

<https://doi.org/10.17221/4/2021-JFS>

Exploring the variability in elastic properties of roots in Alpine tree species

ALESSIO CISLAGHI^{1,2*}

¹*Department of Agricultural and Environmental Sciences (DiSAA), University of Milan, Milan, Italy*

²*Centre of Applied Studies for the Sustainable Management and Protection of Mountain Areas (Ge.S.Di.Mont), University of Milan, Brescia, Italy*

**Corresponding author: alessio.cislaghi@unimi.it*

Electronic Supplementary Material (ESM)

The authors are fully responsible for both the content and the formal aspects of the electronic supplementary material. No editorial adjustments were made

Table S1. Main characteristics of the stand selected for the analysis.(To be continued)

Code	Latin name	Geographical area	Sample site	Latitude*	Longitude*	Mean elevation (m)	WRB	Soil texture	Silvicultural system
QrPVBere	<i>Quercus robur</i> L.	Ticino Valley	Bereguardo (PV)	499880	5010396	67	Arenosols on alluvial deposits	sand	high forest
ArPVBron	<i>Acer platanoides</i> L.	Oltrepo' Pavese	Broni (PV)	518947	4992364	67	Vertisols on conglomerates	clay	high forest
RpPVBron	<i>Robinia pseudoacacia</i> L.	Oltrepo' Pavese	Broni (PV)	518915	4991547	71	Vertisols on conglomerates	clay	coppice
UmPVBron	<i>Ulmus minor</i> Mill.	Oltrepo' Pavese	Broni (PV)	519512	4991721	71	Vertisols on conglomerates	loamy sand	high forest
ArPVStra	<i>Acer platanoides</i> L.	Oltrepo' Pavese	Stradella (PV)	524567	4990490	91	Fluvisols on alluvial deposits	loam	high forest
RpMIOper	<i>Robinia pseudoacacia</i> L.	Lomellina Plain	Opera (MI)	515560	5023645	98	Cambisols on conglomerates	loamy sand	coppice
ArPVCann	<i>Acer platanoides</i> L.	Oltrepo' Pavese	Canneto pavese (PV)	520874	4989754	121	Cambisols on conglomerates	clay loam	high forest
QrPVCann	<i>Quercus robur</i> L.	Oltrepo' Pavese	Canneto Pavese (PV)	520874	4989754	121	Cambisols on conglomerates	clay loam	high forest
QpMICugg	<i>Quercus pubescens</i> Willd.	Ticino Valley	Cuggiono (MI)	481054	5037939	128	Umbrisols on alluvial deposits	sand	high forest
RpBGPont	<i>Robinia pseudoacacia</i> L.	Valseriana	Ponte Nossa (BG)	568440	5078438	454	Leptosols on dolomite	loam	coppice
CsVCMnFe	<i>Castanae sativa</i> Mill.	Valsesia	Valduggia (VC)	447056	5062692	550	Entisols on porphyries	sand	coppice
CsSBBoar	<i>Castanae sativa</i> Mill.	Lower Valcamonica	Boario (BS)	593172	5080146	595	Cambisols on alluvial deposits	loamy sand	coppice
FsCOFagg	<i>Fagus sylvatica</i> L.	Como Lake	Faggeto Lario (CO)	513323	5078434	640	Cambisols on marls and limestone	clay loam	high forest
FeBGOnet	<i>Fraxinus excelsior</i> L.	Valseriana	Oneta (BG)	563517	5079107	646	Cambisols on mudstone, marls and limestone	loamy sand	coppice
ApBGOnet	<i>Acer pseudoplatanus</i> L.	Valseriana	Oneta (BG)	563460	5079139	662	Cambisols on limestone, marls, mudstone and sandstone	clay loam	high forest
FeLCPast	<i>Fraxinus excelsior</i> L.	Valsassina	Pasturo (LC)	534807	5087118	700	Cambisols on alluvial deposits	loam	coppice

<https://doi.org/10.17221/4/2021-JFS>

Table S1 to be continued

Code	Latin name	Geographical area	Sample site	Latitude*	Longitude*	Mean elevation (m)	WRB	Soil texture	Silvicultural system
OcLCPast	<i>Ostrya carpinifolia</i> Scop.	Valsassina	Pasturo (LC)	534790	5087026	724	Cambisols on alluvial deposits	loam	coppice
QpLCVend	<i>Quercus pubescens</i> Willd.	Valsassina	Vendrogno (LC)	525142	5098196	737	Cambisols on paragneiss	loamy sand	high forest
OcBSMale	<i>Ostrya carpinifolia</i> Scop.	Lower Valcamonica	Malegno (BS)	599403	5090683	766	Cambisols on limestone	clay loam	coppice
CsSOViCh	<i>Castanea sativa</i> Mill.	Val Chiavenna	Villa di Chiavenna (SO)	539614	5130846	776	Regosols on alluvial deposits	loamy sand	coppice
CaAVaVara	<i>Corylus avellana</i> L.	Valcuvia	Vararo (VA)	473804	5084832	786	Leptosols on marls and sandstone	loamy sand	high forest
FeVAVara	<i>Fraxinus excelsior</i> L.	Valcuvia	Vararo (VA)	473806	5084842	790	Leptosols on marls and limestone	loamy sand	high forest
FoBSMale	<i>Fraxinus ornus</i> L.	Lower Valcamonica	Malegno (BS)	599598	5090819	807	Cambisols on limestone	clay loam	coppice
CsVABren	<i>Castanea sativa</i> Mill.	Valcuvia	Brenta (VA)	474358	5084471	850	Cambisols on marls and sandstone	clay loam	coppice
FeBSPres	<i>Fraxinus excelsior</i> L.	Lower Valcamonica	Prestine (BS)	602503	5085973	867	Cambisols on sandstone, marls, siltstone, mudstone and limestone	loam	high forest
PaBGFino	<i>Picea abies</i> L.	Valseriana	Fino del Monte (BG)	577288	5083962	931	Leptosols on dolomite	loam	high forest
FsLCMogg	<i>Fagus sylvatica</i> L.	Valsassina	Moggio (LC)	538479	5085553	949	Cambisols on dolomite	loamy sand	coppice
ApBSPres	<i>Acer pseudoplatanus</i> L.	Lower Valcamonica	Prestine (BS)	602858	5085810	957	Cambisols on sandstone, marls, siltstone and limestone	loam	high forest
FsBSGian	<i>Fagus sylvatica</i> L.	Lower Valcamonica	Gianico (BS)	593489	5078827	964	Cambisols on phyllites and mica-schists	loamy sand	coppice
CsLCCasa	<i>Castanea sativa</i> Mill.	Valsassina	Casargo (LC)	528864	5098264	980	Umbrisols on conglomerates and sandstone	loamy sand	coppice
FsLCBarz	<i>Fagus sylvatica</i> L.	Valsassina	Barzio (LC)	537069	5088205	1 002	Leptosols on dolomite	loamy sand	coppice
AiBSCort	<i>Alnus incana</i> L.	Upper Valcamonica	Corteno Golgi (BS)	593298	5113098	1 007	Cambisols on phyllites and micaschists	loamy sand	coppice

4 Table S1 to be continued

Code	Latin name	Geographical area	Sample site	Latitude*	Longitude*	Mean elevation (m)	WRB	Soil texture	Silvicultural system
CsLCCran	<i>Castanae sativa</i> Mill.	Valsassina	Crandola (LC)	530564	5095697	1 012	Regosols on conglomerates and sandstone	sandy loam	coppice
CsVABrin	<i>Castanae sativa</i> Mill.	Val Resia	Brinzio (VA)	482820	5079276	1 041	Cambisols on limestone	clay loam	coppice
FsVABrin	<i>Fagus sylvatica</i> L.	Val Resia	Brinzio (VA)	482820	5079276	1 041	Cambisols on limestone	clay loam	high forest
AaBGAvér	<i>Abies alba</i> Mill.	Valbrembana	Averara (BG)	548701	5095635	1 075	Cambisols on porphyry bedrock	loamy sand	high forest
PaSOVich	<i>Picea abies</i> L.	Val Chiavenna	Villa di Chiavenna (SO)	537591	5129747	1 085	Regosols on paragneiss	loamy sand	high forest
PaSOPiur	<i>Picea abies</i> L.	Valtellina	Piuro (SO)	533992	5128939	1 095	Umbrisols on basaltic bedrock	loamy sand	high forest
FsBSArto	<i>Fagus sylvatica</i> L.	Lower Valcamonica	Artogne (BS)	594402	5077243	1 197	Podzol on phyllites and mica-schists	loamy sand	coppice
PaBSIncu	<i>Picea abies</i> L.	Upper Valcamonica	Incudine (BS)	605235	5120820	1 209	Cambisols on alluvial deposits	loamy sand	high forest
LdSOChie	<i>Larix decidua</i> Mill.	Valmalenco	Chiesa in Valmalenco (SO)	564539	5122568	1 234	Cambisols on alluvial deposits	loamy sand	high forest
FsLCMort	<i>Fagus sylvatica</i> L.	Valsassina	Morterone (LC)	537876	5079600	1 266	Cambisols on marls and limestone	clay	coppice
AaBGCusi	<i>Abies alba</i> Mill.	Valbrembana	Cusio (BG)	545428	5093720	1 284	Cambisols on sandstone, siltstone and mudstone	loamy sand	high forest
CsBSCevo	<i>Castanae sativa</i> Mill.	Upper Valcamonica	Cevo (BS)	607665	5104295	1 311	Podzol on phyllites and micaschists	loamy sand	high forest
LdBSCevo	<i>Larix decidua</i> Mill.	Upper Valcamonica	Cevo (BS)	607665	5104295	1 311	Podzol on phyllites and micaschists	loamy sand	high forest
FsCOAIGi	<i>Fagus sylvatica</i> L.	Alpe Gigiai	Montemezzo (CO)	530313	5116559	1 370	Cambisols on granite bedrock	loamy sand	coppice
AaSOTriv	<i>Abies alba</i> Mill.	Valtellina	Trivigno (SO)	588896	5112897	1 377	Cambisols on andesites	loamy sand	high forest
PaSOTriv	<i>Picea abies</i> L.	Valtellina	Trivigno (SO)	588896	5112897	1 385	Cambisols on andesites	loamy sand	high forest

<https://doi.org/10.17221/4/2021-JFS>

Table S1 to be continued

Code	Latin name	Geographical area	Sample site	Latitude*	Longitude*	Mean elevation (m)	WRB	Soil texture	Silvicultural system
ApLCIntr	<i>Acer pseudoplatanus</i> L.	Valsassina	Introbio (LC)	537528	5092483	1 422	Regosols on phyllites and micaschist	loamy sand	high forest
OcLCIntr	<i>Ostrya carpinifolia</i> Scop.	Valsesia	Introbio (LC)	537558	5092491	1 437	Regosols on phyllites and micaschist	loamy sand	coppice
FsLCIntr	<i>Fagus sylvatica</i> L.	Valsassina	Introbio (LC)	537558	5092491	1 440	Regosols on phyllites and micaschist	loamy sand	high forest
LdBGMnPo	<i>Larix decidua</i> Mill.	Presolana Mount	Castione della Presolana (BG)	583858	5081260	1 464	Cambisols on mudstone, marls and limestone	clay	high forest
PaBGMnPo	<i>Picea abies</i> L.	Presolana Mount	Castione della Presolana (BG)	583951	5081375	1 477	Cambisols on mudstone, marls and limestone	clay	high forest
PaCOAlGi	<i>Picea abies</i> L.	Alpe Gigiai	Montemezzo (CO)	528884	5117133	1 548	Umbrisols on granite bedrock	loamy sand	high forest
LdCOAlGi	<i>Larix decidua</i> Mill.	Alpe Gigiai	Montemezzo (CO)	528285	5117218	1 562	Umbrisols on granite bedrock	loamy sand	high forest
LdBSPont	<i>Larix decidua</i> Mill.	Upper Valcamonica	Ponte di Legno (BS)	614575	5129448	1 701	Podzols on micaschist	loamy sand	high forest

*WGS 84/UTM zone 32N EPSG:32632;

<https://doi.org/10.17221/4/2021-JFS>Table S2. Coefficients and statistical parameters of power regression E_{mat} vs. root diameter for all study sites

Code	E_0	β	R^2	SE
AaBGAver	118.433	-0.854	0.696	0.292
AaBGCusi	112.411	-0.804	0.659	0.303
AaSOTriv	103.629	-0.917	0.576	0.320
AiBSCort	286.449	-1.848	0.799	0.941
ApBGOnet	198.563	-1.439	0.732	0.763
ApBSPres	287.814	-1.051	0.740	0.528
ApLCIntr	140.544	-1.002	0.634	0.672
ArPVBron	148.533	-0.685	0.747	0.238
ArPVCann	140.441	-0.648	0.470	0.294
ArPVStra	165.890	-0.790	0.694	0.313
CaVAVara	316.125	-0.856	0.294	0.852
CsBSBoar	328.852	-1.878	0.792	0.847
CsBSCevo	192.805	-0.673	0.331	0.442
CsLCCasa	184.488	-1.080	0.620	0.718
CsLCCran	189.701	-0.876	0.751	0.439
CsSOViCh	400.828	-1.949	0.841	0.850
CsVABren	202.620	-1.152	0.739	0.392
CsVABrin	267.869	-0.654	0.572	0.402
CsVCMnFe	146.773	-0.724	0.478	0.341
FeBGOnet	140.448	-1.224	0.698	0.736
FeBSPres	275.480	-1.398	0.693	0.892
FeLCPast	192.991	-1.090	0.684	0.725
FeVAVara	245.501	-1.127	0.799	0.406
FoBSMale	346.702	-1.621	0.752	0.874
FsBSArto	402.254	-1.699	0.797	0.829
FsBSGian	435.039	-1.329	0.741	0.714
FsCOAlGi	360.502	-1.001	0.788	0.482
FsCOFagg	150.854	-1.546	0.830	0.465
FsLCBarz	231.228	-0.978	0.782	0.355
FsLCIntr	185.478	-0.585	0.214	0.625
FsLCMogg	281.796	-1.159	0.785	0.593
FsLCMort	217.572	-0.911	0.639	0.623
FsVABrin	407.597	-0.978	0.622	0.432
LdBGMnPo	138.228	-1.376	0.800	0.550
LdBSCevo	133.115	-0.623	0.388	0.524
LdBSPont	64.307	-0.376	0.248	0.410
LdCOAlGi	300.164	-1.362	0.733	0.829
LdSOChie	135.270	-1.019	0.583	0.678
OcBSMale	345.656	-1.532	0.708	0.903
OcLCIntr	143.807	-0.862	0.475	0.690
OcLCPast	227.328	-1.173	0.663	0.809
PaBGFino	283.371	-1.652	0.769	0.781
PaBGMnPo	199.313	-1.304	0.761	0.690
PaBSIncu	184.211	-1.218	0.627	0.638

<https://doi.org/10.17221/4/2021-JFS>

Table S2 to be continued

Code	E0	β	R^2	SE
PaCOALGi	225.947	-1.193	0.710	0.732
PaSOPiur	201.404	-1.443	0.829	0.571
PaSOTriv	248.403	-1.438	0.906	0.457
PaSOViCh	194.272	-1.480	0.841	0.574
QpLCBell	165.890	-0.790	0.694	0.313
QpMICugg	128.211	-0.887	0.618	0.697
QrPVBere	141.952	-0.823	0.496	0.442
QrPVCann	228.973	-0.468	0.389	0.444
RpBGPont	144.799	-0.818	0.619	0.462
RpMIOper	160.094	-0.827	0.413	0.588
RpPVBron	137.265	-0.581	0.649	0.319
UmPVBron	121.530	-0.760	0.669	0.329

E0 and β – coefficients of power law; R^2 – coefficient of determination; SE – the standard error