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DATA PAPER

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TropiRoot 1.0: Database of tropical root characteristics across environments

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Abstract

Tropical ecosystems contain the world's largest biodiversity of vascular plants. Yet, our understanding of tropical functional diversity and its contribution to global diversity patterns is constrained by data availability. This discrepancy underscores an urgent need to bridge data gaps by incorporating comprehensive tropical root data into global datasets. Here, we provide a database of tropical root characteristics. This new database, TropiRoot 1.0, will be instrumental in evaluating an array of hypotheses pertaining to root functional ecology and plant biogeography, both within the tropics and relative to other global biomes. The data compilation was conducted by the TropiRoot Initiative, in partnership with the Fine-Root Ecology Database (FRED) and the Global Root Trait (GRooT) database, Colorado State University (CSU) and the Smithsonian Tropical Research Institute (STRI). Literature search and data extraction were conducted between 2020 and 2024. Literature was identified using Web of Science, Scopus, and complemented using the expert knowledge of members of TropiRoot. To provide broad environmental and geographical distributions, literature searches included root characteristics

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(traits) across global change drivers, natural gradients, and from different continents. We adopted FRED standardized data columns and streamlined the format to enhance accessibility for data extraction across various user groups. This optimized framework resulted in a smaller, yet comprehensive datasheet. To make the database compatible with other global root trait initiatives, column identification was standardized following the codes provided by FRED. These efforts culminated in data extracted from 104 new sources, resulting in more than 8000 rows of data (either species or community data). Most of the data in TropiRoot 1.0 include root characteristics such as root biomass, morphology, root dynamics, mass fraction, architecture, anatomy, physiology, and root chemistry. This initiative represents a 30% increase in the currently available data for tropical roots in FRED. TropiRoot 1.0 contains root characteristics from 25 different countries, where seven are located in Asia, six in South America, five in Central America and the Caribbean, four in Africa, two in North America, and 1 in Oceania. Due to the volume of data, when ancillary data were available, including soil data, these data were either extracted and included in the database or its availability was recorded in an additional column. Multiple contributors checked the entries for outliers during the collation process to ensure data quality. For text-based observations, we examined all cells to ensure that their content relates to their specific categories. For numerical observations, we ordered each numerical value from least to greatest and plotted the values, checking apparent outliers against the data in their respective sources and correcting or removing incorrect or impossible values. Some data (soil and aboveground) have different columns for the same variable presented in different units, including originally published units, but root characteristics data had units converted to match those reported in FRED. By filling a gap from global databases, TropiRoot 1.0 expands our knowledge of otherwise so far underrepresented regions and our ability to assess global trends. This advancement can be used to improve tropical forest representation in vegetation models. The data are freely available and should be cited when used.

KEYWORDS
database, plants, root traits, root characteristics, tropical, TropiRoot, functional traits, FRED

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DATA AVAILABILITY STATEMENT

The dataset is available as Supporting Information to this Ecology data paper and is also accessible in the ESS-DIVE repository at https://doi.org/10.15485/2507279.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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