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ANTIOXIDANT ACTIVITY OF NATURAL PHENOLIC COMPOUNDS IN BIOLOGICAL SYSTEMS

Johnson, P. W.
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Abstract: Natural phenolic compounds are widely distributed in plants and demonstrate strong antioxidant properties. They protect biological systems from oxidative damage by neutralizing reactive oxygen species and regulating cellular defense mechanisms. This study analyzes antioxidant activity of phenolic compounds and their biological significance. The findings show that flavonoids, phenolic acids, tannins, and stilbenes play important roles in reducing oxidative stress and supporting cellular protection.
Keywords: phenolic compounds, antioxidants, free radicals, biological systems, oxidative stress

Introduction

Oxidative stress occurs when reactive oxygen species exceed antioxidant defense capacity. It contributes to aging, inflammation, metabolic disorders, and cellular damage. Natural phenolic compounds are important plant secondary metabolites with electron-donating capacity. Their antioxidant effects are associated with chemical structure, hydroxyl groups, and ability to chelate metal ions.

Materials and Methods

Literature on antioxidant chemistry and biological activity of phenolic compounds was reviewed. Studies using DPPH, ABTS, FRAP, and cellular antioxidant assays were analyzed. Comparative evaluation of major phenolic classes was performed.

Results

Flavonoids showed strong radical scavenging activity. Phenolic acids contributed to reduction of oxidative reactions. Tannins demonstrated metal-chelating and protein-binding properties. Antioxidant activity depended on molecular structure and concentration. Plant extracts rich in phenolics showed protective effects in biological models.

Discussion

Phenolic compounds act through multiple antioxidant mechanisms. They neutralize free radicals, inhibit lipid peroxidation, chelate transition metals, and regulate antioxidant enzymes. Their biological effects are relevant for nutrition, pharmacology, and disease prevention. However, bioavailability and metabolism influence their effectiveness in vivo.

Conclusion

Natural phenolic compounds are important antioxidants in biological systems. Their ability to reduce oxidative stress supports health protection and disease prevention. Further studies are needed to improve understanding of bioavailability and therapeutic potential.

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