TropSOC Database

2.1.3. Forest – Vegetation – Fresh leaves chemistry

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Doetterl, S.; Bukombe, B.; Cooper, M.; Kidinda, L.; Muhindo, D.; Reichenbach, M.; Stegmann, A.; Summerauer, L.; Wilken, F.; Fiener, P. (2021): TropSOC Database. V. 1.0. GFZ Data Services.
https://doi.org/10.5880/fidgeo.2021.009
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Doetterl S., Asifiwe R.K., Baert G., Bamba F., Bauters M., Boeckx P., Bukombe B., Cadisch G., Cizungu L.N., Cooper M., Hoyt A., Kabaseke C., Kalbitz K., Kidinda L., Maier A., Mainka M., Mayrock J., Muhindo D., Mujinya B.B., Mukotanyi, S.M., Nabahungu L., Reichenbach M., Rewald B., Six J., Stegmann A., Summerauer L., Unseld R., Van-lauwe B., Van Oost K., Verheyen K. Vogel C., Wilken F., Fiener P. Organic matter cycling along geochemical, geo-morphic and disturbance gradients in forests and cropland of the African Tropics - Project TropSOC Database Version 1.0. *Earth System Science Data*. https://doi.org/10.5194/essd-2021-73, 2021.

Introduction

The dataset comprises a unique plot identifier followed by 15 variables that describe the chemical properties of collected individual living canopy leaves. Missing values are indicated by -9999.

Data structure

No.	Variable	Explanation	Unit
1	plotID	unique identifier of each plot and point where data were collected	-
2	treeID	tree identifier unique for every recorded tree	-
3	sampling_date	date of sampling of leaves	dd.mm.yyyy
4	species	species of tree	-
5	N	nitrogen concentration in dry leaves	%
6	C	carbon concentration in dry leaves	%
7	CN	C/N ratio of dry leaves	-
8	Al	aluminium concentration in dry leaves	mg kg^{-1}
9	Ca	calcium concentration in dry leaves	mg kg^{-1}
10	Fe	iron concentration in dry leaves	mg kg^{-1}
11	K	potassium concentration in dry leaves	mg kg^{-1}
12	Mg	magnesium concentration in dry leaves	mg kg^{-1}
13	Mn	manganese concentration in dry leaves	mg kg^{-1}
14	Na	sodium concentration in dry leaves	mg kg^{-1}
15	P	phosphorus concentration in dry leaves	mg kg^{-1}
16	Si	silicon concentration in dry leaves	mg kg^{-1}

Methods

Leaf sampling: To assess the functional (chemical) traits of living canopy leaves, we sampled sun-exposed shoots from the outer canopy of selected tree species that collectively make up 80 % of the standing basal area per plot (for details regarding plots and plot design see *2_forest.pdf*) with the help of specially trained tree climbers and following protocols provided by Pérez-Harguindeguy et al.

(2016). Where sampling of outer canopy leaves was physically not possible, we sampled partially shaded leaves situated below the uppermost canopy.

A minimum of 5 and a maximum of 17 trees per plot were sampled this way and all mature, healthy-looking individual leaves of a minimum of 3 individuals per species were sampled by tree climbers. For the determination of specific leaf area and to avoid dehydration and leaf shrinkage, all leaves were kept cooled and moist before being scanned with an Epson Perfection V800 Photo scanner (Epson, EU), the day of sampling. After scanning, all leaf samples were oven-dried at 70°C for approximately 72 hours, dry-weighed and milled for later chemical analyses.

Organic carbon and nitrogen analyses [variables 5 to 7]: Carbon (C) and nitrogen (N) of leaf samples were measured in 1 g of ground subsamples using a dry combustion analyser (Variomax CN, Elementar GmbH, Hanau, Germany) with a measuring range of 0.2 - 400 mg g^{-1} biomass (absolute C or N mass in a sample) and a reproducibility of < 0.5 % (relative deviation).

Total element composition based on ICP-OES measurements [variables 9 to 17]: Total elemental composition of the collected leave biomass was determined using inductively coupled plasma optical emission spectrometry (ICP-OES) (5100 ICP-OES Agilent Technologies, USA) for the determination of aluminium (Al), calcium (Ca), iron (Fe), potassium (K), magnesium (Mg), manganese (Mn), sodium (Na), phosphorous (P), and silicon (Si). 200 mg of sample materials were placed in digestion tubes and boiled for 90 minutes at 120 °C adding 15 ml of 65 % nitric acid (HNO_3) using a DigiPREP digestion system (DigiPREP MS SCP Science, Canada). After 30 minutes of cooling, 3 ml of 30 % hydrogen peroxide (H_2O_2) were added to the plant sample mix and heated for another 90 minutes at 120°C. All extracts, including calibration standards, were cooled, mixed with nanopure water, filtered through 41 grade Whatman filters and transferred into 50 ml PE-Tubes. PE tubes were rinsed three times with bi-distilled water to remove potential residues before measurement of the extract.

Acknowledgment

References

Pérez-Harguindeguy, N., Díaz, S., Garnier, E., Lavorel, S., Poorter, H., Jaureguiberry, P., Bret-Harte, M. S., Cornwell, W. K., Craine, J. M., Gurvich, D. E., Urcelay, C., Veneklaas, E. J., Reich, P. B., Poorter, L., Wright, I. J., Ray, P., Enrico, L., Pausas, J. G., de Vos, A. C., Buchmann, N., Funes, G., Quétier, F., Hodgson, J. G., Thompson, K., Morgan, H. D., ter Steege, H., van der Heijden, M.G. A., Sack, L., Blonder, B., Poschlod, P., Vaieretti, M. V., Conti, G., Staver, A. C., Aquino, S., Cornelissen, J. H. C.: New handbook for standardised measurement of plant functional traits worldwide. Aust. J. Bot., 64, 715–716, http://dx.doi.org/10.1071/BT12225_CO, 2016.