

Molecular and Chemical Diagnosis of Curcumin Compound and Study its Antioxidant Activity in Two Varieties of *Curcuma longa* L. Plants

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Abstract: In this work, the Curcumin synthase 1 (*CURS1*) gene from *Curcuma longa* L., which plays an important role in the biosynthesis of the curcumin compound, was chosen. The objectives were to identify the genetic variations of *CURS1* in two turmeric plant varieties (NDH-98 and GNT-2) and their relationship with curcumin content. Using DNA sequencing technology, the results were analyzed, and the three-dimensional structure of the *CURS1* protein was modeled in silico. The primer employed in this investigation amplified 900 bp fragments of the *CURS1* gene. A single nucleotide polymorphism (SNP) was identified in the first exon (g.850 C>G), which resulted in a change in the three-dimensional structure of the protein due to the substitution of the amino acid threonine with arginine. Haplotype and nucleotide diversity values were 1.00 and 0.00169, respectively. This investigation involved a relative measurement of the putative *CURS1* gene using DNA sequencing from the roots of GNT-2, compared to NDH-98, and an HPLC-assisted curcumin measurement for the two varieties. The amount of curcumin in the rhizomes of GNT-2 was 784.0 $\mu\text{g g}^{-1}$, while in NDH-98, it was 712.1 $\mu\text{g g}^{-1}$. The DPPH assay, which evaluates the free radical scavenging capacity of extracts, revealed that the methanolic fraction of *Curcuma longa* (NDH-98 and GNT-2) demonstrated a significant capacity to inhibit free radicals, with an IC₅₀ value exceeding 125% of the total extract's capacity. Consequently, the methanolic extracts of NDH-98 and GNT-2 exhibited significant effects in the DPPH assay for scavenging free radicals, and regulating vitamin D levels.

Keywords: Antioxidant activity, *Curcuma longa*, *CURS1* gene, protein three dimensions, single nucleotide polymorphism.

Introduction

Curcuma longa L. (*C. longa*) is rhizome or substrate of a plant similar to ginger (Zingiberaceae). *C. longa* is a perennial herb

that is usually known as turmeric, 60-90 cm tall, with short stems, large, oblong leaves, and rhizomes that are ovate, elliptical, or pear-shaped, occasionally branched, and brownish-yellow in color (Kocaadam & Şanlıer, 2017).