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### THE EXAMINATION OF SEED POSTERITY OF SCOTS PINE HYBRID SEED PLANTATIONS IN DIFFERENT FOREST

In this paper we studied the characteristics of growth sort of pine ordinary in test cultures of different ages, created Nemansko-Predpolessky, Beresinsko-Predpolessky and Polessko-Pridneprovsky forest plant districts. Found that the progeny pine is characterized by intensive growth in height and of extended 9-year tests retains its inherent high growth. Currently the progeny pine state strain testing on the economic usefulness in Mozyr sort-test station public institution.

**Introduction.** In the sphere of forest breeding development one of the prior directions is studying and selection of local tree species populations that provide increase of artificial plantings efficiency when they are used in silvicultural production [1–3]. Besides, the selection of highly productive populations, the present stage of forest seed breeding development in the Republic of Belarus provides the use of high-quality seeds with valuable hereditary properties and high sowing qualities in forest seed and silvicultural production.

In accordance with forest vegetation division into areas, the territory of the Republic of Belarus is divided into 3 geobotanical subzones that include 7 forest site areas.

The purpose of this work is to examine seed posterity of Scots pine clonal hybrid seed plantation of Negorelsky experimental forestry station in test cultures created in Nemansko-Predpolessky, Beresinsko-Predpolessky and Polessko-Pridneprovsky forest site areas.

**Main part.** The inspection of peculiarities of growth of seed posterity of Scots pine clonal hybrid seed plantation (application No. 2009015 dd. 22.02.2008) was carried out in test cultures of Negorelsky experimental forestry station and Ivyevsky forestry station (Nemansko-Predpolessky forest site area), Starobinsky forestry station (Berezinsko-Predpolessky forest site area), and in Mozyrskaya seed-trial station (Polessko-Pridneprovsky forest site area); the given forestry stations belong to the State Inspection for testing and protection of plant varieties of the Republic of Belarus. The history of creation of the mentioned institutions and their characteristics are given in the works.

The conducted research on studying the features of Scots pine family growth on a test cultures orchard that was created in 2004 in Negorelsky experimental forestry station (Nemansko-Predpolessky forest site area) confirms that some of the families during the 9-year period of examination have been characterized by high growth indices.

Among the examined families there was a group of posterities which growth lagged behind at

the initial stage, but by the age of 9 years they had begun to grow quite intensively and afterwards hold leading positions. This group of posterities included families 1–3, 10–5 and 4–1. There also was a group of families that lagged behind during the whole testing period. This group included posterities 6–7, 5–1, 1–6 and 1–8.

Besides, an examination of growth of Scots pine families in the test cultures created in 2008 was conducted in Krasnoslobodsky forest orchard of Starobinsky forestry station (Berezinsko-Predpolessky forest site area (Table 2)).

There were 20 families of Scots pine examined in total. To compare the growth indices, the seed posterity that had been grown on the plantation of the first generation in Starobinsky forestry station was planted as a control in the orchard.

Besides, the seed posterity that had been grown on the plantation of the first generation in Kalinkovichsky forestry station was planted on the plantation of test cultures.

The conducted research showed that the tested families in identical conditions were characterized by different growth indices. For instance, at the same and higher level of height index as the control grew families 7–3 (157.0 cm), 7–5 (151.5 cm), 7–9 (149.0 cm), 7–6 (148.1 cm), 13–1 (146.5 cm), 13–9 (146. cm), 7–4 (144.8 cm) and 7–10 (143.8 cm), and significant height exceeding was shown by the first two families.

The following families showed worse height index 13–2 (114.5 cm), 7–7 (117.9 cm), 8–5 (119.1 cm), 12–10 (122.3 cm), 6–7 (122.6 cm), 12–9 (124.1 cm), 7–8 (128.0 cm), 13–3 (128.6 cm), 13–4 (134.4 cm) и 3–6 (136.9 cm) and 6–3 (141.5 cm). The results of mathematic-statistical processing of a field material showed that among the listed families all of posterities, except for 3–6 and 6–3, grew significantly lower than control.

The seed posterity of the first order clonal forest seed plantation of Kalinkovichsky forestry station was examined, and the results showed that at 5-year age the posterity had growth indices that were significantly lower than the control indices.

Table 1

**Growth indices of seed posterity of Scots pine hybrid seed plantations in test cultures  
of Nemansko-Predpolessky forest site area**

Family number	Indices, cm			Family number	Indices, cm		
	Height min-max	Height increment min-max	Diameter min-max		Height min-max	Height increment min-max	Diameter min-max
1-3	<u>412.5 ± 10.0</u> 340-480	<u>77.5 ± 5.0</u> 60-90	<u>5.8 ± 0.2</u> 3.9-7.1	3-5	<b>447.5 ± 10.0</b> 390-495	<u>85.0 ± 5.0</u> 70-95	<b>6.5 ± 0.2</b> 4.8-8.7
1-6	<u>387.5 ± 10.0</u> 345-475	<u>75.0 ± 5.0</u> 55-85	<b>5.0 ± 0.2</b> 3.8-6.1	4-1	<u>405.0 ± 10.0</u> 345-440	<u>75.0 ± 5.0</u> 55-90	<b>6.3 ± 0.2</b> 3.7-8.9
1-8	<u>389.0 ± 10.0</u> 290-490	<u>67.5 ± 5.0</u> 45-90	<u>5.3 ± 0.2</u> 3.9-6.8	4-12	<b>377.5 ± 7.5</b> 320-415	<u>65.0 ± 5.0</u> 50-80	<u>6.1 ± 0.2</u> 4.9-7.6
2-2	<b>445.0 ± 10.0</b> 395-470	<u>80.0 ± 5.0</u> 65-90	<b>6.7 ± 0.2</b> 5.4-7.8	5-1	<b>360.0 ± 10.0</b> 285-405	<u>65.0 ± 5.0</u> 45-85	<b>5.0 ± 0.2</b> 3.8-6.3
2-6	<u>410.0 ± 10.0</u> 340-445	<u>75.0 ± 5.0</u> 65-85	<u>5.8 ± 0.2</u> 4.5-8.0	6-7	<b>355.0 ± 10.0</b> 300-395	<u>65.0 ± 5.0</u> 50-85	<u>4.8 ± 0.2</u> 3.3-6.2
2-7	<u>392.5 ± 10.0</u> 335-455	<u>70.0 ± 5.0</u> 55-90	<u>5.5 ± 0.2</u> 3.9-6.6	7-8	<u>390.0 ± 10.0</u> 315-445	<u>75.0 ± 5.0</u> 65-95	<b>5.6 ± 0.2</b> 3.1-8.0
3-3	<u>402.5 ± 12.5</u> 365-450	<u>75.0 ± 5.0</u> 60-90	<u>5.5 ± 0.2</u> 3.5-7.3	10-5	<u>410.0 ± 10.0</u> 360-465	<u>75.0 ± 5.0</u> 55-85	<u>6.0 ± 0.2</u> 4.5-7.2

Note: 1. As a control for comparison we took an average performance of trees that were received after examination of all the families (height – (389.9 ± 7.5) cm, height increment – (73.2 ± 4.0) cm and diameter – (5.7 ± 0.1) cm).

2. The indicators of values that are significantly different from the control (the standard value of Student's coefficient is  $t_{0.05} = 1.96$ ) are highlighted by bold-face type.

Table 2

**Growth indices of seed posterity of Scots pine hybrid seed plantations in test cultures  
of Berezinsko-Predpolessky forest site area**

Family number	Indices, cm			Family number	Indices, cm		
	Height min-max	Diameter min-max	Needle length min-max		Height min-max	Diameter min-max	Needle length min-max
3-6	<u>136.9 ± 2.8</u> 110-160	<u>3.1 ± 0.1</u> 2.3-4.6	<b>7.6 ± 0.2</b> 6.0-10.0	8-5	<b>119.1 ± 2.1</b> 102-148	<u>3.3 ± 0.1</u> 2.5-4.4	<b>8.4 ± 0.2</b> 6.0-11.0
6-3	<u>141.5 ± 2.3</u> 116-160	<u>3.2 ± 0.1</u> 2.0-3.9	<b>7.4 ± 0.2</b> 5.0-9.0	12-3	<b>128.1 ± 1.8</b> 109-145	<b>2.6 ± 0.1</b> 2.0-3.3	<b>7.7 ± 0.1</b> 6.0-9.0
6-7	<b>122.6 ± 3.9</b> 90-159	<b>2.7 ± 0.1</b> 1.6-3.6	<u>6.9 ± 0.1</u> 6.0-8.0	12-9	<b>124.1 ± 5.5</b> 90-210	<b>2.9 ± 0.1</b> 1.8-3.6	<b>7.9 ± 0.2</b> 6.0-10.0
7-3	<b>157.0 ± 3.6</b> 112-195	<b>2.5 ± 0.1</b> 2.4-4.2	<b>8.3 ± 0.2</b> 6.0-10.0	12-10	<b>122.3 ± 3.6</b> 90-162	<b>2.7 ± 0.1</b> 1.6-3.4	<b>7.1 ± 0.1</b> 6.0-8.0
7-4	<u>144.8 ± 1.3</u> 130-158	<u>3.3 ± 0.1</u> 2.7-4.0	<b>8.1 ± 0.2</b> 7.0-9.0	13-1	<u>146.1 ± 2.0</u> 130-166	<u>3.2 ± 0.1</u> 2.8-4.0	<b>7.2 ± 0.1</b> 6.0-8.0
7-5	<b>151.5 ± 4.1</b> 111-205	<u>3.2 ± 0.1</u> 2.3-4.0	<b>7.8 ± 0.2</b> 6.0-10.0	13-2	<b>114.5 ± 1.7</b> 99-132	<b>2.9 ± 0.1</b> 1.8-3.8	<b>7.9 ± 0.1</b> 6.5-9.0
7-6	<u>148.1 ± 3.1</u> 113-173	<u>3.1 ± 0.1</u> 2.0-3.7	<b>8.1 ± 0.2</b> 7.0-11.0	13-3	<b>128.6 ± 3.1</b> 95-170	<b>2.9 ± 0.1</b> 2.1-3.6	<b>6.4 ± 0.1</b> 5.0-7.5
7-7	<b>117.9 ± 2.1</b> 96-142	<b>2.3 ± 0.1</b> 1.7-2.8	<u>6.8 ± 0.3</u> 5.0-11.0	13-4	<b>134.4 ± 2.6</b> 101-160	<u>3.1 ± 0.1</u> 2.3-3.6	<b>8.0 ± 0.2</b> 7.0-10.0
7-8	<b>128.0 ± 2.7</b> 103-155	<b>2.8 ± 0.1</b> 2.5-3.4	<b>8.1 ± 0.1</b> 7.5-10.0	13-9	<u>146.0 ± 3.2</u> 111-188	<b>3.6 ± 0.1</b> 3.0-4.1	<b>7.3 ± 0.2</b> 5.0-8.5
7-9	<u>149.0 ± 3.6</u> 119-190	<b>3.5 ± 0.1</b> 2.6-5.1	<b>7.9 ± 0.1</b> 7.0-9.0	SPKL	<b>117.3 ± 2.5</b> 99-159	<b>2.6 ± 0.1</b> 1.4-4.0	<u>7.2 ± 0.2</u> 5.0-9.0
7-10	<u>143.8 ± 3.1</u> 106-174	<u>3.0 ± 0.1</u> 2.2-3.6	<b>7.3 ± 0.1</b> 6.0-8.0	Control	<u>142.0 ± 2.2</u> 120-175	<u>3.2 ± 0.1</u> 2.0-4.0	<u>6.8 ± 0.1</u> 6.0-8.0

Note: 1. As a control for growth indices comparison we took Scots pine seed posterity that was grown using seeds of forest seed orchard of the first generation of Starobinsky forestry station.

2. The indicators of values that are significantly different from the control (the standard value of Student's coefficient is  $t_{0.05} = 1.96$ ) are highlighted by bold-face type.

In the spring of 2012 on the area of 0.5 hectares we created test cultures of a hybrid seed plantation of Scots pine in Ivyevesky forestry station (Nemansko-Predpolessky forest site area). On the site which wasn't used for agricultural purposes, there were 9 families of Scots pine put on examination. The results of studying of one-year cultures growth revealed that the families of Scots pine were featured by high growth indices. All the examined posterities exceeded the height of the control which was represented by the seed posterity that had been grown up from the seeds of production yield. It should be noted that all seed posterities of Scots pine hybrid seed plantation had significantly longer needles in comparison with the control.

Currently the seed posterity of a clonal hybrid seed plantation of Negorelsky experimental forestry station is participating the government competitive test for economic utility in Mozyrsky strain testing station of the State inspectorate for test and protection of plant varieties of the Ministry of Agriculture and Food of Republic of Belarus; the mentioned strain testing station according to forest vegetation division into areas is a part of Polessko-Pridneprovsky forest site area.

According to the results of 4-year short term testing on a strain testing station, the seed posterity of Scots pine hybrid seed plantation had high growth indices. The average height of trees reached 120 cm, height increment of a central trunk during the vegetative period was 50 cm and root neck diameter was 3.3 cm. The needle packing of a trunk averaged 80%, the number of sprouts in a whorl reached 8 pieces, the average length of needles reached 10 cm.

**Conclusion.** On the basis of the conducted research of growth of seed posterity of Scots pine clonal hybrid seed plantation in Negorelsky experimental forestry station in the test cultures created in different forest site areas, it is possible to conclude that families are characterized by successful growth. Among the test cultures created in Nemansko-Predpolessky forest site area, it is possible to distinguish the most perspective families after a 9-year testing period (3–5 and 2–2).

There were families among the tested cultures, which at the initial stage lagged behind in growth indices, but having reached 9-year age they were characterized by a rather successful growth and became one of the leading families. This group includes families 1–3, 10–5 and 4–1.

The examination of growth features of the tested seed posterity of Scots pine in Berezinsko-Predpolessky forest site area highlights that growth indices are different.

Families 7–9 (149.0 cm), 7–6 (148.1 cm), 13–1 (146.5 cm), 13–9 (146.0 cm), 7–4 (144.8 cm) and 7–10 (143.8 cm) were growing at the same level with the control (142.0 cm). The best characteristics of high growth indices is for families 7–3 (157.0 cm) и 7–5 (151.5 cm). The worst characteristics of high growth indices is for families 13–2 (114.5 cm), 7–7 (117.9 cm), 8–5 (119.1 cm), 12–10 (122.3 cm), 6–7 (122.6 cm), 12–9 (124.1 cm), 7–8 (128.0 cm), 13–3 (128.6 cm), 13–4 (134.4 cm), 3–6 (136.9 cm) and 6–3 (141.5 cm).

On the plantation of testing cultures, which were created in 2012 in Ivyevesky forestry station that belonged to Nemansko-Predpolessky forest site area, seed posterity of hybrid seed plantation at the age of 1 year was characterized by high growth indices (plants height averaged from 8.2 to 17.1 cm). All of the tested families significantly exceeded the control's height (7.2 cm).

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