

CHAPTER

2

EXTRACTION FOR STINGLESS BEE PROPOLIS

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2.1 STINGLESS BEE PROPOLIS

Propolis, often called “bee glue”, is a special substance that is widely used as natural preservative and health care products, mainly because of its remarkable pharmacological significance. It has a complex mixture of chemicals. It helps to protect beehives from threats, while providing various health benefits to mankind. Propolis is a great natural product, having a close connection between bees and humans.

Propolis, which is collected by bees from the resinous exudates of surrounding plants, serves as a versatile building material for beehives. Figure 2.1 shows a picture of a wooden beehive where propolis can be harvested along with honey and pollen. Its color ranges from light yellow to deep brown, reflecting the botanical diversity of its sources. Propolis is composed of over 300 chemical components, including a wide range of polyphenols, stilbenes, and lignans. Each of them contributes to its unique properties and pharmacological potentials (Nayak et al., 2024). The botanical origins of propolis can be identified through detailed analysis.

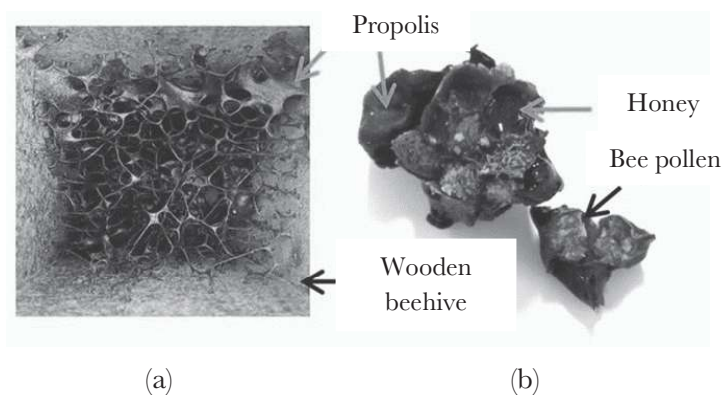


Figure 2.1 Stingless bee products and hive structure: (a) Stingless bee wooden beehive and (b) Honey, bee pollen, and propolis (Source: Amalia et al., 2020)

Studies on propolis and its chemical components are interesting and relatively challenging. A range of analytical techniques has been applied to reveal the molecular information of propolis. Researchers use various analytical tools that range from straightforward methods like ultraviolet-visible (UV-Vis) spectrophotometry and nuclear magnetic resonance (NMR) spectroscopy to advanced separation techniques such as gas chromatography (GC), high-performance thin-layer chromatography (HPTLC), high-performance liquid chromatography (HPLC), and high-performance capillary electrophoresis (HPCE). Spectrophotometric methods offer quick and reliable routine analysis, while the combination of liquid chromatography and mass spectrometry (LC-MS) has transformed the way to separate, identify, and quantify phenolic compounds simultaneously, providing insights into the pharmacological potential of this remarkable substance.

Propolis has long been recognized in traditional folk medicine. It continues to intrigue modern scientists with its remarkable pharmacological properties. Propolis is a natural treasure that is also known for its strong antibacterial, antimycotic, and antiviral activities, as well as its cytotoxic, antioxidant, anti-inflammatory, and immunomodulating effects. Scientific findings have confirmed its traditional uses, specifically

attributing to its notable antioxidant activity. This age-old wisdom about the use of propolis has triggered scientists and researchers to develop new therapeutic agents from propolis.

2.2 ANTIOXIDANT AND POLYPHENOLS IN PROPOLIS

Propolis provides a powerful source of antioxidative polyphenolic compounds, thus providing impressive pharmacological properties. Therefore, researchers are exploring new and sustainable extraction techniques to concentrate the antioxidant capacity of propolis and to fully unlock its potential. Nowadays, the antioxidant power of propolis has captured the global interest. Propolis has been widely used and formulated into various types of natural products to combat oxidative stress and protect human health.

In India, studies showed that aqueous propolis extracts exhibited strong antioxidant properties, largely due to their high polyphenol content, particularly pinocembrin and galangin (Bhargava et al., 2021). In Egypt, freeze-dried propolis extracts were known to potentially enhance their antioxidant ability, mainly attributed to their elevated polyphenol levels (Saleh et al., 2023). Additionally, in vitro studies confirmed that propolis extracts could protect liver cells from oxidative damage, reinforcing their therapeutic potential for oxidative stress-related conditions.

Portugal propolis that was collected at different seasons of the year revealed the significant influence of environmental factors on its chemical composition and antioxidant capacity. Notably, spring-harvested propolis showed a higher polyphenol content and stronger antioxidant activity than samples collected in winter (Calegari et al., 2017). The observation further provides valuable insights into propolis quality affected by seasonal variation.

2.3 EXTRACTION METHOD FOR PROPOLIS

Efficient and sustainable methods for extracting propolis have sparked the interest of researchers and led to the exploration of advanced techniques