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PROSPECTS ASSESSMENT OF ORIGINS OF SCOTS PINE IN A CHANGING CLIMATE

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A study of Scots pine climatypes growing in geographic Scots pine forest plantations on the territory of the Negorelsky Forestry Experimental Station revealed a certain pattern in the radial growth of trees of different origins depending on changes in helioclimatic factors. Two groups of Scots pine climatypes can be distinguished based on the degree of influence of helioclimatic factors on radial growth.

Climate change has now become a widely recognized fact and is observed in virtually all natural zones, impacting various ecosystem components. Scientists from around the world have observed the most significant changes in precipitation patterns, surface air temperature variations, and snow cover in various regions of the world. Global increases in air temperature could lead to reduced snow cover, river runoff, soil moisture, increased aridity, and a number of other negative consequences.

Since woody vegetation is a reliable indicator of the transformation of the natural environment and climate change, an assessment of the prospects for using the most environmentally sustainable origins of Scots pine in forest seed and silvicultural production, as the most common tree species in the country's forest fund, is relevant [1, 2].

One of the most important indicators of tree species' adaptation to changing growing conditions is radial tree growth. Studying the response of annual ring width to weather conditions allows us to identify limiting factors affecting the formation of timber reserves in certain geographic races [3].

Research on Scots pine climatypes growing in geographic Scots pine forest plantations on the territory of the Negorelsky Forestry Experimental Station (Dzerzhinsky District, Minsk Region) revealed a certain pattern in the radial growth of trees in stands of various origins, depending on helioclimatic factors. Two groups of climatypes can be distinguished based on their influence on radial growth. The first group consists of climatypes that exhibit a reliable moderate negative correlation between tree diameter growth and changes in the sum of active temperatures and direct solar radiation indices (table).

Table – Summary table of annual ring width of Scots pine in geographical forest plantations

Climatype of Scots pine	Continental climate, %	The width of the annual layer of wood ($M \pm mM$), cm	Coefficient of variation (V), %	The values of the correlation coefficient between the width of the annual layer of the climatype and the following indicators							
				the sum of active air temperatures during the growing season	total precipitation during the growing season	diffuse solar radiation	snow depth	Selyaninov's hydrothermal coefficient	indices of direct solar radiation in the year of the research	indices of direct solar radiation with a 1-year offset	indices of direct solar radiation with a 2-year offset
Arkhangelsk	40–50	0.20 ± 0.014	50.8	**–0.43**	–0.02	0.29	0.03	0.18	**–0.50**	**–0.57**	**–0.45**
Leningradsky	38–45	0.26 ± 0.009	24.1	0.15	0.04	0.19	–0.09	–0.05	+0.06	+0.03	+0.31
Tomsk	60–70	0.27 ± 0.013	33.3	**–0.46**	0.00	0.43	0.28	0.23	**–0.45**	**–0.52**	**–0.42**
Vologda	42–50	0.20 ± 0.009	31.1	0.08	–0.25	0.18	–0.14	–0.25	–0.01	–0.15	–0.10
Estonian	35–36	0.25 ± 0.017	45.6	**–0.61**	0.09	0.36	0.39	0.40	**–0.59**	**–0.60**	**–0.53**
Latvian	35–36	0.26 ± 0.009	24.7	0.26	0.03	0.02	–0.01	–0.11	+0.19	+0.22	+0.37
Vitebsk	38–42	0.32 ± 0.010	22.2	–0.15	–0.03	0.02	–0.07	0.03	–0.04	+0.12	+0.10
Minsk	36–43	0.23 ± 0.007	21.1	0.08	0.04	0.22	0.02	0.00	+0.14	–0.01	+0.17
Ulyanovsk	60–64	0.20 ± 0. 007	24.5	–0.27	0.17	0.13	0.20	0.26	–0.10	–0.10	+0.01
Bashkir	44–57	0.22 ± 0.014	47.0	**–0.50**	0.05	0.30	0.33	0.27	**–0.41**	**–0.44**	**–0.44**
Grodno	36–43	0.19 ± 0. 011	40.2	**–0.59**	0.00	0.31	0.32	0.26	**–0.47**	**–0.54**	**–0.59**
Kursk	49–55	0.24 ± 0.019	59.0	**–0.65**	0.15	0.35	0.45	0.42	**–0.53**	**–0.53**	**–0.61**
Belgorod	49–55	0.21 ± 0.012	43.9	**–0.57**	0.11	0.41	0.45	0.35	**–0.53**	**–0.51**	**–0.53**
Volgograd	60–64	0.19 ± 0.011	42.0	**–0.50**	0.10	0.28	0.25	0.32	–0.28	–0.40	–0.24
Rostov	50–60	0.19 ± 0.008	30.8	–0.35	0.10	0.35	0.31	0.22	–0.22	–0.34	–0.27
Khmelnitsky	36–42	0.20 ± 0.008	28.4	0.02	–0.07	–0.01	0.27	–0.07	+0.10	+0.25	–0.01
Poltava	46–50	0.27 ± 0.014	38.8	**–0.59**	–0.10	0.49	0.18	0.19	**–0,55**	**–0.69**	**–0.64**

Note: correlation coefficients that are statistically significant are highlighted in bold.

As the values of these helioclimatic factor parameters increase, radial tree growth decreases. These Scots pine climatypes include the Arkhangelsk, Tomsk, Bashkir, Grodno, Kursk, Belgorod, Volgograd, and Poltava climatologies.

The second group of Scots pine climatypes includes provenances for which changes in helioclimatic factors do not significantly affect tree radial growth. These climatypes of Scots pine include the Leningrad, Vologda, Latvian, Vitebsk, Minsk, Ulyanovsk, Rostov, and Khmelnitsky provenances.

New data obtained during the study of Scots pine climatypes on the change in the radial growth of trees depending on fluctuations in the values of helioclimatic factors make it possible to select promising origins of Scots pine for a specific growing region at an early stage, especially taking into account the trend of climate change that has emerged in recent decades and its impact on forest ecosystems.

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