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**An Extensive Analysis of the Morphological and Molecular
Characteristics of South Indian Cucurbitaceae**

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Abstract

The family Cucurbitaceae comprises a diverse group of economically and ecologically important plants, including several cultivated vegetables, medicinal species, and wild relatives distributed across South India. This study presents an extensive assessment of the morphological and molecular characteristics of selected members of Cucurbitaceae to understand their diversity, relationships, and taxonomic significance. Morphological evaluation focuses on characters such as growth habit, stem characteristics, leaf morphology, floral structure, fruit shape and size, seed features, and other diagnostic traits. These characteristics are compared among selected taxa to identify patterns of variation and distinguishing features. Molecular characterization is incorporated to complement morphological observations and provide additional evidence for determining genetic relationships among the studied taxa. Suitable molecular markers and DNA-based approaches can be employed to assess genetic diversity, species differentiation, and phylogenetic relationships. The integration of morphological and molecular data provides a more comprehensive understanding of the evolutionary relationships and diversity within the family. Particular emphasis is placed on the occurrence of phenotypic variation across geographical regions and its possible association with environmental conditions and genetic differentiation. The study is expected to contribute to the taxonomy, conservation, and utilization of Cucurbitaceae genetic resources in South India. A better understanding of species diversity and genetic relationships may also support crop improvement, germplasm conservation, and sustainable utilization of economically important cucurbit species. The findings highlight the value of combining traditional taxonomic approaches with modern molecular techniques in plant diversity research.

Keywords: Cucurbitaceae, South India, Morphological Diversity, Molecular Characterization, Genetic Diversity, Plant Taxonomy, Phylogenetics, DNA Markers, Germplasm, Biodiversity.