



Positive Health Effects of Propolis on Gut System



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Abstract

Propolis, commonly known as bee glue, is a natural substance renowned for its intricate composition, which is comprised of balsamic and resin fractions, volatile compounds, fatty acids, pollen, and waxes. This review explores the relationship between propolis and gut health, identifying polyphenols, including those in propolis. Propolis-derived phenolics demonstrate the ability to inhibit pathogenic bacteria growth, suppress adhesion to gut cells and protect the gastrointestinal tract. Propolis extracts are promising as bio-products for various diseases, particularly in ulcer treatment and gastrointestinal health. Scientific studies highlight the positive effects of propolis on colitis symptoms, intestinal inflammation, gut microbiota modulation, and nutrient digestibility. Propolis extracts, characterized by polyphenols, exhibit a modulatory effect on the composition and functionality of the intestinal microbiota, suggesting potential use as a prebiotic component. In conclusion, propolis emerges as a promising natural remedy for promoting gastrointestinal well-being through its effects on gut microbiota, intestinal barrier function, and immune system stimulation. Further research is warranted to unravel the full therapeutic potential of propolis in diverse health conditions.

Keywords: Microbiota; Anti-inflammatory effects; Geographical factors; Systemic immune function; Short-chain fatty acids

Mini Review

Propolis, or bee glue, is a natural substance with a complex composition, containing balsamic and resin fractions, volatile compounds, fatty acids, pollen, and waxes. Notably, its active ingredients, including polyphenols, are primarily found in the extractable balsamic fraction, known for antioxidant, antibacterial, antimicrobial, antiviral, immunomodulatory, and anti-inflammatory effects [1]. Various types of propolis exhibit distinct characteristics, encompassing physical properties, chemical constituents, and bioactivity. With its strategic geographical position and diverse habitats characterized by varying humidity and altitude, Anatolia stands out for its remarkable floral diversity. Propolis sourced from this region uniquely capitalizes on the abundance of floral resources, leading to a heightened concentration of phenolic constituents. Anatolian propolis is predominantly derived from bees foraging on trees within the poplar family, contributing to its recognizable brown hue. This interplay of geographical factors and specific botanical sources enriches Anatolian propolis with its own set of distinctive features [2]. The investigation of optimal gut health and the characterization of gastrointestinal bacteria is a current focus, with some linking imbalances in the gut microbiota to disease states. A healthy array of intestinal microbiota releases microbial

bioactive molecules, such as short-chain fatty acids, confer health benefits [3].

Polyphenols, including those in propolis, are now considered probiotics as they are selectively metabolized by gut microbiota. Propolis polyphenols may promote optimal gut microbiota by inhibiting pathogenic bacteria growth and suppressing their adhesion to gut cells. Recent studies suggest that propolis-derived phenolics protect the gastrointestinal tract by inhibiting the growth of pathogenic bacteria such as *Clostridium spp.* and *Staphylococcus aureus*. Additionally, propolis suppresses pathogen adhesion to the intestinal wall and enhances systemic immune function, including natural killer cell activity and cytokine secretion [3]. Due to its multifaceted properties, propolis extracts hold promise as bio-products for various diseases, with a particular focus on ulcer treatment. Research suggests propolis may positively impact gastrointestinal health, especially in inflammatory and ulcerative colitis conditions. These findings underscore the potential therapeutic applications of propolis in addressing a range of health issues, making it an intriguing subject for further investigation and development [1,3].

Furthermore, propolis has been found to ameliorate symptoms of colitis, decrease intestinal inflammation, and modulate

the gut microbiota, indicating its potential as a therapeutic agent for gastrointestinal diseases [4,5]. Additionally, propolis supplementation has been associated with improved nutrient digestibility and absorption, which could contribute to its positive effects on gastrointestinal health [6]. These findings suggest that propolis may hold promise as a natural remedy for promoting gastrointestinal well-being. A scientific study determined the in vitro effects of a standardized propolis extract with polyphenols on the composition and functionality of the intestinal microbiota obtained from the fecal material of five different donors. This research revealed that propolis exhibited a modulatory effect on the composition and functionality of the intestinal microbiota in both healthy and sick participants, increasing the concentration of short-chain fatty acids. Based on the scientific data, the researchers suggested propolis could contribute to intestinal health and may be a candidate for further research, especially regarding its use as a prebiotic component [7].

On the other hand, a scientific study published in 2018 investigated the effect of Anatolian propolis on stomach ulcers. This study aimed to examine the efficiency of propolis in treating *H. pylori*. The anti-*H. pylori* and anti-urease activities of 15 different ethanolic propolis extracts were tested. The total phenolic contents and total flavonoid contents of the ethanolic propolis extracts were also measured. According to the results, all propolis extracts highly inhibited *H. pylori* 199 and reduced the activity of the *Helicobacter pylori* urease enzyme. The degree of inhibition was related to the phenolic content of the propolis extracts. In conclusion, propolis extract was found to be an efficient inhibitor that can be used in *H. pylori* treatment to improve human health [8]. While propolis has been considered as a potential nutrition source for gut bacteria, research also explores its effect on intestinal barrier function. Propolis treatment activates various signaling pathways in gut cell lines and increases colonic epithelium expression, indicating a potential strengthening of intestinal barrier function. These findings offer novel insights into the potential application of propolis in human health, especially in conditions like inflammatory and ulcerative colitis. These observed effects suggest that propolis positively impacts the health of the stomach and intestine. Studies have demonstrated that propolis can improve gut health and disease conditions such as inflammatory and ulcerative colitis. The authors suggested longer-term studies are needed on the influence of dietary polyphenols on gut microbiota [3].

Additionally, propolis has been found to decrease intestinal inflammation and modulate the gut microbiota, leading to improved colitis symptoms and colon tissue structure [4,9]. Furthermore, propolis has been shown to strengthen intestinal barrier function, potentially enhancing human gut health [10]. Another research reported that propolis positively affects the immune system, stimulating the lymphatic tissue in the digestive system and improving intestinal health, digestion, and absorption [11]. Additionally, propolis supplementation has been linked

to increased spleen percentages and improved small intestine percentages [6]. Besides, propolis has been found to have antimicrobial and antiseptic properties, stabilizing the microbiome and reducing disease load in the gut [12]. Furthermore, propolis has been associated with increased growth of beneficial bacterial species in the gut. This potential positive alteration of the gut microbiome is exemplified in a study by Amira et al. [13], where diabetic rats administered propolis extracts exhibited heightened growth of beneficial bacterial species. This outcome was linked to increased production of health-promoting bacterial metabolites, such as short-chain fatty acids, and elevated levels of tight junction proteins in the ileum, indicating a correction of gut dysbiosis. Overall, propolis has shown promise in positively impacting the health of the stomach and intestine through its effects on gut microbiota, intestinal barrier function, and immune system stimulation.

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