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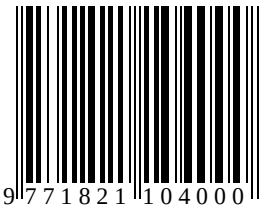

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STATE OF ARTIFICIALLY-ESTABLISHED STANDS OF INTRODUCED CONIFERS ON THE SITE OF SESSILE OAK IN MU `CER-VIDOJEVICA`

Branka SPASOJEVIĆ, Vlado ČOKEŠA, Đorđe JOVIĆ[1]

Abstract: *The paper presents the results of a study on the state of artificially-established stands of Douglas-fir and white pine on the site of sessile oak with hornbeam (Querco-Carpinetum moesiacum Rud. 1945), in Podrinje-Kolubara forest area in MU `Cer-Vidojevica`. The stands of Douglas-fir and white pine are 51 years. The main task of the paper was to examine extensive data on forest estimation elements obtained from the measurements carried out on the selected sample plots in order get a deeper insight into the structure (diameter structure, distribution of basal area, volume, height curve) and productivity (volume and volume increment) of the stands. With the aim of achieving comparability of the results, one sample plot was established in a 70-year old indigenous coppice stand of sessile oak. The knowledge of these characteristics will provide better understanding of the issues of forest management in these artificially-established stands and help define short-term and long-term management goals and measures for their implementation.*

Keywords: artificially-established stands stand state, stand structure, Douglas-fir, white pine, sessile oak.

"STANJE VEŠTAČKI PODIGNUTIH SASTOJINA ČETINARSKIH EGZOTA NA STANIŠTU HRASTA KITNJAKA U GJ "CER-VIDOJEVICA"

Izvod: *U radu su prikazani rezultati proučavanja stanja veštački podignutih sastojina duglazije bora, na staništu kitnjaka sa grabom (Querco-Carpinetum moesiacum Rud. 1945), na i vajmutovog Podrinjsko-kolubarskom šumskom području u GJ „Cer-*

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Vidojevica". Starost sastojina duglazije i borovca iznosi 51 godinu. Osnovni zadatak rada je da se na osnovu podataka detaljnog premera na oglednim poljima sagleda strukturna izgrađenost (debljinska struktura, distribucija temeljnice, zapremine, visinske krive) i proizvodnost (nivo zapremine i zapreminskog prirasta) ovih sastojina. Radi poređenja rezultata, jedno ogledno polje postavljeno je i u autohtonoj izdanačkoj sastojini hrasta kitnjaka starosti 70 godina. Upoznavanjem ovih karakteristika, biće moguće realnije sagledavanje problema gazdovanja u ovim veštački podignutim sastojinama, kao i definisanje kratkoročnih i dugoročnih ciljeva gazdovannja i mera za njihovu realizaciju.

Ključne reči: veštački podignute sastojine, sastojinsko stanje, strukturna izgrađenost, duglazija, borovac, hrast kitnjak.

INTRODUCTION

The substitution of indigenous broadleaved tree species with conifer monocultures in the given study area is a focus of special attention. Since these are broadleaved sites, the justification of this action is disputable. After the World War II, extensive afforestation and land reclamation of degraded and coppice broadleaved stands were performed in Serbia. Different methods of pure or partial felling with the introduction of allochthonous, mostly conifer tree species were applied. However, when selecting trees for afforestation, little attention was paid to the complex characteristics of forest ecosystems and on that account conifer monocultures were often established on unsuitable sites.

The most frequently used conifers belonged to native species, such as: Austrian pine (*Pinus nigra* Arn.) and Scots pine (*Pinus silvestris* L.), to a lesser extend spruce (*Picea abies* L) and fir (*Abies alba* Mill.). Since the 1970s, the following exotic and allochthonous - fast-growing conifers have been increasingly used for the afforestation of highly productive sites: white pine (*Pinus strobus* L), Douglas-fir (*Pseudotsuga menziesii (*Mirb.) Franco), larch (*Larix decidua* Mill.), white fir (*Abies concolor* Engelm) and other species. Since the afforestation has been carried out without any previous experience to rely on and without any previous testing of the suitability of the given species for the specific sites, the achieved results have not always been the same.

Artificially-established conifer stands make 456.31 ha or 12% of the total surface area of MU `Cer-Vidojevica`. This share is similar in most other management units (10-15%). The dominant conifer tree species is Austrian pine which participates with 42%. It is followed by spruce with 31%, Scots pine with 13%, white pine with 8% and Douglas-fir with 5% of the total volume of conifers. The age structure of these artificially-established conifer stands shows the dominance of middle-aged stands, with 63% of the area belonging to age classes III and IV. There is a significant percentage of old stands (36%), while the youngest stands participate with a negligable share of 1% (Special forest management plan for MU `Cer-Vidojevica`, 2013-2022).

"The substantial share of artificially-established conifer stands in the growing stock points to the prime importance of the knowledge of biological and ecological characteristics of the species and the dominant features of the sites they grow on. Without this knowledge, the management of these forests becomes even

more complex, especially due to the risk of fires, windthrows and windfalls", Medarević, M., *et al.* (2002). The same author states that one of the strategic issues of Serbian forestry is related to the significant share of artificially-established stands in the total forest area because they call for urgent silvicultural and protection measures, while their unfavorable age and diameter structures make them economically unfavourable.

According to Stojanović, Lj. *et al*. (2010), artificially-established stands of introduced conifer species and the problem of species substitution in Serbia have been the focus of interest of many authors: Vrcelj-Kitić, D. (1982); Vučković, M. *et al*. (1990); Stamenković, V. (1994); Dražić, M. (1994); Koprivica, M. *et al*. (2002); Krstić, M. (2006); Stojanović, Lj. *et al.* (1994) (2006); Stajić, S. *et al*. (2006); Bjelanović, I. *et al.* (2010) and others. Furthermore, research studies have been conducted on the productivity and structure, mainly of spruce, Scots pine and Austrian pine plantations, while there have been only partial studies of non-native conifer species.

The main task of the paper was to use extensive data obtained from detailed measurements of trees on the sample plots established in the process of substitution of coppice forests of sessile oak trees in the area Vidojevica in 1960s to study the structure (diameter structure, distribution of basal area, volume, height curves) and productivity (volume and volume increment) of these stands and to determine whether it was a rational decision to introduce exotic species into these sites.

RESEARCH AREA, MATERIALS AND METHODS

The research was carried out in 2014 in the northwest of Serbia, *i.e.* on the mountain of Vidojevica which makes the northwestern part of the mountain Cer. Cer is a low mountain that completely belongs to the belt of oak forests. Montane beech forests have a significant share in the zone of oak forests. Nine sample plots were established, four in each artificially- established stand of Douglas-fir and white pine on the site of sessile oak with hornbeam **(***Querco-Carpinetum moesiacum* Rudski), aged about 50 years, and one sample plot was established in the sessile oak coppice stand, aged 70 years.

Forest estimation elements were measured by using conventional measurement methodology. Having established and marked sample plots and permanently marked the selected trees, we carried out detailed measurements of trees and stands in order to determine their structure (diameter structure, distribution of basal area, volume, and height curves) and productivity (volume and volume increment). The quality and health status of trees on the sample plots was also estimated during the research (Spasojević, B. 2014) as well as the development dynamics of individual trees and whole stands. Data processing was carried out by the methods usual for this type of research.

The study site is at the altitude ranging from 150 to 200 *m* a.s.l., and the average slope gradient is about 15º. The study stands have different aspects. The parent rock consists of crystalline schists and phyllites. SP 1 and SP 9 have medium-deep, leached acid soil (luvisol on acid silicate parent rock), which is the deepest soil in the study area. The other sample plots have medium deep acid

brown soil. The mean annual air temperature is 11.1ºC. July is the warmest month with the mean annual air temperature of 20.9ºC, and January is the coldest with 0.1°C. The mean temperature of the growing period is 17.4ºC on average. The mean annual rainfall total is 825.8 mm, while it averages 476.2 mm in the growing period. Cer is considered to be a mountain at the transition from the dry climate of the extreme eastern parts of our country to the humid climate of the western parts. These climate characteristics had a significant impact on the development of soil and vegetation of this forest complex.

RESULTS AND DISCUSSION

It should be noted that due to intensive die-back of the investigated artificially-established stands, frequent sanitary fellings have been performed in the past ten years. They have in turn created gaps on large areas. Sample plots were established in homogeneous areas so they do not represent the general state of the entire territory of MU `Cer-Vidojevica`.

Basic data on the investigated stands are presented in Table 1, 2 and 3 and Figures 1-5.

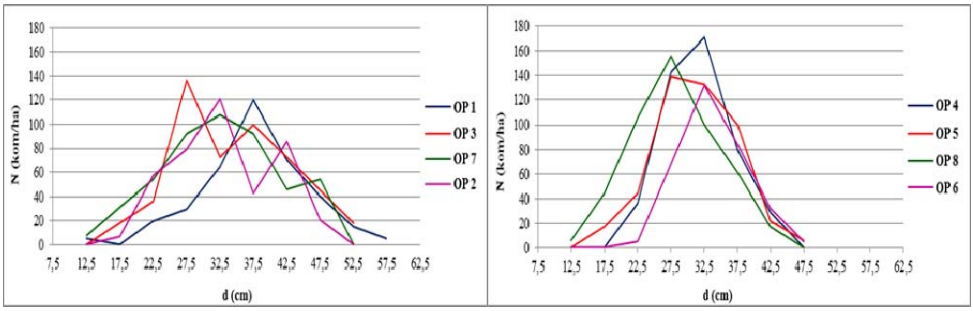

Figure 1. *Distribution of the number of trees per diameter degrees on Douglas-fir and white pine sample plots*

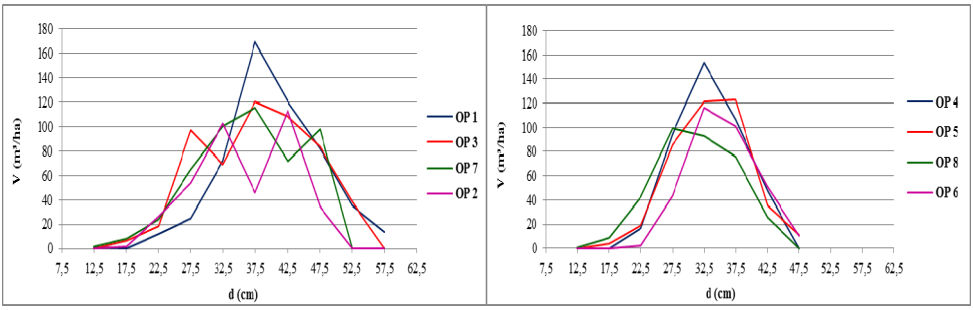

Figure 2. *Distribution of the volume per diameter degrees on Douglas- fir and white pine sample plots*

Artificially-established stands of Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco) on the site of sessile oak with hornbeam (*Querco-Carpinetum moesiacum* Rud. 1945), on acid brown and leached acid soil (dystric cambisol and luvisol on acid silicate parent rock):

The investigated Douglas-fir stands are 51 years old. They belong to different site classes (I-VI). The number of trees ranges between 370 and 499 trees per ha. The curves of distribution of trees per diameter degrees show that most of the trees are in the diameter degrees of 32.5 and 37.5 cm. The mean stand diameter is 33.0 to 37.6 cm, and the mean height amounts to 23.9 - 32.1 m. The wood volume ranges between 380 m^3/ha and 541.9 m^3/ha, with the average volume being 483.90 m^3/ha. The volume increment ranges from 5.57 m^3/ha to 7.05 m^3/ha and the average increment is 6.54 m^3/ha. The curve of distribution of volume per diameter degrees follows the distribution of the number of trees, so the maximum volume is also concentrated in the diameter degrees of 32.5 and 37.5 cm. The curve of distribution of basal area has the same shape as the distribution of trees per diameter degrees and the basal area of Douglas-fir ranges from 37.82 m^2/ha – to 49.24 m^2/ha, with the average value of 43.39 m^2/ha. The values of basal area and volume point to high productivity of these stands.

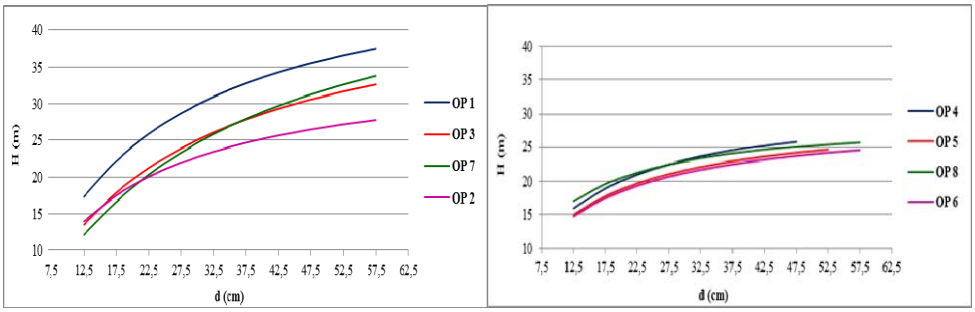

Figure 3. *Height curves of the trees on the sample plots of Douglas-fir and white pine*

Artificially-established stands of white pine (*Pinus strobus L.*) on the site of sessile oak with hornbeam (*Querco-Carpinetum moesiacum* Rud. 1945) on acid brown soil:

The investigated white pine stands are 51 years old. They belong to different site classes (I-IV). The number of trees ranges between 326 and 490 trees per ha. The curves of distribution of trees per diameter degrees show that most of the trees are in the diameter degrees of 27.5 and 32.5 cm. The mean stand diameter is 27.8 to 34.1 cm, and the mean height amounts to 22.2 – 23.2 m. The wood volume ranges between 324 m^3/ha and 419.0 m^3/ha, with the average volume being 372.5 m^3/ha. The volume increment ranges from 4.31 m^3/ha to 6.62 m^3/ha and the average increment is 5.4 m^3/ha. The maximum volume is concentrated in the diameter degrees of 27.5 to 37.5 cm. The curve of distribution of basal area has the same shape as the distribution of trees per diameter degrees and the basal area for white pine ranges from 29.88 m^2/ha – 36.93 m^2/ha, with the average value of 33.87 m^2/ha. The distribution of basal area and volume per diameter degrees shows that the trees with diameters above the mean stand diameter are the holders of volume, and the values of basal area and volume point to relatively high productivity of these stands.

Table 1. *Basic data on the investigated Douglas-fir stands*

Diam.degree. (cm)	Artificially-established stand of Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco) on the site of sessile oak with hornbeam (*Querco-Carpinetum moesiacum* Rud. 1945), on acid brown and leached acid soil (luvisol on acid silicate parent rock)																			
	SP 1 (Compartment and subcomp.: 11/b)					**SP 3** (Compartment and subcomp.: 10/c)					**SP 7** (Compartment and subcomp.: 10/c)					**SP 2** (Compartment and subcomp.: 10/c)				
	Slope: 11°-15°; Aspect: E					Slope: 20°- 25°; Aspect: SW					Slope: up to 10°; Aspect: W					Slope: 5°-10°; Aspect: W				
	Elevation: 148 m					Elevation: 185 m					Elevation: 177 m					Elevation: 168 m				
	N		**G**	**V**		**N**		**G**	**V**		**N**		**G**	**V**		**N**		**G**	**V**	
	per ha	%	m²/ha	m³/ha	%	per ha	%	m²/ha	m³/ha	%	per ha	%	m²/ha	m³/ha	%	per ha	%	m²/ha	m³/ha	%
12.5	5	1.4	0.06	1.2	0.2						8	1.7	0.10	1.5	0.3					
17.5						18	3.6	0.43	6.4	1.2	31	6.4	0.75	8.2	1.7	7	1.7	0.17	2.0	0.5
22.5	20	5.4	0.79	12.2	2.3	36	7.2	1.43	18.4	3.4	54	11.1	2.15	24.3	5.0	57	13.8	2.27	26.7	7.0
27.5	30	8.1	1.78	24.6	4.6	136	27.3	8.07	97.5	18.0	92	19.0	5.46	65.0	13.4	79	19.1	4.69	53.7	14.1
32.5	65	17.6	5.39	72.1	13.6	73	14.6	6.05	68.9	12.7	108	22.3	8.95	100.8	20.8	121	29.2	10.03	103.2	27.2
37.5	120	32.4	13.25	169.7	32.0	100	20.0	11.04	120.7	22.3	92	19.0	10.16	115.5	23.8	43	10.4	4.75	46.2	12.2
42.5	70	18.9	9.93	120.5	22.7	73	14.6	10.35	108.2	20.0	46	9.5	6.52	71.2	14.7	86	20.8	12.19	113.3	29.8
47.5	40	10.8	7.08	81.6	15.4	45	9.0	7.97	83.4	15.4	54	11.1	9.56	98.3	20.3	21	5.1	3.72	34.9	9.2
52.5	15	4.1	3.25	35.4	6.7	18	3.6	3.89	38.4	7.1										
57.5	5	1.4	1.30	13.4	2.5															
∑	**370**	**100**	**42.83**	**530.7**	**100**	**499**	**100**	**49.24**	**541.9**	**100**	**485**	**100**	**43.65**	**484.8**	**100**	**414**	**100**	**37.82**	**380**	**100**
	Site class I	dg = 37.6 cm hg = 32.1 m dgmax = 47.9 cm hgmax = 35.7 m Iv = 5.57 m³/ha				Site class III	dg = 34.6 cm hg = 26.7 m dgmax = 47.0 cm hgmax = 30.3 m Iv = 7.05 m³/ha				Site class IV	dg = 33.0 cm hg = 25.3 m dgmax = 45.2 cm hgmax = 30.0 m Iv = 6.51 m³/ha				Site class VI	dg = 33.5 cm hg = 23.9 m dgmax = 44.4 cm hgmax = 26.1 m Iv = 7.03 m³/ha				

Table 2. *Basic data on the investigated white pine stands*

Diam. degree. (cm)	Artificially-established stand of white pine (*Pinus strobus L.*) on the site of sessile oak with hornbeam (*Querco-Carpinetum moesiacum* Rud. 1945) on acid brown soil																			
	SP 4 (Compartment and subcomp.: 10/d)					**SP 5** (Compartment and subcomp.: 10/d)					**SP 8** (Compartment and subcomp.: 3/g)					**SP 6** (Compartment and subcomp.: 10/d)				
	Slope: 5°- 10°; Aspect: NW					Slope: do 5°; Aspect: NW					Slope: 15°- 20°; Aspect: NE					Slope: 5°- 10°; Aspect: NW				
	Elevation: 200 m					Elevation: 194 m					Elevation: 146 m					Elevation: 160 m				
	N		**G**	**V**		**N**		**G**	**V**		**N**		**G**	**V**		**N**		**G**	**V**	
	per ha	%	m²/ha	m³/ha	%	per ha	%	m²/ha	m³/ha	%	per ha	%	m²/ha	m³/ha	%	per ha	%	m²/ha	m³/ha	%
12.5											6	1.2	0.07	0.7	0.2					
17.5						17	3.7	0.41	4.2	1.1	44	9.0	1.06	8.8	2.5					
22.5	36	7.9	1.43	16.8	4.0	44	9.5	1.75	18.9	4.7	106	21.6	4.21	43.1	12.4	5	1.5	0.20	2.5	0.8
27.5	143	31.2	8.49	94.8	22.6	139	30.2	8.25	85.7	21.4	156	31.8	9.26	99.2	28.6	68	20.9	4.04	43.7	13.5
32.5	171	37.3	14.18	153.3	36.6	133	28.9	11.03	121.1	30.3	100	20.4	8.29	92.8	26.8	132	40.5	10.94	116.5	35.9
37.5	79	17.3	8.72	106.6	25.4	100	21.7	11.04	123.3	30.8	61	12.5	6.73	76.1	22.0	84	25.8	9.27	100.7	31.0
42.5	29	6.3	4.11	47.5	11.3	22	4.8	3.12	35.3	8.8	17	3.5	2.41	25.9	7.5	32	9.8	4.54	50.6	15.6
47.5						6	1.3	1.06	11.5	2.9						5	1.5	0.89	10.5	3.24
52.5																				
57.5																				
∑	**458**	**100**	**36.93**	**419**	**100**	**461**	**100**	**36.66**	**400**	**100**	**490**	**100**	**32.04**	**346.6**	**100**	**326**	**100**	**29.88**	**324.5**	**100**
	Site class I	dg = 31.8 cm hg = 23.2 m dgmax = 39.6 cm hgmax = 24.9 m Iv = 6.14 m³/ha				Site class II	dg = 31.2 cm hg = 22.2 m dgmax = 38.6 cm hgmax = 24.1 m Iv = 6.62 m³/ha				Site class II	dg = 27.8 cm hg = 22.6 m dgmax = 36.8 cm hgmax = 23.6 m Iv = 4.31 m³/ha				Site class IV	dg = 34.1 cm hg = 22.15 m dgmax = 41.4 cm hgmax = 23.4 m Iv = 4.56 m³/ha				

The analysis of the adequacy of the introduction of exotic conifer species into the sessile oak sites in this area included the study of the structure and productivity characteristics of an indigenous stand of sessile oak with hornbeam.

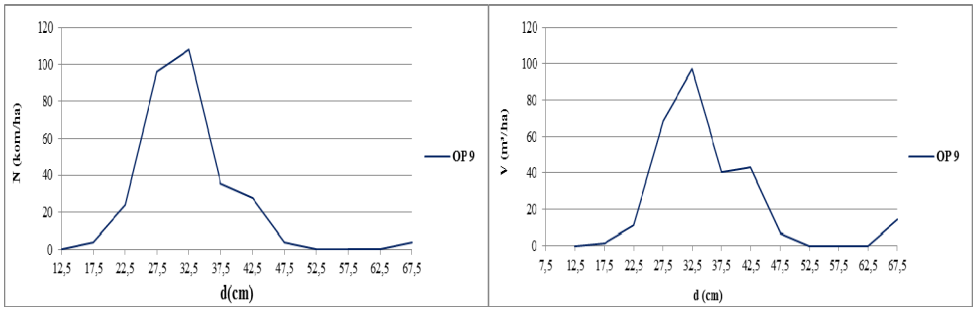

Figure 4. *Distribution of the number of trees and volume per diameter degrees on the sessile oak sample plot*

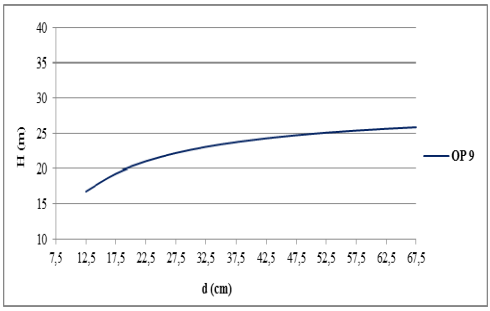

Figure 5. *Height curve of the trees on the sessile oak sample plot*

Mesophilic coppice forest of sessile oak with hornbeam (*Quercetum montanum subass. Carpinetosum betuli*) on leached acid soil (luvisol on acid silicate parent rock):

The investigated stand is 70 years old. It belongs to site class II. There are 304 trees per ha. The trees are distributed in the diameter degrees of 17.5 to 47.5 cm, but the greatest number of trees is in the diameter degrees of 27.5 cm to 32.5 cm (67%). The mean stand diameter is 31.98 cm, and the mean tree diameter of the dominant layer amounts to 37.6 cm. The mean stand height is 23.0 m. The distribution of forest estimation elements per diameter degrees forms a normal bell-shaped curve, with a small number of predominant trees in the diameter degree of 67.5 cm. These trees should certainly be removed in the preparatory cutting which must be taken in these stands. The distribution of the number of trees per diameter degrees resembles the distribution of basal area and volume, so the trees are mostly concentrated in the diameter degrees of 27.5 cm and 32.5 cm. The values of basal area (25.79 m^2/ha), volume (283 m^3/ha) and volume increment (2.40 m^3/ha) are significantly lower compared to the fast-
growing conifers on its site.

Table 3. *Basic data on the investigated stand of sessile oak*

Diam. degree (cm)	Mesophilic coppice forest of sessile oak with hornbeam (*Quercetum montanum subass. Carpinetosum betuli*) on leached acid soil (luvisol on acid silicate parent rock)				
	SP 9 (Compartment and subcomp: 13/c); Slope: 13°-17°; Aspect: N; Elevation: 180 m;				
	N		**G**	**V**	
	per ha	%	m²/ha	m³/ha	%
17.5	4	1.32	0.10	1.30	0.46
22.5	24	7.89	0.95	11.00	3.89
27.5	96	31.58	5.70	68.30	24.13
32.5	108	35.53	8.95	97.20	34.35
37.5	36	11.84	3.97	40.60	14.35
42.5	28	9.21	3.97	43.30	15.30
47.5	4	1.32	0.71	7.00	2.47
67.5	4	1.32	1.43	14.30	5.05
∑	**304**	**100.00**	**25.79**	**283.00**	**100.00**
	Site class II	dg = 31.98 cm hg = 23.0 m	dgmax = 37.6 cm hgmax = 23.5 m	Iv = 2.40 m³/ha	

The growing stock of this stand is significantly higher than the estimated optimum for Serbia, which according to Milin Ž. *et al.* (1987) amounts to 200 m³/ha. The volume increment is below the optimum estimated for coppice sessile oak forests in Serbia (according to Milin, Ž. *et al*., 1987-5 m³/ha) as well as below the average for the sessile oak forests established for production purposes which, according to Aleksić (2005) amounts to 3.7 m³/ha.

CONCLUSIONS

Based on detailed research conducted in 50-year old stands of allochthonous fast-growing conifers (white pine and Douglas-fir), established on the site of sessile oak and in a 70-year old indigenous coppice stand of sessile oak with hornbeam in the area of MU `Cer-Vidojevica`, the following conclusions were reached:

Artificially-established stands of Douglas-fir and white pine are highly productive. At the age of 50 years, they are three times more productive than indigenous sessile oak stands of the same age. The investigated artificially-established stands had a very intensive development by the age of about 40 years. The height and diameter increments were pronounced. The stands were very vital, with high quality and good health. In the last ten years, increment has been declining, vitality decreasing and die-back has been getting larger proportions (Spasojević, B. 2014). When young, these species did not show their mesophilic character and the site could meet their requirements. With age, as they grew in size, their requirements grew, too. Trees needed increasing amounts of water in the soil and humidity in the air which weren`t available.

Therefore, these sites can only serve for the growth of the investigated species on intensive short rotation plantations. They are unsuitable for longer rotation periods, especially in terms of rainfall and soil water capacity. Relative air

humidity is another important environmental factor. Between the two studied species, Douglas-fir, however, proved to be a more suitable and more resistant species. White pine is vulnerable to various pathogens, so the growing conditions in Serbia are not suitable and they lead to its extensive die-back. Furthermore, the wood of this species is brittle, fragile and of low quality. Therefore the stands are unstable and easily affected by adverse abiotic factors (wind, snow and ice).

Sessile oak is also prone to die-back, both in coppice and in high stands. However, sessile oak as the primary species of this site should not be given up. Its sites should not be allowed to be taken over by native species that occur naturally and make an integral part of this community (hornbeam and lime), let alone the species such as flowering ash, hawthorn, wild rose, blackthorn and blackberry.

The problem with sessile oak forests cannot be solved by its replacement with introduced tree species since their introduction into an autochthonous ecosystem can have more serious adverse effects on the biodiversity and the site in general than clear-cutting or fire. The solution lies in the measures to improve their state and structure. Coppice forests should be transformed into high forests by conversion or artificial reconstruction, or by a combination of different methods. However, this is an extremely expensive and time-consuming process difficult to implement without frequent additional measures, given the increasingly rare seed crop and abundant weed growth.

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STATE OF ARTIFICIALLY-ESTABLISHED STANDS OF INTRODUCED CONIFERS ON THE SITE OF SESSILE OAK IN MU `CER-VIDOJEVICA`

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Summary

Die-back of both individual trees and entire stands of white pine and Douglas-fir established on the sites unsuitable for their growth (small altitude of 150-200 m, southern aspect, lack of moisture) was recognized as one of the biggest problems not only in the area of MU `Cer-Vidojevica` but also in most of Serbia. Severe droughts have led to physiological weakening of trees and made them predisposed to attacks of various pathogens. Since episodes of die-back had already been recorded in this forest complex before and the state of the stands has been getting worse over the last ten years, it can be concluded that the introduction of the given species was not a reasonable decision. Natural stands are less prone to damage which occur only sporadically there, and provided that they are tended regularly and properly, these stands are more resistant to the harmful effects of the stated climate elements.

Based on the aforementioned, we can conclude that the artificially-established white pine and Douglas-fir stands showed good productivity in these conditions, but based on the general state of the plantations, their weakened vitality and intensive die-back of individual trees and entire stands, these species are not recommended for further substitution of coppice forests of sessile oak in the area. After the planned rotation, it is recommended to perform reconstruction - the restore native species, which are in any case more adapted to bio-ecological conditions of these sites. Indigenous sessile oak stands are more acceptable from the aspect of ecology and natural ecosystems are more stable in the long run (having a more favorable impact on the site and conservation of biodiversity of other species).

In case coniferous species are used (native or non-native), it is recommended to plant them on smaller areas, taking into account bio-ecological characteristics of the selected conifers. When using exotic species in the reconstruction of coppice oak forests, special care must be taken in the selection of provenances. We must select the provenances that have proved resistant to the effects of different abiotic and biotic factors that threaten the vitality of these species in our conditions. These species can be used for the establishment of intensive short rotation plantations in similar soil conditions of deforested areas.

"STANJE VEŠTAČKI PODIGNUTIH SASTOJINA ČETINARSKIH EGZOTA NA STANIŠTU HRASTA KITNJAKA U GJ "CER-VIDOJEVICA"

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Rezime

Kao najveći problem, koji je i ranije konstatovan na području GJ „Cer-Vidojevica", ali i na području gotovo cele Srbije, treba istaći sušenje kako pojedinačnih stabala, tako i čitavih sastojina borovca i duglazije podignutih na neodgovarajućem staništu (mala nadmorska visina 150-200 m, južna ekspozicija, nedostatak vlage). Jake suše su poslednjih godina dovele do fiziološkog slabljenja stabala i njihove predispozicije za napade raznih patogena. S obzirom da je pojava sušenja konstatovana i ranije u ovom šumskom kompleksu, a stanje ovih sastojina se poslednjih deset godina samo pogoršava, ukazuje da se unošenje navedenih vrsta u ovim uslovima nije pokazalo opravdanim. U prirodnim sastojinama, štete se javljaju samo sporadično, a ako su uredno i na pravi način negovane, pokazuju veću otpornost na štetne uticaje navedenih klimatskih elemenata.

Na osnovu svega izloženog, možemo konstatovati da su veštački podignute sastojine borovca i duglazije pokazale dobru proizvodnost u ovim uslovima, ali da se na osnovu opšteg stanja kultura, oslabljene vitalnosti i intenzivnog sušenja stabala i čitavih sastojina, ove vrste ne mogu preporučiti za dalje radove prilikom supstitucije izdanačkih šuma hrasta kitnjaka na ovom području. Nakon predviđene ophodnje, predlaže se ***rekonstrukcija*** – vraćanje autohtonih vrsta, kojima u svakom slučaju bioekološki više i bolje odgovaraju uslovi ovih staništa. Autohtone sastojine hrasta kitnjaka su ekološki prihvatljivije, a prirodni ekosistemi su, gledajući dugoročnije, stabilniji (povoljnije utiču na stanište i očuvanje biodiverziteta drugih vrsta).

U slučaju da se koriste četinarske vrste (domaće ili unešene), preporuka je da se to radi na malim površinama, vodeći pri tome računa o bioekološkim karakteristikama pomenutih četinara. Pri korišćenju egzota u rekonstrukciji izdanačkih hrastovih šuma, posebno treba voditi računa o izboru odgovarajućih provenijencija, koje su se pokazale

otpornim na delovanje različitih abiotičkih i biotičkih činilaca, a za koje je dokazano da ugrožavaju vitalnost ovih vrsta u našim uslovima. Njihova primena ne treba da se isključi za formiranje intenzivnih zasada sa kratkom ophodnjom u sličnim edafskim uslovima na obešumljenim površinama.