Analysing the Impact of Total Dry Matter on Plant Growth and Fibre Yield of Banana

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Abstract

Banana, a widely cultivated fruit crop in Sri Lanka, is not only valued for its popularity as a fruit but also a valuable source of natural fibre due to its desirable properties. Among the 29 banana varieties in Sri Lanka, the Embul (AAB) and Seeni (ABB) varieties are in high demand. Dry matter (DM), representing the material left after water removal, is a crucial factor in understanding banana growth and fibre yield. Yet, a research gap persists in understanding how DM affects these aspects in the Sri Lankan context. This study analysed DM content on banana plant growth and fibre yield by addressing this gap. Data on leaf dry weight, pseudostem dry weight, root dry weight, fibre dry weight, and pseudostem volume (V) were collected from Embul and Seeni banana varieties established at the same growth stage over a year in a field located in Badulla (Latitude: 6.9934°N, Longitude: 81.0550°E) within the Intermediate Zone (IM1). Thirty-five replicates were used for the model development, and 10 replicates were used for the model validation. Predictive models were constructed employing correlation analysis and bootstrap regression. Consequently, plant growth was modelled as $V = 244 DM_T - 101629$ and $V = 105 DM_T - 11940$, while fibre yield (FY) was predicted as $FY = 0.2 DM_T - 35.3$ and $FY = 0.2 DM_T - 18.2$ for Embul and Seeni respectively (DM_T is the total DM). These models demonstrated accuracy in future predictions, with $R^2 > 0.6$ and Mean Absolute Percentage Error (MAPE) < 8.05, suitable for banana plants aged six months or older. Overall, the study highlights the significant impact of total dry matter on both plant growth and fibre yield.

Keywords: bootstrap regression, correlation analysis, Embul, residual matter, Seeni

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