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EC MICROBIOLOGY
Mini Review

Activity of Medicinal Plants against Food-Borne Toxin-Producing Bacteria

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Abstract

Food safety management systems practiced traditionally have become wasteful. A food safety management system needs to be planned in a way that takes into account the dangers of food-borne pathogens faced by the users. Hence, a risk-conscious sterilization approach is now needed. The interest in medicinal plants as a source of pharmacologically active compounds has increased around the world. This review discusses some of the plant species that are potent against a large number of pathogenic bacteria. It has been found by the agar disk diffusion strategy that most plant extracts are more active against Gram-positive than Gram-negative bacteria. *Streptococcus pyogenes* is the most vulnerable to plant extracts (97.6%), followed by *Bacillus cereus* (63.4%) and *Staphylococcus aureus* (61.0%).

Keywords: *Medicinal Plants; Food-Borne Toxin-Producing Bacteria; Food Safety Management*

Introduction

Microbes are the most widely accepted reason for food-borne sickness and are found in various shapes, types, and forms. Most microorganisms are mesophilic with a growth temperature ranging from 20°C to 45°C. Food-borne pathogens can cause a food-related infection to develop. Some pathogenic bacteria are known for spore development and due to this reason are heat-resistant. Also, some bacteria are equipped for delivering heat-resistant toxins. A food-borne disease flare-up is characterized by at least two instances of comparable infection due to the ingestion of contaminated food. Food-borne disease develops when a microbe is ingested with food and secures and typically replicates in the human host, or when a toxigenic microorganism enters a food item and produces a toxin. In this way, food-borne bacteria result in (i) food-borne disease production and (ii) food-borne inebriation. Among food-related infections, a delay period is normally involved from the time of ingestion of food until side effects develop. More than 200 unique food-borne diseases have been distinguished. The most serious cases generally occur in extremely old, exceptionally youthful, frail people, and fit individuals exposed to an extremely high level of a toxin.

Interest in the investigation of medicinal plants and their pharmacological activity is increasing around the world. Various investigations have reported the anti-bacterial use of different types of therapeutic plants against various pathogenic microorganisms [10]. Medicinal plants are being used by people due to their therapeutic potential, including their utility against various microbes. It has been found that in most developing countries, plants are being used as therapies to treat recalcitrant infections. In Asia and Latin America, due to social convictions, conventional medicines are still being used [28,29]. However, alternative medications are also being used more frequently in developed countries. The percentage of that have used some form of alternative medication is 48% in Australia, 70% in Canada, 42% in the USA, 38% in Belgium, and 75% in France [28].

Discussion

Many plants are known for possessing anti-bacterial action against pathogenic microorganisms [1,3,7-24,27,30]. Plant extracts obtained from therapeutic plants have been investigated by researchers and they show different natural activities. For example, antimicrobial mixtures from therapeutic plants might inhibit the development of microscopic organisms, growths, infections, and protozoa.

Artificially created complex mixtures have enormous therapeutic potential as they have fewer secondary effects than manufactured drugs and little chance of creating drug-resistant species. The adequacy of therapeutic plant extracts to inhibit the development of microbes is additionally connected with the synergistic effect between the active mixtures of the concentrates. The synergistic activity is due to various reasons, specifically the rise of multi-target systems, the reduction of bacterial resistance, pharmacokinetic or physicochemical reasons resulting in increased bioavailability and solubility, resorption rate, the balance of unfavorable factors, and decreased toxicity.

The ethnobotanical information of thirty one plant species ordinarily used by Thai herbal medicine for bacterial infections has been reported [21,22]. The results for the anti-bacterial activities of extracts from therapeutic plants against any chosen pathogenic microscopic organisms of clinical significance have been tested by the Clinical and Laboratory Standards Institute [5,6]. The test strains used for the analysis were chosen due to their very various medication-safe profiles. Preliminary information from zone inhibition tests demonstrated that *Streptococcus pyogenic* is highly susceptible and easily killed by all of the plant extracts (97.6%), followed by *Bacillus cereus* (63.4%) and *Staphylococcus aureus* (61.0%). *Quercus infectoria* and *Piper beetle* were the main two plant species that showed the maximum activity against most gram-negative microorganisms. The high activity of *Rhodomyrtus tomentosa* against Gram-positive microorganisms is particularly extremely interesting. This plant species needs to be specially investigated. It might substitute the use of presently recommended anti-microbial and could decrease the development of drug-resistant gram-positive microorganisms. Another interesting plant species is *Eleutherine yankee*, a homegrown plant with bulbs routinely utilized in Asian cooking. The use of its bioactive mixtures with anthraquinones, bi-eleuthero, and elecanacin, has recently been reported (Nakatani, 1994). The study highlights the use of *Eleutherine Yankee* folk medicine as a food additive to forestall various food-borne infections [4].

Conclusion and Future Direction

Therapeutic plant-extracted mixtures can provide novel methodologies for treatment of infections by pathogens. The enormous spectra of activities of extracts from *Quercus infectoria* and *Piper betel* support their use for the treatment of different bacterial diseases. *Rhodomyrtus tomentosa* has antibacterial action against Gram-positive microscopic organisms, with MICs and MBCs in the range of 3.9 - 7.8 and 7.8 - 125 µg/mL, respectively. The extract from *Eleutherine americana* may be used as a food additive to forestall various food-borne infections. Certain food-borne microbes, for example, *Listeria monocytogenes*, and *Yersinia enterocolitica*, are well suited for storage in the refrigerator at temperatures less than 10°C. However, the rising rate of medication-resistant strains of microbes raises a burning need to catalog new bioactive extracts from therapeutic plants utilizing the latest technology.

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