

# Phytoconstituents of Genus *Micromelum* and Their Bioactivity—a Review

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## Abstract

The genus *Micromelum* belongs to the Rutaceae family. As its rich bioactive constituents its stems, flowers, leaves, and roots have been used in traditional medicine, for the treatment of various diseases from ancient time. Phytochemically, many bioactive compounds, including coumarins, polyoxygenated flavonoids, phenylpropanoic acid derivatives, quinolone alkaloids, and also carbazole alkaloids, have been reported as secondary metabolites of the *Micromelum* spp. including many new compounds. Therefore, *Micromelum* spp. are considered potential for drug leads. In this article, we present an overview of secondary metabolites isolated from genus *Micromelum* and their bioactivities that have been reported between 1982 and 2019.

## Keywords

*Micromelum*, Rutaceae, coumarins, flavonoids, quinolone and carbazole alkaloids

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## Introduction to Chemical Constituents of Genus *Micromelum* and Their Bioactivity

*Micromelum* spp. (Rutaceae) consist of 9 species found mostly in Samoa, Fiji, and Tonga islands, Australia, Southeast Asia, southern China, Ceylon, northeastern India, and West Pakistan.<sup>1,2</sup> *Micromelum* spp. are known for being rich in coumarins such as the 6- and 8-prenylated coumarins. In addition, the carbazole alkaloids, dihydrocinnamic acid derivatives, and flavonoids have been isolated from it.<sup>3,4</sup> The leaves and stems of *Micromelum* species have been found to contain coumarins, phenylpropanoic acid derivatives, polyoxygenated flavonoids, and also alkaloids.<sup>5,6</sup> The following *Micromelum* species have been well investigated due to their pharmaceutical properties.

*M. integerrimum* is a tree that grows up to 8 m high. Its young parts have rust-colored pubescent. It usually grows in moist mountain forests, maritime thickets in sandy soil; near sea level to 2000 m and is widely distributed in China, Bhutan, Cambodia, India, Laos, Myanmar, Nepal, Thailand, and Vietnam.<sup>7</sup> *M. integerrimum* is highly diversified for its secondary metabolites, and apart from acridone and carbazole alkaloids, a variety of coumarin derivatives, especially 6,7-di and 7,8-disubstituted coumarin core structures, having at least a prenyl unit have been isolated. Naturally occurring coumarin derivatives from *Micromelum* spp. exhibit a variety of biological activities including anti-corpulence, cytotoxicity, anti-platelet, and antimutagenicity.<sup>3</sup>

*M. minutum* is a small spineless tree that can reach up to 3 m in height. It is widely distributed in Southeast Asia and in Pacific islands. The stems, flowers, leaves, and roots are used pharmaceutically for a variety of indications.<sup>8,9</sup> The plant is known to contain coumarins, some of which are active compounds showing strong cytotoxic activities. The leaves are traditionally used to treat fever and giddiness. The poultice of the boiled roots is used for ague.<sup>10</sup> In Indochina, the roasted and crushed leaves are rubbed to skin irritated by scabies and are considered to be emmenagogues.<sup>11</sup> Previous phytochemical investigations on the different parts of *M. minutum* have showed the presence of coumarins, triterpenes, alkaloids, and phenylpropanoids.<sup>12</sup>

*M. falcatum* is a tree of 1-3 m high and its leaflet blades are alternate, ovate to lanceolate, in equilateral. Flowers are ellipsoid or broad in bud. Petals are white, oblong, outside glabrous, or

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