, 100 mg/kg, 200 mg/kg and 400 mg/kg. The intestinal transit was inhibited significantly (P <0.01) by 29.34%, 31.35% and 43.29%, respectively of the aqueous extract of *A. leiocarpus* at doses 25 mg/kg, 50 mg/kg and 100 mg/kg. The volume of the intestinal content was decreased significantly (P <0.01) by 53.91%, 83.43% and 72.17%, respectively [27].

10. *Mangifera indica*

Mangifera indica is a tender Fruits Seed Kernel (MITFSK) commonly known as mango, is a species of flowering plant in the family Anacardiaceae. It is a large fruit tree, capable of growing to a height of 30 metres (100 feet). There are two distinct genetic populations in modern mangoes – the "Indian type" and the "Southeast Asian type". Tetanus and asthma.

Result showed that Ethanolic extract of MITFSK at 400µg/ml (Gp VI) showed higher latency period (178.00±8.10). Purging indices of aqueous and ethanolic extracts at 400µg/ml are less than 2.90 (Gp VI and Gp IX). Both extracts of MITFSK have effectively controlled the effect of castor oil induced diarrhea. Aqueous extract provides effective control in faecal output up to

73.74±3.39% at 400µg/ml concentration. Similarly ethanolic extract produced 70.44±2.10% inhibition of faecal output. Volume of intestinal fluid output was decreased in dose dependent manner. Increased concentration of extract dose decreases intestinal fluid output. Ethanolic extract at 400µg/ml concentration inhibited 57.22±2.00% of defacation and 53.57±5.12% diarrhoea, where as loperamide inhibited only 36.67±1.92% of defecation and 12.07±7.12% diarrhea output. Aqueous extracts showed greater effect on intestinal fluid output up to 60.56±3.15 [28].

11. *Litsea deccanensis Gamble*

Litsea deccanensis Gamble belong to the Lauraceae family contains of nearly 55 genera and more than 2,000 species throughout the world, its common are deccan tallow laurel, Ganapathy tree; Kannada. Lauraceae and the plants are deciduous or evergreen shrubs or trees. There are more than 600 species widely distributed in tropical and subtropical regions including South America, The plant possess significant bioactivities as anti-diarrheal, antimicrobial.

Result: The experiments were carried out by using three different doses (100, 200, and 400 mg/kg body weight). The number of wet feces and total weight of the feces were significantly ($p < 0.05$) and dose-dependently reduced by all the doses of the extracts and this effect was comparable with standard drug. *Listea deccanensis* extracts at dose of 100, 200 and 400 mg/kg body weight demonstrated diarrheal inhibition by 43.55%, 45.16%, 32.26% respectively, while it was 98.39% for the standard loperamide. Percentage (%) of fecal output for the doses were 40.14%, 62.27%, and 64.06%, respectively. The gastrointestinal motility induced by castor oil was also reduced noticeably ($p < 0.05$) by the plant extracts with the increasing doses. The percentage inhibition of gastrointestinal motility at all the dose were 26.26%, 33.22%,and 32.36% extracts respectively, while it was 27.56% for loperamide [29].

12. *Colocasia gigantea*

Colocasia gigantea belong to the genus *Colocasia* is represented by 13 species worldwide among which eight species were found in Asia and the Malay Archipelago initially. *Colocasia* is a flowering plant genus under Araceae family, and locally known as Kochu, native to southeastern Asia and the Indian subcontinent which are widely cultivated and naturalized in other tropical and subtropical regions. In Fiji, the locals make use of either boiled or baked breadfruit or tubers of taro as slices along with roasted pig. Along with culinary items of taro**.** Is a perennial herb of 1.5–3 m tall. *C. gigantea* has been used as medicine to treat constipation and tuberculosis in Hawaii.

Result: The methanol extract of *C. gigantea* leaves exhibited promising anti-diarrhea activity with a 16.96% ($p < 0.01$) and 38.89% ($p < 0.001$) reduction of diarrhea at the dose of 200 mg/kg and 400 mg/kg compared to the standard loperamide 64.04% which has extremely statistically significant anti-diarrhea activity in castor oil induced diarrhea. The result of this study shows that the methanol extract of *C. gigantea* possesses noteworthy anti-diarrhea activity which is dose-dependent and activity is more pronounced and statistically significant ($p < 0.001$) at 400 mg/kg body weight dose [30].

13. *Abutilon indicum*

Abutilon Indicum (Linn.) is belonging to malvaceae family; Also known as Mallow in, English Hindi: Kanghi, Kakahi, Common Name: Abutilon, Indian mallow. Habitat: Present in sub-Himalayan tract and hills up to 1,200 m and hotter parts of India. Abutilon indicum (Linn.) is three meter in height. Traditional applications: It is useful in anti asthmatic activity etc.

Result obtained revealed that Leaf extracts of *Abutilon indicum* were evaluated for anti-diarrhoeal activity by gastro-intestinal motility, castor oil-induced diarrhoea. The methanolic and aqueous extracts at doses of 200 mg/kg and 400 mg/kg body weight showed significant anti-diarrhoeal activity in castor oil-induced diarrhoea and prostaglandin E2- induced diarrhoea. The extracts reduced diarrhoea by inhibiting intestinal peristalsis; gastrointestinal motility and PGE2 induced enteropooling [31].

14. *Acorus calamus*

Acorus calamus (Sweet flag) is commonly known drug in traditional system of medicine. It is a tall perennial wetland monocot plant from the Acoraceae family. The scented leaves and rhizomes of sweet flag have been traditionally used as a medicine and the dried and powdered rhizome has a spicy flavor and is used as a substitute for ginger, cinnamon and nutmeg for its odour, it is wild or cultivated throughout Himalayas at an altitude ascending up to 6000 feet. *Acorus calamus* is distributed across Central Asia and Eastern Europe and also it is indigenous to the marshes of the mountains of India. Medicinal uses *Calamus* is used for the appetite immunosuppressant, antioxidant and hypo lipidemic activities.

Findings from revealed that the mice ingested with castor oil showed the rapid onset of diarrhea within the period of four hours. Meanwhile, the mice which were given the extract (methanol or water) of the rhizome showed the decreases in total number of feces, number of wet feces, and total weight of wet feces. When the large doses of the methanol extract were given, diarrhea is not found to occur. *Acorus calamus* at a dose 15mg, aqueas and methanolic extract in combination with other drug aqueous and methanolic plant extracts of *Acorus calamus* rhizome, *Pongamia glabra* leaves, *Aegle marmelos* unripe fruit and Strychnos nux-vomica root bark for their anti-diarrhoeal potential against castor-oil induced diarrhoea in mice [32].

15. *Murraya koenigii or Bergera koenigii*,

Murraya koenigii or Bergera koenigii, is a tropical to sub-tropical tree in the family Rosaceae and is native to Asia. The plant is also sometimes called sweet neem, though *M. koenigii* is in a different family to neem, *Azadirachta indica*, which is in the related family Meliaceae. Its leaves, known as curry leaves, are used in many dishes in the Indian subcontinent. It is a small tree, growing 4–6 metres (13–20 ft)) tall, with a trunk up to 40 cm (16 in) diameter. The tree is native to the Indian subcontinent. It is medically use for the following; The green leaves of *M. koenigii* are used in treating piles, inflammation, itching, and nephroprotective activities in animal models.

Result revealed that Antidiarrheal Activity; Kurryam and koenimbine were isolated from the seeds of *Murraya koenigii Spreng*. These compounds showed significant antidiarrheal activity in a castor oil-induced diarrhea rat model. The results showed that the mean defecation of rats treated with koenimbine at doses of 10, 30, and 50 mg/kg were 2.51 ± 0.58, 1.94 ± 0.81, and 1.29 ± 0.21, respectively, whereas rats treated with the same dose of kurryam had mean defecation of 2.35 ± 0.35, 1.88 ± 0.28, and 1.21 ± 0.25, respectively [33].

Table 1: Diagrammatic representation of medicinal plant associated with antidiarrhea potential

Scientific Name	Common Name	Family Name	Extract Dose(s)	Diarrhea induction model(s)	Reference
Lantana camara	Ewonadele, Kimbamahalba, Anya-nnunu	Verbenaceae	400mg/kg,600mg/kg	*Castor oil*	[24]
Allamanda neriifolia	Yellow bell	Apocynaceae	100mg/kg, 200mg/kg, 400mg/kg	*Castor oil, Charcoal meal*	[26]
Bruguiera cylindrical	Bakau, Putih, Oriya	Rhizophoraceae	100mg/kg, 200mg/kg, 400mg/kg	*Charcoal meal*	[26]
Anogeissus Leiocarpus	African birch, Bambara	Combretaceae	25mg/kg, 50mg/kg, 100mg/kg, 200mg/kg, 400mg/kg	*Castor oil*	[27]
Magnifera indica	Mango	Anacardiaceae	400µg/ml	*Castor oil*	[28]
Listea deccanensis Gamble	deccan tallow laurel,Ganapathy tree	Lauraceae	100mg/kg. 200mg/kg, 400mg/kg	*Castor oil*	[29]
Murraya Koenigii OR Bergera Koenigii	Sweet neem	Rutaceae	10mg/kg, 30mg/kg, 50mg/kg	*Castor oil, magnesium sulfate, and arachidonic acid*	[32]

Conclusion

The study showed a rich diversity of medicinal plants commonly used for treatment of diarrhea diseases. In this review paper, 15 medicinal plant species are reported that are used in the traditional diarrhea treatment, however prior to use, safety and curability in animal models should be justified through in vivo and in vitro experiment. Therefore, to search for a better alternative than synthetic drug becomes the demand of the time. Medicinal plants well researched and documented may be a good option to play a pivotal role against the observed shortcomings of synthetic drugs. Medicinal plants harbor avalanche of secondary metabolites which are the mainstay of herbal therapy. The diverse role of secondary metabolites may provide a platform for undiscovered remedy against diarrhea. Drug development needs clinical trials, this is the ultimate procedure to drug development for human or animal use. In that case, long term research on medicinal plants is essential to justify their antidiarrhea potential.

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