Pharmacognostical, biochemical activities and zootechnical applications of *Psidium guajava* (Myrtaceae), plant with high médicinale value in tropical and subtropical parts of the World: A review

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Abstract

In the search for new molecules capable of treating intestinal parasitosis with less risk in the short, medium and long term, the potential of medicinal plants is explored. *Psidium guajava* is plant used traditional medicine to treat gastrointestinal disorders and intestinal parasitosis. According to the synthesis of reviews presented here, very few studies have been devoted to the evaluation of anthelmintic activities of *Psidium guajava*. *Psidium guajava* has secondary metabolisms responsible for its demonstrated biological activities and reported medicinal uses. The leaves and fruits of *Psidium guajava* contain essential oils that know a great variation in the content of compounds. Geographic and edaphic conditions, and genetic factors are factors that influence the composition of essential oils. The direct consequence is the observation of several chemotypes of essential oils of *Psidium guajava*. Further studies are important to demonstrate the efficacy of *Psidium guajava* in the treatment of intestinal parasitosis.

Keywords: Anthelmintics, bibliographical review, essential oils, intestinal parasitoids, *Psidium guajava*

Introduction

Intestinal parasitosis is a real health problem in both veterinary and human medicine [1, 2]. In small ruminants, they cause production loss while threatening food security [2, 3]. In humans, they contribute to the perpetuation of poverty by compromising the physical and intellectual development of children and reducing the work capacity and productivity of adults [4]. In general, the treatment of these intestinal parasitoses relies on the administration of synthetic drugs (including anthelmintics). However, these drugs have more and more limitations related to side effects and reported parasite resistances [5-7]. It is then convenient to search for new substances, effective, accessible, without toxicity and with a wide spectrum of action, to face these parasitoses and medicinal plants are a great asset. The aim of this work is to make a bibliographic synthesis of the uses, compositions, biological activities of *Psidium guajava* species for a better exploitation in the treatment of human and small ruminant intestinal parasitosis.

Material and method

The material consists of published scientific journals. The collection of these articles was done in the Google scholar engine. The articles are selected according to their relevance to the subject.

Results and discussion

Generalities

*Psidium guajava* is a plant in the Myrtaceae family is a 6-9m tall tree cultivated for its nutritional and mineral values [8, 9]. The leaves are opposite, the flowers are branch colored, and the fruits are small, 3-6 cm long, pear-shaped, and reddish-yellow in color when ripe. The fruit is a berry containing many seeds [8, 10]. *Psidium guajava* is used in tropical and subtropical countries as food and for its medicinal values [11, 12].
Indeed, in traditional medicine, it is used in the treatment of dysentery, diarrhea vomiting, rheumatism, diabetes, and gastroenteritis, pulmonary problems, to cure wounds, ulcer, rheumatism and intestinal parasitosis \cite{13-16}. Phytochemical analyses of the plant reported the presence of the secondary metabolites flavonoids, catechic tannins, saponosides, leucoanthocyanins, anthocyanins, reducing compounds, mucilages, sterols and terpenes \cite{17-19}. Differences in chemical composition may exist. They can be explained by the geographical origin, the nature of the soil, the mode of extraction, the type of organ collected \cite{18}. Psidium guajava fruits are very rich in fiber, vitamin (C and A), minerals such as Potassium (P), Copper and Manganese \cite{8,19}.

**Volatile compounds**

The essential oil of *Psidium guajava* has been widely studied in the world \cite{20}. In Benin, the analysis of the essential oils of *Psidium guajava* leaves was carried out by \cite{21,22}, the major compounds are β-caryophyllene, epi-β-bisabolol, Limonene, β-curcumene, ar-curcumene, β-bisabolene.

**Figure 1**: Majority of compounds identified in the essential oils of *Psidium guajava* leaves collected in Benin

![Figure 1](image_url)

**Table 1**: Non-exhaustive list of the main compounds of the essential oils of *Psidium guajava* identified in different countries of the world

<table>
<thead>
<tr>
<th>Country</th>
<th>Parts</th>
<th>Majority compound</th>
<th>Most represented class</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benin \cite{21}</td>
<td>Leaf</td>
<td>limonene, β-bisabolone, epi-β-bisabolol, (2E,6E)farnesol, β-bisabolene, 1,8-cineole, sabine, β-caryophyllene, (Z)β-ocimene</td>
<td>Majoritary compounds depend on the sampling stations</td>
<td></td>
</tr>
<tr>
<td>Benin \cite{22}</td>
<td>Leaf</td>
<td>β-bisabolone, ar-curcumene, βbisabolol</td>
<td>Sesquiterpenes, Hydrocarbon compound, Hydrocarbon sesquiterpenes</td>
<td></td>
</tr>
<tr>
<td>Brazil \cite{25}</td>
<td>Leaf</td>
<td>β-caryophyllene, α-humulene, aromadendrene oxide, δ-selinene, selin-11-en-4α-ol</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Egypt \cite{9}</td>
<td>D-Limonene, α-Pinene</td>
<td>Monoterpene hydrocarbons, Sesquiterpene hydrocarbons</td>
<td>the majority compounds depend on the variety of the tree</td>
<td></td>
</tr>
</tbody>
</table>
The most represented compound classes are sesquiterpenes and hydrocarbon compounds [23]. These results corroborate the observations of [20] that essential oils obtained from Psidium species are rich in mono- and sesquiterpenic compounds. The promoter of monoterpenes is geranyl pyrophosphate (C10) and that of sesquiterpenes is farnesyl pyrophosphate [20]. The analysis of Table I, shows that Psidium guajava essential oils have several chemotypes [14].

### Biological activities

Several authors have contributed to synthesize (literature review) the traditional uses, biological properties and chemical compounds present in Psidium guajava plant [11, 12, 33]. Biological properties: antibacterial, antifungal, antioxidant, antidiarrheal, antidiabetic, antiinflammatory, cardioprotective, anticancer and lycidical effects have been reported as a result of bioassays [12, 19, 34-36]. These reviews provide a general overview of the studies that have been conducted on the species. It is apparent that Psidium guajava has been widely studied for its antibacterial, antifungal, antioxidant properties, but very little for its antiparasitic activities especially anthelmintic. The numerous studies on the evaluation of antimicrobial activities of Psidium guajava have shown its potential in food preservation [37, 38], in the treatment of infectious and parasitic diseases [15, 18, 27], in the treatment of tooth decay [17] the treatment of gastrointestinal disorders [99, 25]. The microorganisms Staphylococcus aureus, Pseudomonas aeruginosa, Escherichia coli, Salmonella typhi, Vibrio cholerae have been identified as responsible for gastrointestinal [199]. Gastrointestinal disorders are not only due to bacterial and or fungal infections. These observations are consistent with those of [40-42] who demonstrated the antidiarrheal potential of Psidium guajava. Gastrointestinal disorders (vomiting, diarrhea) are also manifestations of intestinal parasitosis.

### Anthelmintic activity

Very few authors have studied the anthelmintic activity of Psidium guajava [43-47]. The common methods used for in vitro evaluation of anthelmintic activity of plant extracts are: egg hatch test, adult worm mobility test, and larval migration inhibition test. The helminths used are Haemonchus contortus nematode of small ruminants [44, 47] and Phaeritima posthumina study model of human helminthes [43]. According to the results of [47], hydroalcoholic extracts of Psidium guajava stem barks act much more on the eggs by preventing their hatching. This has the advantage of suspending the life cycle of the parasite and limiting reinfections and contaminations of the pasture. These observations corroborate those of [48] who showed that Psidium guajava extracts can also cause paralysis of adult worms. The results obtained from these studies justify the use of Psidium guajava in the treatment of intestinal parasitosis of humans and small ruminants. The leaves could also be used as a food supplement as sources of tannins and those for the reinforcement of biological parameters in the fight against gastrointestinal parasitosis of small ruminants [38].

<table>
<thead>
<tr>
<th>Country</th>
<th>Plant Part</th>
<th>Main Compounds</th>
<th>Anthelmintic Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egypt</td>
<td>Leaf</td>
<td>β-Caryophyllene, Globulol</td>
<td>Oxygenated sesquiterpenes</td>
</tr>
<tr>
<td>Egypt</td>
<td>Fruits</td>
<td>β-Caryophyllene limonene</td>
<td></td>
</tr>
<tr>
<td>Mexico</td>
<td>Leaves</td>
<td>β-Caryophyllene, Eugenol</td>
<td></td>
</tr>
<tr>
<td>Nepal</td>
<td>Leaves</td>
<td>(E)-nerolidol, (E)-caryophyllene</td>
<td></td>
</tr>
<tr>
<td>Egypt</td>
<td>Leaves</td>
<td>α-phellandrene, eucalyptol, α-terpinene, spathulanol, caryophyllene, dihydrocarveol acetate, nerolidol, caryophyllene oxide</td>
<td>Oxygenated monoterpenes, Oxygenated sesquiterpene hydrocarbons, the majority compounds depend on the variety of the tree</td>
</tr>
<tr>
<td>Pakistan</td>
<td>Leave</td>
<td>isocaryophyllene, veridiflorene, farnesene</td>
<td>Sesquiterpene hydrocarbon</td>
</tr>
<tr>
<td>Oman</td>
<td>Leave</td>
<td>β-Caryophyllene, Limonene, α- Pinene</td>
<td>Sesquiterpene hydrocarbon</td>
</tr>
<tr>
<td>Pakistan</td>
<td>Leave</td>
<td>α-terpinyl acetate, trans-caryophyllene nerolidol</td>
<td>Sesquiterpene hydrocarbon</td>
</tr>
<tr>
<td>Nakhon</td>
<td>Leave</td>
<td>Limonene, α- Pinene</td>
<td></td>
</tr>
<tr>
<td>Alexandria</td>
<td>Leave</td>
<td>(E)-caryophyllene, (E)-nerolidol</td>
<td></td>
</tr>
<tr>
<td>Brazil</td>
<td>Leave</td>
<td>β-Caryophyllene, β-Caryophyllene, β-Selinene, α-Selinol</td>
<td>Sesquiterpene hydrocarbon</td>
</tr>
</tbody>
</table>
activities of *Psidium guajava*, previous results have demonstrated its potential in the treatment of gastrointestinal disorders. Further studies are needed for proper use of *Psidium guajava* in the control of gastrointestinal nematodes of small ruminants and humans.

**Références**


