



ZIBELINE INTERNATIONAL™
PUBLISHING
ISSN: 2521-5051 (Print)
ISSN: 2521-506X (Online)
CODEN: ASMCCQ



REVIEW ARTICLE

BIOACTIVITIES OF *GUETTARDA SPECIOSA* L. EXTRACTS

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ARTICLE DETAILS

Article History:

Received 28 December 2020
Accepted 02 February 2021
Available online 29 March 2021

ABSTRACT

Guettarda speciosa L. is a tree of the *Rubiaceae* family. *G. speciosa* has been used to treat diarrhea, abscesses, wounds, epilepsy, and malaria in ethnomedicinal systems. So far, there is no systematic review for the bioactivities of *G. speciosa*. Therefore, the purpose of this minireview is to analyze, summarize and document the reported bioactivities of *G. speciosa*. Major electronic databases (Web of Science, Scopus, ScienceDirect, PubMed, and Semantic Scholar) were used to identify related studies from 1900 to January 2021. So far, *in vivo* and *in vitro* scientific data are available for the bioactivities of this plant species. Studies have reported that *G. speciosa* contains antidiarrheal, antiepileptic, anti-inflammatory, anti-ulcer, antimalarial, antineurodegenerative, and antioxidant activities. Furthermore, no bioactive compound of *G. speciosa* has been isolated. This work will be useful for researchers interested in bioactivity and phytochemical researches.

KEYWORDS

Guettarda speciosa, *Rubiaceae*, *Jasminum hirsutum*, bioactivities, Sri Lanka.

1. INTRODUCTION

Guettarda speciosa L. [synonyms: *Jasminum hirsutum* (L.) Willd.; *Mogorium hirsutum* (L.) Poir.; *Nyctanthes hirsuta* L.; *Cadamba jasminiflora* Sonn.; *Gardenia speciosa* (L.) Roxb. ex Wight & Arn.; *Guettarda speciosa* var. *glabrata* DC.; *Guettarda tahitensis* Nadeaud; and *Matthiola speciosa* (L.) Kuntze] is a small tree that belongs to the *Rubiaceae* family. *G. speciosa* is usually found in tidal forests and it is native to Asia (Sri Lanka, India, Bangladesh, Malaysia, China, Indonesia, Malaya, Maldives, Philippines, Taiwan, Thailand, Vietnam, Chagos Archipelago, and Japan), Africa (Kenya, South Africa, Madagascar, Mozambique, Seychelles, and Tanzania), Oceania (Christmas Islands, Cocos (Keeling) Island, Cook Island, Fiji, Australia, Papua New Guinea, Micronesia, Kiribati, French Polynesia, Nauru, New Caledonia, Niue, Pitcairn Island, Samoa, Society Island, Solomon Island, New Zealand, Tonga, Tuamotu, Tubuai Island, Tuvalu, Vanuatu, and Wallis-Futuna Island), and North America (Phoenix Island) (Kew Science, 2020; Khare, 2007).

G. speciosa is called பண்ணீர் (Panneer) in Tamil and its flower extract is used as rose water in Saiva rituals in Sri Lanka (Khare, 2007) as well as a deodorant (Clarke and Thaman, 1993). Furthermore, the flowers are utilized as a scent for coconut oil and to prepare garlands. The flower essential oil serves as a scent. Its leaves are used for making expendable

plates, lavatory paper, and infant shower material. Also, black hair dye is gained from leaves. Its bark is used as firewood, to make a fishing pole, spear, handle, steering paddle, trap, bowl, and needle, in construction (Clarke and Thaman, 1993). Apart from these uses, bark, leaves, flowers, and fruits are utilized in ethnomedicines (Clarke and Thaman, 1993). The bark is used in the treatment of diarrhea, abscesses, and wounds (Khare, 2007). *G. speciosa* also used in the treatment of fever, epilepsy, headache, cold, cough, sore throat, infection, malaria, aches, and conjunctivitis (Gandhimathi et al., 2009; Kaou et al., 2008; Weiner, 1989, 1971; World Health Organization, 1998). Compounds such as strictosidine, sweroside, loganin, β -sitosterol, sickeningine, 5-caffeoylquinic acid, rotundic acid, 4,5-dicaffeoylquinic acid, and quinovic acid have been isolated from leaf methanol extract (Tan et al., 2019).

Till date, there is no systematic review available summarizing bioactivities of *G. speciosa*. Hence, this minireview article aims to analyze, summarize, and document the reported bioactivities of *G. speciosa* and would be helpful for the researchers who are interested in bioactivity and phytochemical researches. Major electronic databases (Web of Science, Scopus, ScienceDirect, and Semantic Scholar) were used to identify the related articles from 1900 to January 2021. Accepted scientific name (*Guettarda speciosa*) and synonyms (*Jasminum hirsutum*, *Mogorium hirsutum*, *Nyctanthes hirsute*, *Cadamba jasminiflora*, *Gardenia speciosa*,

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DOI:

10.26480/asm.01.2021.20.22

Guettarda speciosa var. *glabrata*, *Guettarda tahitensis*, and *Matthiola speciosa*) were used as search terms.

2. REPORTED BIOACTIVITIES OF *G. SPECIOSA*

Details of reported bioactivities of *G. speciosa* are listed in Table 1. So far, *in vivo* and *in vitro* scientific evidence available for bioactivities of this plant species. Anyway, more *in vivo* scientific evidence is available for bioactivities studies. Investigations reported that *G. speciosa* exhibited antidiarrheal, antiepileptic, antiinflammatory, antiulcer, antimalarial, antineurodegenerative, and antioxidant activities (Arumugam et al., 2009; Gandhimathi et al., 2009; Kaou et al., 2008; Kim et al., 2020; Kumar and Gandhimathi, 2010, 2009; Le et al., 2018; Revathi and Rajeswari, 2015; Sunil et al., 2010; Tan et al., 2019). More investigations have been conducted to study both antiepileptic and antiinflammatory activities.

Various parts like leaf, flower, and bark have been used in the investigations and leaf has been used in a greater number of investigations. Solvents including ethanol, methanol, chloroform, dichloromethane, water, acetone, and petroleum ether were used to prepare the extracts of which ethanol extracts showed the majority of the reported bioactivities. Reported antiepileptic, antiinflammatory, antiulcer, and antimalarial studies provide scientific evidence for ethnomedicinal uses to treat disorders such as diarrhea, abscesses, wounds, epilepsy, sore throat, malaria, and aches. Furthermore, no bioactive compound has been isolated from *G. speciosa*. Therefore, more bioactivity and phytochemical investigations should be conducted to generate more scientific evidence and to identify the bioactive compounds from this plant species. A toxicity study revealed that there was no death observed when the methanol extract prepared using leaves was orally administered to rats at a daily dose of 2000 mg/kg for 14 days (Tan et al., 2019).

Table 1: Reported bioactivities of *G. speciosa*

Level of scientific evidence	Bioactivity	Part used	Extract / compound	Assay / model	Dose / concentration	Reference
<i>In vivo</i>	Anti-diarrheal	Bark	Ethanol (90%)	Castor oil-induced-diarrhea	200 mg/kg	(Gandhimathi et al., 2009)
<i>In vivo</i>	Anti-epileptic	Bark	Ethanol	Maximal electroshock-induced seizure, Pentylentetrazol-induced seizure	200 mg/kg	(Kumar and Gandhimathi, 2010)
<i>In vivo</i>	Anti-epileptic	Bark	Ethanol (95%)	Maximal electroshock-induced seizure, Pentylentetrazol-induced seizure	200 mg/kg	(Arumugam et al., 2009)
<i>In vivo</i>	Anti-epileptic	NS	Ethanol (95%)	Maximal electroshock-induced seizure, Pentylentetrazol-induced seizure	200 mg/kg	(Kumar and Gandhimathi, 2009)
<i>In vivo</i>	Anti-inflammatory	Leaf, stem	Methanol	Acute lung injury	1 mg/kg	(Kim et al., 2020)
<i>In vivo</i>	Anti-ulcer	Leaf	Ethanol	Pyloric ligation-induced gastric ulcer	200 mg/kg	(Sunil et al., 2010)
<i>In vitro</i>	Anti-inflammatory	NS	Methanol	Murine macrophage	300 µg/ml	(Le et al., 2018)
<i>In vitro</i>	Anti-inflammatory	Leaf	Chloroform	Cyclooxygenase-1	3.56 µg/ml (IC ₅₀)	(Tan et al., 2019)
		Leaf	Methanol	Cyclooxygenase-1	4.98 µg/ml (IC ₅₀)	
<i>In vitro</i>	Anti-malarial	Flower	Dichloromethane, Methanol, Methanol (50%), Water	<i>Plasmodium falciparum</i>	> 50 µg/ml (IC ₅₀)	(Kaou et al., 2008)
<i>In vitro</i>	Anti-neurodegenerative	Leaf	Chloroform, Methanol	Thioflavin T	50 µg/ml	(Tan et al., 2019)
<i>In vitro</i>	Anti-oxidant	Leaf	Acetone	NO radical scavenging	284.37 µg/ml (IC ₅₀)	(Revathi and Rajeswari, 2015)
		Leaf	Chloroform	NO radical scavenging	319.17 µg/ml (IC ₅₀)	
		Leaf	Ethanol	NO radical scavenging	343.89 µg/ml (IC ₅₀)	
		Leaf	Petroleum ether	NO radical scavenging	342.88 µg/ml (IC ₅₀)	
		Leaf	Water	NO radical scavenging	77.22 µg/ml (IC ₅₀)	

Abbreviations:

NS: Not stated; IC₅₀: Half maximal inhibitory concentration; NO: Nitric oxide

3. CONCLUSION

G. speciosa is used to treat a range of disorders in ethnomedicines and at the moment some of these ethnomedicinal uses have scientific evidence. Anyhow, more investigations should be conducted to provide more scientific evidence. This work evaluated, recapped, and documented the reported bioactivities of *G. speciosa* and this work will be convenient for researchers to conduct further bioactivity and phytochemical researches.

ACKNOWLEDGEMENT

The authors are grateful to their families and relatives for their vital support to complete this work.

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