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The Study of An Anti-Diabetic Activity Using *Syzygium Cumini, Costus Speciosus, and Melastoma malabathricum* Plant Extracts Compared to Standard Acarbose

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The purpose of this investigation was to develop a tablet formulation with antidiabetic properties using natural, polyherbal plant extracts, specifically *Syzygium cumini, Costus speciosus, and Melastoma malabathricum.* These plants were selected due to their antidiabetic potential for Diabetes Mellitus. Qualitative and quantitative analyses were performed to identify and characterize the chemical composition of these plant materials, focusing on their phenolic content, which is known for its antidiabetic potential. Phytochemical screening revealed the presence of key bioactive compounds, including flavonoids, tannins, phenols, etc. The phenolic composition, particularly the concentration of gallic acid, was determined using UV spectrophotometry. The *Syzygium cumini* was found to have the highest concentration of gallic acid at 19.28% in the dried concentrated extract, highlighting strong antidiabetic activity. The antidiabetic potential was further evaluated by testing their inhibitory effects on the α-amylase enzyme, which plays a critical role in carbohydrate metabolism. Inhibition of this enzyme can slow down carbohydrate digestion. The extracts were tested against this enzyme, and the IC_{50} values (the concentration required to inhibit 50% of the enzyme activity) were determined to assess their potency, calculated using dose-response curves, where different concentrations of the extracts were incubated with the enzymes. The amount of reducing sugars produced was measured. The *Syzygium cumini* exhibited the lowest IC_{50} value at 13.95 µg/mL, indicating strong inhibitory activity, while the reference drug, acarbose, had an IC_{50} value of 8.92 µg/mL. The plant extracts showed notable antidiabetic activity compared to acarbose. Thus, *Syzygium cumini, Costus speciosus*, and *Melastoma malabathricum* demonstrated 63.98%, 1.953%, and 25.60% equivalence inhibition activity, respectively, in comparison to acarbose (100%)

Keywords: *Syzygium cumini, Costus speciosus, Melastoma malabathricum, diabetes mellitus, anti-diabetic, α-amylase*