



Therapeutic Applications of Medicinal Plants for the Treatment of Human Intestinal Diarrhea: Review Article

SHAJAAN RIDHA HASAN*, FEEDAN MOHAMMED JUNAID, BAYAN MOHAMMED MAHDI, FARHAN HUSSEIN

Department of Biology, College of Education for Pure Sciences, University of Kirkuk, Iraq.

Abstract | Intestinal parasites are widespread pathogens worldwide and are considered one of the most critical pathogens a person may encounter, especially in developing countries that lack the necessary conditions for personal hygiene and health awareness. These parasites can intrude on the digestive system, causing many diseases, including chronic diarrhea, one of the most common diseases in children. It is also essential to use an alternative treatment to chemical drugs using herbs and medicinal plants, including mint, chamomile, ginger, carob, and other spices, with safe and sound therapeutic properties without causing severe side effects to the human body and intestines.

Keywords | Diarrhea, Intestinal parasites, Drugs, Medicinal herbs, Pathogens, Health awareness

Editor | Muhammad Nauman Zahid, Quality Operations Laboratory, University of Veterinary and Animal Sciences, Lahore, Pakistan.

Received | November 20, 2024; **Accepted** | December 5, 2024; **Published** | January 27, 2025

***Correspondence** | Shajaan Hasan, Department of Biology, College of Education for Pure Sciences, University of Kirkuk, Iraq; **Email:** farhanbio45@gmail.com

Citation | Hasan SR, Junaid FM, Mahdi BM, Hussein F (2025). Therapeutic applications of medicinal plants for the treatment of human intestinal diarrhea: Review article. S. Asian J. Life Sci. 13: 20-24.

DOI | <https://dx.doi.org/10.17582/journal.sajls/2025/13.20.24>

ISSN (Online) | 2307-8316; **ISSN (Print)** | 2309-3331

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INTRODUCTION

Diarrhea is a symptom of disease caused by many types of germs, parasites and viruses. It is one of the leading causes of death in children, especially in developing countries that lack the necessary conditions for personal hygiene and health awareness (Ghosh *et al.*, 2021; Nantege *et al.*, 2022). Parasitic infection occurs due to infection with protozoa or Helminthes worms, which cause diseases. Intestinal parasites cause many problems for the digestive system, causing many diseases, including diarrhea in humans, especially among children all over the world. Chronic diarrhea is among the most widespread diseases, especially (Nantege *et al.*, 2022). In poor countries, intestinal parasites live in the digestive tract of humans in different age groups, and infection occurs mainly in the small or large intestine (Ghosh *et al.*, 2021). Symptoms are in the form of stomach pain without clear causes sometimes, with some cramps in the stomach muscles, and the pain lasts for a few hours and then disappears without treatment, as well as nausea, vomiting and weight loss. Malnutrition also occurs in humans (Ahmad, 2021). According to estimates, the parasite *Entamoeba histolytica* is

the cause of amoebic dysentery in humans (Hennessey *et al.*, 2018). It infects the large intestine, causing intestinal colic, diarrhea, occasionally diarrhea with bleeding of the mucosa, ulceration in the walls of the large intestine, colon wall invasion or the growth of non-pathogenic colonies in the bowels, and dysentery worldwide (Afrakhteh *et al.*, 2016). According to the World Health Organization, data from 2021 indicated that diarrheal disease is responsible for 8% of deaths in children under the age of 5. In the world, more than 1 billion under-five children live in poverty, social exclusion, and discrimination affected by intestinal parasitic infections and diarrhea disease (Hamady, 2012; Bakr *et al.*, 2024).

Diarrhea can last for days and causes the body to lose water and salts essential for survival. In the past, severe dehydration and fluid loss were the leading causes of diarrheal deaths among most people. Other causes, such as bacterial infections, are likely to account for an increasing proportion of all diarrheal deaths. Children who are malnourished or immunocompromised, as well as those living with HIV, are at greater risk of life-threatening diarrhea (Mergani *et al.*, 2014). In industrialized countries,

although deaths from diarrhea are uncommon occurrences, this disease remains an important cause of morbidity and incurs substantial health care costs (Hizam and Qahtan, 2022).

Diarrhea is defined as three or more loose or liquid stools per day (or more frequent than usual). Frequent passage of firm stools is not considered diarrhea or loose, soft stools in breastfed infants. Diarrhea is usually a symptom of an intestinal infection that various bacteria, viruses, and parasites can cause. The disease is spread through contaminated food or drinking water or from person to person due to poor hygiene (Wanamaker and Grimm, 2004). The risk of diarrhea can be reduced through interventions to prevent the disease, including providing safe drinking water, using improved sanitation facilities, and washing hands with soap. Diarrhea should be treated with oral rehydration solution (ORS), which consists of clean water, sugar, and salt. In addition, a 10 to 14 days course of supplemental treatment with dispersible zinc tablets can shorten the duration of diarrhea and improve treatment outcomes (Darvesh *et al.*, 2017).

Herbal remedies are considered beneficial in treating diarrhoea, and for several years, herbs and their extracts have been utilised to address various gastrointestinal disorders, including diarrhoea (Akram *et al.*, 2020; Dubreuil, 2013).

The use of herbal therapy in contemporary medical procedures is strongly endorsed. Furthermore, herbal medicines have active components and prototype leader compounds for developing new drugs (Damtie, 2023). Documenting herbal medicines is thus documenting future drugs (Tegen *et al.*, 2021). However, the plants are steadily diminishing due to environmental degradation, deforestation, and a lack of recordkeeping (Giday *et al.*, 2009). Therefore, documentation of traditional knowledge regarding the usage of medicinal herbs is crucial to ensure its use by both present and future generations (Boadu and Asase, 2017). Hence, the present study aims to document medicinal plants traditionally used to treat diarrhoea.

TYPES OF DIARRHEA

Diarrhea occurs when the stool is loose and watery, and the child needs to defecate more often than usual (more than three times a day). Diarrhea is a common problem that affects most children, especially in the early stages of life (less than five years). It usually lasts for a day or two and disappears without treatment. However, if it lasts more than two days, it may indicate that the child suffers from a more severe problem. Diarrhea is not a disease but a symptom of several diseases. In general, diarrhea can be classified into two types: Short-term diarrhea (acute), which lasts for a day or two and disappears. It may occur due to eating food or water contaminated with bacteria (bacterial infection) or a

viral infection. The second is long-term diarrhea (chronic): Diarrhea that lasts for a few weeks and may occur due to another health problem, such as irritable bowel syndrome or as a result of intestinal disease such as ulcerative colitis or Crohn's disease. It may also occur due to infection with parasites such as giardia (Ibrahim and Salem, 2020).

DROUGHT

Dehydration is one of the most severe threats posed by diarrhea. During an episode of diarrhea, a person loses water and electrolytes (sodium, chloride, potassium, and bicarbonate) through loose stools, vomit, sweat, urine, and breathing. The body becomes dehydrated because the body fails to replace these losses (Sitotaw and Shiferaw, 2020).

CAUSES OF DIARRHEA

Infection: Diarrhea is a symptom of an infection caused by a range of bacteria, viruses and parasites, most of which are spread through water contaminated with faeces. Infection is more common in areas with a lack of adequate sanitation and hygiene facilities and safe water supplies for drinking, cooking and cleaning (Hussein *et al.*, 2020).

Malnutrition: Children who die from diarrhea are often already malnourished, making them more susceptible to disease. Each amount of diarrhea makes their malnutrition worse, and diarrhea is the leading cause of malnutrition in children under five (Daryani *et al.*, 2017). **Water sources:** Water contaminated with human faeces, such as sewage, septic tanks, and toilets, is of particular concern. Animal faeces also contain microorganisms that can cause diarrhea.

Other causes: Diarrheal disease can also be transmitted from person to person and is exacerbated by poor personal hygiene. Food is another major cause of diarrhea if it needs to be prepared or stored hygienically. Unsafe storage and handling of household water is also a significant risk factor. Fish caught in contaminated waters and prepared seafood may also contribute to the disease (Ahs *et al.*, 2010).

DIARRHEA TREATMENT

Most cases of acute diarrhea go away on their own within a few days without treatment. But if you've tried making lifestyle changes and home remedies for diarrhea have failed, your doctor may recommend medications or other medicines. Antibiotics or ant-parasitic medications may help treat diarrhea caused by bacteria or parasites. If a virus causes your diarrhea, antibiotics won't help. Treatment varies depending on the cause of your diarrhea. Treatment options include (Benzamin and Hoque, 2024).

Treatment of diarrhea caused by viral infection: There is no specific antiviral treatment for viruses that cause diarrhea. The doctor usually prescribes medications to treat symptoms associated with the disease, such as vomiting

and fever. He may prescribe an oral rehydration solution if the diarrhea is moderate to severe. The doctor may also advise limiting fatty and sugary foods. Bed rest and fluid intake also help improve symptoms (Dahiya and Nigam, 2023).

Treatment of diarrhea caused by a bacterial infection: Most children with diarrhea caused by a bacterial infection may not need treatment and will improve over time. In some cases, the doctor may prescribe antibiotics (Ellis *et al.*, 2023).

Treating diarrhea caused by antibiotics: Studies suggest that eating yoghurt fortified with live cultures (probiotics) may help relieve diarrhea caused by antibiotics. Probiotics help replace the healthy gut bacteria that antibiotics kill (Langlois *et al.*, 2020).

Treatment of diarrhea caused by parasitic infection: The doctor may prescribe anti-parasitic medications for diarrhea caused by infection with giardia, amoeba, intestinal worm eggs, or other parasites. These treatments include metronidazole, tinidazole, or nitazoxanide (Suchodolski *et al.*, 2012).

Dehydration treatment depends on replacing the body's lost fluids and salts and treating the cause of diarrhea. The doctor will prescribe rehydration solutions if the child shows signs of dehydration. Suppose the mother notices these signs in the child. In that case, she can gradually provide the rehydration solution orally, especially if the child is vomiting (5 ml every five minutes), until consulting the doctor. In this case, you should avoid giving the child juices or soda, as they may worsen diarrhea. The child may need intravenous solutions in severe cases (Ellis *et al.*, 2023).

ALTERNATIVE TREATMENT FOR DIARRHEA

Mint is recommended to treat intestinal diarrhea with herbs, as it contains methanol, which helps relieve diarrhea and the associated abdominal pain. Drinking ginger tea once or twice a day is recommended, as it contains acetone, which treats diarrhea associated with the hormone serotonin, and green tea, chamomile tea, and carob (Leitsch, 2019). Hussein *et al.* (2020) indicated the effectiveness of the plant extracts *Cyperus rotundus* and *Thymus serpyllum* as a treatment for parasitic infections after conducting the study on laboratory mice (Darvesh, 2017).

PREVENTION

Diarrhea cannot be wholly prevented in humans. Still, some tips and precautions help reduce the chances of infection and recover from it quickly, including washing hands with soap and water after the child uses the bathroom and before eating, washing vegetables and fruits well, not drinking tap

water or using it to brush teeth if you are not sure that the water is safe to drink, not drinking unpasteurized milk, not eating food from street vendors or food trucks, cleaning table surfaces, door handles and other surfaces that are touched a lot with a cleaner that kills viruses, cooking food well, and eating balanced meals to boost immunity in general (Leitsch, 2019).

CONCLUSIONS AND RECOMMENDATIONS

Despite global interventions to prevent and control diarrhea, it remains a public health problem leading to childhood morbidity and mortality majorly in developing countries. Finally, diarrhea in humans is common, occurring at almost every stage of their lives. Appropriate clinical care must be provided, and attention must be paid to signs of dehydration, as well as knowing the type of diarrhea, whether it is bacterial, parasitic or viral diarrhea resulting from eating undercooked food and drinking unsterilized water contaminated with these deadly organisms, as well as a result of neglecting personal and home hygiene. Diarrhea can be treated either by therapeutic drugs prescribed by the attending physician or by alternative treatment (herbs) that are safe and have no side effects on the body. Diarrhea cannot be avoided entirely, but the infection rate can be reduced. It can be cured by following the conditions of personal and home health protection, paying primary attention to healthy eating and drinking sterile water, and strengthening the immune system that protects the body from exposure to diarrhea or other chronic or fatal diseases in terms of harm.

ACKNOWLEDGMENT

The authors would like to express their great appreciation and gratitude to Department of Biology, College of Education for Pure Sciences, University of Kirkuk, Iraq.

NOVELTY STATEMENT

This study investigates the importance of using herbs and medicinal plants, including mint, chamomile, ginger, carob, and other spices, as an alternative treatment to chemical drugs. These plants have safe and sound therapeutic properties without causing severe side effects to the human body and intestines.

AUTHOR'S CONTRIBUTION

SRH and FMJ: Contributed to the conception of the manuscript, acquisition of data, drafting, and final approval of the manuscript. BMM: Contributed to the acquisition of data, revising the manuscript. All authors read and

CONFLICT OF INTEREST

The authors have declared no conflict of interest.

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