

**ANTIOXIDANT POTENTIAL OF A LOW-MOLECULAR-WEIGHT
POLYSACCHARIDE FROM CLOVE BUDS (*Syzygium aromaticum* L.):
PHYSICOCHEMICAL AND STRUCTURAL CHARACTERIZATION**

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Plant polysaccharides have attracted increasing attention as natural bioactive compounds due to their diverse biological activities and potential health-promoting effects. Their antioxidant properties are of particular interest because oxidative stress is closely associated with the development and progression of various chronic and metabolic disorders. Clove buds (*Syzygium aromaticum* L.) are widely recognized for their biological properties, which are commonly attributed to their phenolic compounds and essential oils, whereas their polysaccharide fraction remains comparatively less explored. Investigation of this fraction may therefore provide further insight into the contribution of clove polysaccharides to the biological properties of this medicinal plant. In the present study, a polysaccharide obtained from clove buds was characterized in terms of its physicochemical and structural properties and evaluated for its antioxidant potential.

A polysaccharide fraction was obtained from clove buds (*Syzygium aromaticum* L.) using microwave-assisted extraction, followed by purification and physicochemical characterization. The isolated polysaccharide contained only 0.08% protein and showed a phenolic content of 0.0504 mg GAE/mg. Monosaccharide composition analysis identified mannose as the predominant monosaccharide, together with other sugar residues, confirming the heteropolysaccharide nature of the sample. Molecular weight analysis classified the isolated material as a low-molecular-weight heteropolysaccharide. Fourier-transform infrared spectroscopy confirmed the characteristic functional groups of the polysaccharide and indicated a relatively high degree of esterification, supporting its distinct structural characteristics.

The antioxidant potential of the isolated polysaccharide was evaluated using the 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical-scavenging assay, the 2,2'-azinobis-(3-ethylbenzothiazoline-6-sulfonic acid) (ABTS) radical-scavenging assay, and the ferric reducing antioxidant power (FRAP) assay. The polysaccharide exhibited concentration-dependent antioxidant activity in both radical-scavenging assays. In the DPPH assay, an IC₅₀ value of 0.230 mg/mL was obtained, with 88.30% radical-scavenging activity at 1.0 mg/mL. In the ABTS assay, the polysaccharide showed an IC₅₀ value of 0.980 mg/mL and reached 62.07% radical-scavenging activity at 1.2 mg/mL. In the FRAP assay, the reducing capacity reached 1.02 μ mol Fe²⁺/mg. Collectively, these results demonstrate that the clove polysaccharide exhibits antioxidant activity through both radical-scavenging and reducing mechanisms.

Overall, the low-molecular-weight heteropolysaccharide isolated from clove buds demonstrated notable antioxidant potential despite its low protein and phenolic contents. Its antioxidant activity may be associated with its molecular weight, mannose-rich monosaccharide composition, degree of esterification and other structural features. The findings suggest that the polysaccharide fraction may contribute to the biological properties of clove and may have potential as a natural antioxidant with relevance to oxidative stress-associated metabolic disorders. Further studies, particularly *in vivo* investigations, are warranted to validate its antioxidant effects and to clarify the relationship between its structural characteristics and biological activity.