

README how to use data released from the TRY database (Version 6)

- a) Generalities, data structure and recommendations for data extraction and import
- b) Column headers
- c) Standardized metadata
- d) Recommendations in the case of publications using trait data via TRY

a) Generalities and data structure

Data format: The data are provided as zipped text files (.txt) with 'latin1 swedish ci' encoding (the default setting of MySQL installations) prepared on a Linux 64-bit operating system. Columns are tab-delimited. The first row contains the header. The decimal point is given as a point (e.g. 0.123) not as a comma. We recommend opening the data in a system with English settings, because so far we have been reported problems if the data were opened in a system with German or Portuguese settings.

Data extraction and import: You should be able to extract the zip file in any operating system. In case of large files on a Mac, use the 'unzip' command in the 'Terminal' application to extract the data. You can read the data file (.txt) with a text editor. It should also seamlessly open in Excel. However, in some cases the file may contain too many rows to be accessible via Excel. To work with the data in R, we recommend using the rtry package: <https://cran.r-project.org/web/packages/rtry/index.html> The rtry package supports data import, exploration, filtering, reformatting and export.

- 1) You receive only the trait records, which are public or for which you have the permissions from data contributors.
- 2) A trait may consist of different sub-groups, which have been called "Data", given as DataName and DataID.
- 3) You receive the original values of traits and covariates (column: OrigValueStr). The units of traits with >1000 records and some metadata, e.g., the geographical references and sampling dates) have been standardized. In these cases you additionally receive the standardized values (columns: StdValue and StdUnit for numerical data, StdValueStr for textual data).
- 4) Each row in the data table contains an entry in the database (identified by ObsDataID). This entry is categorized either as trait – in this case it has an entry in the column TraitID - or as covariate – in this case it has no entry in the column TraitID.
- 5) The "ObservationID" links database entries (measurements of traits and covariates) on the same entity to observations (e.g. two traits measured on the same leaf). **Different rows in the data table with the same ObservationID are directly related to each other.**
- 6) You receive the requested trait records and all covariates related to the respective Observations. The covariates you receive may therefore not always make sense in the context of your trait data.

7) The data you receive may contain data from plants grown in natural environment and from plants grown under experimental conditions. If plants were reported to have grown under experimental conditions this is reported as a covariate entry (DataID 327). The covariate is related to the trait entry via the ObservationID. Same for mature and juvenile plants (DataID 413) and leaves (DataID 1444), and for healthy and non-healthy plants (DataID 1961).

8) The data may contain duplicates, e.g. if the same data have been contributed to TRY by different contributors. We used the following criteria for the identification of duplicates: the same trait, the same accepted species name, the same standardized trait values (apart from potential rounding differences), no indication for different measurement sites. In case of duplicates, the later contribution is identified as duplicate. If we have identified a trait record as duplicate you will find the ID of the original entry in the column OrigObsDataID.

9) A general consistency check for the standardized numerical trait values (Column: StdValue) has been applied. For standardized trait values we provide the largest distance of the trait record from either species-mean, genus-mean, family mean or the mean of all data in terms of the respective standard deviation ("z-score", Column: ErrorRisk). For example, an ErrorRisk value of 3 indicates that this trait record has a maximum distance of 3 standard deviations from at least one of the mean values mentioned above. Error risk > 4 may indicate likely problems in the data (similar to Kattge et al. 2011 Global Change Biology, supplementary material). The z-scores for all levels are available at: <https://www.try-db.org/TryWeb/Data.php#90>

10) Geographic coordinates are standardized to longitude and latitude values in decimal format (Column: StdValue) and checked against ESA CCI Land Cover Map of Global Water Bodies (<https://www.esa-landcover-cci.org/?q=node/162>). Information about soil, climate and biome-type of these sites is publicly available at the TRY File Archive: <https://www.try-db.org/TryWeb/Data.php#89>

Standardization of species names (AccSpeciesName) in TRY version 6: The Plant List has been static since 2013 and is assumed to be outdated. We therefore used the following reference floras for the standardization of species names: World Flora Online (WFO, <http://www.worldfloraonline.org/>), Leipzig Catalogue of Vascular Plant Names (LCVP, <https://idiv-biodiversity.github.io/lcvplants>), Tropicos (<https://www.tropicos.org>), and Index Fungorum (<http://www.indexfungorum.org>). If a fuzzy match with acceptable levenshtein distance (in general: <2 in the genus, <3 in the epithet) could be established to an accepted name in WFO, this name was used for standardization, else the accepted name in one of the other reference floras was used, if available.

Note: Curated information for categorical traits (plant growth form, woodiness, leaf type, etc.) for many species is publicly available at the TRY File Archive: TRY Categorical Traits Dataset: <https://www.try-db.org/TryWeb/Data.php#3>

Please do not hesitate to contact us in case you have questions with respect to the data, if you have problems importing the data, or if you find inconsistencies in the data or in the rtry package: jkattge@bgc-jena.mpg.de; boenisch@bgc-jena.mpg.de

b) Column headers

Column	Comment
1. LastName	Surname of data contributor
2. FirstName	First name of data contributor
3. DatasetID	Unique identifier of contributed dataset
4. Dataset	Name of contributed dataset
5. SpeciesName	Original name of species
6. AccSpeciesID	Unique identifier of consolidated species name
7. AccSpeciesName	Consolidated species name
8. ObservationID	Unique identifier for each observation
9. ObsDataID	Unique identifier for each record
10. TraitID	Unique identifier for traits (only if the record is a trait)
11. TraitName	Name of trait (only if the record is a trait)
12. DataID	Unique identifier for each sub-trait or context information
13. DataName	Name of sub-trait or context information
14. OriginalName	Original Name of sub-trait or context information
15. OrigValueStr	Original value as text string
16. OrigUnitStr	Original unit as text string
17. ValueKindName	Value kind (single measurement, mean, median, etc.)
18. OrigUncertaintyStr	Original uncertainty as text string
19. UncertaintyName	Kind of uncertainty (standard deviation, standard error,...)
20. Replicates	Count of replicates
21. StdValue	Standardized value: available for standardized traits
22. StdUnit	Standard unit: available for standardized traits
23. RelUncertaintyPercent	Relative uncertainty in %
24. OrigObsDataID	Unique identifier for duplicate entries
25. ErrorRisk	Indication for outliers: distance to mean in standard deviations
26. Reference	Reference to be cited if trait record is used in analysis
27. Comment	Explanation for the OriginalName in the contributed dataset
28. StdValueStr	Standardized entries for textual metadata

Sometimes R may show a column 29, which should be empty. This column is then an artefact due to different software (MySQL versus R).

c) Standardized Metadata

Numerical values in column StdValue:

Latitude:	DataID 59
Longitude:	DataID 60
Altitude:	DataID 61

Textual values in column StdValueStr:

Sampling Date:	DataID 6601
Exposition:	DataID 327
Plant developmental state:	DataID 413

Leaf developmental state:
Health status of the plant:

DataID 1444
DataID 1961

d) Recommendations in case of publications using trait data via TRY

The intellectual property guidelines of TRY provide the following suggestions:

Trait data via TRY are in general shared under the Creative Commons Attribution License 'CC BY' (<https://creativecommons.org/licenses/by/4.0>). Users are free to use, share and adapt the data, under the condition to provide appropriate credit. Following the 'Joint Declaration of Data Citation Principles' the appropriate credit involves citation of the data sources, and these data citations should 'facilitate giving scholarly credit and normative and legal attribution to all contributors to the data' (<https://doi.org/10.25490/a97f-egykh>).

Any product that involves trait data received via the TRY Database therefore needs to cite the references of the datasets as contributed to TRY and the standard reference of the TRY Database. In the context of peer-reviewed publications these citations should be accountable by indexing services like Google Scholar or the Science Citation Index (SCI).

If data received during their embargo period ('restricted access') have been used in analyses, the respective custodians need to be invited to contribute to the development of manuscript/s, if they had indicated this at the time of data request.

In case of publications that rely on a significant amount of public plant trait data received via TRY, or if a research could not be completed without a specific dataset or would be notably compromised, it is strongly recommended to consider inviting the respective data custodian(s) and the TRY database management for collaboration and authorship.

Sending invitations for co-authorship at early stages of manuscript preparation is strongly recommended, so valid suggestions by co-authors can be accommodated. Co-authorship should be offered to those who respond to this invitation and subsequent updates within a timely fashion with a significant contribution.

The standard reference of the TRY Database is currently:

Kattge, J., Bönisch, G., Díaz, S., Lavorel, S., Prentice, I. C., Leadley, P., Tautenhahn, S., Werner, G., et al. (2020). TRY plant trait database - enhanced coverage and open access. *Global Change Biology*, 26(1), 119-188. doi:10.1111/gcb.14904.

If data via TRY have made a decidedly minor contribution to the manuscript, offering authorship and citing original references in the main part of the manuscript may not be appropriate. However, these exceptions need to be discussed with the TRY database management in each case.

Apart from these general requirements of authorship, citation and acknowledgement, **please respect all individual agreements with data contributors made at the time of data requests!**

Complete standard reference:

Kattge, J., G. Bönisch, S. Díaz, S. Lavorel, I. C. Prentice, P. Leadley, S. Tautenhahn, G. D. A. Werner, T. Aakala, M. Abedi, A. T. R. Acosta, G. C. Adamidis, K. Adamson, M. Aiba, C. H. Albert, J. M. Alcántara, C. Alcázar C, I. Aleixo, H. Ali, B. Amiaud, C. Ammer, M. M. Amoroso, M. Anand, C. Anderson, N. Anten, J. Antos, D. M. G. Apgaua, T.-L. Ashman, D. H. Asmara, G. P. Asner, M. Aspinwall, O. Atkin, I. Aubin, L. Baastrup-Spohr, K. Bahalkeh, M. Bahn, T. Baker, W. J. Baker, J. P. Bakker, D. Baldocchi, J. Baltzer, A. Banerjee, A. Baranger, J. Barlow, D. R. Barneche, Z. Baruch, D. Bastianelli, J. Battles, W. Bauerle, M. Bauters, E. Bazzato, M. Beckmann, H. Beeckman, C. Beierkuhnlein, R. Bekker, G. Belfry, M. Belluau, M. Beloiu, R. Benavides, L. Benomar, M. L. Berdugo-Lattke, E. Berenguer, R. Bergamin, J. Bergmann, M. Bergmann Carlucci, L. Berner, M. Bernhardt-Römermann, C. Bigler, A. D. Bjorkman, C. Blackman, C. Blanco, B. Blonder, D. Blumenthal, K. T. Bocanegra-González, P. Boeckx, S. Bohlman, K. Böhning-Gaese, L. Boisvert-Marsh, W. Bond, B. Bond-Lamberty, A. Boom, C. C. F. Boonman, K. Bordin, E. H. Boughton, V. Boukili, D. M. J. S. Bowman, S. Bravo, M. R. Brendel, M. R. Broadley, K. A. Brown, H. Bruelheide, F. Brumnich, H. H. Bruun, D. Bruy, S. W. Buchanan, S. F. Bucher, N. Buchmann, R. Buitenwerf, D. E. Bunker, J. Bürger, S. Burrascano, D. F. R. P. Burslem, B. J. Butterfield, C. Byun, M. Marques, M. C. Scalon, M. Caccianiga, M. Cadotte, M. Cailleret, J. Camac, J. J. Camarero, C. Company, G. Campetella, J. A. Campos, L. Cano-Arboleda, R. Canullo, M. Carbognani, F. Carvalho, F. Casanoves, B. Castagneyrol, J. A. Catford, J. Cavender-Bares, B. E. L. Cerabolini, M. Cervellini, E. Chacón-Madrugal, K. Chapin, F. S. Chapin, S. Chelli, S.-C. Chen, A. Chen, P. Cherubini, F. Chianucci, B. Choat, K.-S. Chung, M. Chytrý, D. Ciccarelli, L. Coll, C. G. Collins, L. Conti, D. Coomes, J. H. C. Cornelissen, W. K. Cornwell, P. Corona, M. Coyea, J. Craine, D. Craven, J. P. G. M. Crowsigt, A. Csecserits, K. Cufar, M. Cuntz, A. C. da Silva, K. M. Dahlin, M. Dainese, I. Dalke, M. Dalle Fratte, A. T. Dang-Le, J. Danihelka, M. Dannoura, S. Dawson, A. J. de Beer, A. De Fritos, J. R. De Long, B. Dechant, S. Delagrangue, N. Delpierre, G. Derroire, A. S. Dias, M. H. Diaz-Toribio, P. G. Dimitrakopoulos, M. Dobrowolski, D. Doktor, P. Dřevojan, N. Dong, J. Dransfield, S. Dressler, L. Duarte, E. Ducouret, S. Dullinger, W. Durka, R. Duursma, O. Dymova, A. E-Vojtkó, R. L. Eckstein, H. Ejtehadi, J. Elser, T. Emilio, K. Engemann, M. B. Erfanian, A. Erfmeier, A. Esquivel-Muelbert, G. Esser, M. Estiarte, T. F. Domingues, W. F. Fagan, J. Fagúndez, D. S. Falster, Y. Fan, J. Fang, E. Farris, F. Fazlioglu, Y. Feng, F. Fernandez-Mendez, C. Ferrara, J. Ferreira, A. Fidelis, B. Finegan, J. Firn, T. J. Flowers, D. F. B. Flynn, V. Fontana, E. Forey, C. Forgiarini, L. François, M. Frangipani, D. Frank, C. Frenette-Dussault, G. T. Freschet, E. L. Fry, N. M. Fyllas, G. G. Mazzochini, S. Gachet, R. Gallagher, G. Ganade, F. Ganga, P. García-Palacios, V. Gargaglione, E. Garnier, J. L. Garrido, A. L. de Gasper, G. Gea-Izquierdo, D. Gibson, A. N. Gillison, A. Girollo, M.-C. Glasenhardt, S. Gleason, M. Gliesch, E. Goldberg, B. Gödel, E. Gonzalez-Akre, J. L. Gonzalez-Andujar, A. Gonzalez-Melo, A. Gonzalez-Robles, B. J. Graae, E. Granda, S. Graves, W. A. Green, T. Gregor, N. Gross, G. R. Guerin, A. Günther, A. G. Gutiérrez, L. Haddock, A. Haines, J. Hall, A. Hambuckers, W. Han, S. P. Harrison, W. Hattingh, J. E. Hawes, T. He, P. He, J. M. Heberling, A. Helm, S. Hempel, J. Hentschel, B. Hérault, A.-M. Hereş, K. Herz, M. Heuertz, T. Hickler, P. Hietz, P. Higuchi, A. L. Hipp, A. Hiron, M. Hock, J. A. Hogan, K. Holl, O. Honnay, D. Hornstein, E. Hou, N. Hough-Snee, K. A. Hovstad, T. Ichie, B. Igić, E. Illa, M. Isaac, M. Ishihara, L. Ivanov, L. Ivanova, C. M. Iversen, J. Izquierdo, R. B. Jackson, B. Jackson, H. Jactel, A. M. Jagodzinski, U. Jandt, S. Jansen, T. Jenkins, A. Jentsch, J. R. P. Jespersen, G.-F. Jiang, J. L. Johansen, D. Johnson, E. J. Jokela, C. A. Joly,

G. J. Jordan, G. S. Joseph, D. Junaedi, R. R. Junker, E. Justes, R. Kabzems, J. Kane, Z. Kaplan, T. Kattenborn, L. Kavelenova, E. Kearsley, A. Kempel, T. Kenzo, A. Kerkhoff, M. I. Khalil, N. L. Kinlock, W. D. Kissling, K. Kitajima, T. Kitzberger, R. Kjøller, T. Klein, M. Kleyer, J. Klimešová, J. Klipel, B. Kloeppe, S. Klotz, J. M. H. Knops, T. Kohyama, F. Koike, J. Kollmann, B. Komac, K. Komatsu, C. König, N. J. B. Kraft, K. Kramer, H. Kreft, I. Kühn, D. Kumarathunge, J. Kuppler, H. Kurokawa, Y. Kurosawa, S. Kuyah, J.-P. Laclau, B. Lafleur, E. Lallai, E. Lamb, A. Lamprecht, D. J. Larkin, D. Laughlin, Y. Le Bagousse-Pinguet, G. le Maire, P. C. le Roux, E. le Roux, T. Lee, F. Lens, S. L. Lewis, B. Lhotsky, Y. Li, X. Li, J. W. Lichstein, M. Liebergesell, J. Y. Lim, Y.-S. Lin, J. C. Linares, C. Liu, D. Liu, U. Liu, S. Livingstone, J. Llusia, M. Lohbeck, Á. López-García, G. Lopez-Gonzalez, Z. Lososová, F. Louault, B. A. Lukács, P. Lukeš, Y. Luo, M. Lussu, S. Ma, C. Maciel Rabelo Pereira, M. Mack, V. Maire, A. Mäkelä, H. Mäkinen, A. C. M. Malhado, A. Mallik, P. Manning, S. Manzoni, Z. Marchetti, L. Marchino, V. Marcilio-Silva, E. Marcon, M. Marignani, L. Markesteyn, A. Martin, C. Martínez-Garza, J. Martínez-Vilalta, T. Mašková, K. Mason, N. Mason, T. J. Massad, J. Masse, I. Mayrose, J. McCarthy, M. L. McCormack, K. McCulloh, I. R. McFadden, B. J. McGill, M. Y. McPartland, J. S. Medeiros, B. Medlyn, P. Meerts, Z. Mehrabi, P. Meir, F. P. L. Melo, M. Mencuccini, C. Meredieu, J. Messier, I. Mészáros, J. Metsaranta, S. T. Michaletz, C. Michelaki, S. Migalina, R. Milla, J. E. D. Miller, V. Minden, R. Ming, K. Mokany, A. T. Moles, A. Molnár V, J. Molofsky, M. Molz, R. A. Montgomery, A. Monty, L. Moravcová, A. Moreno-Martínez, M. Moretti, A. S. Mori, S. Mori, D. Morris, J. Morrison, L. Mucina, S. Mueller, C. D. Muir, S. C. Müller, F. Munoz, I. H. Myers-Smith, R. W. Myster, M. Nagano, S. Naidu, A. Narayanan, B. Natesan, L. Nengoita, A. S. Nelson, E. L. Neuschulz, J. Ni, G. Niedrist, J. Nieto, Ü. Niinemets, R. Nolan, H. Nottebrock, Y. Nouvellon, A. Novakovskiy, The Nutrient Network, K. O. Nystuen, A. O Grady, K. O Hara, A. O Reilly-Nugent, S. Oakley, W. Oberhuber, T. Ohtsuka, R. Oliveira, K. Öllerer, M. E. Olson, V. Onipchenko, Y. Onoda, R. E. Onstein, J. C. Ordonez, N. Osada, I. Ostonen, G. Ottaviani, S. Otto, G. E. Overbeck, W. A. Ozinga, A. T. Pahl, C. E. T. Paine, R. J. Pakeman, A. C. Papageorgiou, E. Parfionova, M. Pärtel, M. Patacca, S. Paula, J. Paule, H. Pauli, J. G. Pausas, B. Peco, J. Penuelas, A. Perea, P. L. Peri, A. C. Petisco-Souza, A. Petraglia, A. M. Petritan, O. L. Phillips, S. Pierce, V. D. Pillar, J. Pisek, A. Pomogaybin, H. Poorter, A. Portsmouth, P. Poschlod, C. Potvin, D. Pounds, A. S. Powell, S. A. Power, A. Prinzing, G. Puglielli, P. Pyšek, V. Ravel, A. Rammig, J. Ransijn, C. A. Ray, P. B. Reich, M. Reichstein, D. E. B. Reid, M. Réjou-Méchain, V. R. de Dios, S. Ribeiro, S. Richardson, K. Riibak, M. C. Rillig, F. Riviera, E. M. R. Robert, S. Roberts, B. Robroek, A. Roddy, A. V. Rodrigues, A. Rogers, E. Rollinson, V. Rolo, C. Römermann, D. Ronzhina, C. Roscher, J. A. Rosell, M. F. Rosenfield, C. Rossi, D. B. Roy, S. Royer-Tardif, N. Rüger, R. Ruiz-Peinado, S. B. Rumpf, G. M. Rusch, M. Ryo, L. Sack, A. Saldaña, B. Salgado-Negret, R. Salguero-Gomez, I. Santa-Regina, A. C. Santacruz-García, J. Santos, J. Sardans, B. Schamp, M. Scherer-Lorenzen, M. Schleuning, B. Schmid, M. Schmidt, S. Schmitt, J. V. Schneider, S. D. Schowaneck, J. Schrader, F. Schrod, B. Schuldt, F. Schurr, G. Selaya Garvizu, M. Semchenko, C. Seymour, J. C. Sfair, J. M. Sharpe, C. S. Sheppard, S. Sheremetiev, S. Shiodera, B. Shipley, T. A. Shovon, A. Siebenkäs, C. Sierra, V. Silva, M. Silva, T. Sitzia, H. Sjöman, M. Slot, N. G. Smith, D. Sodhi, P. Soltis, D. Soltis, B. Somers, G. Sonnier, M. V. Sørensen, E. E. Sosinski Jr, N. A. Soudzilovskaia, A. F. Souza, M. Spasojevic, M. G. Sperandii, A. B. Stan, J. Stegen, K. Steinbauer, J. G. Stephan, F. Sterck, D. B. Stojanovic, T. Strydom, M. L. Suarez, J.-C. Svenning, I. Svitková, M. Svitok, M. Svoboda, E. Swaine, N. Swenson, M. Tabarelli, K. Takagi, U. Tappeiner, R. Tarifa, S. Taugourdeau, C. Tavsanoğlu, M. te Beest, L. Tedersoo, N. Thiffault, D. Thom, E. Thomas, K. Thompson, P. E. Thornton, W. Thuiller, L. Tichý, D. Tissue, M. G. Tjoelker, D. Y. P. Tng, J.

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