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# What are we linking?

The 1<sup>st</sup> annual meeting of Cost Action FP1305  
**Biolink**

COST Action FP1305 BioLink:  
Linking belowground biodiversity and ecosystem function in  
European forests



## (28) Anatomical-morphological identification of fine roots of the common European tree species

Tanja Mrak\*, Jožica Gričar, Peter Železnik, Hojka Kraigher

Slovenian Forestry Institute, Večna pot 2, 1000 Ljubljana

\* corresponding author (tanja.mrak@gozdis.si)

Fine roots ( $\leq 2$  mm) are the most dynamic part of the root system and represent the primary route for uptake of water and nutrients to the plants (Joslin et al. 2006). At the same time, turnover of the tree fine roots is one of the major carbon pathways in forests (Brunner et al. 2013). The ability to identify tree (fine) roots would enable analyses of root distribution of different tree species as well as linking of mycorrhizal symbionts to their hosts, thereby allowing for studies of belowground functional pathways. Root identification key of Cutler et al. from 1987, which is sold out, is mostly based on single specimen not regarding the possibility of certain anatomical character to change within the root (Trockenbrodt et al. 2001), e.g with decreasing diameter/root order. The key of Cutler et al. (1987) was also used for the preparation of the anatomical key of the most common European boreal and temperate ectomycorrhizal hosts in Agerer's Colour atlas of ectomycorrhizae (1987-2008). The comprehensive atlas of Kutschera & Lichtenegger (2002) is missing identification key and information on typical characteristics of the presented species are difficult to find. Up to our knowledge, there is no identification key available that would take into account also the morphological characteristics of the roots. In the frame of EUFORINNO project (REGPOT no. 315982), we are investigating both anatomical and morphological identification approaches on roots of ten common European tree species to specify the most useful identification characteristics. These characteristics will be used to prepare an identification key for the studied species and if possible, extended to other woody plants. Roots of diameters less than 5 mm are analysed, taking into account also the most distal fine roots. Anatomy of roots is studied on transversal and longitudinal/radial sections, whereby especially root wood characteristics are considered and compared to characteristics of stem wood described in the existing stem wood identification keys. For morphology, characteristics such as diameter of lateral branches, branching pattern, colour, texture of the root bark or epidermis are evaluated as suggested by Pregitzer et al. (2002).

### References:

- Agerer R., ed. (1987-2008) Colour atlas of ectomycorrhizae 1<sup>st</sup>-14<sup>th</sup> del., Einhorn-Verlag, Schwäbisch Gmünd
- Brunner I., Bakker M.R., Björk R.G., Hirano Y., Lukac M., Aranda X., Børja I., Eldhuset T.D., Helisaari H.S., Jourdan C. et al. (2013) *Plant and Soil* 362(1-2), 357-372.
- Cutler D. F., Rudall P. J., Gasson P. E., Gale R. M. O. (1987) *Root identification manual of trees and shrubs. A guide to the anatomy of roots of trees and shrubs hardy in Britain and northern Europe. First Edition.* Chapman and Hall, London: 245 pp.
- Joslin J.D., Gaudinski J.B., Torn M.S., Riley W. J., Hanson P.J. (2006) *New Phytologist* 172, 523-535.
- Kutschera L. and Lichtenegger E. (2002) *Wurzelatlas mitteleuropäischer Waldbäume und Sträucher. Ersteauflage.* Stocker, Graz: 604 pp.
- Pregitzer K. S., DeForest J. L., Burton A. J., Allen M. F., Ruess R. W., Hendrick R. L. (2002) *Ecological Monographs* 72 (2), 293-309.
- Trockenbrodt M., Richter H.G., Möller\_Lindenhof Y., Dujesiefken D. (2001) *Stadt und grün* 6, 430-434