



## ANTI-DIARRHEAL ACTIVITY OF SOME MEDICINAL PLANTS IN INDONESIA: A REVIEW

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### ABSTRACT

In developing countries like Indonesia, diarrhea is one of the main causes of morbidity and death in both children and adults. This is mainly due to poor hygiene and sanitation. Currently, researchers are searching for natural ingredients that have empirically proven anti-diarrheal effects to serve as new candidates for anti-diarrheal compounds. This is done to replace anti-diarrheal drugs, which currently have many side effects. Several medicinal plants native to Indonesia, including *Syzygium polyanthum*, *Kaempferia galanga*, *Psidium guajava*, *Moringa oleifera*, *Camellia sinensis*, *Annona muricata*, and *Myrtus communis*, have been scientifically proven to have anti-diarrheal activity using different mechanisms. Therefore, this review article discusses the potential of several native Indonesian medicinal plants that have anti-diarrheal effects.

**KEYWORDS:** *Syzygium polyanthum*, *Kaempferia galanga*, *Psidium guajava*, *Moringa oleifera*, *Camellia sinensis*, *Annona muricata*, *Myrtus communis*.

### INTRODUCTION

Diarrhea is defined as three or more loose stools associated with abnormally loose or liquid stools. In addition, stool frequency, consistency, and weight are taken into account to identify diarrhea.<sup>[1]</sup> Active and osmotic secretion, impaired peristalsis, and exudation cause diarrhea.<sup>[2, 3]</sup> There are three diarrheal syndromes: acute diarrhea (water loss of 250 mL/kg/day in the stool), bloody diarrhea (with visible blood in the stool), and persistent diarrhea (which lasts for two weeks or more). The main cause of death due to diarrhea is acute watery diarrhea accompanied by dehydration.<sup>[4]</sup> Every year, 1.7 billion cases of diarrhea are reported in children, and there are 525,000 deaths in children under the age of five. Diarrhoea can be prevented and treated. However, treatment of diarrhea is limited by contraindications to unsafe anti-diarrheal drugs, ineffectiveness, and/or the development of resistance.<sup>[5]</sup> Medicinal plants are the most important and sometimes the only source of treatment for diarrhea. This is because medicinal plants are culturally acceptable, easy to access, and cheap compared to modern medicine.<sup>[6,7]</sup> Indonesia is the second-largest country in the world with forest biodiversity, where there are 28,000 plant species, and 2,500 of these species are medicinal plants.<sup>[8,9]</sup> Currently, research to obtain new anti-diarrheal drugs derived from

natural ingredients continues to be carried out, one of which is exploring active compounds from natural ingredients, especially medicinal plants, which have traditionally been used by people to treat diarrhea in various regions of Indonesia.<sup>[10-12]</sup> The aim is to find new anti-diarrheal compounds that have mild side effects with low toxicity so they do not harm patients.<sup>[13,14]</sup> Therefore, this review article discusses the potential of several native Indonesian medicinal plants that have anti-diarrheal effects.

#### *Syzygium polyanthum*

*S. polyanthum* is a plant belonging to the *Myrtaceae* family that is traditionally used for various medicinal and non-medical purposes. The roots and fruit are consumed to relieve the effects of drunkenness due to alcohol, while the leaves are traditionally consumed to treat various diseases such as diabetes mellitus, hypertension, gastritis, diarrhea, skin diseases, and infections.<sup>[15]</sup> Administration of *S. polyanthum* with concentrations of 10%, 20%, and 30% was reported to have significant anti-diarrheal activity in mice induced by castor oil by reducing defecation frequency, feces consistency, and feces weight.<sup>[16]</sup>

***Kaempferia galanga***

*Kaempferia galanga* is a plant belonging to the *Zingiberaceae* family that is traditionally used as an anti-inflammatory for diarrhea, stomach aches, dyspepsia, and respiratory tract diseases such as coughs, chest pain, and blocked nasal passages. The main chemical constituents of this plant are essential oils, namely ethyl-p-methoxycinnamate (31.77%), methyl cinnamate (23.23%), carvone (11.13%), eucalyptus (9.59%), and pentadecane (6.41%). Cineol, borneol, 3-carene, camphene, kaempferol, cinnamaldehyde, p-methoxycinnamic acid, ethyl cinnamate, and ethyl p-methoxy-trans-cinnamate are some of the other ingredients.<sup>[17]</sup> Administration of *K. galanga* rhizomes and leaves at doses of 100 and 200 mg/kg, respectively, was reported to have significant anti-diarrheal activity in mice induced by castor oil.<sup>[18]</sup> Researchers believe that the plant's anti-diarrheal effect is attributed to its ability to inhibit electrolyte permeability to the intestine caused by castor oil, as well as its inhibition of prostaglandin release and suppression of intestinal fluid accumulation.<sup>[19]</sup>

***Psidium guajava***

Guava, scientifically known as *Psidium guajava*, has a long history of traditional medicinal use in tropical countries, including Indonesia. *P. guajava* is a plant belonging to the *Myrtaceae* family that can be used as an anti-inflammatory, analgesic, anti-diabetic, anti-hypertensive, anti-microbial, antioxidant, antibacterial, and antitumor drug.<sup>[20, 21]</sup> Administration of *P. guajava* at doses of 50, 100, 200, and 400 mg/kg was reported to have significant anti-diarrheal activity in mice induced by castor oil by inhibiting all parameters of diarrhea, namely, onset, frequency, and severity of diarrhea, number of wet stools, and weight of wet feces.<sup>[22]</sup>

***Moringa oleifera***

*Moringa oleifera* is a plant belonging to the *Moringaceae* family that is traditionally used as anti-asthmatic, anti-diabetic, hepatoprotective, anti-inflammatory, anti-fertility, anti-cancer, antimicrobial, antioxidant, cardiovascular, anti-ulcer, central nervous system activity, anti-allergy, wound healing, analgesic, and antipyretic.<sup>[23]</sup> Administration of *M. oleifera* at doses of 150 and 300 mg/kg was reported to have significant anti-diarrheal activity in mice induced by castor oil by delaying the onset of profuse diarrhea, reducing the frequency of diarrhea, reducing the weight of wet feces, and reducing the total weight of feces.<sup>[24]</sup>

***Camellia sinensis***

*Camellia sinensis*, a plant belonging to the *Theaceae* family, predominantly grows in tropical and subtropical regions.<sup>[25]</sup> This plant has been attributed with antioxidant, anti-inflammatory, anti-cancer, cholesterol-lowering, and cardiovascular protective properties.<sup>[26, 27]</sup> Previous studies have identified flavanol compounds, including glycosyl derivatives of flavonols (e.g., epigallocatechin gallate), flavonols, and theflavin and

thearubigin, as the primary bioactive constituents in the leaves of *C. sinensis*.<sup>[28, 29]</sup> According to a study by Besra et al., giving mice castor oil-induced diarrhea *C. sinensis* at concentrations of 1.5%, 3%, and 6% made their diarrhea go away.<sup>[30]</sup> These effects were achieved by reducing intraluminal water accumulation and upper gastrointestinal transit. In a randomized single-blind clinical trial, pediatric patients suffering from acute nonbacterial diarrhea who received tablets containing 500 mg of black tea experienced a reduction in defecation frequency, volume, and consistency.<sup>[31]</sup>

***Annona muricata***

*Annona muricata* (*Annonaceae*) is a tropical plant species known for its edible fruit which has several medicinal properties. Traditional uses of *A. muricata* have been identified in tropical areas to treat various diseases such as fever, pain, respiratory and skin diseases, internal and external parasites, bacterial infections, hypertension, inflammation, diabetes and cancer. More than 200 chemical compounds have been identified and isolated from this plant; the most important are alkaloids, phenol, and acetogenin.<sup>[32]</sup> In addition, many studies have reported the therapeutic effects of *A. muricata*, such as anti-tumor, anti-worm, anti-fungal, antibacterial, hypotensive, anti-viral and anti-inflammatory effects.<sup>[33]</sup> Administration of *A. muricata* at doses of 100, 200, and 400 mg/kg was reported to have significant anti-diarrheal activity in mice induced by castor oil by delaying the onset of profuse diarrhea, preventing intestinal motility and hydroelectrolytic secretion.<sup>[34]</sup>

***Myrtus communis***

*Myrtus communis* is a plant belonging to the *Myrtaceae* family that is traditionally used as a medicinal herb throughout the world. A large number of components have been isolated from this plant, including polyphenols, myrtucommulone, semimyrtucommulone, 1,8-cineole,  $\alpha$ -pinene, myrtenyl acetate, limonene, linalool, and  $\alpha$ -terpinolene. This plant is traditionally used for treatments such as diarrhea, stomach ulcers, hemorrhoids, inflammation, lung, and skin diseases. In addition, many studies have reported the therapeutic effects of *M. communis* as antioxidant, anticancer, anti-inflammatory, diabetes activity, antiviral, antibacterial, antifungal, hepatoprotective, and neuroprotective.<sup>[35]</sup> Sisay et al., reported that *M. communis* administration at doses of 100, 200, and 400 mg/kg significantly delayed the onset of diarrhea and reduced the amount and volume of wet feces produced by mice induced by castor oil, demonstrating its anti-diarrheal activity.<sup>[5]</sup>

**CONCLUSION**

Indonesia is a country that has various types of medicinal plants that have potential properties to be developed as alternative medicines for treating diarrhea. Empirical and scientific evidence supports the use of these plants as anti-diarrheals. This cannot be separated from the active compounds contained in these plants, which have anti-

diarrheal properties with different working mechanisms. It is expected that research on medicinal plants can be used to improve the treatment of diarrhea and to replace anti-diarrheal drugs, which currently have many adverse side effects.

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