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# Usage of carvacrol in essential oils

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## Abstract

Carvacrol is a naturally occurring phenolic monoterpenoid widely distributed in the essential oils of aromatic plants, particularly oregano, thyme, marjoram, and Savory. It is recognized as an important bioactive constituent responsible for many of the biological properties associated with these essential oils. Carvacrol has attracted considerable attention because of its antimicrobial, antioxidant, antifungal, anti-inflammatory, and insecticidal activities. Its antimicrobial action is primarily associated with disruption of microbial cell membranes, leading to changes in membrane permeability and cellular integrity. Consequently, carvacrol-rich essential oils have been investigated for applications in food preservation, pharmaceutical formulations, agriculture, cosmetics, and personal-care products. In the food industry, carvacrol may help inhibit the growth of foodborne pathogens and spoilage microorganisms, while its antioxidant properties can contribute to maintaining food quality. In pharmaceutical and biomedical research, carvacrol has been studied for its potential against bacteria, fungi, and inflammatory processes. Its use in agriculture has also gained interest as a natural alternative for controlling certain plant pathogens and pests. However, factors such as strong aroma, volatility, limited water solubility, and concentration-dependent biological effects can restrict its practical application. Encapsulation and other delivery systems are therefore being explored to improve its stability, solubility, and controlled release. Overall, carvacrol represents a promising natural compound with diverse applications, although further studies are required to establish optimal concentrations, safety, and large-scale applications.

**Keywords: Carvacrol, Essential oils, Oregano oil, antimicrobial activity, Antioxidant activity, Food preservation, Natural compounds**