

Plant Extracts: Chemical Analysis, Investigation of Antioxidant, Antibacterial, and Antifungal Activities and Their Applications in Food Packaging Materials

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Abstract : Plant extracts are an increasingly popular natural product with a wide range of potential applications in food, industrial, and health care industries. They are rich in polyphenolic compounds and flavonoids, which have been demonstrated to possess a variety of beneficial properties, including antimicrobial and antioxidant activity. Plant extracts have been found to possess antimicrobial activity against a variety of foodborne pathogens and can be used as a natural preservative to extend the shelf life of food products. They have also strong antioxidant activity, which can reduce the formation of free radicals and oxidation of food components. Recently there is an increase interest in bio-based polymers to be used as innovative "bioplastics" for industrial exploitation e.g. packaging materials for food products. Additionally, incorporation of active compounds (e.g. antioxidants and antimicrobials) in bio-polymer materials is of particular interest since such active polymers can be used as active packaging materials (with antimicrobial and antioxidant activity). In this work, different plant extracts have been characterized for their phenolic compounds, flavonoids content, antioxidant activity (both as free radical scavenging ability and reducing ability), and antimicrobial activity against gram positive and negative bacteria (*Escherichia coli*; *Staphylococcus aureus*, and *Pseudomonas aeruginosa*) as well as antifungal activities (against yeast, mold and *Botrytis cinerea*/a plant pathogen). Results showed that many extracts are rich with polyphenolic compounds and flavonoids and have strong antioxidant activities, and rich with phytochemicals (e.g. rutin, quercetin, oleuropein, tyrosol and hydroxytyrosol). Some extracts showed antibacterial activity against both gram positive and negative bacteria as well as antifungal activities and can work, therefore, as preservatives for food or pharmaceutical industries. As an application, two extracts were used as additive to pectin-based packaging film, and results showed that the addition of these extracts significantly improve their functionality as antimicrobial and antioxidant activity. These biomaterials, therefore can be used in food packaging materials to extend the shelf life of food products.

Keywords : plant extracts, antioxidants, flavonoids, bioplastic, edible biofilm, packaging materials

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