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Review

Antidiarrhoeal activity of different plants used in traditional medicine

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Diarrhoea is one of the main causes of morbidity and mortality in children under age of 5 years. In view of this problem, the World Health Organization has a Diarrhoea Disease Control Program, which includes studies of traditional medical practices together with the evaluation of health education and prevention approaches. In this paper a review of the last 7 years about the studies of extracts of plants used to combat diarrhoea in different countries has been done.

Key words: Diarrhoea, medicinal plants, antidiarrhoeal effect.

INTRODUCTION

Diarrhoeal diseases caused several million of deaths in the world anually (Field, 2003). In developing countries they are the most common causes of morbidity and mortality (Amstrong and Cohen, 1999). At the beginning of the 1980s, deaths caused by diarrhea were estimated at 4.6 millions every year for children under the age of 5 years (Snyder and Merson, 1982). Infants younger than 1 year account for more than half of these deaths, and the risk can be 2 - 3 times higher among infants who are not exclusively breast-fed (Bhandari et al., 2003).

Entherotoxigenic *Escherichia coli* (ETEC) is responsible for approximately 380,000 deaths annually. ETEC diarrhoea is a primary cause of death in children less than 5 years (Orndorff et al., 1996; Jaw-Chyun et al., 2006), other bacteria which produce enterotoxins are *Salmonella typhimurium, Clostridium difficile, Clostridium freundii, Aeromonas hydrophyla, Yersinia enterocolitica, Campylobacter jejuni* and *Vibrio cholerae*. Enterotoxins have their effect on the enterocyte functions by stimulating the secretion of transpithelial electrolytes, thus increasing the osmotic flux of water and ions to the intestinal lumen (Velazquez et al., 2006). Also G*iardia lambia* and *Entamoeba histolitica* are intestinal protozoa parasites that cause diarrhoea (Barbosa et al., 2006). *E. coli* is also a significant cause of disease among travelers (Adachi et al., 2001).

The deficient sanitary conditions (environmental and educational) and malnutrition (Parimala et al., 2002) predispose mainly children to a major risk to diarrhoea problems. Also some people are unable to digest food components such as artificial sweeteners and lactose and the result is the diarrhoea.

Developing countries face numerous resource constraints, so that it is necessary to focus on particular interventions that are very expensive and likely to reduce the burden of disease attributable to specific risk factor. Evaluating the risk of diarrhoeal diseases requires knowledge of the complex interactions between biological, socio-economic, behavioral, and environmental factors over the time (Pathela et al., 2006). Many risk factors have been analyzed, most of them have been done retrospectively, and only few of them have been able to associate the risk factors with subsequent incidence of diarrhoea. In view of this problem, the World Health Organization has initiated the Diarrhoea Disease Control Program, which includes studies of traditional medical practices together with the evaluation of health education and prevention approaches (Mukherjee et al., 1995). In spite of the importance of diarrhoea as a problem of public health, it is counted by relatively reduced number of drugs for its treatment. Most of them produce

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undesirable side effects in man.

The present review deals with the review of the ethnobotanical information to select the most important plant species used in ailments associated to a diarrhoea problem. Reports on phyto-chemical and pharmacological relevant species in scientific literature will allow, to a certain extent, the support of the selection. Finally, a brief review on the actual knowledge of the anti-diarrhoeal potentials in some species of medicinal flora will be performed.

TRADITIONAL MEDICINE

A big variety of plants have been studied in the search of antidiarrhoeal activity and from some of them has been isolated the compound responsible of the antidiarrhoeal effect. Following are shown some examples of plants extracts obtained from plants which have been pharmacologically studied in the last 7 years.

Epinetrum villosum (Excell) Troupin, Menispermaceae was collected in Lomelia, Democratic Republic of Congo, its methanol extract of the root reduced castor-oil induced diarrhoea in mice, and inhibited the frequency of defecation and greatly reduced the wetness of faecal excretion (Otshudi , 2001). *Roureopsis obliquifoliata* (Gilg.) Schellenb. Connaraceae collected in Lomelia, Democratic Republic of Congo, produced methanol extract from the root at doses of 750 mg/kg which exhibited antidiarrhoeal effect against castor oil-induced diarrhoea, and diminished the frequency of defaecation and reduced the wetness of faecal excretion (Otshudi, 2001). *Byrsocarpus coccineus* Schum and Thonn Connaraceae was collected in Lagos State, Nigeria; its aqueous extract of the leaves produced a decrease in propulsion in the castor oil-induced intestinal transit in mice, and in the frequency of defaecation, and protected the mice treated with castor oil. (Akindele, 2006). *Alhagi maurorum* Medic. Leguminosae was collected in Egypt; its methanol extract of aerial parts at doses of 200 mg/kg exhibited a significant antidiarroeal effect against castor oil-induced diarrhoea, and increased the contractile force of rabbit duodenal smooth muscle (Atta, 2004). *Conyza dioscoridis* (l.) Desk. Compositae, collected in Egypt, with oral administration of 200 mg/kg of methanol extract of the leaves reduced the number of fecal discharge produced by castor oil. This extract induced a dose-dependent ralaxation of rabbit duodenal muscle (Atta, 2004). *Mentha michophylla* C. Kosh, collected in Egypt, at doses of 400 mg/kg of methanol extract of aerial parts reduced the fecal discharge in rats and induced relaxation of rabbit duodenal smooth muscle (Atta, 2004). *Zygophyllum album* L.f. Tackh. Zygophyllaceae, was collected in Egypt, and the methanol extract of its aerial parts, at doses of 400 mg/kg showed antidiarrhoeal effect against castor oil-induced diarrhoea and inhibitory effect on the isolated rabbit's duodenum (Atta, 2004). The essential oil and hydro-alcoholic extract obtained from aerial parts of *Pycnocyacla spinosa* Decne. exBoiss. Var *spinosa*. Umbelliferae, collected in central Iran showed a relaxant effect on rat isolated ileum contractions. Furthermore, in castor oil-induced diarrh-oea, the hydro-alcoholic extract had a dose dependent anti-diarrhoeal effect (Sandrei, 2003). *Piper chaba* Hunter Piperaceae, collected in Satkhira, Bangladesh, and methanol extract of its bark reduced the frequency of castor oil-induced diarrhoeal episodes in mice, and decreased gastrointestinal motility as assessed by the charcol motility test in mice (Taufiq-Ur-Rahman, 2005). *Strychnos potatorum* L. Loganiaceae, collected in West Bengal, India, produced a methanol extract from its seeds which significantly inhibited the frequency of defaecation and reduced the wetness of faecal droppings in castor oil-induced diarrhoea, decreased the propulsion of charcoal meal through the gastrointestinal tract, and also reduced the PGE2-induced enteropooling (Swati, 2002). *Vitis vinifera V. askari* Vitidaceae, was collected in Ahwaz Jundishapur, Iran, and its Hydro-alcoholic extract of the leaves (0.5 - 4 mg/mL) reduced the contractions induced by KCl, $BaCl_2$ and acetylcholine (Gharib et al., 2006), *Acorus calamus* L., Araceae, *Pogamia glabra* Vent. Fabaceae, *Aegle marmelos* L., Rutaceae, *Strychnos nux-vomica* L., Loganiaceae, collected in Vellore, India, had methanol extracts which were more effective than the aqueous plant extracts against castor oil-induced diarrhoea. The methanolic plant extracts significantly reduced induction time of diarrhoea and total weight of the faeces (Shoba, 2001). Also it was found that methanol extract of the fruits of *A. marmelos* decreased the intestinal propulsion in rats (Rao et al., 2003).

Chloroform extract of *A. marmelos* showed inhibitory activity against castor oil-induced diarrhoea (Mazumder et al., 2006). *Byrsonima cinera* DC. Malpighiaceae, collected in Prätania, Brazil; methanol and hydroalcohol extracts of the leaves reduced the gastrointestinal motility. From methanol extract was isolated (+)-catechin and quercetin-3-O-α-L-arabinopyranoside (Figueredo et al., 2005). *Juniperus phoenicia* L. Cupressaceae, collected in Altafila, Jordan, aqueous extract of the leaves caused a dose dependent protection of rats against castor oil induced diarrhoea and reduced castor oil induced enteropooling. This extract also caused a decrease in intestinal transient and showed a significant relaxant effect on rat ileal smooth muscle (Qnais et al., 2005). *Oriza sativa* L. Poaceae, collected in Tunis, A rice solution obtained from rice boiled in phosphate buffer saline showed an antisecretory effect on intestinal fluid secretion induced by prostaglandins in the jejunum and the colon of rats, also it produced a myorelaxant effect of the electrically-evoked twitch response of the longitudinal myenteric-muscle (Lofti and Moncef, 2005). *Acacia nilotica* L., Mimosaceae, *Acanthospermum hipidum* DC., Compositae, *Gmelina arborea* Roxb. Verbenaceae, *Parkia biglobosa* Keay Mimosaceae, V*itex doniana* Sweet.

Verbenaceae, collected in Kaduna State, Nigeria, The results obtained revealed that aqueous methanol extracts of all five plants have pharmacological activity against diarrhoea. Furthermore, the extracts relaxed spontaneous contractions of rabbit jejunum (Agunu, 2005). *Croton urucurana* Baill, Euphorbiaceae, Mato Grosso, Brazil, the reed sap obtained from slashing the bark (dragon's blood), at an oral dose of 600 mg/kg resulted in marked inhibition of the diarrhoeal response following castor oil administration as well as the intestinal fluid accumulation promoted by cholera toxin. Also the red sap inhibited the small intestinal transit. (Gurgel, 2001). *Boswellia dalzielii* Hutch, Burseraceae, collected in Kano State, Nigeria, aqueous extract (25 - 100 mg/kg p.o.) dose dependently reduced intestinal propulsion of charcoal-treated mice, but however did not protected against castor oil-induced diarrhoea in rats (Nwinyi et al., 2004). *Boswellia serrata* Roxb, Burseraceae, gum resin extract inhibited upper gastrointestinal transit in croton oil or castor mice induced diarrhoea, also inhibited intestinal transit in pathophysiologycal state (Borrelli et al., 2006). *Cylicodiscus abunensis,* Mimosaceae, which was collected in Yaoundé, Cameroon, had a single oral dose of ethyl acetate extract of stem bark which produced a decrease in severe diarrhoea of rats treated with castor oil. This extract also possesses an anti-enteropooling activity and produced a decrease in intestinal transit (Laure et al., 2006). *Pongamia pinnata* L., Fabaceae, collected in Maharashtra, India, the findings of the biological assays were indicative of the selective anti-diarroeal action of decoction, but it's not active against toxin induced diarrhoea or those caused by protozoa and virus (Brijesh et al., 2006). *Xylocarpus granatum* J. Köning, Meliaceae, was collected in District of Khulna, Bangladesh, and the methanol extract of its bark showed significant antidiarrhoeal activity on castor oil and magnesium sulfate induced diarrhoea in mice. The extract also reduced the intestinal transit in charcoal meal test when compared to atropine sulphate (Rouf, 2007). *Euphorbia hirta* L., .Euphorbiaceae, collected in Uttaranchal, India, produced an aqueous extract of its leaves which diminished the normal defecation in rats and decreased the effect of castor oil-induced diarrhoea in mice (Hore et al., 2006). In *Alchornea cordifolia* Shum and Thon, Euphorbiaceae, collected in Yaounde, Cameroon, a significant dose related (100, 200, 400 and 800 mg/kg) antidiarrhoeal activity of ethanol extract of the leaves was observed, also delayed mice intestinal transit accelerated by castor oil, inhibited the production of diarrhoeal faeces and modified the fluid and electrolyte transport across the colonic mucosa when administered intraluminally (Gabriel et al., 2004). *Emblica officinalis* Gaertn, Euphorbiaceae, collected in Tamilnadu, India, produced methanol extract of the fruits which showed a significant inhibitory activity on rats with diarrhoea induced by castor oil and magnesium sulfate, it also produced a reduction in gastrointestinal motility meal test in rats, and inhibited PGE_2-induced enteropooling as compared to control animals (Perinayagam et al., 2005). *Bidens bipinnata* L., Compositae, *Cynachum acutum* L. Asclepiadaceae, *Convulvulus fatmensis* CF, Convolvulaceae, *Diplotaxis acris* Forssk. Cruciferae *Euphorbia paralias* L. Euphorbiaceae, *Plantago major* L, Plantaginaceae *Schouwia thebaica* Webb, Cruciferae, collected in Egypt, showed a significant antidiarrhoeal effect of the methanol extracts of the tested plants against castor oil-induced diarrhoea in rats achieved by 200 and 400 mg/kg. The tested plants extracts decreased the gastrointestinal movement by significantly decreasing the distance travelled by the charcoal meal (Atta and Mounier, 2005). *Ficus hispida* L, Moraceae, was collected in Jadavpur, India, its methanol extract of the leaves showed inhibitory activity against castor oil-induced diarrhoea and PGE_2-induced enteropooling in rats; it also produced a reduction in gastrointestinal motility on charcoal meal test in rats (Mandal and Kumar, 2002). *Shaeranthus senega-lensis,* Vaill, Asteraceae, collected in Adamawa State, Nigeria, was pre-treatmented 30 min with aqueous extract of the whole plant (50, 100 and 200 mg/kg, p.o.) causes a dose-dependent protection against castor oil-induced diarrhoea in rats and intraluminal fluid accumu-lation and inhibited gastrointestinal transit motility (Adzu et al., 2004). *Emilia coccinea (*Sims) G., Dom, Asterea-ceae, collected in Menoua Division, Cameroon, the methanol extract of the leaves (at doses of 200, 400 and 600 mg/kg), and to a lesser extent the aqueous extract prolonged the time for diarrhoea induction. Methanol extract reduced the frequency of diarrhoea episodes and decreased the propulsion of charcoal meal through the gastrointestinal tract (Teke et al., 2007). *Enhydra fluctuans* L*,* Compositae, collected in Khulna, Bangla-desh, methanol and aqueous extracts of the whole plant at doses of 250 mg/kg showed anti-diarrhoeal activity on castor oil-induced diarrhoea. Both extracts also reduced the intestinal transit of charcoal meal in mice (Uddin et al., 2005). *Zanthoxylum rhetsa* (Roxb.) DC, Rutaceae, collected in Cittagong, Bangladesh, Methanol extract of the stem bark significantly and dose dependently reduced the diarrhoeal episodes induced by castor oil in mice (Rahman et al., 2002). *Zingiber officinale* Roscoe, Zingi-beraceae, collected in Karashi, Pakistan, the propulsive effect of the extract of 70% aqueous methanol of rhizome, similar to that of carbachol, was blocked in atropina-pretreated mice, and in atropinized tissue, it showed spasmolytic activity (Ghayur and Gilani, 2005). *Aframomum melegueta* K. Schum*,* Zingiberacea, collected in Lagos, Nigeria, The aqueous extract of the seeds offered significant protection against diarrhoea induced by castor oil, and at dose range of 250 - 500 mg/kg, the extract reduced the volume of fluid secretion in castor oil-treated rats and showed antitransit activity (Umukoro and Ashorobi, 2005). *Rhus javanica* L., Anacardiaceae, collected in Manipu, India, the methanol extract of ripen fruits reduced

the faecal output and protected the mice from castor oil-induced diarrhoea. The extract also reduced the intestinal fluid secretion induced by $MgSO_4$ and gastrointestinal motility after charcoal meal administration in mice (Tangpu and Yadav, 2004). *Magnifera indica* L, Anacardiaceae, collected in Varanasi, India, methanol and aqueous extracts of the seeds showed anti-diarrhoeal activity against castor oil and $MgSO_4$-induced diarrhoea. However only methanol extract reduced intestinal transit in charcoal meal test (Sairam et al., 2003). *Bixa orellana* L, Bixaceae, collected in District of Khulna, Bangladesh, At doses of 125 - 500 mg/kg of methanol extract of the leaves was observed a decrease in the total number of stool in castor oil-induced diarrhoea model. A statistically significant delay in the passage of charcoal meal was observed at 500 mg/kg in the gastrointestinal motility test (Shilpi et al., 2006). *Azadirachta indica* A. Juss, Maliaceae, collected in Kolkata, India, methanol extract of the leaves showed antisecretory activity on *Vibrio cholerae* induced fluid secretion in mouse intestine, also inhibited hemorrhage induced by Vibrio cholerae in mouse intestine (Nwafor et al., 2007 and Thakurta et al., 2007) *Carpolobia lutea* G. Don, Polygalaceae, collected in Akwa Ibom State, Nigeria, the ethanol extract of the leaves (245 - 735 mg/kg) inhibited small intestinal transit time, castor oil-induced diarrhoea and fluid accumulation (Nwafor and Bassey, 2007). *Irvingia gabonensis* (O'Rorke) Bail, Irvingiaceae, collected in Western Nigeria, gastrointestinal motility was reduced in the methanol extract of the plant -treated rats (Raji et al., 2001). *Cleome viscosa* L, Capparidaceae, collected in West Bengal, India, methanol extract whole plant showed significant inhibitory activity against castor oil-induced diarrhoea and PGE_2 induced enteropooling in rat. It also produced a reduction in gastrointestinal motility in the charcoal meal test in rats (Parimala et al., 2002). *Epilobium rosmerinifolium* L, *E. hirsutum* L, *E. palustre* L, *E. spicatum* L, *E. tetragonum* L, Onagraceae, Ethanol extract of aerial parts had activity against diarrhoea induced by castor oil; also they reduced intestinal transit in charcoal meal test. The pretreatment of *E. rosmarinifolium* inhibited the castor oil-induced intestinal fluid accumulation in a dose-related fashion (Vitali et al., 2006). *Paederia foetida* L, Rubiaceae, collected in Chittagong, ethanol extract of whole plant increased the latent period of diarrhoea induced by castor oil or $MgSO_4$, and reduced the gastrointestinal motility; the extract also enhanced the morphine-induced reduction motility at 500 mg/kg (Afroz et al., 2006). *Gentianopsis paludosa*, (Hook.f.), Gentianaceae, collected in Qinghai, China, the ethanol extract of whole plant inhibited castor oil induced-diarrhoea and also reduced gastrointestinal motility in the charcoal meal test in mice. In the rabbit-isolated ileum, the extract showed inhibitory effects on its spontaneous contraction, and on acetylcholine-induced contractions (Wang et al., 2006). *Calotropis procera* (Ait.) R. Br., Asclepiadaceae, collected in India, the latex collected from the aereal parts produced a significant decrease in frequency of defecation, severity diarrhoea and afforded protection from diarrhoea in 80% rats treated with castor oil. The latex also produced a decrease in intestinal transit, and inhibited castor oil-induced enteropooling (Kumar et al., 2001). *Rumex maritimus* L, .Polygonaceae, collected in Dhaka, Bangladesh, methanol extract of the root was evaluated for antidiarrhoeal activity in mice using castor oil and serotonin induced diarrhoea. This extract prolonged the time for induction of diarrhoea, reduced the frequency of diarrhoeal episodes and decreased the propulsion of charcoal meal through the gastrointestinal tract (Rouf et al., 2003). *Cassia nigricans* Vahl, Caesalpinaceae, collected in Plateau State, Nigeria, methanol extract of leaves dose dependently reduced small intestinal propulsive movement and castor oil-induced fluid accumulation. However, castor oil-induced diarrhoea was increased (Nwafor and Okwuasaba, 2001). *Cyperus rotundus* L, Cyperaceae, collected in Khulna, Bangladesh, the methanol extract of rhizome given orally at the doses of 250 and 500 mg/kg, showed antidiarrhoeal activity in castor oil diarrhoea in mice (Uddin et al., 2006). *Litsea polyantha,* Lauraceae, collected in Jharkhand State, India, methanol extract of bark and aerial parts reduced the onset of diarrhoea, fecal excretion on castor oil-induced diarrhoea in mice, and also showed a reduction in gastrointestinal motility on charcoal meal test in mice (Poonia et al., 2007). *Asparagus pubescens,* Liliaceae, collected in Plateau State, Nigeria, the methanol extract of the root reduced the intestinal propulsive movement, castor oil-induced diarrhoea and intestinal fluid accumulation (Nwafor et al., 2000). *Jussiaea suffruticosa* Linn, Onagraceae, collected in Thankavur, India, methanol extract of aerial parts inhibited castor oil-induced diarrhoea and PGE_2-induced enteropooling. Also this extract reduced gastrointestinal motility following a charcoal meal in rats (Murugesan et al., 2000). *Satureja hortensis* L. Lamiaceae, collected in Kashan, Iran, the antispasmodic activity of the essential oil was assessed on contractions of isolated rat ileum, induced by KCl and acetylcholine. The effect of essential oil on KCl was similar to that of dicyclomine, also reduced the response to acetylchloline. In addition to antispasmodic activity in vitro, the essential oil inhibited castor oil-induced diarrhoea in mice (Hajhashemi et al., 2000). *Chromolaena odorata* Linn. King and Robinson, Compositae, collected in Ibadan, Nigeria, methanol extract of leaves showed a dose dependent reduction in the movement of the charcoal meal in the intestinal motility test. In the castor oil diarrhoea study the total number of wet faeces produced by rats in extract-treated animals was significantly reduced compared with control animals (Taiwo et al., 2000). *Terminalia avicennoides* Guill and Per, Combretraceae, collected in Bauchi State, Nigeria, aqueous extract of the root exhibited a concentration-dependent inhibition of the spontaneous pendular movement of the isolated rabbit jejunum and

attenuated acetylcholine induced contractions. Also it caused a decrease of gastrointestinal transit and markedly protected mice against castor oil-induced diarrhoea (Abdullahi et al., 2001). *Guiera senegalensis* J.F. Gmel Combretaceae was collected in Kano, Nigeria and it reduced intestinal transit in mice and delayed gastric emptying. 100 or 200 mg/kg of the root extract elicited a grater anti-motility activity than 0.1 mg/kg of atropine. Also it exerted anti-enteropooling effects causing a dose-related inhibitory effect on castor oil-induced enteropooling in rats. An antidiarrhoeal activity was observed with the extract, the frequency of defecation as well as the wetness of the faecal dropping was reduced. Furthermore, the extract produced 100% inhibition of castor oil-induced diarrhoea in mice (Aniagu et al., 2005).

Zizyphus spinachristi Willd. Rhamnaceae was collected in Adamawa State, Nigeria. Studies of stem bark methanol extract on castor oil-induced diarrhoea, interluminal fluid accumulation, and gastrointestinal transit revealed that the extract caused a dose- dependent protection of rats against castor oil induced diarrhoea, decreased the intraluminal fluid accumulation and gastrointestinal transit (Adzu et al., 2003).

Jatropha curcus L. Euphorbiaceae was collected in Western ghat area of India. The methanol extract of the root showed activity against castor oil-induced diarrhoea and intraluminal accumulation of fluid. It also reduced gastrointestinal motility after charcoal meal administration in mice (Mujumdar et al., 2000). *Evodia rutaecarpa* Hook f. et Thoms Rutaceae was obtained in Taipei. Aqueous extract of Evodiae fructus (unripe fruits) had both anti-transit and antidiarrhoeal effects (Li-Li et al., 2000). *Butea monosperma* (Lam) Kuntz Fabaceae was collected in District of Tamilnadu, India. Ethanol extract of stem bark inhibited castor oil-induced diarrhoea and PGE_2 induced enteropooling in rats; it also reduced gastrointestinal motility after charcoal meal administration (Gunakkunru et al., 2005). *Dalgergia lanceolaria* L. f. Fabaceae was collected in Khanapur, India. The bark ethanol extract showed activity against castor oil, $MgSO_4$ induced diarrhoea in mice. The extract also reduced castor oil-induced intraluminal fluid accumulation and intestinal motility (Mujumdar et al., 2005). *Albizia lebbek* Benth Fabaceae was collected in India.

Aqueous methanol extract of seeds possessed antidiarrhoeal activity. The antidiarrhoeal dose of the extract was at least 10 - 30 times less than the LD_{50} (Besra et al., 2002).

DISCUSSION

People have customarily used the plant(s) or plant(s)-derived preparations to combat diarrhoeal disorders. However, only few of them have been controlled clinically, or studied chemically and biologically to identify their active constituents (Arun and Vareishang, 2007).

The aim of this review is to make a summary of the most important plant species used in ailments associated to a diarrhoeal disorders. A great variety of plant species used in the World to treat diarrhoea have been studied and they are ethno-botanically different. These plant species mainly belongs to the families: Euphorbiaceae (six species), Compositae (five species), Rutaceae, Mimosaceae, Fabaceae and Anacardiaceae (three species each one), Verbenaceae, Connaraceae, Longaniaceae, Burseraceae, Ascleapiadaceae, Cruciferae, Asteraceae, Zingiberaceae, Polygalaceae, Onagraceae and Combretraceae (two species each one) and the rest of the families listed have only one specie each one.

The analysis based on data in the field reveals that most of the plants were collected in developing countries mainly in Asia and Africa, with India being the country with more species studied, followed by Nigeria and Bangladesh, maybe due of their ecological and cultural richness and also because in these countries the use of traditional medicines are still important.

Several studies have validated the use of antidiarrhoeal medicinal plants by investigating the biological activity of extracts of such plants, which have antispasmodic effects, delayed intestinal transit, suppress gut motility, stimulate water adsorption, or reduce the intraluminal fluid accumulation (Almeida et al., 1995).

Almost all the extracts presented in this review have antidiarroeal efficacy in the castor oil-induced diarrhoea model, which is known to induce diarrhoea by increasing the volume of intestinal content through the prevention of water adsorption, Therefore any agent that allows or promotes water adsorption in the intestine obviously would have an antidiarrhoeal potential (Katzung, 2004).

Taking into account the results obtained from the pharmacological research with regard to most of the plants with antidiarrhoeal activity, it is clear that future investigation should aim to elucidate the mechanisms of action; to evaluate their potential long-term toxicities; and to isolate, purify, and identify the active components. Such research can help to standardize the extracts and validate these plants as a secure and trustworthy alternative to traditional pharmaceuticals used for diarrhoeal disorder treatment, like Loperamide and other opiates, which have secondary undesired effects like addiction.

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