

Review

Metabolites and Bioactivity of the Marine *Xestospongia* Sponges (Porifera, Demospongiae, Haplosclerida) of Southeast Asian Waters

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Abstract: Sponges are aquatic, spineless organisms that belong to the phylum Porifera. They come in three primary classes: Hexactinellidae, Demospongiae, and Calcarea. The Demospongiae class is the most dominant, making up over 90% of sponge species. One of the most widely studied genera within the Demospongiae class is *Xestospongia*, which is found across Southeast Asian waters. This genus is of particular interest due to the production of numerous primary and secondary metabolites with a wide range of biological potentials. In the current review, the antioxidant, anticancer, anti-inflammatory, antibacterial, antiviral, antiparasitic, and cytotoxic properties of metabolites from several varieties of Southeast Asian *Xestospongia* spp. were discussed. A total of 40 metabolites of various natures, including alkaloids, fatty acids, steroids, and quinones, were highlighted in *X. bergquistia*, *X. testudinaria*, *X. muta*, *X. exigua*, *X. ashmorica* and *X. vansoesti*. The review aimed to display the bioactivity of *Xestospongia* metabolites and their potential for use in the pharmaceutical sector. Further research is needed to fully understand their bioactivities.

Keywords: Sponge; Demospongiae; *Xestospongia*; metabolites; bioactivity; Southeast Asian waters



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1. Introduction

Sponges, aquatic animals of the phylum Porifera, have existed for millions of years as the simplest multicellular organisms. They are filter feeders and are known for their unique species diversity and morphological complexity [1,2]. Sponge species number over 8000 and are found in temperate, tropical, and polar regions, inhabiting a wide range of freshwater and marine habitats [3]. They are an important source of metabolites. More than 5300 distinct metabolites produced by sponges and the accompanying microbes are known and more than 200 novel sponge metabolites are reported each year [3]. Alkaloids, fatty acids, sterols, terpenoids, polyketones, macrolides, quinines, glucosides, and peptides are a few examples of novel metabolites that have been identified from marine sponges [4–9].

There are three primary classes of sponges: Hexactinellidae, Demospongiae, and Calcarea. The Demospongiae class is the most dominant, comprising over 90% of sponge species. The genus *Xestospongia* (Petrosiidae) is widely studied due to its various primary and secondary metabolites with various biological potentials. They are also known as “giant barrel sponges” and have a large, erect, barrel-shaped appearance with variations in height, diameter, and surface complexity among distinct species [10]. However, they can be distinguished by their unique morphological characteristics, which include a thick cortex, a large central osculum, and a porous spongin skeleton [11–13]. Their external morphology also varied from smooth to highly digitated or lamellate surfaces (Figure 1) [10,11,14,15].