Sys Rev Pharm 2024; 15(1): 33-35
A multifaceted review journal in the field of pharmacy
E-ISSN 0976-2779 P-ISSN 0975-8453 / DOI: 10.31858/0975-8453.15.1.33-35

Brief Report

# Evaluation of Antidiarrheal Activity of Hydromethanolic Root Extract of *Acacia seyal*

**Assefa Kebad Mengesha***
Department of Pharmacology, College of Medicine and Health Sciences, University of Gondar, Gondar, Ethiopia

*Article History:* *Submitted: 12.01.2024* *Accepted: 29.1.2024* *Published: 05.02.2024*

## ABSTRACT

Diarrhea is defined as having three or more loose or watery stools within a 24-hour period. Using aqueous solvent fractions, n-hexane, ethyl acetate, and hydromethanolic crude extract, the study sought to evaluate the antidiarrheal properties of *Acacia seyal* roots in a model of diarrhea produced by castor oil. The results of this investigation showed that hydromethanolic crude extract of *Acacia seyal* root and solvent fractions had encouraging antidiarrheal activities in a dose-dependent manner. The findings of this study will serve as a foundation for future investigations into the structure, link between structure and activity, and mechanism of action of the biological substance that is active.

**Keywords:** *Acacia seyal*, antidiarrheal, castor oil, gastrointestinal motility, enteropooling

***Correspondence:** Assefa Kebad Mengesha, Department of Pharmacology, College of Medicine and Health Sciences, University of Gondar, Gondar, Ethiopia, Email: asielove23@gmail.com

## INTRODUCTION

Three or more loose or watery stools per day is considered to be diarrhea (WHO, 2017; Ugboko HU, *et al.*, 2020; Guerrant RL, *et al.*, 2021). It still poses an existential threat to public health on a worldwide scale, especially for young children in low- and middle-income nations who are under five (WHO, 2017). 15% of all deaths in children under the age of five are caused by diarrhea, making it the second leading cause of death in this age group globally (Arasaradnam RP, *et al.*, 2018; Walker FCL, *et al.*, 2010). The regular bowel movement is altered during diarrhea, which causes an increase in the water content, volume, or frequency of the stools (Guerrant RL, *et al.*, 2021). Diarrhea is frequently brought on by gastrointestinal infections caused by many kinds of bacteria, viruses, and parasites. Food, water and an unsanitary environment can all spread this virus. In addition to other pathological conditions, pathophysiology in the transportation of electrolytes and water typically results from four main mechanisms, including an increase in luminal osmolerity and electrolyte secretion, a decrease in electrolyte absorption, and an acceleration of intestinal motility that ultimately results in a reduction in transition time (Lutterodt GD, 1992).

Given their potent biological and therapeutic properties, herbal medicines play a significant role in enhancing primary healthcare in both developed and developing nations (Li Y and Tian J, 2016). Since it is affordable and may be made from plants or other natural sources that are readily available locally, ethno-medicine is always the first option for treating illnesses in Africa (Shimelis D, *et al.*, 2008). Contrary to contemporary medicine, traditional medicine is commonly practiced in Ethiopia, both in urban and rural areas, which may be a result of the systems' accessibility, cultural acceptability, and financial affordability (Messaoudene D, *et al.*, 2011).

Traditional uses for *Acacia seyal* include the treatment of edema, cancer, diarrhea, wounds, malaria, and wound infections (Mesfin F, *et al.*, 2014; Tefera BN and Kim YD, 2019; Esubalew ST, *et al.*, 2017; Chekole G, 2017; Bitew H, *et al.*, 2019; Gradé JT, *et al.*, 2009; Magnini RD, *et al.*, 2020). It is also used to treat cancer by crushing and spitting leaves. Pharmacological studies on the *Acacia seyal* plant have revealed antibacterial, anti-inflammatory, and antioxidant properties *in vitro* (Eldeen IM and van Staden J, 2007; Mekbib SB, 2016; Elmi A, *et al.*, 2020; Eldeen IM and van Staden J, 2008), as well as *in vivo* antimalarial and antidepressant effects (Mwangi GG, *et al.*, 2015; Shehu A, *et al.*, 2020). Many species have been reported to have antidiarrheal properties in Ethno-botanical survey studies (Messaoudene D, *et al.*, 2011; Umer S, *et al.*, 2013), however scientific medicinal and safety investigations of some of these plants, such *Acacia seyal*, have not been documented. And also people use plant(s) or plant-derived preparations considering them to be efficacious against diarrheal disorders without any scientific basis (Atta AH and Mouneir SM, 2005).

The World Health Organization has supported research on the use of conventional medicine in the treatment and prevention of diarrheal illnesses because of this (Snyder JD and Merson MH, 1982). Drugs that are currently on the market have been connected to side effects and contraindications (Woronow D, *et al.*, 2017). Another issue to consider when considering antibiotics used to treat diarrhea is drug resistance (Alam S and Bhatnagar S, 2006). Due to the high prevalence of diarrhea in impoverished nations, limits of currently available antidiarrheal medications, and inadequate healthcare coverage, traditional remedies may be a good alternative to modern medications for the treatment of diarrhea.

For the reasons listed above, *Acacia seyal* roots were subjected to test the antidiarrheal effects in a castor oil-induced diarrheal model utilizing hydromethanolic crude extract, n-hexane, and ethyl acetate as well as aqueous solvent fractions.

## MATERIALS AND METHODS

Mice were randomly assigned to five groups of six in each model. For the hydromethanolic crude extract experiments, mice in groups II, III, and IV received 100 mg/kg, 200 mg/kg, and 400 mg/kg of hydromethanolic crude extract or solvent fractions, while animals in negative control group (group I) received 1 ml/100 g distilled water along with n-hexane, ethyl acetate, and aqueous fractions. For the castor oil-induced diarrhea and enteropooling test, 3 mg/kg of loperamide was administered to positive control group (group V). The dosages were all taken orally. For the gastrointestinal motility test, however, intraperitoneally administration of Atropine sulphate at a dose of 5 mg/kg was used. Statistical Package for the Social Sciences (SPSS) version 26 was used to examine the statistical significance of differences in the number and weight of wet and total feces, distance traveled by a charcoal meal, and intestinal fluid accumulation across groups.

## RESULTS AND DISCUSSION

When compared to the vehicle-treated group, the crude extract and n-hexane fraction notably delayed the onset of diarrhea, reduced the weight and volume of intestinal contents, and hindered the intestinal transit at all tested doses ($p<0.001$). The ethyl acetate fraction also significantly ($p<0.001$) decreased the weight of intestinal content at all doses examined. Only at 400 mg/kg did the aqueous fraction statistically ($p<0.01$) prolonged the onset of diarrhea and impeded gastrointestinal motility.

The anti-diarrheal index of the crude extract was 107.17% at the tested dose of 400 mg/kg. At the measured dose of 400 mg/kg, the aqueous fraction also provided the lowest antidiarrheal index value (59.63%). The anti-diarrheal index values of the hydromethanolic extract ($R^2$=0.989), aqueous fraction ($R^2$=0.997), ethyl acetate fraction ($R^2$=1), and n-hexane fraction ($R^2$=0.995) increased in a dose-dependent manner as shown in *Figure 1*.

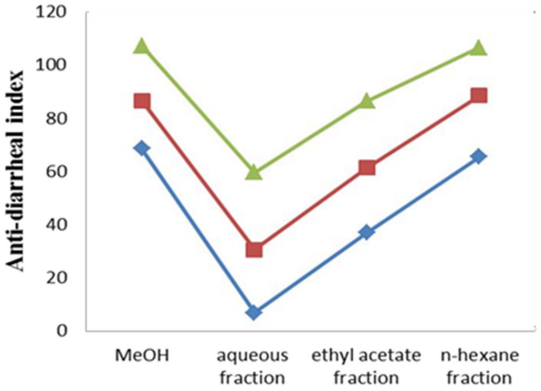


**Figure 1: Anti-diarrheal indices of the crude extract and solvent fractions of *Acacia seyal* roots in mice**
**Note: (—): 100 mg/kg ; (—): 200 mg/kg; (—): 400 mg/kg**

The study's findings demonstrated the anti-secretory, anti-motility, and antidiarrheal indices that are dose-dependent for both the crude extract and solvent fractions of *Acacia seyal* roots. The presence of phytoconstituents such tannins, saponins, and flavonoids (Bun SS and Ollivier E, 2020; Ramde-Tiendrebeogo A, *et al.*, 2019; Prasad SK, *et al.*, 2014), which were shown to be more concentrated at higher tested doses, may be the cause for dose-dependent percentage inhibition of stool defecation by the hydromethanolic crude extract and each fraction.

Furthermore, the acute oral toxicity test was done and showed no harm, indicating that the plant extract was safe. This demonstrates that the plant is safe and palatable, even at doses higher than those used in the three antidiarrheal models of this study. This proves that the plant is safe to use in traditional settings. Therefore, for the treatment of diarrhea caused by a variety of causes, *Acacia seyal* root extract can be an excellent alternative to typical antidiarrheal medications.

## CONCLUSION

The results of this investigation showed that hydromethanolic crude extract of *Acacia seyal* root and solvent fractions had encouraging antidiarrheal activities in a dose-dependent manner. The phytoconstituents found in *Acacia seyal* roots may be responsible for these antidiarrheal properties. The findings of this study will serve as a foundation for future investigations into the structure, link between structure and activity, and mechanism of action of the biological substance that is active. The present study provides a qualitative and quantitative chemo-profiling of a strong plant species that has antidiarrheal properties, which can be used for quality control of raw materials, formulations, and final products. It also provides platform and preliminary-level information on the toxicity profile of solvent fractions and crude extract of this medicinally significant plant for future preclinical and clinical studies. The results support the plant's alleged clinical benefit in treating diarrheal illness, as do those from previous investigations.

It is unable to investigate the quantity or quality of secondary metabolites in each fraction or in the hydromethanolic crude extract, nevertheless, because this investigation solely employed qualitative phytochemical screening assays. It should be noted that this study did not investigate secondary metabolite dependence. It would be advantageous to overcome these limitations and improve the data through further study, by conducting an additional research.

## REFERENCES

1. Diarrhoeal disease fact sheet. World Health Organization (WHO). 2017.
2. Ugboko HU, Nwinyi OC, Oranusi SU, Oyewale JO. Childhood diarrhoeal diseases in developing countries. Heliyon. 2020; 6(4).
3. Guerrant RL, van Gilder T, Steiner TS, Thielman NM, Slutsker L, Tauxe RV, *et al.* Practice guidelines for the management of infectious diarrhea. Clin Infect Dis. 2001; 32(3): 331-351.
4. Arasaradnam RP, Brown S, Forbes A, Fox MR, Hungin P, Kelman L, *et al.* Guidelines for the investigation of chronic diarrhoea in adults: British Society of Gastroenterology, 3rd edition. Gut. 2018; 67(8): 1380-1399.
5. Walker FCL, Sack D, Black RE. Etiology of diarrhea in older children, adolescents and adults: A systematic review. PLoS Negl Trop Dis. 2010; 4(8): e768.
6. Lutterodt GD. Inhibition of Microlax-induced experimental diarrhoea with narcotic-like extracts of *Psidium guajava* leaf in rats. J Ethnopharmacol. 1992; 37(2): 151-157.
7. Li Y, Tian J. Evaluation of local anesthetic and antipyretic activities of Cinchona alkaloids in some animal models. Trop J Pharm Res. 2016; 15(8): 1663-1666.
8. Shimelis D, Benti D, Challi D. Effect of zinc supplementation in treatment of acute diarrhea among 2-59 months children treated in Black Lion Hospital, Addis Ababa, Ethiopia. Ethiop J Health Dev. 2008; 22(2): 187-190.
9. Messaoudene D, Belguendouz H, Ahmedi ML, Benabdekader T, Otmani F, Terahi M, *et al. Ex vivo* effects of flavonoïds extracted from *Artemisia herba* alba on cytokines and nitric oxide production in Algerian patients with Adamantiades-Behçet's disease. J Inflamm. 2011; 8(1): 1-9.
10. Mesfin F, Seta T, Assefa A. An ethnobotanical study of medicinal plants in Amaro Woreda, Ethiopia. Ethnobot Res Appl. 2014; 12: 341-354.
11. Tefera BN, Kim YD. Ethnobotanical study of medicinal plants in the Hawassa Zuria District, Sidama zone, Southern Ethiopia. J Ethnobiol Ethnomed. 2019; 15: 1-21.
12. Esubalew ST, Belete A, Lulekal E, Gabriel T, Engidawork E, Asres K. Review of ethnobotanical and ethnopharmacological evidences of some Ethiopian medicinal plants traditionally used for the treatment of cancer. Ethiop J Health Dev. 2017; 31(3): 161-187.
13. Chekole G. Ethnobotanical study of medicinal plants used against human ailments in Gubalafto District, Northern Ethiopia. J ethnobiol ethnomed. 2017; 13(1): 1-29.
14. Bitew H, Gebregergs H, Tuem KB, Yeshak MY. Ethiopian medicinal plants traditionally used for wound treatment: A systematic review. Ethiop J Health Dev. 2019; 33(2): 102-127.
15. Gradé JT, Tabuti JR, van Damme P. Ethnoveterinary knowledge in pastoral Karamoja, Uganda. J Ethnopharmacol. 2009; 122(2): 273-293.

16. Magnini RD, Hilou A, Millogo-Koné H, Compaore S, Pagès JM, Davin-Regli A. A review on ethnobotanical uses, biological activities and phytochemical aspects of *Acacia senegal* (L.) Willd. and *Acacia seyal* Delile.(Fabaceae). Int J Plant Sci Hortic. 2020; 2: 32-55.
17. Eldeen IM, van Staden J. *In vitro* pharmacological investigation of extracts from some trees used in Sudanese traditional medicine. S Afr J Bot. 2007; 73(3): 435-440.
18. Mekbib SB. *In vitro* antimicrobial assay of selected medicinal plants against medically important plant and food-borne pathogens. 2016; 4(3):163-9.
19. Elmi A, Spina R, Risler A, Philippot S, Mérito A, Duval RE, *et al.* Evaluation of antioxidant and antibacterial activities, cytotoxicity of *Acacia seyal* Del bark extracts and isolated compounds. Molecules. 2020; 25(10): 2392.
20. Eldeen IM, van Staden J. Cyclooxygenase inhibition and antimycobacterial effects of extracts from Sudanese medicinal plants. S Afr J Bot. 2008; 74(2): 225-259.
21. Mwangi GG, Wagacha JM, Nguta JM, Mbaria JM. Brine shrimp cytotoxicity and antimalarial activity of plants traditionally used in treatment of malaria in Msambweni district. Pharm Biol. 2015; 53(4): 588-593.
22. Shehu A, Anyip B, Magaji MG. Antidepressant effect of methanol root bark extract of *Acacia seyal* Del.(Fabaceae): Possible involvement of the inflammatory pathway. Trop J Pharm Res. 2020; 19(7): 1459-1464.
23. Umer S, Tekewe A, Kebede N. Antidiarrhoeal and antimicrobial activity of *Calpurnia aurea* leaf extract. BMC Complement Altern Med. 2013; 13: 1-5.
24. Atta AH, Mouneir SM. Evaluation of some medicinal plant extracts for antidiarrhoeal activity. Phytother Res. 2005; 19(6): 481-485.
25. Snyder JD, Merson MH. The magnitude of the global problem of acute diarrhoeal disease: A review of active surveillance data. Bull World Health Organ. 1982; 60(4): 605-613.
26. Woronow D, Swank KA, Wu E, Kortepeter C, Levin RL. Labeling and drug safety communication approaches to loperamide abuse. JACC Clin Electrophysiol. 2017; 3(4): 422.
27. Alam S, Bhatnagar S. Current status of anti-diarrheal and anti-secretory drugs in the management of acute childhood diarrhea. Indian J Pediatr. 2006;73: 693-696.
28. Bun SS, Ollivier E. Ethnobotanical study of medicinal plants used by K'Ho-Cil people for treatment of diarrhea in Lam Dong Province, Vietnam. J Herb Med. 2020; 19: 100320.
29. Ramde-Tiendrebeogo A, Koala M, Ouattara N, Lompo M, Guissou IP. A comparative study of phytochemical profile and antioxidant activity of Sahelian plants used in the treatment of infectious diseases in northern part of Burkina Faso: *Acacia seyal* Delile and *Acacia tortilis* (Forssk.) Hayne subsp. *raddiana* (Savi). J Pharmacognosy Phytother. 2019; 11(3): 74-79.
30. Prasad SK, Laloo D, Kumar R, Sahu AN, Hemalatha S. Antidiarrhoeal evaluation of rhizomes of *Cryptocoryne spiralis* Fisch. ex Wydler: Antimotility and antisecretory effects. Indian J Exp Biol. 2014; 52(2): 139-146.