



Morphological Variations and Biochemical Properties of Mandarin (*Citrus reticulata*) Varieties in Sri Lanka

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Abstract

Mandarin (*Citrus reticulata*) is one of the underutilized fruit crops in Sri Lanka and belongs to the family Rutaceae. Seven Mandarin varieties are available in Sri Lanka: *Indu*, *Madhu*, *Juicy*, *Rahangala*, *Horana ehemi 1*, *Horana ehemi 2* and *Horana ehemi 3*. The study aimed to examine the morphological variations and biochemical properties of these Mandarin varieties. A total of 35 quantitative and qualitative morphological characters were scored for the morphological analysis. Ascorbic acid content, Total Soluble Solids (TSS), and pH were determined for the fruit juice. In addition, the essential oil content of the leaves and the antioxidants of the peel were also determined. The hydro-distillation method was employed to distil essential oil, and the chemical compounds of the oils were analyzed through gas chromatography. DPPH radical scavenging assay determined Antioxidant activity, and Total Phenolic Content (TPC) was determined by the Folin-Ciocalteu method. Qualitative and quantitative morphological data were subjected to IBM SPSS 22 statistical software, and a hierarchical dendrogram was created using Ward's method. According to the dendrogram, morphological similarities showed among the varieties *Horana ehemi 1*, *2* and *3*, whereas among the varieties of *Indu*, *Madhu*, *Juicy* and *Rahangala*. Laboratory evaluation was carried out following a completely randomized design. Four replicates from each variety were used to

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analyze biochemical properties, and data were subjected to Minitab 21 statistical software. To compare several groups, an analysis of variance was performed by the Tukey mean comparison method at a 95% significance level. P-value was used to determine the significance of the study. The significantly highest and the lowest TSS were obtained in *Madhu* (10.4) and *Rahangala* (7.4), respectively. *Madhu* (3.37) and *Horana ehemi 3* (2.29) had the significantly highest and the lowest pH values respectively. *Horana ehemi 3* had significantly the highest Ascorbic acid content (37.50 mg/mL). The essential oil content of leaves varied from 0.34% to 1.87%. The highest oil content was obtained in *Indu* (1.87%). The DPPH scavenging activity was significantly highest in *Horana ehemi 2* (31.35%), and TPC was significantly highest in *Horana ehemi 1* (82 mg GA/g of extract). It can be concluded that *Madhu*, *Juicy* and *Ehemi* varieties are better for the production of novel beverages in the food industry because of their highest Ascorbic acid content, TSS, high volume of fruit juice and highest I*, a*, b* values for juice colour. In addition, the varieties *Indu* and *Juicy* had the highest essential oil content, while the *Ehemi* varieties are rich in antioxidants, and these varieties are well-suited for use in the pharmaceutical and cosmetics industries.

Keywords: *Citrus reticulata*, hydro-distillation, mandarin antioxidants, morphology