



COMPARISON OF COLOUR PROPERTIES IN AMERICAN WALNUT (*Juglans nigra*) WOOD COATED WITH DIFFERENT SURFACE FINISHES

PRIMERJAVA BARVNIH LASTNOSTI PRI AMERIŠKEM OREHU (*Juglans nigra*), PREMAZANEM Z RAZLIČNIMI POVRŠINSKIMI PREMAZI

Ümit Ayata^{1*}

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Abstract / Izvleček

Abstract: In this research, the colour characteristics [hue (h°) angle, yellow (b^*) colour tone, lightness (L^*), red (a^*) colour tone, chroma (C^*), ΔE^* , ΔL^* , Δa^* , Δb^* , ΔC^* , and ΔH^*] of surfaces treated with three distinct types of coatings [solvent-based yacht varnish, which has high hardness and is highly resistant to water, a waxy varnish formulated for interior and exterior wood coatings, consisting of a mixture of natural oils, waxes, and resins, and matte-glossy, solvent-based, acrylic resin-based stone varnish] on American walnut (*Juglans nigra* L.) wood were examined and compared. When all types of varnishes are applied to wooden surfaces, decreases in b^* , C^* , h° , and L^* values were observed, while increases in a^* values were detected. Reviewing the ΔE^* values, 13.59 was identified for stone, 16.62 for yacht, and 12.40 for waxy varnish. Upon examination of the ΔH^* values, they were determined as 4.72 for stone, 5.06 for yacht, and 3.42 for waxy varnish. The highest values for the parameters L^* , b^* , C^* , and h° , and the lowest value for a^* , were determined on the control experimental samples (without any varnish application). In the study, it was observed that the coating types, each with different chemical compositions, yielded different results.

Keywords: Colour, American walnut = *Juglans nigra*, stone varnish, yacht varnish, waxy varnish

Izvleček: Raziskali in primerjali smo barvne značilnosti (barvitost (h°), rumeno-modri ton (b^*), svetlost (L^*), rdeče-zeleni ton (a^*), nasičenost (C^*), ΔE^* , ΔL^* , Δa^* , Δb^* , ΔC^* , in ΔH^*) površin lesa ameriškega oreha (*Juglans nigra* L.), obdelanih s tremi različnimi vrstami lakov. Pri uporabi različnih lakov [topilni lak za jahte, ki ima visoko trdoto in je zelo odporen proti vodi; voskast lak, formuliran za notranje in zunanje premaze za les, sestavljen iz zmesi naravnih olj, voskov in smol; mat-sijajni topilni lak na osnovi akrilne smole za površinsko obdelavo kamna] na površinah lesa ameriškega oreha so bile opažene zmanjšane vrednosti b^* , C^* , h° in L^* , medtem ko so bile zaznane povečane vrednosti a^* . Pri pregledu vrednosti ΔE^* smo ugotovili, da je le-ta bila 13,59 pri laku za kamen, 16,62 pri laku za jahte in 12,40 pri voskastem laku. Pri pregledu vrednosti ΔH^* so bile le-te določene kot 4,72 pri laku za kamen, 5,06 pri laku za jahte in 3,42 pri voskastem laku. Najvišje vrednosti parametrov L^* , b^* , C^* in h° , ter najnižje vrednosti za parameter a^* so bile ugotovljene na kontrolnih vzorcih (brez nanesenih premazov). V študiji je bilo ugotovljeno, da je raba različnih vrst lakov, ki imajo različno kemično sestavo, privedla do razlik v rezultatih.

Ključne besede: Barva, ameriški oreh = *Juglans nigra*, lak za kamen, lak za jahte, voskast lak

1 INTRODUCTION

1 UVOD

Wood is one of the most common construction materials globally. Thanks to its remarkable mechanical properties relative to its weight, it facilitates the creation of lightweight structures with a high robustness. Its ease of manipulation, as opposed to more labour-intensive materials, renders it a compelling substitute in the field of construction (Niemz et al., 2015).

The unique aesthetic of treated wood holds significant commercial value. Its rich and appeal-

ing appearance makes it a sought-after material for upscale furnishings, decorative elements in both residential and commercial settings, and luxury automotive interiors (Marschner et al., 2005).

Varnish is composed of two primary substances: solid matter and solvent. In the case of chemical curing varnishes, the curing process results from

¹ Bayburt University, Faculty of Arts and Design, Department of Interior Architecture and Environmental Design, Bayburt, Turkey

* e-mail: umitayata@yandex.com

a chemical reaction between two distinct components within the varnish. Consequently, the reaction time dictates the complete curing duration. Varnishes such as polyester, polyurethane, and synthetic resin belong to this category (Kurtoğlu, 2000).

In the literature, various wood species have been subjected to different types of varnish applications, such as water-based varnish for oriental beech and Scots pine (Pelit, 2007), single and two-component water-based varnishes for iroko, Scots pine, and Anatolian chestnut (Çakicier, 2007), polyurethane and synthetic varnishes for oak, chestnut, iroko, and teak (Dalyan, 2010), cellulosic, polyurethane, synthetic, and water-based varnishes for bamboo (Aykaç, 2016), UV varnish for beech, maple, northern red oak, American black walnut, and walnut (Ayata et al., 2018), single and two-component water-based varnishes for Corsican pine, hybrid, Scots pine, and larch (Saygın, 2016), rubberwood, keruing, keranji, meranti, and niové (Çamlıbel & Ayata, 2024), water-based, polyurethane, and acrylic varnishes for Scots pine, sessile oak, and chestnut (Kılıç, 2019), yacht, polyurethane, and epoxy varnishes for limba, chestnut, and sapele (Altıparmak, 2017), synthetic glass lacquer varnish for juniper (Bilgen, 2010), linseed oil, nitrocellulose varnish, water-borne stain, nano-coating for beech (Bohinc et al., 2019), water-based, polyurethane, and synthetic varnishes for beech and Scots pine (Koç, 2023), two-component acrylic modified polyurethane varnish for Scots pine (Yazıcı, 2020), synthetic, cellulosic, polyurethane, and water-based varnishes for elm, Anatolian chestnut, limba, and iroko (Güler, 2010), single and two-component water-based varnishes, as well as two-component solvent-based acrylic and polyurethane varnishes for elm and iroko (Ulay, 2018), polyester, synthetic, polyurethane, and cellulosic varnishes for beech and oak (Sönmez, 1989), water-based and synthetic varnishes for Scots pine, oriental beech, and sessile oak (Özder, 2023), parquet varnish for chestnut, eucalyptus, and Scots pine (Akter et al., 2019), cellulosic, polyurethane, and water-based varnishes for beech (Ceylan, 2016), water-based single-component and synthetic varnishes for European spruce, American elm, alder, and poplar (Gürleyen, 2018), water-based marine varnish for jelutong (Naide et al., 2022), and water-based single and two-compo-

nent varnishes for Scots pine, beech, and oak (Ayata, 2014), Swedish pine (Ayata & Bal, 2024).

These studies involved conducting a range of tests on wooden surfaces treated with varnish, encompassing assessments such as colour analysis, glossiness measurement, determination of whiteness index, bacterial adhesion, the cigarette test, taber abrasion testing, wetting behaviour examination, scratch resistance evaluation, assessment of surface adhesion strength, pendulum hardness testing, and more. However, it was observed in the literature that UV varnish had been applied to American walnut (*Juglans nigra* L.) wood, while stone, yacht, and waxy varnishes have not yet been used in this way.

This study compares the colour properties of surfaces treated with three different types of coatings applied to American walnut (*Juglans nigra* L.) wood. To briefly describe this tree species, the wood is a type that is quite hard and tightly structured, yet splits easily. It is a diffuse-porous tree with moderately sized pores and a ring-porous structure. Its rays are indistinct, giving it a dull appearance. The specific gravity of air-dried wood averages 0.55 g/cm³ (Şanivar & Zorlu, 1980). This type of walnut is generally straight-grained, easy to work with tools, and holds well in place. It is heavy, rigid, strong, and has good resistance to shock. Its wood has a suitable structure for natural finishes. Its most significant use is in furniture making. Other important uses include gunstocks, cabinets, and interior decoration. It is used both as solid wood and plywood (Anonymous, 1955). In American walnut wood, the Janka hardness values are 89.38 N/mm² tangentially, 85.53 N/mm² radially, and 101.94 N/mm² on the transverse surface. The air-dried density is measured at 796 kg/m³. Nail-holding resistance is determined as 15.33 N/mm² tangentially, 18.65 N/mm² radially, and 13.92 N/mm² on the transverse surface (Ayata & Bal, 2019).

2 MATERIALS AND METHODS

2 MATERIAL IN METODE

2.1 WOOD MATERIAL

2.1 LES

American black walnut (*Juglans nigra* L.) wood samples were prepared in dimensions of 100 mm x 100 mm x 15 mm. Conditioning treatments were

applied to the samples (temperature of $(20 \pm 29^\circ\text{C})$ at 65% of relative humidity) (ISO 554, 1976).

2.2 VARNISHES

2.2.2 LAKI

In the study, three different types of coatings (stone, yacht, and waxy varnish) were used. The varnishes did not contain any paint or pigment, and are briefly described as follows:

a) A solvent-based yacht varnish, characterized by high hardness and high resistance to water (solid content: 50%, containing 60-70% oil alkyd resin, density: 0.87-0.92 g/ml, 2-coat application, coverage: 14-16 m²/lt).

b) A waxy varnish, formulated for interior and exterior wood coatings, consisting of a mixture of natural oils, waxes, and resins (transparent, density: 0.87 g/cm³, coverage: 16-20 m²/lt, initial drying time: 6-8 h, full drying time: 24-48 h, 2-coat application).

c) A stone varnish (matte, solvent-based, acrylic resin-based, density: 0.95 g/cm³, touch dry: 6-8 h, full hardening: at least 24 h, viscosity: 24 seconds, solid content: 27%, two-coat application, 200-250 g/m²).

2.2.3 APPLICATION OF VARNISHES TO WOOD SURFACES

2.2.3.1 NANOS LAKOV NA POVRŠINE LESA

In the study, the test samples were sanded with 80, 120, and 180 grit sandpapers, and the surfaces were then cleaned with a compressor. A drying time of 24 h was allowed between coats. All coatings were applied to the wood surfaces in two coats using a brush, according to industrial practices.

2.2.4 DETERMINATION OF COLOUR PROPERTIES

2.2.4.1 DOLOČITEV BARVE

The colour changes in the samples were evaluated using a CS-10 (CHN Spec, China) device, following the ASTM D 2244-3 (2007) standard and employing the CIELAB colour model (Ayata & Ayata, 2024). Assessments were carried out using a CIE 10° standard observer and CIE D65 light source in an 8/d illuminating environment (8°/diffused illumination). Ten measurements were taken from each sample in each group.

The L^* variable indicates lightness or brightness, ranging from 0 (black) to 100 (white). The a^* and b^* variables represent colour coordinates, both of which can vary between -60 and +60. The angle formed between the C^* axis and the a^* axis is called the hue (h°), which denotes the colour angle. The C^* variable reflects the saturation or chromaticity of the colour. In the CIE- Lab^* colour diagram, the positive and negative signs signify: $+a^*$ for an increase in red, $-a^*$ for an increase in green, $+b^*$ for an increase in yellow, and $-b^*$ for an increase in blue (Konica Minolta, 2014; Mesquita et al., 2023).

The results of total colour differences were determined using the following formulas.

$$C^* = \left[(a^*)^2 + (b^*)^2 \right]^{0.5} \quad (1)$$

$$h^\circ = \arctan (b^*/a^*) \quad (2)$$

$$\Delta C^* = (C^*_{\text{coated sample}} - C^*_{\text{control sample}}) \quad (3)$$

$$\Delta a^* = (a^*_{\text{coated sample}} - a^*_{\text{control sample}}) \quad (4)$$

$$\Delta L^* = (L^*_{\text{coated sample}} - L^*_{\text{control sample}}) \quad (5)$$

$$\Delta b^* = (b^*_{\text{coated sample}} - b^*_{\text{control sample}}) \quad (6)$$

$$\Delta H^* = \left[(\Delta E^*)^2 - (\Delta L^*)^2 - (\Delta C^*)^2 \right]^{0.5} \quad (7)$$

$$\Delta E^* = \left[(\Delta L^*)^2 + (\Delta a^*)^2 + (\Delta b^*)^2 \right]^{0.5} \quad (8)$$

Visual assessment comparison criteria for ΔE^* colour difference (DIN 5033, 1979) are provided in Table 1.

The definitions of Δa^* , ΔH^* , Δb^* , ΔC^* , and ΔL^* are provided as follows (Lange, 1999):

Δb^* : A positive value indicates that the sample is more yellow or less blueish than the reference, while a negative value indicates that the sample is more blue or less yellowish than the reference.

ΔC^* : Represents the difference in chroma or saturation between the sample and the reference.

Table 1. Comparison criteria for evaluating ΔE^* values (DIN 5033, 1979).

Preglednica 1. Merila za ocenjevanje barvnih razlik ΔE^* (DIN 5033, 1979).

ΔE^* values	Visual colour score difference
<0.20	Imperceptible
0.20–0.50	Very weak
0.50–1.50	Weak
1.50–3.00	Noticeable
3.00–6.00	Very noticeable
6.00–12.00	Strong
> 12.00	Very strong

A positive value indicates that the sample is clearer and brighter than the reference, while a negative value indicates that the sample is duller and hazier than the reference.

ΔL^* : A positive value indicates that the sample is lighter than the reference, while a negative value indicates that the sample is darker than the reference.

ΔH^* : Represents the difference in hue or shade between the sample and the reference.

Δa^* : A positive value indicates that the sample is redder or less greenish than the reference, while a negative value indicates that the sample is greener or less reddish than the reference.

2.5 CALCULATION OF TEST DATA

2.5 OBDELAVA PODATKOV

The standard deviations, mean values, maximum and minimum values, homogeneity groups, variance analyses, and percentage (%) change rates were calculated using a statistical software programme.

3 RESULTS AND DISCUSSION

3 REZULTATI IN RAZPRAVA

Measurement results for total colour differences are shown in Table 2. After analysing the ΔH^* values, it was found that they were 4.72 for stone varnish, 5.06 for yacht varnish, and 3.42 for waxy varnish. Considering the ΔE^* values, 13.59 was determined for stone varnish, 16.62 for yacht varnish, and 12.40 for waxy varnish. When all types of coatings are considered, the ΔL^* , Δb^* , and ΔC^* values

Table 2. Measurement results for total colour differences.

Preglednica 2. Izračuni skupnih barvnih razlik.

Coating Type	ΔL^*	Δa^*	Δb^*	ΔC^*	ΔH^*	ΔE^*	Criteria for Colour (DIN 5033, 1979)
Stone	-12.67	3.39	-3.57	-1.42	4.72	13.59	Very strong (> 12.00)
Yacht	-14.26	0.82	-8.51	-6.89	5.06	16.62	
Waxy	-11.49	2.12	-4.16	-3.19	3.42	12.40	

are determined to be negative (respectively: darker than the reference, less yellowish than the reference, and matte, hazier than the reference), while Δa^* values are found to be positive (more reddish than the reference). According to the colour alteration criteria (DIN 5033, 1979), when compared with the results obtained in this study, it is observed that all types of varnishes provide a “very strong” (> 12.00) colour change (Table 2).

The results of the variance analyses are presented in Table 3, and these show that the coating type factor was found to be significant in terms of all colour parameters [hue (h°) angle, yellow (b^*) colour tone, lightness (L^*), red (a^*) colour tone, and chroma (C^*)] (Table 3).

Measurement results for all colour parameters, obtained using both unvarnished and varnished test samples, are presented in Table 4.

When all varieties of coatings are administered onto wooden surfaces, reductions in the h° (stone varnish: 20.30%, yacht varnish: 25.81%, and waxy varnish: 17.24%), b^* (stone varnish: 18.80%, yacht varnish: 44.81%, and waxy varnish: 21.91%), C^* (stone varnish: 6.88%, yacht varnish: 33.38%, and waxy varnish: 15.41%), and L^* (stone varnish: 26.00%, yacht varnish: 29.26%, and waxy varnish: 23.57%) parameters were noted, accompanied by elevations in the a^* (stone varnish: 41.96%, yacht varnish: 10.02%, and waxy varnish: 26.24%) values (Table 4).

At the L^* measurements, the highest result was found in the control sample (without varnish application) (48.74), while the lowest result was observed on samples coated with yacht varnish (34.48). For the a^* value, the lowest result was determined in the control sample (8.08), whereas the highest result was found on experimental samples coated with stone varnish (11.47) (Table 4).

Table 3. Analysis of variance results for colour parameters.
Preglednica 3. Rezultati analize variance za barvne parametre.

Source	Test	Sum of Squares	df	Mean Square	F	Sig.
Coating Type	Lightness (L^*)	1268.062	3	422.687	505.876	0.000*
	Red (a^*) colour tone	66.580	3	22.193	82.517	0.000*
	Yellow (b^*) colour tone	365.242	3	121.747	180.614	0.000*
	Chroma (C^*)	265.835	3	88.612	68.858	0.000*
	Hue (h°) angle	1667.291	3	555.764	339.034	0.000*
Error	Lightness (L^*)	30.080	36	0.836		
	Red (a^*) colour tone	9.682	36	0.269		
	Yellow (b^*) colour tone	24.267	36	0.674		
	Chroma (C^*)	46.327	36	1.287		
	Hue (h°) angle	59.013	36	1.639		
Total	Lightness (L^*)	62560.853	40			
	Red (a^*) colour tone	3807.728	40			
	Yellow (b^*) colour tone	9307.198	40			
	Chroma (C^*)	12940.946	40			
	Hue (h°) angle	128734.696	40			
Corrected Total	Lightness (L^*)	1298.142	39			
	Red (a^*) colour tone	76.263	39			
	Yellow (b^*) colour tone	389.509	39			
	Chroma (C^*)	312.163	39			
	Hue (h°) angle	1726.304	39			
For the column $\alpha \leq 0.05$: * indicates significance.						

Regarding the b^* parameter, the highest result was obtained in the control samples (18.99), while the lowest result was determined on samples coated with yacht varnish (10.48). For the C^* value, the highest result was identified in the control sample (20.64), whereas the lowest result was obtained on samples coated with yacht varnish (13.75). In terms of the h° parameter, the highest result was observed in the control experimental samples (66.95), while the lowest result was determined on samples coated with yacht varnish (49.67) (Table 4).

In the literature, studies also report that different colour parameters were obtained on the surfaces of wooden materials after varnish was applied to them (Ayata & Bal, 2024; Ayata, 2014; Ayata et al., 2024; Çamlıbel & Ayata, 2024; Ulay, 2018).

The current study has fulfilled its purpose, and shown that various outcomes were achieved after applying different surface coatings to the same

wooden surfaces. This variation is believed to arise from the different formulations used in preparing the varnishes.

The structural characteristics of varnish layers differ, and the primary factors behind this divergence are the constituents employed during varnish manufacture. Employing varying types and quantities of main binders and supplementary layer-forming agents effectively generates this diversity (Sönmez, 1989).

4 CONCLUSIONS

4 SKLEPI

Examining the ΔE^* values, stone varnish was found to be 13.59, yacht varnish was 16.62, and waxy varnish was 12.40.

The control experimental samples (without any varnish application) exhibited the highest val-

Table 4. Measurement results determined for colour parameters.

Preglednica 4. Izmerjeni rezultati za barvne parametre.

Test	Coating Type	Mean	Change (%)	HG	Standard Deviation	Minimum	Maximum	Coefficient of Variation
Lightness (L^*)	None–Control	48.74	-	A*	1.04	46.34	49.64	2.13
	Stone	36.07	↓26.00	C	0.79	34.94	37.16	2.18
	Yacht	34.48	↓29.26	D**	0.47	33.79	35.21	1.36
	Waxy	37.25	↓23.57	B	1.19	35.60	39.27	3.20
Red (a^*) colour tone	None–Control	8.08	-	D**	0.22	7.53	8.27	2.68
	Stone	11.47	↑41.96	A*	0.87	10.67	12.89	7.57
	Yacht	8.89	↑10.02	C	0.41	7.96	9.52	4.57
	Waxy	10.20	↑26.24	B	0.33	9.78	10.73	3.25
Yellow (b^*) colour tone	None–Control	18.99	-	A*	0.46	17.87	19.54	2.44
	Stone	15.42	↓18.80	B	0.95	14.06	16.69	6.15
	Yacht	10.48	↓44.81	C**	0.55	9.71	11.46	5.27
	Waxy	14.83	↓21.91	B	1.13	13.37	16.96	7.62
Chroma (C^*)	None–Control	20.64	-	A*	0.48	19.40	21.13	2.33
	Stone	19.22	↓6.88	B	1.22	17.65	20.92	6.35
	Yacht	13.75	↓33.38	D**	0.59	12.84	14.90	4.29
	Waxy	17.46	↓15.41	C	1.75	14.74	19.99	10.05
Hue (h°) angle	None–Control	66.95	-	A*	0.45	66.36	67.62	0.68
	Stone	53.36	↓20.30	C	1.21	51.63	55.22	2.26
	Yacht	49.67	↓25.81	D**	1.46	47.36	51.68	2.94
	Waxy	55.41	↓17.24	B	1.66	53.08	58.06	3.00

Number of Measurements: 10,

For the Homogeneity Group (HG) column: * indicates the highest value, ** indicates the lowest value

ues for the parameters L^* , C^* , b^* , and h° , while showcasing the lowest value for the a^* parameter.

When all varieties of coatings are administered onto wooden surfaces, reductions in h° , b^* , C^* , and L^* were noted, accompanied by elevations in a^* .

It can be said that the different structural compositions of coating types interact with the wooden material, causing a variety of results.

5 SUMMARY

5 POVZETEK

Ta študija raziskuje in primerja barvne parametre [rdeče-zeleni (a^*) barvni ton, barvitost (h°), rumeno-modri (b^*) barvni ton, svetlost (L^*), nasičenost oz. kroma (C^*), Δa^* , Δb^* , ΔE^* , ΔL^* , ΔC^* in ΔH^*] površin, obdelanih s tremi različnimi vrstami lakov [lak za jahte na osnovi topil, ki ima visoko trdoto in

je zelo odporen proti vodi; voskast lak, pripravljen za notranje in zunanje premaze na lesu, sestavljen iz zmesi naravnih olj, voskov in smol; topilni mat-sijajni lak za kamen na osnovi akrilnih smol]] na ameriškem orehu (*Juglans nigra* L.).

V študiji je bil uporabljen topilni lak za jahte, za katerega sta značilni visoka trdota in visoka odpornost proti vodi (vsebnost suhe snovi: 50 %, vsebuje 60–70 % oljne alkidne smole, gostota: 0,87–0,92 g/ml, dvoslojni nanos, prekrivnost: 14–16: m²/l).

Uporabljen je bil tudi voskast lak, pripravljen za notranje in zunanje premaze za les, sestavljen iz zmesi naravnih olj, voskov in smol (prozoren, gostota: 0,87 g/cm³, prekrivnost 16–20 m²/l, začetni čas sušenja: 6–8 ur, polni čas sušenja: 24–48 ur, nanos v dveh slojih). V raziskavi je bil uporabljen še lak za kamen (dvoslojni nanos, mat-sijaj, na osnovi topil, na osnovi akrilnih smol, gostota: 0,95 g/cm³, praš-

no suh po 6–8 urah, popolna utrditev po najmanj 24 urah, viskoznost: 24 s, vsebnost suhe snovi: 27 %, nanos v dveh slojih, 200–250 g/m²).

Pri nanosu vseh vrst lakov na površine lesa so se zmanjšale vrednosti h° (lak za kamen: 20,30 %, lak za jahte: 25,81 % in voskast lak: 17,24 %), b^* (lak za kamen: 18,80 %, lak za jahte: 44,81 % in voskast lak: 21,91 %), C^* (lak za kamen: 6 %, 88, lak za jahte: 33,38 % in voskast lak: 15,41 %) in L^* (lak za kamen: 26,00 %, lak za jahte: 29,26 % in voskast lak: 23,57 %), ki so jih spremljala povečanja vrednosti a^* (lak za kamen: 41,96 %, lak za jahte: 10,02 % in voskast lak: 26,24 %).

Na podlagi tega preskusa je bilo ugotovljeno, da izbira vrste transparentnega laka pomembno vpliva na vse barvne parametre premazanih površin [barvitost (h°), rumeno modri (b^*) barvni ton, svetlost (L^*), rdeče zeleni (a^*) barvni ton in kroma (C^*)].

Kontrolni poskusni vzorci (brez nanosa laka) so imeli najvišje vrednosti parametrov L^* , b^* , C^* in h° , medtem ko so imeli najnižjo vrednost parametra a^* .

Pri merjenju vrednosti L^* je bil najvišji rezultat ugotovljen pri kontrolnem vzorcu (brez nanosa laka) (48,74), najnižji rezultat pa pri vzorcih, premazanih z lakom za jahte (34,48). Pri vrednosti a^* je bil najnižji rezultat določen pri kontrolnem vzorcu (8,08), medtem ko je bil najvišji rezultat ugotovljen pri vzorcih, premazanih z lakom za kamen (11,47). Pri parametru b^* je bil najvišji rezultat dosežen pri kontrolnih vzorcih (18,99), medtem ko je bil najnižji rezultat določen pri vzorcih, premazanih z lakom za jahte (10,48). Pri vrednosti C^* je bil najvišji rezultat določen pri kontrolnem vzorcu (20,64), najnižji rezultat pa pri vzorcih, obdelanih z lakom za jahte (13,75). Pri parametru h° je bil najvišji rezultat ugotovljen pri kontrolnih vzorcih (66,95), medtem ko je bil najnižji rezultat določen pri vzorcih, obdelanih z lakom za jahte (49,67).

Pri pregledu vrednosti ΔE^* je bilo ugotovljeno, da je bila vrednost barvne razlike po obdelavi z lakom za kamen 13,59, vrednost pri laku za jahte je bila 16,62, vrednost pri voskastem laku pa 12,40. Po analizi vrednosti ΔH^* je bilo ugotovljeno, da so bile te vrednosti 4,72 za lak za kamen, 5,06 za lak za jahte in 3,42 za voskast lak.

Pri pregledu vpliva vseh vrst lakov na barvo lesa smo ugotovili, da so vrednosti premazanega

lesa ΔL^* , Δb^* in ΔC^* v negativnem območju (natančneje: temnejše, manj rumene in bolj motne, zamegljene od kontrolnega nepremazanega lesa), medtem ko so vrednosti Δa^* pozitivne (kažejo na bolj rdeč odtenek v primerjavi z neobdelanim lesom).

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