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A Comparative Study of Essential Oil and Oleoresin Extraction from Different Ceylon Cinnamon Bark Grades: Process Optimization, Antioxidant Activity, and Chemical Composition

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Abstract

Sri Lankan cinnamon (*Cinnamomum zeylanicum* Blume) is the world's premier cinnamon, prized for its delicate flavour and potent health benefits. It is increasingly recognized as a key ingredient in healthy diets. This study was conducted to optimize the hydro-distillation extraction process of essential oil and solvent extraction process of oleoresin from the nine grades of true cinnamon bark mentioned in the Department of Cinnamon Development. This study underscores the significance of preserving the genetic diversity within Ceylon cinnamon. By optimizing extraction processes, we can minimize the amount of plant material needed to produce desired products. This, in turn, reduces pressure on wild populations and promotes sustainable harvesting practices. Recognizing the immense value of cinnamon can drive efforts to protect its natural habitats. The residue part of the grading process, commercially known as cinnamon offcuts yielded the highest sieved percentage (95.39±0.29%), making it the most viable grade for large-scale processing. The highest essential oil yield of the cinnamon offcuts (1.38±0.01 ml/g) was achieved at 100°C and 4h of extraction. While H2 (2.36±0.18%), H3 (2.30±0.07%), and Special (2.36±0.12%) grades exhibited the highest oil contents. Moreover, the cinnamon offcuts (1.36±0.03%) were the most strategic choice due to their lower raw material cost among all the grades. The highest cinnamaldehyde content was observed in H3 (72.31±0.30%) grade. The highest eugenol content (5.27±0.02%) was in the H3 grade and the highest linalool content (2.63±0.002%) was in the cinnamon offcuts. The highest safrole content was in C4 (0.62±0.007%), C5 (0.61±0.005%), and M4 (0.61±0.002%) grades. The Special grade had the highest cinnamyl acetate content (3.37±0.02%). In addition, the cinnamon offcuts had the highest DPPH radical scavenging activity (3.53±0.01 TE mg/g) among H3 and cinnamon offcuts. This study recognized Cinnamon offcuts as the most profitable and strategically sound option for the large-scale production of essential oil, due to its high oleoresin yield, lower production cost, availability, and favorable chemical profile.

Keywords: *Cinnamomum zeylanicum, Essential oil, Oleoresin, Cinnamaldehyde, Eugenol*