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Applied Microbiology: Open Access

Perspective

Antibacterial Activity Against Food-Borne Pathogenic Bacteria

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ABOUT THE STUDY

The occurrence, outbreak, consequences, control, and evaluation of food spoilage microorganisms, providing the necessary basic knowledge of food spoilage ecology and control to ensure food safety, particularly in developing countries where food hygiene in storage requires extreme precautions. The spoilage of microorganisms in plant-based foods such cereals, beans, fruits, and vegetables and spoiling bacteria in animal-based meals like meat, poultry, seafood, powdered milk, and egg products.

Several nontoxic medicinal plants that have long been utilised in traditional folk medicine were extracted, and their antibacterial activity was tested against a variety of foodborne pathogens and food poisoning germs. Sansa, Hwangryun, Cheukbaek, and Seokchangpo ethanol extracts displayed considerable antibacterial activity against Gram positive and Gram negative bacteria, while Sakunja, Sukjihwang, and Baekji ethanol extracts had low antimicrobial activity on the microorganisms examined. The ethanol extract of *Coptis chinensis Franch* (hwangryun) has the strongest antibacterial activity among medicinal herb extracts.

Catechin's Minimum Inhibitory Concentration (MIC) for *E. coli* and *S. aureus* were both 640 g/ml, while its Minimum Bactericidal Concentration (MBC) was 640 and 1,280 g/ml, respectively. For *L. innocua*, the MIC and MBC values of lysozyme were 160 and 640 g/ml, respectively. Because its MIC and MBC were both the lowest (2.5 g/ml), *S. cerevisiae* was the most vulnerable microbe to lysozyme. When catechin and lysozyme were mixed in equal concentrations, all of the bacteria that were examined were efficiently suppressed, as evidenced by both qualitative and quantitative antimicrobial activity. As a result of this research, it was discovered that several active chemicals, including as catechin and lysozyme, might be used in food products.

Antibacterial efficacy of egg white lysozyme against pathogens of concern in food safety, such as Listeria monocytogenes and certain strains of *Clostridium botulinum*, is observed. The food spoilage thermophile *Clostridium thermosaccharolyticum* was especially sensitive to lysozyme, as were the spoilage germs *Bacillus stearothermophilus* and *Clostridium tyrobutyricum*.

Bacillus cereus, *Clostridium perfringens*, *Staphylococcus aureus and Campylobacter jejuni*, *Escherichia coli* O157:H7, *Salmonella typhimurium*, and *Yersinia enterocolitica*, all of which were isolated from food poisoning outbreaks, were all resistant. The lysozyme could be useful in food preservation, particularly when thermophilic sporeformers are present, and as a preventative measure against food poisoning caused by *C. botulinum* and *L. monocytogenes*.

Diffusion method, antibacterial effects against food-borne pathogenic bacteria (*Listeria monocytogenes*, *Salmonella Typhimurium* and enterohemorrhagic *Escherichia coli* O157:H7) and food spoilage bacteria (*Brochothrix thermosphacta* and *Pseudomonas fluorescens*) were determined, followed by MIC and MBC concentrations. Except for galangal oil, most of the essential oils tested had antibacterial action against all of the pathogens tested.

Cinnamon, oregano, and thyme essential oils all had high antibacterial activity, with MICs of 0.125 L/mL and MBCs of 0.25 L/mL. *P. fluorescens* was the bacteria that proved most resistant to essential oils, with MICs and MBCs of 1 L/mL. The findings imply that the activity of cinnamon, oregano, thyme, and clove essential oils can be linked to the presence of cinnamaldehyde, carvacrol, thymol, and eugenol, which appear to have similar antibacterial properties against all of the microorganisms examined. These compounds have the potential to be a valuable natural option for preventing bacterial development in food.

Food-borne infections and food quality deterioration are thought to be caused mostly by pathogenic and food spoilage microorganisms in both developed and developing countries. Incorporation of chemical preservative agents into food items or decontamination treatments *via* physical, chemical, or biological processes, or their mixtures, has been widely used in the food industry to "ensure food safety and increase food product shelf life". However, due to treatment process limitations and the survival of environment-adapted bacteria after treatment processes high resistance of bacteria such as pathogenic

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Received: 15-Mar-2022, Manuscript No. AMOA-22-16590; **Editor assigned:** 17-Mar-2022, PreQC No. AMOA-22-16590 (PQ); **Reviewed:** 04-Apr-2022, QC No. AMOA-22-16590; **Revised:** 12-Apr-2022, Manuscript No. AMOA-22-16590 (R); **Published:** 20-Apr-2022, DOI: 10.35248/ 2471-9315.22.8.246.

Citation: Broeckhoven K (2022) Antibacterial Activity Against Food-Borne Pathogenic Bacteria. Appli Microbiol Open Access. 8.246

Escherichia coli O157:H7, *Listeria monocytogenes* and some *Salmonella serovars* has been raised.

Spoilage bacteria contribute to the shortening of the shelf life of highly perishable commodities like meat and meat products by creating off-odors, off-flavors, discoloration, gas production, and slime development. Consumers demand fewer chemicals and more natural foods, necessitating the need for natural alternatives. Because they are natural antimicrobials, regulatory approval is simple (GRAS). Essential oils, it appears, have been examined as possible substitutes.

Expression, solvent extraction, steam or hydro distillation can be used to extract secondary metabolites from plant flowers, buds, seeds, leaves, bark, herbs, fruits, and roots. These bioactive volatile oils were known for their biological activity, particularly antioxidant and antimicrobial activity against food-borne pathogens and food spoilage bacteria. In addition to being used as a flavoring agent in meals, several research on the use of essential oils as antimicrobials have been undertaken and proved to boost the safety and shelf life of food products.