



Psiloxylon mauritianum (Bouton ex Hook.f.) Baillon (*Myrtaceae*): A promising traditional medicinal plant from the Mascarene Islands

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ABSTRACT

Psiloxylon mauritianum (PM) (Bouton ex Hook.f.) Baillon (*Myrtaceae*) is an evergreen endemic medicinal plant which has shown promising uses in traditional medicine from the Mascarene Islands (Mauritius and Réunion Islands). Folk use of this endemic plant in Mauritius and Réunion Islands has been geared toward the treatment and management of amenorrhea, dysentery and Type II diabetes mellitus. Recent findings from *in vitro* studies have led to the discovery of two potent acids namely corosolic acid and asiatic acid which have been shown to bear most inhibitory activities against *Staphylococcus aureus*. Such findings tend to appraise the therapeutic potential of this medicinal plant against infectious diseases. The present monograph has tried to establish the botanical description, traditional uses and the main constituents identified from PM (Bouton ex Hook.f.) Baillon. The limited documentation of *in vitro* assays of this plant demonstrates an urgent need for extensive research in order to validate other traditional uses and hence open new avenues for drug development.

KEY WORDS: Antimicrobial, medicinal plant, *Psiloxylon mauritianum*, *Staphylococcus aureus*

GENERAL INFORMATION

Psiloxylon mauritianum (PM) (Bouton ex Hook.f.) Baillon demarcates itself in the natural flora of the islands of Mauritius and Réunion as a rare endemic whilst also being indigenous to the Mascarene region in the Western Indian Ocean [Figure 1]. This species can be found on some of the mountains like Le Pouce and Deux Mamelles but can also be seen at piton, Grand Bassin, Trou Kanaka, Mon Vert and “Cascade 500 pieds” in Mauritius [1-3]. The endemic evergreen flowering plant which was formerly placed in the family Psiloxylaceae [4], now belongs to the *Myrtaceae* family [5] and has, fortunately, not been identified as being a critically threatened species in the Mascarene regions [2].

The genus name is composed of the Greek words “psiloneked, glabrous, bare” and “xylon-wood” while the epithet “*mauritianum*” is derived from the name of the island Mauritius [3]. Common vernacular names include Bois Bigaignon or Bigaignon rouge in Mauritius and Bois de gouyave marron or Bois de pêche marron or Bois à grater in Réunion Island [2]. The vernacular name “bois a grater” has been attributed following the itching sensation arising from the dust of the crumbled bark [3].

BOTANICAL DESCRIPTION

PM is a small dioecious glabrous flowering plant of up to 10 m height assisted by a pale grey or white bark [2,6]. The stratified cork of the bark features anatomically crystalliferous wood fibers, a characteristic which is totally at odds with all *Myrtaceae* despite the fact that this family usually harbors poorly known wood [7]. The branches are relatively smooth and pinkish, while the petiole which is reddish on young leaves reaches a maximum length of 6 mm [3]. This evergreen plant bears simple, oblong and entire leaves which are spirally arranged [Figure 2]. Moreover, the coriaceous leaves with myrtaceous leaf venation, lack essential oils despite being lamina gland-dotted [1,2,6]. Inflorescence occurs as fascicles of three-seven flores which are scented and yellowish white in color, with calyx 5-6 mm in diameter, petals spreading and waxy [2,3]. Interestingly, each staminate flower bears 10-12 stamens in diplostemonous arrangement coupled with a non-functional gynoeceum, while each pistillate flower usually contain the same number of sterile stamens (lacking pollen) as the staminate flower but having a normal trilocular gynoeceum [7]. Furthermore, the short style and divided stigma of PM remains appealing organographic features which can hardly be compared to the normal features of most *Myrtaceae* [7]. Fruits are thin walled, 3-locular green berries crowned by



Figure 1: Mascarene Islands in the Western Indian Ocean

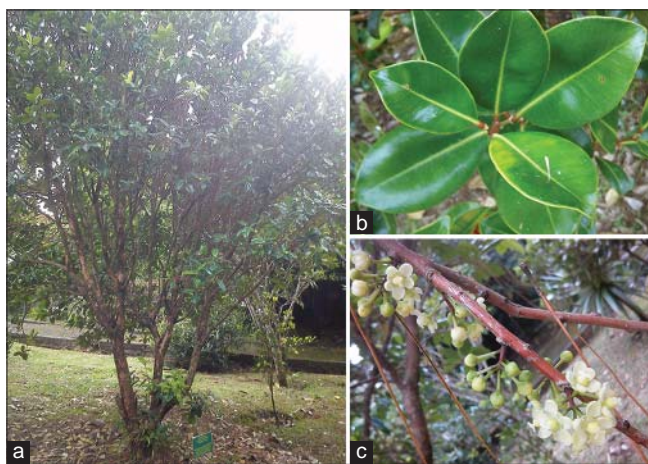


Figure 2: *Psiloxylon mauritianum*, (a) Whole plant, (b) Matured leaves and (c) Flowers and buds

persistent stigmas and appearing white upon maturation, while seeds with a scalariform-reticulate testa (lacking wings), straight embryo, flat cotyledons occur in large numbers [1-3].

ETHNOPHARMACOLOGICAL USES

PM has been extensively used in folk medicine among the local people of the Mascarene Islands in the Indian Ocean. Earlier clinical studies revealed the diuretic, antispasmodic and antiseptic properties of Bois de pêche marron [8]. A decoction of the leaves, taken in a cup twice daily has been reported to be used for Type II diabetes mellitus in Mauritius [9]. On the other hand, the twice-daily consumption of a cup of the decoction

prepared from seven leaves of the plant, reinforced with the gizzard of a chicken and sweetened with some sugar is widely known to be useful against dysentery. Other folk data suggest its use in the treatment and management of common infectious diseases. In addition, the use of the wood decoction of PM in the treatment of amenorrhea and dysentery has been interestingly thrust into prominence among the local people [3,10]. In Réunion Island, the leaves were reported to be traditionally used to decrease the formation of uric acid in the body associated with gout as well as to help in the elimination of excess cholesterol from the body [11,12]. The folk people of Réunion Island also make use of the plant as an astringent [10]. Furthermore, a decoction of the barks of PM is still used against diarrhea [12]. A recent preliminary bio-guided assay fractionation performed on this species led to the discovery of two molecules which tend to appraise the folk use of PM as an antimicrobial [6] [Figure 3].

BIOLOGICAL ACTIVITIES OF SELECTED CONSTITUENTS

Preliminary phytochemical screening of the leaves indicate the presence of flavones, flavanes, flavonoids, phenols, terpenes and tannins [3,13,14]. The bacteriostatic properties of this endemic plant of Mauritius, documented from its traditional use, can be attributed to the presence of the high amount of triterpenoids identified as asiatic acid and corosolic acid [3,6] [Figure 4]. Interestingly, this can be compared to the isolation of tripenoid acids from the ethyl acetate and *n*-butanolic extracts of the leaves of *Syzygium guineense*, a plant from the *Myrtaceae* family in Cameroon, which was reported to exhibit potent antibacterial activity against various bacteria [15].

The biological activities of asiatic acid and corosolic acid were dependent upon the position of different substituent groups on the pentacyclic triterpinoid skeleton. The antimicrobial property of the compounds was related to the hydroxyl group at position 23 which when absent resulted in the loss of activity [6]. Asiatic acid and corosolic acid isolated from the ethyl acetate, and *n*-butanol extracts of the leaves of *S. guineense* (*Myrtaceae*) demonstrated potent antibacterial activities against *Escherichia coli*, *Bacillus subtilis* and *Shigella sonnei* whereas those isolated from the methanolic extracts of *Symplocos lancifolia* had anti-staphylococcal activity [15,16]. Asiatic acid isolated from extracts of *Syzygium claviflorum* was further identified as anti-HIV agent thus validating the broad spectrum of activities of asiatic acid isolated from the *Myrtaceae* family [15]. Likewise, the antimicrobial activities of asiatic acid and corosolic acid isolated from PM justify its use in the local folklore pharmacopeia as an anti-infective agent [14]. Crude acetone extracts of the leaves of PM had an inhibitory effect on gram-negative bacteria *Enterococcus faecalis*, *Staphylococcus aureus*, *E. coli* and *Pseudomonas aeruginosa* revealing the strong antibacterial activity of the extracts [6].

RECENT FINDINGS

Rangasamy *et al.* [6] have recently investigated into crude acetone extracts and isolated constituents of leaves of PM for



Figure 3: *Psiloxylon mauritianum*, (a) Branchlet with flower buds, (b) Fruiting branchlet, (c) Flower bud, (d) Male flower, (e) Female flower, (f) Ovary sectioned, (g) Fruit sectioned, (h) Seed, (i) Embryo

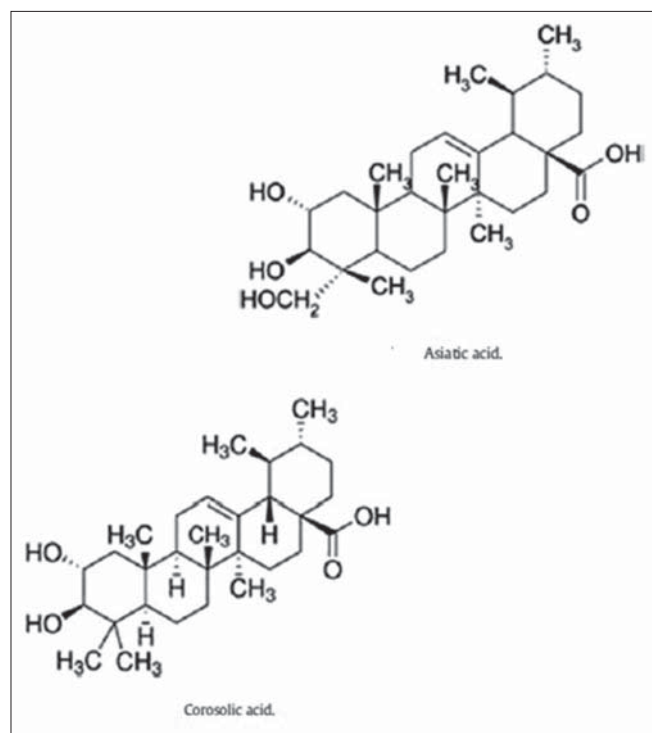


Figure 4: Asiatic acid and corosolic acid (adapted and modified from [6])

their antimicrobial, particularly, anti-staphylococcal activity, antioxidant properties and their potential cytotoxicity on Chinese hamster ovary (CHO) cells. PM was distinctly

active against *S. aureus* (minimum inhibitory concentration [MIC] $\leq 51 \mu\text{g/ml}$), *P. aeruginosa* (MIC $\leq 410 \mu\text{g/ml}$) and *E. coli* (MIC $810 \mu\text{g/ml}$) and was thus selected for bioassay guided fractionation among many other endemic plants [6]. PM was found to be the most markedly anti-staphylococcal plant both in terms of lowest MIC ($\leq 19 \mu\text{g/ml}$) recorded for its preliminary fractions and the highest number of intrinsic *S. aureus* growth inhibiting compounds revealed via bioautography [14]. The plant was found to possess no activity against *Candida albicans* and *Apergillus niger*. The PM crude acetone extracts exhibited dose-dependent radical scavenging activity in various antioxidant assays. Acetone leaf extract with an $\text{IC}_{50} = 13.5 \pm 1.1 \mu\text{g/ml}$, demonstrated efficient 2,2-diphenyl-1-picrylhydrazyl radical scavenging activity which was significantly ($P < 0.05$) higher with respect to the control ascorbic acid ($\text{IC}_{50} = 8.3 \pm 0.3 \mu\text{g/ml}$) and lower when α -tocopherol ($\text{IC}_{50} = 18.2 \pm 4.3$) was used as control. Furthermore, the crude extract was markedly more effective at scavenging hypochlorous (HOCl) acid and hydroxyl radical than vitamin C. As a consequent, a solution of $500 \mu\text{g/ml}$ of the crude acetone extract of PM was found to be able to scavenge 97.0% of the total HOCl present in the reaction mixture as compared to only 49.5% for the same concentration of ascorbic acid ($P < 0.05$) [6,14]. On the other hand, the extract had a weak ferric reducing ability (3.9 ± 0.2 Trolox equivalent $\mu\text{m/g}$ fresh plant) and low total phenolic content (14.9 ± 0.9 mg gallic acid equivalent/g dried plant). Cytotoxicity assays on CHO-wild type cells performed on different crude extracts and fractions, revealed the different samples to be moderately cytotoxic when compared to the reference standard cycloheximide, for which a solution of $0.41 \pm 0.07 \mu\text{g/ml}$ was found to kill 50% of the CHO cells [6].

CONCLUSIONS

This monograph has endeavored to project some of the medicinal properties of the endemic plant PM, which has been documented in the traditional Mauritian pharmacopoeia as a plant having promising antimicrobial, antidiabetic and curative properties for the treatment of dysentery and amenorrhea. Preliminary study has evaluated the presence of corosolic acid and asiatic acid which appraise the folk uses of the plant as anti-infective. However, further research is required to explore and validate the therapeutic potential of the endemic plant with respect to new phytochemicals as lead molecules or new possible pharmacological effects of isolated molecules.

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