

Phytochemicals as a Source of Natural Antimicrobials

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Perspective Article

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ABOUT THE STUDY

Natural antimicrobials are substances derived from natural sources such as plants, animals and microorganisms, which have been found to have antimicrobial properties. These substances can be utilized as alternative agents to conventional antibiotics for food preservation and in the treatment of microbial infections. The use of natural antimicrobials can help to reduce the risk of antibiotic resistance in microorganisms and promote sustainable practices in food production and healthcare. Plant-based natural antimicrobials, in particular, have gained increasing attention in recent years due to their broad spectrum of activity against various microorganisms, their ease of availability and low toxicity. Many plants contain phytochemicals, such as essential oils, flavonoids, tannins, and alkaloids, which have potent antimicrobial activity. For example, oregano, thyme, and rosemary are among the most studied herbs, which contain antimicrobial compounds such as carvacrol, thymol, and rosmarinic acid. These compounds have been shown to be effective against several bacteria, including *Listeria*, *Salmonella*, and *Escherichia coli*.

Additionally, garlic is another popular plant that contains allicin, a compound with broad-spectrum antimicrobial activity against a wide range of microorganisms. It has shown efficacy against antibiotic-resistant strains such as Methicillin-Resistant *Staphylococcus Aureus* (MRSA) and *Helicobacter pylori*, associated with gastric ulcers and stomach cancer. In addition to plants, animal-derived natural antimicrobials have also been studied for their potential antimicrobial properties. Chitosan, for example, is a natural biopolymer derived from the exoskeletons of crustaceans and arthropods. It has been shown to have antimicrobial activity against several bacteria, including *Bacillus cereus*, *Salmonella typhimurium*, and *Listeria monocytogenes*. Overall, natural antimicrobials offer an alternative means of controlling microbial growth and reducing the risk of antibiotic resistance, and they have the potential to be used in various applications such as food preservation, in the treatment of microbial infections, and in the development of new drugs. However, further research is needed to better understand their mechanisms of action and safety profiles before they can be widely adopted for these purposes. Phytochemicals are naturally occurring compounds found in plants that have various biological functions, including protection from pests and diseases. Many of these phytochemicals have been found to exhibit antimicrobial properties, making them a potential source for natural antimicrobials. In this article, we will explore the use of phytochemicals as a source of natural antimicrobials.

Phytochemicals and Antimicrobial Activity

Phytochemicals are known to exhibit a wide range of biological activities, including antimicrobial properties. These properties have been attributed to the presence of secondary metabolites such as alkaloids, flavonoids, phenolics, terpenoids and glycosides. These secondary metabolites are believed to play a vital role in plant defenses against pathogens, pests, and herbivores. Antimicrobial properties of phytochemicals have been shown to be effective against a wide range of microorganisms, including bacteria, viruses and fungi. Compared to synthetic antibiotics, natural antimicrobials have been reported to exhibit fewer side effects, and their use is less likely to lead to antibiotic resistance. Additionally, the use of plant-based antimicrobials supports the development of sustainable and eco-friendly solutions for controlling microbial growth. Berberine is one of the most widely studied and used phytochemicals with antimicrobial activity. It is a quaternary ammonium salt that has been found to be effective against a wide range of bacteria, including antibiotic-resistant strains such as *Salmonella*, *Staphylococcus aureus*, and *Escherichia coli*. Berberine has also demonstrated antifungal activity against *Candida* species. Curcumin is another phytochemical with broad-spectrum antimicrobial properties. Curcumin, the active ingredient in turmeric, has been found to be effective against various bacterial strains, including *Helicobacter pylori*, *Klebsiella pneumoniae*, and *Pseudomonas aeruginosa*. Furthermore, curcumin has been shown to have antiviral activity against multiple viruses, including influenza and hepatitis.