

Radial growth, present status and future prospects of west Himalayan fir (*Abies pindrow* Royle) growing in the moist temperate forest of Himalayan mountains of Pakistan

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Table S1. Descriptive statistics of tree-ring chronology from the Ayubia site of the moist temperate forest of the Himalayan mountain of Pakistan.

Seq. series	Interval	No. of years	No. of flags ¹	Corr with master ²	Unfiltered					Filtered				AR ¹¹
					mean msmt ³	max msmt ⁴	std. dev. ⁵	auto corr ⁶	mean sens ⁷	max value ⁸	std. dev. ⁹	auto corr ¹⁰		
Ayub11	1924–2020	208	4	0.235	2.13	5.76	1.273	0.826	0.278	0.56	0.329	0.039	1	
Ayub21	1703–2020	238	12	0.291	0.69	2.5	0.429	0.768	0.261	0.87	0.342	−0.021	1	
Ayub22	1710–2020	226	12	0.166	0.66	2.04	0.374	0.712	0.266	1.61	0.369	−0.01	1	
Ayub31	1813–2020	204	8	0.523	1.31	2.98	0.51	0.579	0.25	1.43	0.351	0.014	1	
Ayub32	1783–2020	98	9	0.51	1.16	2.88	0.498	0.629	0.269	1.12	0.337	0.003	1	
Ayub41	1795–2020	258	9	0.104	1.33	4.75	0.903	0.763	0.283	1.5	0.432	−0.011	2	
Ayub42	1817–2020	170	8	0.472	1.26	6.38	1.03	0.779	0.287	1.25	0.424	0.001	2	
Ayub51	1923–2020	173	4	0.246	1.94	6.43	1.481	0.822	0.248	1.73	0.433	−0.007	1	
Ayub62	1763–2020	262	10	0.42	0.84	6.14	0.784	0.665	0.396	3.88	0.717	−0.014	1	
Ayub71	1851–2020	208	6	0.665	0.82	1.95	0.365	0.519	0.357	1.27	0.415	0.005	1	
Ayub72	1848–2020	250	7	0.625	0.83	2.9	0.419	0.579	0.36	1.9	0.426	0.006	1	
Ayub81	1759–2020	253	10	0.314	1.01	3.87	0.698	0.781	0.314	2.04	0.428	−0.02	1	
Ayub82	1813–2020	230	8	0.308	1.07	6	0.794	0.668	0.367	1.7	0.474	0.002	1	
Ayub91	1771–2020	216	10	0.534	1.14	3.72	0.778	0.81	0.283	1.12	0.374	0.005	3	
Ayu101	1768–2020	210	10	0.118	1.16	3.24	0.702	0.71	0.311	2.34	0.447	−0.011	2	
Ayu102	1791–2020	192	9	0.003	0.94	3.31	0.662	0.765	0.307	2.58	0.463	0.011	1	
Ayu111	1805–2020	181	8	0.616	1.21	3.22	0.533	0.667	0.273	1.17	0.339	0	1	
Ayu112	1811–2020	179	8	0.313	1.23	3.45	0.547	0.618	0.282	1.41	0.365	−0.009	1	
Ayu121	1829–2020	173	7	0.592	1.21	4.07	0.745	0.736	0.331	1.38	0.395	−0.008	1	
Ayu122	1840–2020	95	7	0.581	1.09	3.72	0.607	0.709	0.324	1.18	0.394	0.006	1	
Ayu131	1842–2020	81	7	0.22	1.2	5.49	0.97	0.708	0.397	1.35	0.468	0.023	1	
Ayu132	1848–2020	178	7	0.211	1.21	6.12	1.057	0.702	0.399	2.1	0.528	0.004	2	
A1412	1926–2020	96	3	0.18	2.4	4.51	0.845	0.597	0.249	0.93	0.33	−0.008	1	
Ayu141	1940–2020	189	3	0.26	2.06	6.63	1.261	0.656	0.32	1.8	0.516	0.058	1	
Ayu142	1843–2020	172	7	0.167	1.55	6.67	0.925	0.613	0.301	1.96	0.48	−0.032	1	
Ayu143	1925–2020	96	3	0.541	0.7	4.27	0.569	0.645	0.249	1.32	0.438	−0.029	2	
Ayu151	1832–2020	189	7	0.422	0.92	3.05	0.528	0.839	0.21	1.03	0.308	0.007	2	
Ayu152	1849–2020	172	7	0.182	0.8	3.2	0.442	0.789	0.207	1.14	0.302	0.02	1	
Total or mean		5 466	105	0.349	1.12	6.67	0.693	0.706	0.312	3.88	0.415	−0.002	–	

1 – No. of problems; 2 – correlation with master; 3 – mean measurement; 4 – maximum measurement; 5, 9 – standard deviation; 6, 10 – autocorrelation, 7 – mean sensitivity; 8 – maximum value; 11 – autoregressive model

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Table S2. Descriptive statistics of tree-ring chronology from the Bara Gali of the moist temperate forest of the Himalayan mountain of Pakistan.

Seq. series	Interval	No. of years	No. of flags ¹	Corr with master ²	Unfiltered				Filtered				AR ¹¹
					mean msmt ³	max msmt ⁴	std. dev. ⁵	auto corr ⁶	mean sens ⁷	max value ⁸	std. dev. ⁹	auto corr ¹⁰	
bara12	1908–2020	113	4	0.108	2.38	5.21	1.103	0.556	0.339	1.08	0.473	0.015	1
bara21	1975–2020	45	1	0.225	2.04	5.03	1.218	0.553	0.416	1.31	0.557	0.08	1
bara31	1875–2020	146	3	0.298	2.11	7.09	1.165	0.402	0.408	1.56	0.538	0.011	2
bara32	1863–2020	158	3	0.16	1.82	5.91	1.095	0.426	0.43	1.78	0.567	0.019	2
bara51	1907–2020	114	4	0.042	1.93	5.82	0.963	0.713	0.291	1.07	0.408	0.049	1
bara52	1906–2020	115	1	0.337	1.69	3.79	0.747	0.688	0.273	1.05	0.364	–0.039	1
bara61	1936–2020	85	3	0.182	2.47	15.69	2.87	0.791	0.443	1.63	0.559	–0.012	2
bara70	1894–2020	127	5	0.145	1.87	6.35	1.161	0.696	0.343	2.52	0.531	0.022	2
bara71	1898–2020	123	5	0.159	1.89	5.13	1.207	0.637	0.392	1.89	0.566	0.018	2
bara81	1932–2020	89	2	0.243	3.16	7.92	1.638	0.635	0.327	0.85	0.388	0.011	1
bara82	1936–2020	85	3	0.119	3.02	6.53	1.548	0.648	0.293	1.16	0.371	0.011	1
bara91	1934–2020	87	1	0.347	3.02	11.22	1.687	0.495	0.333	1.42	0.467	0.033	1
bara92	1932–2020	89	2	0.245	3.01	7.56	1.466	0.578	0.303	1.33	0.408	0.049	1
bara102	1862–2020	159	5	0.04	1.22	5.32	1.018	0.758	0.386	1.54	0.523	0.036	1
bara111	1886–2020	135	4	0.215	2.13	6.4	1.403	0.617	0.442	1.31	0.499	–0.001	1
bara112	1891–2020	130	4	0.102	1.85	7.27	1.303	0.543	0.473	2.07	0.629	0.026	1
bara122	1963–2020	58	1	0.33	1.49	9.54	1.584	0.766	0.401	1.07	0.498	0.007	1
bara141	1941–2020	80	3	0.161	1.96	4.36	0.804	0.35	0.333	1.35	0.424	0.011	2
bara142	1958–2020	63	1	0.435	2.08	5.2	1.146	0.69	0.322	1.15	0.42	0.04	2
bara151	1905–2020	116	2	0.269	2.23	8.49	1.526	0.692	0.353	1.89	0.549	0.042	1
bara161	1940–2020	81	0	0.466	2.55	7.81	1.556	0.682	0.353	1.22	0.452	0.003	2
bara162	1967–2020	54	2	0.141	2.57	8.5	1.876	0.792	0.341	1.45	0.457	0.014	2
bara171	1957–2020	64	2	0.01	3.08	12.11	2.217	0.773	0.305	1.01	0.391	0.002	3
bara172	1948–2020	73	0	0.577	3.23	13.53	2.391	0.807	0.325	1.44	0.513	0.046	1
bara181	1914–2020	107	4	0.05	1.91	4.4	0.808	0.299	0.354	0.94	0.415	0.003	1
bara182	1929–2020	92	0	0.577	1.83	3.9	0.706	0.51	0.302	1.03	0.378	0.039	1
bara191	1942–2020	79	0	0.467	2.61	6.44	1.062	0.618	0.277	0.89	0.342	0.04	1
bara192	1948–2020	73	0	0.465	2.63	6.87	1.11	0.635	0.279	0.92	0.352	0.034	1
bara201	1906–2020	115	1	0.486	2.04	7.51	1.28	0.508	0.407	2.09	0.577	0.001	1
bara202	1891–2020	130	4	0.067	2.16	7.74	1.293	0.53	0.412	1.75	0.547	0.006	1
Total or mean		2 985	70	0.232	2.19	15.69	1.311	0.600	0.362	2.52	0.483	0.019	–

1 – No. of problems; 2 – correlation with master; 3 – mean measurement; 4 – maximum measurement; 5, 9 – standard deviation; 6, 10 – autocorrelation, 7 – mean sensitivity; 8 – maximum value; 11 – autoregressive model

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Table S3. Descriptive statistics of tree-ring chronology from the Kuldana sampling site of the moist temperate forest of the Himalayan mountain of Pakistan

Seq. series	Interval	No. of years	No. of flags ¹	Corr with master ²	Unfiltered				Filtered				AR ¹¹
					mean msmt ³	max msmt ⁴	std. dev. ⁵	auto corr ⁶	mean sens ⁷	max value ⁸	std. dev. ⁹	auto corr ¹⁰	
kldna11	1924–2020	97	4	0.123	1.89	6.63	1.524	0.683	0.433	1.60	0.609	0.011	1
kldna51	1927–2020	94	3	0.196	2.06	4.63	1.21	0.837	0.284	0.95	0.369	0.016	1
kldna61	1865–2020	156	4	0.238	1.26	4.37	0.988	0.844	0.324	1.27	0.39	–0.004	2
kldna71	1931–2020	90	3	0.19	1.73	5.59	1.097	0.889	0.233	0.64	0.295	–0.068	1
kldna91	1929–2020	92	1	0.338	1.94	7.92	1.484	0.806	0.341	1.35	0.461	–0.011	2
kldna922	1937–2020	84	2	0.29	1.81	6.06	1.128	0.743	0.375	1.53	0.465	0.005	1
kldna92	1935–2020	86	0	0.487	1.98	6.34	1.31	0.841	0.304	1.11	0.415	–0.003	2
kldna101	1917–2020	104	3	0.17	1.92	7.79	1.207	0.783	0.319	1.74	0.44	–0.004	2
kldna102	1909–2020	112	3	0.135	1.85	5.79	1.141	0.767	0.332	1.47	0.46	0.031	1
kldna121	1934–2020	87	3	0.111	1.5	3.16	0.638	0.759	0.257	0.81	0.319	–0.014	2
kldna122	1936–2020	85	3	0.064	1.61	3.45	0.598	0.685	0.254	0.87	0.314	0.014	1
kldna130	1944–2020	77	0	0.655	2.43	4	0.744	0.576	0.237	0.64	0.281	0.013	1
kldna131	1948–2020	73	0	0.651	2.32	3.87	0.755	0.627	0.229	0.59	0.273	0.017	1
kldna141	1967–2020	54	0	0.544	3.2	5.19	1.114	0.464	0.293	0.75	0.327	0.022	1
kldna142	1968–2020	53	2	0.144	3.1	5.33	0.983	0.256	0.306	0.59	0.323	0.004	1
kldna152	1915–2020	106	2	0.384	1.6	4.01	0.836	0.62	0.351	1.39	0.428	0.01	1
kldna162	1864–2020	157	5	0.161	1.3	4.43	1.008	0.834	0.316	1.19	0.388	0.008	2
kldnaX1	1934–2020	87	0	0.5	2.21	6.15	1.367	0.885	0.292	0.87	0.367	0.014	2
kldnaX2	1932–2020	89	1	0.374	2.21	5.07	1.264	0.891	0.266	0.74	0.321	0.035	1
kldnaY1	1945–2020	76	0	0.575	2.13	5.06	1.278	0.868	0.28	0.93	0.361	0.064	3
kldnaY2	1933–2020	88	0	0.489	2.36	7.35	1.632	0.844	0.299	0.98	0.378	0.004	2
kldnaZ2	1947–2020	74	0	0.352	2.05	5.6	1.217	0.767	0.316	0.87	0.427	0.011	1
Total or mean		2 021	39	0.307	1.92	7.92	1.114	0.76	0.306	1.74	0.389	0.007	

1 – No. of problems; 2 – correlation with master; 3 – mean measurement; 4 – maximum measurement; 5, 9 – standard deviation; 6, 10 – autocorrelation, 7 – mean sensitivity; 8 – maximum value; 11 – autoregressive model

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Table S4. Pointer year analysis from some selective sites of moist temperate forests of the Himalayan mountains of Pakistan

Site name	Pointer year	Pointer year nature	Cropper value	Class of pointer year
Kuldana	1876	1	0.98	–
	1878	–1	–1.43	S
	1886	–1	–1.01	W
	1898	–1	–1.25	W
	1899	–1	–1.19	W
	1902	1	1.16	W
	1903	1	0.87	–
	1925	1	1.29	S
	1935	1	1.05	W
	1817	1	1.08	W
	1819	–1	–1.48	S
	1820	–1	–0.88	–
	1822	1	1.43	S
	1823	1	1.51	S
	1824	–1	–1.16	W
	1826	–1	–0.8	–
	1831	1	1.14	W
	1832	1	1.46	S
	1833	–1	–1.81	E
	1837	–1	–1.2	W
Bara Gali	1841	1	0.76	–
	1842	1	1.99	E
	1843	–1	–1.35	S
	1844	–1	–1.19	W
	1846	–1	–1.38	S
	1849	1	1.6	S
	1851	1	1.98	E
	1853	–1	–1.29	S
	1854	–1	–1.35	S
	1859	1	1.11	W
	1860	1	0.81	–
	1865	–1	–1.51	S
	1866	1	0.91	–
	1867	1	1.25	W
	1868	1	1.22	W
	1869	–1	–1.14	W
	1870	–1	–1.81	E
	1871	–1	–0.8	–

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Table S4 to be continued

Site name	Pointer year	Pointer year nature	Cropper value	Class of pointer year
Ayubia	1716	1	0.84	–
	1717	–1	–2.06	E
	1720	1	1.65	E
	1729	–1	–1.21	W
	1738	–1	–1.13	W
	1749	1	0.99	–
	1753	–1	–0.96	–
	1765	–1	–1.78	E
	1766	–1	–0.94	–
	1768	1	1.36	S