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Phenolic Compounds and Biological Activity of *Kitaibelia vitifolia*

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ABSTRACT This study was aimed at evaluating the antioxidant activity and efficacy of the ethanolic extract of the endemic plant species *Kitaibelia vitifolia* in inhibiting the growth of selected fungi and bacteria. Antimicrobial activity was tested using the broth dilution procedure for determination of minimum inhibitory concentration (MIC). MICs were determined for eight selected indicator strains. The highest susceptibility to *K. vitifolia* ethanolic extract among the bacteria tested was exhibited by *Bacillus subtilis* ATCC 6633, *Staphylococcus aureus* ATCC 25923, and *Klebsiella pneumoniae* ATCC 13883 (MIC = 15.62 μg/mL), followed by *Escherichia coli* ATCC 25922 and *Proteus mirabilis* ATCC 14153 (MIC = 31.25 μg/mL), and *Proteus vulgaris* ATCC 13315 (MIC = 62.50 μg/mL). Of the fungi, *Candida albicans* ATCC 10231 (MIC = 15.62 μg/mL) showed the highest susceptibility, and *Aspergillus niger* ATCC 16404 (MIC = 31.25 μg/mL) had the lowest. Results showed that *K. vitifolia* extract possesses antioxidant activity, with total antioxidant capacity of 75.45 ± 0.68 μg of ascorbic acid/g and 50% inhibition concentration values of 47.45 ± 0.55 μg/mL for 2,2-diphenyl-1-picrylhydrazyl free radical scavenging activity, 35.35 ± 0.68 μg/mL for inhibitory activity against lipid peroxidation, 95.25 ± 0.52 μg/mL for hydroxyl radical scavenging activity, and 31.50 ± 0.35 μg/mL for metal chelating activity. Total phenolics, flavonoids, condensed tannins, and gallotannins were 85.25 ± 0.69 mg of gallic acid (GA)/g, 45.32 ± 0.55 mg of rutin/g, 54.25 ± 0.75 mg of GA/g, and 41.74 ± 0.55 mg of GA/g, respectively. The phenolic composition of *K. vitifolia* extract was determined by high-performance liquid chromatography. Rosmarinic acid was found to be the dominant phenolic compound of the extract.

KEY WORDS: • ***antimicrobial activity*** • ***antioxidant activity*** • ***high-performance liquid chromatography analysis*** • **Kitaibelia vitifolia**

INTRODUCTION

THE USE OF TRADITIONAL medicinal plants for primary health care and other purposes has progressively increased worldwide in recent years. Plants communicate with their environment by producing a diverse range of chemicals. These secondary metabolites are a common feature of specific plants and plant families. Many plant secondary metabolites have antimicrobial properties that make plant extracts and products successful in the treatment of bacterial, fungal, and viral infections.[1–3] The different parts of plants (root, leaf, flower, fruit, stem, and bark) are used to effectively treat numerous diseases. Their antioxidant and antimicrobial properties affect a range of physiological processes in the human body, thus providing protection against both free radicals and growth of undesirable microorganisms.

Free radicals as highly reactive intermediaries lead to oxidative tissue damage and, therefore, potential damage of each molecular type. Free radicals occur in a cell as a result of the effect of different external factors such as ultraviolet and X-ray radiation, chemical reactions, and some metabolic processes. The accumulation of these species causes serious diseases, including cardiovascular diseases, premature aging, cancer, inflammatory diseases, etc.[4–9] However, synthetic antioxidants, such as butylated hydroxytoluene and butylated hydroxyanisole, widely known for their ability to terminate the chain reaction of lipid peroxidation, have been proved to be carcinogenic and cause liver damage.[10]

Both bacterial resistance to a large number of antibiotics and the capacity of plants to synthesize biologically active substances are reasons for the increasing importance given to the use of plant-derived products in bacterial control. The use of plants in the food industry to replace synthetic preservatives, antioxidants, or other food additives has increased significantly over recent years.[11]

Many species of herbs are active antioxidants, mainly because of the content of phenolic compounds.[12] Phenolic compounds are ubiquitous in plants; flavonoids and other plant phenolics, such as phenolic acids, stilbenes, tannins, lignans, and lignins, are important in the plant for normal

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