

Evaluation of the growth and health of different poplars in the Latorica area in Východoslovenská nížina conditions

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ABSTRACT: The paper presents the results of evaluating the growth and health of 20 different poplars from the *Aigeiros* group in 30-year populetum Leles on uninundated alluvia of the Latorica River in ecological conditions of the lowland Východoslovenská nížina. The populetum is situated on medium-heavy loamy soils in the group of forest site types *Ulmeto-Fraxinetum carpineum*. The results of evaluation document that out of the investigated poplar clones the poplars I-214, I-476, Blanc du Poitou, Flachslanden and *P. nigra* (Baka 5) had the best height and diameter growth and maximum volume production. Their health status was also very good. The lowest volume production was determined in *P. nigra* (009/66 ČR), I-455 and Grandis, and the worst health was found out in Grandis, *P. nigra* (Pavlovce 1) and *P. nigra* (Ivachnova 1). These results will facilitate to include the poplars I-476 and Flachslanden in the assortment of regionalized poplars for the lowland area of Východoslovenská nížina.

Keywords: poplars; growth and production; pests; ecological conditions

The utilization of potential productivity of soil for wood production and for the improvement of social functions of forests assumes that suitable clones will be chosen for different types of sites. The results of researches have demonstrated that the choice of suitable clones facilitates the effective management of poplars in ecological conditions that were negatively influenced by hydrological measures, particularly by a reduction of the groundwater table. These sites are mostly characterized by a management complex of forest site types floodplain ash woods with hornbeam and their proportion in the region of Východoslovenská lowland amounts to ca. 31% of total forest area.

Poplar growth, production and health are usually evaluated in populeta established at sites of different type. The results of poplar evaluation will make it possible to choose suitable clones for site conditions in the given area. The evaluation of poplars in populeta brought about remarkable results mainly in Italy, the Netherlands, France, Hungary, Poland, Czech Republic, former Yugoslavia and other countries. Based on the application of results of these researches Italian clones, also well-known in Slovakia, are successfully grown in many countries; some clones of balsam poplars and/or their hybrids are promising in France while the clones BL, OP-229, Pannonia, Favorit and Blanc du Poitou are highly productive in Hungary. Regionalization of 12 poplar clones was possible in Hungary on the basis of long-term results of researches (PICCAROLO 1952; POURTET 1969; VAN DER MEIDEN 1961; GIORDANO 1970; HEJMANOWSKI 1975; KERESZTESI et al. 1978; SEKAWIN 1979; ZSOMBOR

1981; WEISGERBER 1984; HALUPA, TÓTH 1988; ČÍZEK et al. 1992, etc.).

Based on the results of evaluation of the growth, health and ecological requirements of various poplars in Slovakia it was possible to choose suitable clones for the particular types of sites, providing for high qualitative and quantitative production under different management systems (VOJTUŠ 1978; KOHÁN 1981, 1993, 1998, 1999; VARGA 1982).

It follows logically from the above overview that the monitoring and evaluation of particular poplars in different site conditions of Slovakia is an urgent problem also at present. It is realistic to assume that the growing of research-trying poplars will provide for maximum production and good health of future poplar stands in Slovakia. In addition, poplar plantations will be able to fulfil other social functions of forests.

MATERIAL AND METHODS

In this paper height and diameter growth, basal area, volume production and health are evaluated in 20 different clones of poplars from the *Aigeiros* group, in Leles populetum in the area of Medzibodrožie in the lowland Východoslovenská nížina. The populetum was established on plots with mechanical preparation of soil on the whole area; one-year poplar plants on one-year roots (1/1) were set out. Out of the total number of clones, four clones are domestic black poplars: *P. nigra* (Baka 5), *P. nigra* (Pavlovce 1), *P. nigra* (Ivachnova 1) and *P. nigra* (009/66 ČR). Other poplars are six Italian clones: I-155, I-214,

I-262, I-455, I-462 and I-476, and 10 so called traditional clones as well as newer Euro-American clones: Robusta, Harff, Brabantica, Régénéré de Suisse, Flachslanden, Heidemij, Blanc du Poitou, Virginiana de Nancy, Eckhoff and Grandis.

Regular square spacings 5 × 5 m were used for planting: four plants of each clone were set out in four replications, i.e. 16 individuals in total. At the beginning plant trimming was a part of biotechnical measures while systematic pruning of poplar trees was carried out in subsequent periods. An intensive system of poplar tending was used, namely mechanical cultivation of soil on the whole area. As the initial spacings were relatively wide, no thinnings were performed.

Biometrical measurements were carried out on all individuals after the termination of vegetation period. Heights were measured to the nearest 0.5 m while diameters (at 1.3 m) were determined to the nearest 0.5 cm. The last measurement and evaluation were performed at the end of the 30th year. Processing the material, main mensurational characteristics were determined: mean height and mean diameter, basal area and standing volume per ha, mean stem volume and mean stem basal area, and average increments (AI). Large timber volume was calculated from KORSUN's volume tables (1967). Besides absolute values, relative values in percent were also calculated and data on the particular poplars were compared. The value of a poplar with the best growth and/or the best volume production is taken as 100%.

Health examinations were aimed at the detection and evaluation of occurrence of the most important pests or diseases such as brown sap exudation, *Dothichiza populea* Sacc. et Briard., *Micrococcus populi* Dell. and *Marssonina brunnea* Ell. et Ev. Their occurrence was described by degrees 0–4 (degree 0 – no signs of infestation, degree 1 – scarce infestation, degree 2 – low infestation, degree 3 – frequent infestation, degree 4 – severe infestation on all individuals). Overall health evaluation of the studied poplars: degrees of infestation were summed up for the particular pests.

Our research is important because besides the domestic black poplars important Italian clones and some Euro-American poplars are investigated. As the poplars studied on this research plot are at the age of 30 years, i.e. at cutting age, the results of this evaluation can be taken as reliable.

RESULTS AND DISCUSSION

The populetum is situated on uninundated alluvia of the Latorica River, in Leles cadastral territory, Trebišov district, in the lowland Východoslovenská nížina. But this territory is not a perfect flatland; there are hills of aeolian sands and some formations of Tertiary igneous rocks to an altitude of 261 m. The lowest point of the Slovak Republic lies in the south-western part of this territory – at an altitude of 96 m above sea level near the community Klin nad Bodrogom. The land is owned by the Premonstratensian Order – Jasov Abbey.

Table 1. Height growth of poplars at 30 years of age

Clone	No.	Mean height		Average height increment (m)
		(m)	(%)	
I-214	1	35.1	100.0	1.17
I-476	2	34.5	98.0	1.15
Blanc du Poitou	3	34.4	97.6	1.15
Flachslanden	4	34.1	96.9	1.14
I-462	5	33.7	95.7	1.12
Robusta	6	33.4	94.9	1.11
<i>P. nigra</i> (Baka 5)	7	33.2	94.3	1.10
Brabantica	8	33.1	94.0	1.10
Régénéré de Suisse	9	33.0	93.7	1.10
Harff	10	32.7	92.9	1.09
Virginiana de Nancy	11	32.6	92.9	1.09
Eckhoff	12	32.3	91.8	1.08
Grandis	13	32.0	90.8	1.07
<i>P. nigra</i> (Pavlovce 1)	14	31.8	90.3	1.06
I-262	15	31.7	90.0	1.06
<i>P. nigra</i> (Ivachnova 1)	16	31.6	89.8	1.05
Heidemij	17	31.4	89.2	1.05
I-155	18	31.2	88.6	1.04
I-455	19	31.0	88.1	1.03
<i>P. nigra</i> (099/66 ČR)	20	30.2	85.8	1.01

The climate of this area is warm, moderately arid with cold winter and long sunshine hours. Many-year average air temperature measured at Somotor meteorological station is 9.4°C, and 16.5°C in the growing season that lasts 200–220 days. The average number of summer days when the maximum daily temperature is higher than 25°C is 67.2 days. The warmest month of the year is July (average air temperature 20.2°C) while the coldest month is January (average air temperature –3.1°C). Average annual precipitation amount is 597 mm, of this 362 mm in the growing season. Summer precipitation is often in form of storm rainfalls that are little utilized by plants. The analysis of precipitation sums shows that every third year in this area is deficient in rainfall when the annual sum is lower than 350 mm. Annual evaporation from the soil is 550–600 mm, but it can amount to 450 mm in the months of May to August when atmospheric precipitation in the same period is about 270 mm. Average relative atmospheric humidity is 64%, and only 53% in the growing season. The lowest average humidities are in April and May, the highest in November and December. The soil type is brown Gleysol, which is deep, of medium heavy texture, loamy, medium humic; it has a slightly acid reaction and favourable content of available nutrients, mainly N, P₂O₅ and K₂O. The groundwater level is at a depth of about 3 m in the growing season; it is a decrease by 1 m compared to the level before the hydrological structures were built. Typologically, the studied plot belongs to a management complex of forest site types floodplain ash woods with hornbeam, represented by the group of forest

sites types *Ulmeto-Fraxinetum carpineum*; the forest site type is humid ash wood with elm and hornbeam.

Successful management of poplars in these conditions is mainly based on the choice of suitable clones and on the improvement of water balance of soil, particularly by soil cultivation on the whole area and by application of intensive management principles. As the spring season has a lower amount of precipitation, poplars should be planted in the autumn season in order to utilize the winter moisture maximally; it will increase the rooting of plants. Because the area of these sites in Východoslovenská nížina is large, the results of evaluation are applicable in general.

Data on height and diameter growth, basal area, volume production and health status of the studied poplars are shown in tables; they were acquired at the age of 30 years. Table 1 documents the best height growth of poplar I-214 in the given site conditions: its mean height at 30 years of age was 35.1 m and average annual height increment 1.17 m. It is followed by I-476, Blanc du Poitou, Flachslanden, I-462 and Robusta, whose mean height ranges from 33.4 m (Robusta) to 34.5 m (I-476). Their average annual height increment was from 1.11 to 1.15 m, i.e. more than 1.10 m. In comparison with I-214 poplar, whose mean height is taken as 100%, the values of mean heights of the above poplars amount to 94.9–98.0%. Relatively good height growth was observed in *P. nigra* (Baka 5) with mean height 33.2 m and average annual height increment 1.10 m. On the contrary, the height growth of *P. nigra* (009/66 ČR) and I-455 is very slow: their mean height is only 30.2 m and 31.0 m, respectively, and average annual

Table 2. Diameter growth of poplars at 30 years of age

Clone	No.	Mean diameter		Average diameter increment (cm)
		(cm)	(%)	
I-214	1	52.3	100.0	1.74
I-476	2	50.1	95.8	1.67
Blanc du Poitou	3	48.7	93.1	1.62
Flachslanden	4	46.8	89.5	1.56
<i>P. nigra</i> (Baka 5)	5	46.2	88.3	1.54
Eckhoff	6	44.1	84.3	1.47
<i>P. nigra</i> (Pavlovce 1)	7	42.9	82.0	1.43
I-462	8	41.6	79.5	1.39
Régénéré de Suisse	9	41.4	79.1	1.38
Brabantica	10	39.8	76.1	1.33
Robusta	11	37.3	71.3	1.24
I-262	12	36.4	69.6	1.21
Heidemij	13	36.3	69.4	1.21
Harff	14	36.0	68.8	1.20
<i>P. nigra</i> (Ivachnova 1)	15	35.4	67.9	1.18
I-155	16	35.3	67.5	1.18
Virginiana de Nancy	17	34.7	66.3	1.16
Grandis	18	34.4	65.8	1.15
I-455	19	32.9	62.9	1.10
<i>P. nigra</i> (009/66 ČR)	20	30.5	58.3	1.00

Table 3. Basal areas of poplars at 30 years of age

Clone	No.	Basal area		Average increment of basal area	Mean stem basal area	Average increment of mean stem basal area
		(m ² /ha)	(%)	(m ² /ha)	(m ²)	(m ²)
I-214	1	84.9200	100.0	2.8307	0.2123	0.0071
I-476	2	78.5200	92.5	2.6173	0.1963	0.0065
Blanc du Poitou	3	73.8800	87.0	2.4626	0.1847	0.0062
Flachslanden	4	69.3600	81.7	2.3120	0.1734	0.0058
<i>P. nigra</i> (Baka 5)	5	66.4800	78.3	2.2160	0.1662	0.0055
Eckhoff	6	60.8000	71.6	2.0267	0.1520	0.0051
<i>P. nigra</i> (Pavlovce 1)	7	58.0800	68.4	1.9360	0.1452	0.0048
I-462	8	54.1200	63.7	1.8040	0.1353	0.0045
Régénéré de Suisse	9	52.8000	62.2	1.7600	0.1320	0.0044
Brabantica	10	50.2800	61.5	1.6760	0.1237	0.0042
Robusta	11	44.1600	52.0	1.4720	0.1104	0.0037
I-262	12	42.8800	50.5	1.4293	0.1072	0.0036
Heidemij	13	40.8400	49.3	1.3947	0.1045	0.0035
Harff	14	40.7200	47.9	1.3573	0.1018	0.0034
<i>P. nigra</i> (Ivachnova 1)	15	39.6000	46.6	1.3200	0.0990	0.0033
I-155	16	38.4800	45.3	1.2827	0.0962	0.0032
Virginiana de Nancy	17	37.4000	44.0	1.2467	0.0935	0.0031
Grandis	18	36.3200	42.8	1.2106	0.0908	0.0030
I-455	19	34.2000	40.3	1.1400	0.0855	0.0028
<i>P. nigra</i> (009/66 ČR)	20	29.2400	34.4	0.9747	0.0731	0.0024

height increment is 1.01 and 1.03 m, resp. Compared to poplar I-214, their respective percent values are 85.8% and 88.1%. It is to state that the value of average annual height increment decreased in the range of 0.16–0.19 m in the studied poplars in the last five-year period; it is an average decrease by 0.17 m.

When the growth of poplars is studied, it is very important to measure diameter growth because the management goal is production of valuable logs of large diameter. Table 2 shows the values of mean diameter and average annual diameter increment. It is evident that out of the studied poplars I-214 achieved the maximum mean diameter (52.3 cm) and the highest average annual diameter increment (1.74 cm). If the value of the mean diameter in I-214 is taken as 100%, the percent values of mean diameter in poplars I-476, Blanc du Poitou, Flachslanden and *P. nigra* (Baka 5) range from 88.3% [*P. nigra* (Baka 5)] to 95.8% (I-476). The mean diameter of I-476, Blanc du Poitou, Flachslanden and *P. nigra* (Baka 5) is in the range from 46.2 cm to 50.1 cm, i.e. it is larger than 45.0 cm, and their average annual diameter increment is 1.54–1.61 cm. Very low mean diameter, and also average annual diameter increment, were measured in *P. nigra* (009/66 ČR), I-455 and Grandis: mean diameter 30.5 cm, 32.9 cm and 34.4 cm, respectively, i.e. less than 35.0 cm; their respective average annual diameter increments being 1.00 cm, 1.10 cm and 1.15 cm. These values account for 58.3%,

62.9% and 65.8% of the 100% value in I-214. Similarly like the average annual height increment, the average annual diameter increment has also decreased by 10–18 cm in recent years.

Table 3 shows the values of basal area per 1 ha, average annual diameter increment of basal area and basal area of mean stem. The highest basal area per 1 ha was determined in I-214 – 84.9200 m² while the lowest basal area was found out in *P. nigra* (009/66 ČR) – only 29.2400 m². Similarly, I-214 had the highest basal area of mean stem (0.2123 m²) while *P. nigra* (009/66 ČR) had the lowest value of this characteristic (0.0731 m²). The table documents that the order of the studied poplars according to mean height and diameter or basal area of mean stem does not basically change. The differences between I-214 and other poplars are much larger if evaluated on the basis of percent values for basal area than the differences in mean diameter. If e.g. the values of mean diameter and basal area of mean stem in I-214 are taken as 100%, the mean diameter of *P. nigra* (009/66 ČR) is 58.3% and its basal area of mean stem accounts for 34.4% only.

Standing volume, average annual volume increment per 1 ha and mean stem volume are documented in Table 4.

The values of standing volume, mean stem volume and average annual volume increment of mean stem volume are shown for large timber in Table 4. The highest standing

Table 4. Volume production of poplars at 30 years of age

Clone	No.	Standing volume		Average volume increment	Mean stem volume	Average increment of mean stem volume
		(m ³ /ha)	(%)	(m ³ /ha)	(m ³)	(m ³)
I-214	1	1,204.0	100.0	40.1	3.010	0.103
I-476	2	1,074.0	89.2	35.8	2.685	0.089
Blanc du Poitou	3	1,032.0	85.7	34.4	2.580	0.086
Flachslanden	4	994.0	82.6	33.1	2.485	0.083
<i>P. nigra</i> (Baka 5)	5	956.0	79.4	31.9	2.390	0.079
Eckhoff	6	842.0	69.9	28.1	2.105	0.070
<i>P. nigra</i> (Pavlovce 1)	7	804.2	66.8	26.8	2.010	0.067
I-462	8	768.0	63.8	25.6	1.920	0.064
Régénéré de Suisse	9	704.0	58.5	23.4	1.760	0.059
Brabantica	10	672.0	55.8	22.4	1.680	0.056
Robusta	11	640.0	53.2	21.3	1.600	0.053
Heidemij	12	584.0	48.5	19.5	1.460	0.049
Harff	13	580.0	48.2	19.3	1.450	0.048
I-262	14	574.0	47.7	19.1	1.435	0.048
<i>P. nigra</i> (Ivachnova 1)	15	562.0	46.7	18.7	1.405	0.047
I-155	16	556.0	46.2	18.5	1.390	0.046
Virginiana de Nancy	17	542.0	45.0	18.1	1.355	0.045
Grandis	18	500.0	41.5	16.7	1.250	0.042
I-455	19	472.0	39.2	15.7	1.180	0.039
<i>P. nigra</i> (009/66 ČR)	20	388.0	32.2	12.9	0.970	0.032

volume, 1,204 m³ per ha, and the highest average annual volume increment of the studied clones were measured in I-214, which also had maximum mean height and maximum mean diameter. It was followed by I-476, Blanc du Poitou, Flachslanden and *P. nigra* (Baka 5). The standing volumes of these poplars ranged from 956.0 m³ to 1,074.0 m³ per ha, and their average annual volume increments were from 31.9 to 35.8 m³ per ha. The lowest values were determined in *P. nigra* (Baka 5), the highest in I-476. In comparison with I-214, whose value is taken as 100%, the percent values for *P. nigra* (Baka 5) and I-476 account for 79.4% and 89.2%, respectively. The poplars *P. nigra* (009/66 ČR), I-455 and Grandis had the lowest standing volume and the lowest average annual volume increment: 388.0 m³, 472.0 m³ and 500.0 m³ per ha, respectively. It is 32.2% for *P. nigra* (009/66 ČR), 39.2% for I-455 and 41.5% for Grandis, compared to 100% in I-214.

The evaluation of mean stem volume indicates the maximum volume of mean stem in I-214 – 3.010 m³. It is followed by I-476, Blanc du Poitou, Flachslanden and *P. nigra* (Baka 5). The values of mean stem volume range from 2.390 m³ [in *P. nigra* (Baka 5)] to 2.685 m³ in I-476. The lowest volumes of mean stem were recorded in *P. nigra* (009/66 ČR), I-455 and Grandis: from 0.970 m³ in *P. nigra* (009/66 ČR) to 1.250 m³ in Grandis. Similar results were obtained by the evaluation of average annual volume increment of mean stem volume that was highest

in I-214 – 0.103 m³ and lowest in *P. nigra* (009/66 ČR) with the value of 0.032 m³.

The results of our evaluation were complemented by testing for statistical significance according to mean stem volume. It is evident that the poplars I-214, I-476, Blanc du Poitou and Flachslanden are statistically equivalent. This statistical equivalence was found highly significant. These results were used to propose poplar regionalization for the area concerned.

Table 5 shows the health status of the studied poplars. Brown sap exudation occurred most frequently in Grandis, *P. nigra* (Pavlovce 1), *P. nigra* (Ivachnova 1) and partly also in Robusta while brown sap exudation was not observed in the other poplars at all or its occurrence was scarce. The highest occurrence of *Dothichiza populea* Sacc. et Briard. and *Micrococcus populi* Dell. was found in Robusta and Grandis as well as on domestic black poplars *P. nigra* (Pavlovce 1), *P. nigra* (Ivachnova 1) and *P. nigra* (009/66 ČR); the attacks of these fungi on other poplars were scarce or weak. *Marssonina brunnea* Ell. et Ev. occurred most frequently in Italian clones. This fungus did not attack the other clones at all or its occurrence was scarce or weak. In general, the best health status was determined in Blanc du Poitou and Flachslanden.

The evaluation of some clones that were grown on uninundated alluvia of the Morava River (ČÍZEK et al. 1992) and on our evaluated research plot in similar site condi-

Table 5. Results of evaluation of poplar health at 30 years of age

Clone	Brown sap exudation	<i>Dothichiza populea</i> and <i>Micrococcus populi</i>	<i>Marssonina brunnea</i>	Overall health evaluation
		Degree of infestation		
I-214	0	1	2	3
I-476	0	1	2	3
Blanc du Poitou	0	1	1	2
Flachslanden	1	1	0	2
I-462	0	1	2	3
Robusta	2	3	0	5
<i>P. nigra</i> (Baka 5)	1	2	0	3
Brabantica	1	1	1	3
Régénéré de Suisse	1	2	1	4
Harff	1	1	1	3
Eckhoff	1	2	1	4
Virginiana de Nancy	1	2	1	4
Grandis	3	3	1	7
<i>P. nigra</i> (Pavlovce 1)	3	3	0	6
I-262	0	1	2	3
<i>P. nigra</i> (Ivachnova 1)	3	3	0	6
Heidemij	1	2	1	4
I-155	0	1	2	3
I-455	0	1	2	3
<i>P. nigra</i> (009/66 ČR)	2	3	0	5

tions makes it possible to compare the results obtained in both regions: specifically, the poplars I-214, I-476, I-262, I-155, Robusta, Eckhoff, Blanc du Poitou, Régénéré de Suisse, Brabantica, Harff, Virginiana de Nancy, Heidemij and Grandis. The highest volume production in Moravia was achieved by Blanc du Poitou, followed by I-214 and I-476 while in Východoslovenská nížina I-214 ranked as the first, I-476 as the second and Blanc du Poitou as the third. Among the other clones under study higher volume production in Moravia was recorded in Régénéré de Suisse, Virginiana de Nancy, Heidemij and Grandis; in Východoslovenská nížina higher volume production was measured in Eckhoff, Robusta, Brabantica and Harff. The differences are very small, of no practical importance.

CONCLUSION

Growth, volume production and health were evaluated in 20 different poplar clones at the age of 30 years in Leles populetum, which is situated on medium-heavy uninundated alluvia of the Latorica River in the lowland Východoslovenská nížina in ecological conditions changed by hydrological measures.

The results of our research demonstrated that the growth and health of suitable poplar clones were good in these site conditions, and their wood production was high. It

applies to the Italian clones I-214 and I-476 as well as to Blanc du Poitou, Flachslanden and *P. nigra* (Baka 5), which also had very good diameter increments providing more valuable assortments. The standing volume of these clones ranges from 956.0 m³ [*P. nigra* (Baka 5)] to 1,204.0 m³ (I-214) per ha while their average annual volume increments were from 31.9 m³ to 40.1 m³ per ha. The health status of the studied poplars was also good, particularly with respect to their relatively high resistance to harmful pests and diseases such as brown sap exudation, *Dothichiza populea*, *Micrococcus populi* and *Marssonina brunnea*.

Out of the above-mentioned well-tried clones, the poplars I-214, Blanc du Poitou and *P. nigra* (Baka 5) were regionalized on the basis of previous results that were confirmed by our evaluation presented in this paper. It will be possible to include other suitable clones, e.g. I-476 and Flachslanden, in the collection of poplars regionalized for the area of Východoslovenská nížina.

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Hodnotenie rastu a zdravotného stavu rozličných topoľov v oblasti Latorice v podmienkach Východoslovenskej nížiny

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ABSTRAKT: V práci sa uvádzajú výsledky hodnotenia rastu a zdravotného stavu 20 rozličných topoľov skupiny *Aigeiros* na 30-ročnom populete Leles na nezaplavovaných alúviach Latorice v ekologických podmienkach Východoslovenskej nížiny. Populeťum leží na stredne ťažkých hlinitých pôdach v skupine lesných topoľov *Ulmeto-Fraxinetum carpineum*. Z výsledkov hodnotenia vyplýva, že zo sledovaných topoľov najlepší výškový a hrúbkový rast a maximálnu objemovú produkciu dosiahli I-214, I-476, Blanc du Poitou, Flachslanden a *P. nigra* (Baka 5). Uvedené topole sa osvedčili aj zo stránky zdravotnej. Naproti tomu najnižšiu objemovú produkciu dosiahli *P. nigra* (009/66 ČR), I-455 a Grandis, kým najhorší zdravotný stav mali topole Grandis, *P. nigra* (Pavlovce 1) a *P. nigra* (Ivachnova 1). Dosiagnuté výsledky umožnia doplniť sortiment rajonizovaných topoľov pre oblasť Východoslovenskej nížiny, a to klonmi I-476 a Flachslanden.

Kľúčové slová: topole; rast a produkcia; škodcovia; ekologické pomery

V príspevku hodnotíme výsledky výskumu výškového a hrúbkového rastu, kruhovej základne, objemovej produkcie, ako aj zdravotného stavu 20 rozličných topoľov zo skupiny *Aigeiros* na populete Leles, v oblasti Medzibodrožia na Východoslovenskej nížine. Na založenie populeta na celoplošne mechanicky pripravenej pôde sa použili jednorôčné sadenice na jednorôčnom koreni. Z celkového počtu sa sledovalo a hodnotilo 16 euroamerických klonov, a to I-262, I-455, I-214, Robusta, I-462, Harff, Brabantica, Régénéré de Suisse, Flachslanden, Heidemij, Blanc du Poitou, Virginiana de Nancy, I-155, Eckhoff, I-476 a Grandis, ako aj štyri domáce čierne topole, a to *P. nigra* (Baka 5), *P. nigra* (Pavlovce 1),

P. nigra (Ivachnova 1) a *P. nigra* (009/66 ČR). Topole sa vysadili v pravidelnom štvorcovom spon 5 × 5 m tým spôsobom, že sa z každého klonu vysadili štyri jedince v štyroch opakovaniach, spolu teda 16 jedincov. V rámci intenzívneho pestovania sa na populete vykonala celoplošná mechanická kultivácia pôdy, úprava korún a okliesňovanie topoľov. Prebierkové zásahy sa s ohľadom na použitý spon nerobili. Z významnejších škodcov, resp. chorôb sme hodnotili výskyt hnedého miazgotoku, ako aj výskyt húb: *Dothichiza populea* Sacc. et Briard., *Micrococcus populi* Dell. a *Marssonina brunnea* Ell. et Ev. Hodnotenie výskumu sa vykonalo ku koncu 30 rokov.

Hodnotené populatum leží na nezaplavovaných alúviách Latorice, v okrese Trebišov. Hydrologicky patrí územie do povodia Bodrogu. Klimaticky môžeme túto oblasť charakterizovať ako teplú, mierne suchú s chladnou zimou a dlhým slnečným žiarením. Pôdnym typom je hnedá glejová pôda, ktorá je zrnitostne stredne ťažká hlinitá, stredne humózna a vykazuje mierne kyslú reakciu a priaznivý obsah dôležitých živín. Typologicky patrí do skupiny lesných typov *Ulmeto-Fraxinetum carpineum*, kým lesným typom je vlhká brestová jasenina s hrabom. Vykonaním vodohospodárskych úprav sa ekologické podmienky mierne zhoršili.

Z výsledkov nášho výskumu jednoznačne vyplýva, že zo sledovaných topoľov najväčší výškový rast dosahuje I-214, ktorého stredná výška dosahuje 35,1 m a priemerný ročný výškový prírastok 1,17 m. Za ním nasledujú topole I-476, Blanc du Poitou, Flachslanden, I-462 a Robusta, ktorých stredná výška sa pohybuje v rozpätí od 33,4 m (Robusta) do 34,5 m (I-476), ich priemerný ročný výškový prírastok pritom dosahuje 1,11–1,15 m, teda 94,9–97,8 % z percentuálnej hodnoty topoľa I-214. Naproti tomu vo výškovom raste značne zaostávajú topole *P. nigra* (009/66 ČR) a I-455.

Podobne aj maximálnu strednú hrúbku a najväčší priemerný ročný hrúbkový prírastok vykazuje topoľ I-214, a to 52,3 cm, resp. 1,74 cm. Potom nasledujú topole I-476, Blanc du Poitou, Flachslanden a *P. nigra* (Baka 5). Stredná hrúbka uvedených topoľov sa pohybuje v medziach od 46,2 cm [pri topoli *P. nigra* (Baka 5)], do 50,1 cm (pri topoli I-476), pritom ich priemerný ročný hrúbkový prírastok je od 1,54 cm do 1,67 cm. V porovnaní s topoľom I-214 to znamená v percentuálnom vyjadrení 88,3–95,8 %.

Pri hodnotení kruhovej základni na jeden hektár sme dostali podobné výsledky, ako pri hrúbkovom raste, z čoho vyplýva, že sa poradie sledovaných topoľov či už podľa strednej hrúbky, alebo kruhovej základne na hektár nemení. Rozdiely medzi topoľom I-214 a ostatnými sledovanými topoľmi sú však podľa výsledkov hodnotenia kruhovej základne podstatne vyššie než rozdiely podľa strednej hrúbky.

Najvyššiu zásobu, najväčší priemerný ročný objemový prírastok, ako aj maximálny objem stredného kmeňa vykazuje tiež topoľ I-214, ktorý mal maximálnu strednú výšku, ako aj strednú hrúbku. Topoľ I-214 dosahuje totiž zásobu 1 204 m³, priemerný ročný objemový prírastok 40,1 m³/ha, kým objem jeho stredného kmeňa je 3,010 m³. Z ostatných sledovaných topoľov vysokú zásobu mali predovšetkým I-476, Blanc du Poitou, Flachslanden a *P. nigra* (Baka 5), ktorých zásoba presiahla 950 m³ na hektár. Podobnú tendenciu sme zistili aj pri hodnotení stredného kmeňa jednotlivých sledovaných topoľov. Najvyššiu hodnotu objemu stredného kmeňa mal topoľ I-214, a to 3,010 m³, kým ostatné, vyššie uvedené topole s vysokou zásobou mali hodnoty objemu stredného kmeňa v medziach od 2,390 m³ do 2,685 m³. Naproti tomu najnižšiu zásobu, najmenší priemerný ročný objemový prírastok, ako aj najnižší objem stredného kmeňa dosiahli topole *P. nigra* (099/66 ČR), I-455 a Grandis.

Z celkového hodnotenia zdravotného stavu vyplýva, že hnedým miazgotokom boli najčastejšie napadnuté topole Grandis, Robusta, ako aj *P. nigra* (Pavlovce 1) a *P. nigra* (Ivachnova 1). Podobne aj huby *Dothichiza populea* Sacc. et Briard. a *Micrococcus populi* Dell. sa najviac vyskytovali na uvedených topoľoch najviac napadnutých hnedým miazgotokom, kým na ostatných topoľoch sme zaznamenali ich ojedinelý, alebo slabý výskyt. Huba *Marssonina brunnea* Ell. et Ev. sa najčastejšie vyskytovala na talianskych klonoch, kým na ostatných sledovaných topoľoch bol zistený iba jej ojedinelý výskyt, alebo nebola prítomná.

Záverom môžeme konštatovať, že výskum rastu, objemovej produkcie a zdravotného stavu sledovaných topoľov splnil svoj účel. Potvrdilo sa, že rajonizácia topoľov I-214, Blanc du Poitou a *P. nigra* (Baka 5) bola správna. Tieto výsledky zároveň ukázali, že v najbližšom období bude možné obohatiť sortiment rajonizovaných topoľov ďalšími vhodnými klonmi, aké sú predovšetkým I-476 a Flachslanden, a to najmä pre oblasť Východoslovenskej nížiny.

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