

Phenotypic Plasticity of Qualitative Leaf Traits in Cinnamon (*Cinnamomum Verum*) Accessions across Two Agroecological Regions in Sri Lanka

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Abstract: Ceylon cinnamon (*Cinnamomum verum*) is a globally demanded spice and positioning as a world's largest exporter. However, Sri Lanka currently has only two improved cultivars, Sri Gemunu and Sri Wijaya which yield up to 1500 kg ha⁻¹ under optimal conditions and vegetatively propagated for genetic uniformity. These cultivars exhibit phenotypic plasticity that complicates reliable identification. This study evaluated the environmental stability and phenotypic plasticity of qualitative leaf morphological traits in twenty cinnamon accessions across two agroecological regions of WM3a (Mid country Research Station [MRS]) and WL2a (Thalgampola, Galle) in Sri Lanka. The experiment was conducted using a Randomized Complete Block Design with three replications. Mother plants at MRS were compared with their vegetatively propagated clones established in Thalgampola for two years. Standardized leaf sampling from the 5th and 6th nodes below apical shoot tips were assessed for six qualitative traits of leaf arrangement (opposite, subopposite, opposite or subopposite in different branches and opposite to subopposite within the same branch), shape (elliptic, broadly elliptic, narrowly elliptic, ovate, broadly ovate, oval, lanceolate, ovate-lanceolate, and oblong-lanceolate), apex (acute, obtuse, acuminate, long acuminate, narrowly acuminate, and acuminate with broad acumen), base (acute, subacute, cuneate, rounded, sub-cordate, and obtuse contracted into petiole then shortly cuneate), venation, and margin. Chi-square and Cramér's V analyses revealed that leaf arrangement, apex, base, and venation were environmentally stable ($p > 0.05$, $V < 0.5$). Leaf shape showed moderate plasticity ($p = 0.033$), while leaf margin exhibited strong environmental responsiveness ($p < 0.001$), varying between entire and slightly undulate forms across regions. These findings indicate that environmentally stable traits serve as reliable taxonomic markers for cultivar identification across diverse sites, while phenotypically plastic traits may indicate adaptive responses, supporting breeding and propagation strategies.

Keywords: *Cinnamomum verum*, Environmental stability, Leaf morphology, Phenotypic plasticity