

Supplementary material

Title: Community-level trait patterns are detectable even along short stress gradients but not readily predictable under very limited soil resources

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Fig. S1. Distributions of mean monthly, minimum and maximum temperatures (a), and mean monthly precipitations (b) in Stânceni (640 m a.s.l. in the Mureș valley) and Râu Sadului (630 m a.s.l. in the Sadu valley).

Table S1. Phytosociological table including the 39 relevés of *Sempervivum heuffelii* (1-14) and *Asplenio trichomanis-Poëtum nemoralis* (15-39). The taxonomic nomenclature followed FloraVeg.EU (<https://floraveg.eu>).

Table S2. Equations and error distribution types employed in fitting single trait dominance via generalised regression.

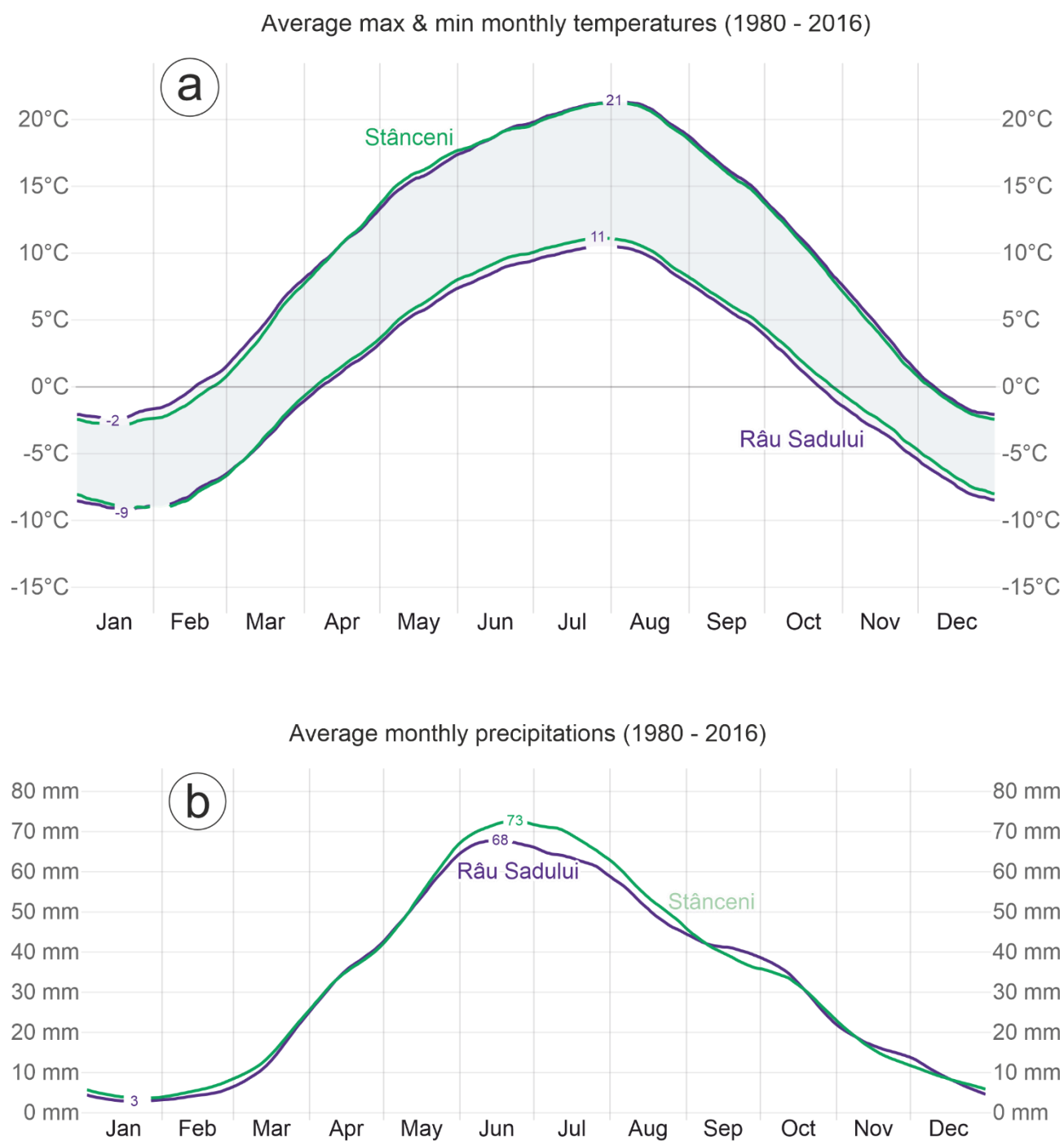


Fig. S1. Distributions of mean monthly, minimum and maximum temperatures (a) and mean monthly precipitations (b) in Stânceni (640 m a.s.l. in the Mureș valley) and Râu Sadului (630 m a.s.l. in the Sad valley).

Table S1. Phytosociological table including the 39 relevés of *Sempervivetum heuffelii* (1-14) and *Asplenio trichomanis-Poëtum nemoralis* (15-39). The taxonomic nomenclature followed FloraVeg.EU (<https://floraveg.eu>).

Relevé number (ID)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	
Elevation (m a.s.l.)	560	585	653	651	615	500	500	450	500	550	650	660	770	770	634	616	592	560	600	547	640	652	640	608	560	578	553	587	651	500	600	660	750	750	770	770	770	780	940	
Aspect	SW	S	SW	SW	S	W	SE	SW	W	SW	SW	SE	S	S	S	S	S	SW	E	N	S	S	S	N	NE	N	N	S	SE	SW	S	SE	SW	SW	SE	S	SW	E	SE	
Slope (degree)	85	70	80	75	80	90	75	90	80	90	80	75	80	75	80	80	85	85	80	85	80	85	85	90	70	90	85	85	80	75	75	65	80	60	85	70	80	85	80	
Area (m²)	16	16	16	16	16	3	4	2	1	1	4	4	4	4	25	16	16	16	25	16	25	25	25	25	25	25	25	25	25	4	4	4	4	4	4	4	4	4	4	
Vegetation cover (%)	47	26	25	30	28	20	40	20	15	1	20	40	20	25	60	30	50	50	56	67	34	64	45	55	32	67	53	52	73	15	60	50	25	30	50	65	40	30	45	
Dominant species																																								
<i>Poa nemoralis</i>	+	+	+	+	+	.	.	.	.	.	+	.	+	+	3	2	3	3	3	3	2	3	2	3	2	3	3	3	2	1	3	1	1	1	3	3	2	2	2	
<i>Jovibarba heuffelii</i>	3	2	2	2	2	1	3	2	2	1	2	3	2	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	
Diagnostic species of <i>Asplenion septentrionalis</i>																																								
<i>Polypodium vulgare</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	+	.	.	+	+	+	+	+	.	+	.	.	.	+	+	.	.	.	.		
<i>Asplenium septentrionale</i>	+	.	+	1	+	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
Diagnostic species of <i>Asplenietea trichomanis</i>																																								
<i>Asplenium trichomanes</i>	+	.	+	+	+	.	.	+	+	.	+	.	.	+	1	1	+	1	1	2	+	1	1	1	+	2	+	+	1	+	+	+	+	1	+	.	+	+	.	
<i>Silene nutans</i> subsp. <i>dubia</i>	+	+	+	+	+	+	+	+	.	+	+	+	+	+	+	+	.	+	+	+	+	+	+	+	+	+	+	.	2	1	+	.	.	.	+	+	.	.	.	
<i>Valeriana tripteris</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	+	+	+	+	+	+	+	+	.	+	+	2	+	.	.	.	.	.	.	.	+	+
<i>Asplenium ruta-muraria</i>	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.
<i>Asplenium viride</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Cystopteris fragilis</i>	.	+	.	+	.	.	.	.	.	.	.	.	.	.	+	.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	.	.	
<i>Epilobium collinum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.
<i>Sedum hispanicum</i>	+	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+	.	
<i>Veronica bachofenii</i>	.	.	.	.	.	.	+	+	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	+	1	1	1	2	1	+	2
Other species (in alphabetical order)																																								
<i>Acer pseudoplatanus</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
<i>Achillea distans</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	.	+	
<i>Achillea millefolium</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
<i>Agrimonia eupatoria</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
<i>Agrostis capillaris</i>	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
<i>Ajuga genevensis</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
<i>Arabidopsis arenosa</i>	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	+	.	.	+	+	+	+	+	+	+	.	.	.	+	.	.	.	.	.	
<i>Arrhenatherum elatius</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
<i>Artemisia absinthium</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	.	.	+	+	+	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	
<i>Asarum europaeum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
<i>Asperula cynanchica</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
<i>Athyrium filix-femina</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	
<i>Atocion armeria</i>	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
<i>Aurinia saxatilis</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	+	.	.
<i>Brachypodium sylvaticum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
<i>Bromus commutatus</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
<i>Calamagrostis arundinacea</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	+	.	+	+	+	+	+	.	.
<i>Campanula abietina</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	
<i>Campanula glomerata</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
<i>Campanula persicifolia</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	
<i>Campanula rapunculoides</i>	.	+	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	+	+	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	
<i>Carpinus betulus</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
<i>Centaurea stoebe</i> subsp. <i>australis</i>	.	.	+	.	+	+	.	+	.	.	+	.	+	.	.	.	+	.	.	.	.	.	.	.	+	.	.	+	+	.	+	.	.	.	+	.	.	.	.	

<i>Chelidonium majus</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
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Relevés 1-14: *Sempervivetum heuffelii* Schneider-Binder 1969

Date, locality and location: 1-5: Mureș Valley (original relevés), 1: 22-Aug-2019, Stânceni (46.96235° N, 25.237217° E); 2: 12-Jul-2021, Stânceni (46.963033° N, 25.239333° E); 3: 20-Jun-2023, Neagra (46.971681° N, 25.140592° E); 4: 20-Jun-2023, Neagra (46.966081° N, 25.130161° E); 5: Andreneasa, 20-Jun-2023 (46.9562° N, 25.040067° E); 6-10: Sadu Valley (Schneider-Binder 1969), 6-7: 15-Oct-1968, above Gura Râului commune, left mountainside of Cibin Valley; 8: 14-Jul-1968, Sadu Valley, left mountainside, above Râul Sadului village; 9: 14-Jul-1968, Sadu Valley, Masa Verde; 10: 23-May-1967, Cîsnădioara, Dealul Cetății, above Argintiu stream; 11-14: Sadu Valley (Drăgulescu 1995), 11-12: 3-Aug-1978, Râul Sadului; 13-14: 3-Aug-1978, Sădurel.

Relevés 15-39: *Asplenio trichomani* - *Poëtum nemoralis* Boșcaiu 1971

Date, locality and location: 15-29: Mureș Valley (original relevés), 15: 20-Jun-2023, Neagra (46.96872° N, 25.16718° E); 16: 20-Jun-2023, Lunca Bradului (46.95370° N, 25.08946° E); 17: 20-Jun-2023, Andreneasa (46.95957° N, 25.03553° E); 18: 25-Jul-2014, Gălăoaia (46.98541° N, 24.93043° E); 19: 28-Jul-2014, Gălăoaia (46.98228° N, 24.93034° E); 20: 14-Jun-2014, Stânceni (46.96249° N, 25.23464° E); 21: 14-Jun-2014, Stânceni (46.96254° N, 25.23528° E); 22: 14-Jun-2014, Stânceni (46.96257° N, 25.23566° E); 23: 14-Jun-2014, Stânceni (46.96227° N, 25.23708° E); 24: 7-Jun-2014, Răstolița-Peșcoasa Mare (46.96111° N, 25.02515° E); 25: 19-Jul-2013, Răstolița Valley (46.98093° N, 24.99837° E); 26: 28-Jul-2014, Vișa Valley (46.97934° N, 24.97724° E); 27: 28-Jul-2014, Vișa Valley (46.97595° N, 24.97658° E); 28: 21-Aug-2014, Sălard (46.94843° N, 25.07500° E); 29: 16-Sep-2014, Stânceni-Zebrac, (46.96536° N, 25.22514° E); 30: Sadu Valley (Schneider-Binder 1972), 14-Jun-1968, Sadu; 31-33: Sadu Valley (Drăgulescu 1995), 31: 3-Aug-1978, Râul Sadului; 32: 3-Jun-1980, Râul Sadului; 33: 31-Jul-1982, Dealu-Caprei; 34: Sadu Valley (Schneider-Binder 1972), 15-Jul-1971, Dealu-Caprei; 35-39: Sadu Valley (Drăgulescu 1995), 35: 3-Aug-1978, Sădurel; 36-37: 30-Jun-1981, Sădurel; 38: 3-Aug-1978, confluence of Sadu and Sădurel rivers; 39: 2-Aug-1978, Dealu-Grosu.

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Table S2. Equations and error distribution types employed in fitting single trait dominance via generalised regression.

Trait dominance (response)	Right-side formula of the regression equation (as used in the retained model)	Error distribution
Vegetative propagation =	$\log(\text{Elevation}) + \text{Nutrients} + \text{Region}[\text{Mureş/Sad}]$	Gauss
N-fixing =	$\sqrt{\text{Elevation}} + \log(\text{Heat_load}) + \sqrt{\text{Nutrients}} + \text{Region}[\text{Mureş/Sad}]$	Zero-inflated Gamma
Polyploidy =	$\text{Elevation} + \log(\text{Heat_load}) + \text{Region}[\text{Mureş/Sad}]$	Gamma
Basal leaf rosette =	$\log(\text{Elevation}) + \text{Heat_load} + \sqrt{\text{Nutrients}} + \text{Region}[\text{Mureş/Sad}]$	Zero-inflated Gamma
Reproduction via spores =	$\sqrt{\text{Elevation}} + \exp(\text{Aspect}) + \log(\text{Nutrients}) + \text{Region}[\text{Mureş/Sad}]$	Zero-inflated Gamma
Springtime blooming =	$\log(\text{Heat_load}) + \sqrt{\text{Nutrients}} + \sqrt{\text{Nutrients}} \times \log(\text{Heat_load})$	Cauchy
Storage organs =	$\sqrt{\text{Elevation}} + \sqrt{\text{Slope}} + \text{Aspect} + \sqrt{\text{Nutrients}} + \text{Region}[\text{Mureş/Sad}]$	Cauchy
Leaf succulence =	$\text{Slope} + \text{Aspect} + \sqrt{\text{Nutrients}} + \text{Region}[\text{Mureş/Sad}]$	Cauchy
Short-lived therophyte =	$\text{Slope} + \sqrt{\text{Nutrients}} + \text{Region}[\text{Mureş/Sad}]$	Cauchy
Tuft forming =	$\exp(\text{Radiation}) + \exp(\text{Nutrients}) + \text{Region}[\text{Mureş/Sad}]$	Cauchy
Woodiness =	$\exp(\text{Aspect}) + \sqrt{\text{Nutrients}}$	Cauchy