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THE EFFECT OF ACCELERATED WEATHERING ON COLOR AND SURFACE ROUGHNESS IN THERMOWOOD WILD CHERRY WOOD

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Abstract

In this study, changes in some physical properties after accelerated weathering of Thermowood Wild Cherry (*Cerasus avium* (L.) Monench) wood were investigated. Firstly, Wild Cherry (*Cerasus avium* (L.) Monench) planks were heat treated by Thermowood method and Thermowood Wild Cherry was obtained. Afterwards, the trial samples prepared were periodically accelerated with 144, 248, 576 and 864 hours of UVB lamps, and color values (L, a, b and ΔE) and average surface roughness (Ra) values were determined at the end of each period. The results were analyzed by multiple comparison techniques with SPSS and Duncan test was applied to see if there were $p < 0.05$ statistical differences. The results of the study showed that the average surface roughness values were better in Thermowood samples than the control samples. On the other hand, it was determined that the samples got darker with heat treatment, started to gray on the surfaces with aging, and the degree of graying increased due to the prolongation of the aging period.

Keywords: Wild cherry, thermowood, accelerated weathering, color, surface roughness

1. Introduction

Wood material is a renewable natural raw material that people have used for centuries to meet various needs (Bozkurt and Erdin, 1997). The wood material, which has a very wide usage area, has some undesirable properties; depending on the usage conditions, its service life decreases and its value decreases due to features such as dimensional change, biological degradation and color change.

Heat treatment is one of the studies aimed at extending the service life of the wood material by removing the unwanted properties (Anonymous, 2003). The basic idea in the practice, which is a physical process resulting in permanent changes in the chemical composition of cell wall polymer compounds, is based on heat treatment of wood material at temperatures above 150 °C, where chemical reactions accelerate (Johansson 2005, TS CEN/TS 15679, 2010).

Since the application of heat treatment causes the molecular structure of the wood to be modified, it increases its performance. Potential qualities increased with heat treatment application; biological resistance against fungi and insects, low equilibrium moisture content, increased dimensional stability due to the reduction in contraction and expansion, increased thermal isolation capability, paint adhesion, increased resistance to weather conditions, decorative color variety and prolonged use (Wikberg, 2004; Enjily and Jones, 2006).

Heat treatment methods are divided into two as old methods and new methods. Old methods; Staybwood (providing the dimensional stability of the wood by heat alone by not being compressed) and Staypak (wood stabilized by compression with severe heating) (Korkut and Kocaefe, 2009).

New methods; ThermoWood (Finland), PlatoWood-Lignius-Lambowood (Netherlands), Retification process (Retiwood) -New Option wood-Le Bois Perdure (France), Hot Oil treatment (OHT) -Menz Holz (Germany), Calignum (Sweden), Thermabolite (Russia), Huber Holz (Austria), Wood treatment technology (WTT) (Denmark), Westwood (America, Canada, Russia) (Sundqvist, 2004; Tjeerdsma, 2006).

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Various research groups in Europe have developed heat treatment methods based only on heat, hot oil, hygrothermal (the condition in which steam, moisture and heat act simultaneously) and hydrothermal (use of heat energy obtained with hot water). The basic characteristics of these methods are given in Table 1 (Aytin, 2013).

Table 1: Basic characteristics of some heat treatment methods.

Method	Environment	Moisture	Tem.(ºC)	Phases	Country
Thermo Wood	Steam	Fresh or air-dried tree	150-240	1.Temperature increase 2.Heat treatment 3.Cooling and conditioning	Finland
Plato Wood	Steam and air	Fresh or air-dried tree	170-190	1.Pre drying 2.Hydrothermolysis process 3.Drying 4.Heat treatment 5.Equalization and cooling	Netherlands
Oil Heat treatment	Hot oil	Air dried tree or about % 6	180-220	1.Heating and drying 2.Heat treatment 3.Cooling	Germany
Retification	N_2	Air dried tree	200-240	A step	France
Bois Perdure	Steam	Fresh tree	200-240	A step	France

The heat treatment methods that have become commercial among these methods today is the "ThermoWood" method. Thermowood method consist of three basic phases;

•The first phase, in which the oven temperature is increased to 100°C rapidly using heat and steam, then up to 130°C with a slower increase to achieve high temperature drying; At this stage, which varies between approximately 14-30 hours, the moisture of the wood material is reduced to approximately zero.

•At the end of the high temperature phase, the heat treatment application phase in which the temperature in the furnace is raised up to 185 °C and 215 °C, which is the target heat treatment temperature, in approximately 6-8 hours; depending on the purpose of application, the heat treatment is continued for 0.4 hours to 4 hours at the heat treatment temperature reached. Steam is sent into the furnace in order to prevent the wood material from being damaged at high temperatures.

•The cooling and conditioning phase in which the temperature of the wood material is reduced from 50 °C to 60 °C by using the water spray system; This process is continued until the moisture content of the wood material reaches 4-6%. The cooling and conditioning phase varies between approximately 24 hours and 30 hours depending on the thickness and width of the heat-treated wood material.

ThermoWood is classified in two different ways as Thermo S and Thermo D. The average shrinkage and swelling of the wood material treated in Thermo S class due to moisture is 6-8%. Thermo S is classified as relatively durable according to EN 113 standards. Its natural resistance to rot meets the requirements of "CLASS 3". The letter "D" in Thermo D means durability. The average shrinkage and expansion of the wood material treated in Thermo D class due to moisture is 5-6%. Thermo D is classified as durable according to EN 113 standards. Its natural resistance to decay meets the requirements of "CLASS 1". Thermo S end use areas are given in Table 2a and Thermo D class end use areas are given in Table 2 b (Aytin, 2013).

Table 2a: Thermo S use areas. Table 2b: Thermo D use areas.

Thermo S Softwoods	Thermo S Hardwoods	Thermo D Softwoods	Thermo D Hardwoods
Building materials	Upholstery	Exterior cladding	Exterior cladding
Upholstery	Furniture	Interior and exterior door	Outdoor flooring
Furniture	Flooring	Door Window case	Garden furniture
Garden furniture	Sauna banks	Blinds	Parquet
Sauna banks	Garden furniture	Environmental structures	
Door and Window materials		Sauna and bathroom furniture	
Exterior cladding		Flooring	

The properties of wood material in heat treatment classes in ThermoWood method are given in Table 3 (Aytin, 2013).

Table 3: Properties of wood material in heat treatment classes in ThermoWood method

	Pine and Spruce		**Iroko, Ash, Oak, Beech**	
Properties / Class	Thermo S	Thermo D	Thermo S	Thermo D
Process Temperature	190 ºC	212 ºC	180 ºC	200 ºC
Durability	+	++	-	+
Dimensional stability	+	++	+	+
Bending resistance	-	-	-	-
Color darkening	+	++	+	++

Accelerated weathering tests are performed with lamps emitting UV rays in test cabinets where the effects of moisture condensing on the surface are applied in successive periods. The wavelengths of fluorescent lamps used and emitting UV rays contain higher energy than sunlight. Therefore, it may be possible for the test to cause damages in the natural external environment that will never come to the fore (Cakicier, 2007).

Color and surface roughness are very important physical properties in the use of wood. In this respect, even though it has been modified, the condition of the surface properties of heat-treated materials from wood based products should be carefully monitored.

Wild Cherry (*Cerasus avium* (L.) Monench) is a tree species whose wood, which is very valuable in the forest products industry, is mostly used in coating, cabinet making and turning. Due to the fact that the demand for wood in the market is above the supply, it is ready for the use of the industry for a short operating period and the gene resources are depleted, it is the subject of remarkable studies in both Europe and our country. There are very few researches and information in Turkish forestry sources on the ecology, biology and genetics of the Wild Cherry (Cerasus avium (L.) Monench) tree. Efforts are encouraged to increase its productivity and economic input as a rapidly growing species with a valuable wood and fruit, high wildlife function (Eşen et al., 2005).

Having an idea about the surface roughness and color changes of Wild Cherry (*Cerasus avium* (L.) Monench) wood, which grows naturally in our country and has the potential to create great economic value, after being subjected to heat treatment and accelerated aging and to work on increasing its potential benefit value aims to contribute.

2. Materials and Methods

Wild Cherry (*Cerasus avium* (L.)) Monench trees were taken from Düzce Forestry Directorate of Odayeri Operation Department. Trees were selected according to TS 4176(1984). Selected trees were divided into 2 m body parts after 1.30 m height from the bottom and necessary markings were made on each part (Figure 1) (Aytin, 2013).

Figure 1: Wild Cherry (Cerasus avium (L.) Monench

The 2 m body parts obtained were cut planks of 60 mm thickness according to TS 2470(1976) with the sharp cutting method. The planks were kept in the air conditioning room which can be adjusted to 20 ±

2 ° C and 65 ± 5% relative humidity until the heat treatment is done in the classical drying oven which is controlled fully automatically. The air-dried planks were exposed to heat treatment.

In the heat treatment application with the ThermoWood method, 4 different variations were created by heat treatment at 190 ° C and 212 ° C for 1 and 2 hours in accordance with the production schedule of the enterprise. Production schedules in which heat treatment variations are applied are shown in Table 4.

Table 4: Heat treatment variations

Temperature (°C)	Time (min)	Heat treatment variations
190	60	**TW1**
190	120	**TW2**
212	60	**TW3**
212	120	**TW4**

Heat treated test samples were prepared from the planks whose heat treatment application was completed (4 pieces for each of the control and heat treatment variations, 10x75x300 mm in total, 100 pieces together with the control group). Then, color and surface roughness values were measured before weathering to be used for control purposes from 5 points of each test sample in order to compare with the values to be determined after aging. The weathering process is carried out by Nova Forest Products San. Tic. In the R&D laboratory of the 0 factory of Bolu Province Gerede; The QUV Accelerated Weathering Tester-Model QUV / Spray was performed in 144, 288, 576 and 864 hours on the QUV device manufactured by Q-LAB. Aging process in ASTM G154 (2006) with standard principles to be taken by Q-Lab company in Turkey distributor Feza Kimya AS A modified program was used for the QUV accelerated aging device. Modified program stages consisting of 3 consecutive sections are given in Table 5. This section should provide sufficient details of the experiment, simulation, statistical test or analysis carried out to generate the results such that the method can be repeated by another researcher and the results reproduced.

Table 5: Accelerated weathering program.

Operation	Time (Min)	Temperature (°C)	Light intensity (W/m²)	Wavelength (nm)
UV	60	60	0.67	310
Sprinkler	10			
Conditioning	240	50		

After weathering, experimental studies were started after waiting for 2 months until it reached the constant weight in the conditioning room with 20% ± 2 ° C temperature and 65 ± 5% relative humidity.

2.1. Determination of Surface Roughness

Average surface roughness (Ra) is determined according to ISO 4287(1997) and DIN 4768(1990) standards. Mitutoyo Surftest SJ-301 test device was used in the measurements. The measuring process of the device was made with a 4 (μm) needle diameter and a measuring angle of 90° with the longitudinal fiber direction with a measuring speed of 10 mm / minute (Figure 2) (Aytin, 2013).

Figure 2: Determination of Surface Roughness.

2.2. Determining Color Difference

Color difference compared to white color a = 4.91; b = 3.45; It was examined according to the ISO 7724-2 (1984) standard with the Elrepho 071 spectrometer instrument, which can be calibrated to c = 6.00, L = 324.9. In order to determine which tone of the color difference is effective, the red hue (a *), yellow hue (b *) and color angle (L*) values were examined independently (Figure 3) (Aytin, 2013).

Figure 3: Determining color difference.

The color values (L *, a * and b *) of the test samples were determined first, and then the color values of the samples after aging were determined following each aging phase. The total color difference (E *) from the determined color values was calculated with the following formula according to ISO 7724-3 / 1984. In the formula, Δ denotes the difference and the letter E is the initial of the German word Empfindung, which means feeling (Yeşil, 2010).

$$\Delta E^* = \sqrt{(\Delta L^*)^2 + (\Delta a^*)^2 + (\Delta b^*)^2} \quad (1)$$

Equally; ΔE* : Total color difference occurring in samples after heat treatment, ΔL*: Black-white color change, Δa*: Red-green color change, Δb*: Yellow-blue color change.

3. Results

3.1. Average Surface Roughness (Ra)

Simple analysis of variance (BVA), statistics and Duncan test (HG) results for the average surface roughness values of test samples after accelerated aging are given in Table 6.

Table 6: Related to average surface roughness BVA, statistics and HG results.

	BVA						Statistics and HG			
		Sum of squares	df	Squares	F	P	Variation(V)	Ra	Standard	HG
144 hours accelerated weathering	WG*	61.566	4	15.391	7.47		C	**10.37**	2.273	a
	BG	195.662	95	2.060			TW1	**8.154**	0.731	c
	T	257.222	99				TW2	8.352	1.308	bc
							TW3	8.987	1.520	bc
							TW4	9.257	0.755	b
288 hours accelerated weathering	WG	514.537	4	126.634	19.37	0.000	C	**15.48**	4.515	a
	BG	630.651	95	6.638			TW1	10.74	2.178	b
	T	1145.188	99				TW2	**9.31**	1.336	b
							TW3	9.40	1.631	b
							TW4	11.13	3.473	b
576 hours accelerated weathering	WG	573.006	4	143.251	38.93	0.000	C	**16.69**	3.015	a
	BG	349.496	95	3.679			TW1	10.490	1.491	c
	T	922.502	99				TW2	11.848	1.783	b
							TW3	10.911	1.543	bc
							TW4	**10.23**	1.228	c
864 hours accelerated weathering	WG	794.656	4	198.664	75.96	0.000	C	**17.61**	1.505	c
	BG	248.448	95	2.615			TW1	10.226	2.309	ab
	T	1043.103	99				TW2	11.249	1.537	b
							TW3	11.166	1.405	b
							TW4	**10.03**	1.065	a

*WG: Within groups; BG: Between groups; T: Total; df: Degrees of freedom

3.2. Color Values and Total Color Change

Results of L*, a*, b* and ΔE Values after 144 hours weathering: Simple analysis of variance (BVA), statistics and HG results related to L *, a *, b * and ΔE values of test samples after 144 hours weathering are given in Table 7.

Table 7: BVA, statistics and HG test results after accelerated weathering first period (after 144 hours).

BVA							Statistics and HG					
		SUM	**df**	**SQA**	**F**	**P**	**V**	**Control Value (CV)**	**Last Value (LV)**	**Change (CH)**	**SS**	**HG**
L*	WG	10292.9	4	2573.23	178.50	0.000	C	72.66	48.57	24.09	6.75	**b**
	BG	1369.50	95	14.416			TW1	53.10	54.52	-1.42	2.19	**a**
	T	11662.4	99				TW2	52.30	51.40	0.89	1.78	**a**
							TW3	42.10	43.30	-1.2	3.50	**a**
							TW4	40.99	43.71	-2.7	2.48	**a**
a*	WG	2971.83	4	742.959	209.0	0.000	C	5.40	16.6	-11.2	4.09	**a**
	BG	337.549	95	3.553			TW1	9.50	7.48	2.02	0.44	**b**
	T	3309.38	99				TW2	10.10	8.13	1.93	0.27	**b**
							TW3	9.35	6.57	2.79	0.62	**b**
							TW4	9.03	6.34	2.69	0.55	**b**
b*	WG	2730.74	4	682.685	138.8	0.000	C	24.10	32.1	-8.06	3.55	**a**
	BG	467.032	95	4.916			TW1	24.40	18.12	6.28	1.45	**d**
	T	3197.77	99				TW2	23.7	18.5	5.22	0.69	**cd**
							TW3	18.5	14.1	4.37	2.80	**bc**
							TW4	17.3	14.2	3.1	1.22	**b**
ΔE*	WG	7458.92	4	1864.73	117.3	0.000	C	-	-	27.8	8.46	**b**
	BG	1509.86	95	15.893			TW1	-	-	7.08	1.50	**a**
	T	8968.78	99				TW2	-	-	5.91	0.57	**a**
							TW3	-	-	6.67	1.84	**a**
							TW4	-	-	5.48	1.37	**a**

Results of L *, a *, b * and ΔE Values after 288 hours weathering: Simple analysis of variance (BVA), statistics and Duncan test (HG) results related to L*, a*, b* and ΔE values of test samples after 288 hours weathering are given in Table 8.

Table 8: BVA, statistics and HG test results after accelerated weathering first period (after 288 hours).

BVA							Statistics and HG					
		SUM	**df**	**SQA**	**F**	**P**	**V**	**CV**	**LV**	**CH**	**SS**	**HG**
L*	WG	17913.	4	4478.45	344.5	0.000	C	72.23	43.55	28.68	6.55	**c**
	BG	1234.7	95	12.998			TW1	54.70	57.74	-3.03	3.44	**b**
	T	19148.	99				TW2	49.04	53.79	-4.74	1.67	**b**
							TW3	40.13	47.47	-7.33	2.62	**a**
							TW4	38.88	41.47	-2.58	0.68	**b**
a*	WG	2940.8	4	735.21	706.2	0.000	C	5.64	15.43	-9.78	2.09	**a**
	BG	98.89	95	1.041			TW1	9.41	5.96	3.45	0.57	**b**
	T	3039.7	99				TW2	9.81	5.51	4.30	0.34	**c**
							TW3	8.26	4.85	3.40	0.55	**b**
							TW4	8.13	4.32	3.81	0.28	**bc**
b*	WG	3076.7	4	769.191	33.90	0.000	C	24.04	27.46	-3.42	1.54	**a**
	BG0	219.50	95	2.311			TW1	25.42	13.58	11.84	1.58	**d**
	T	3296.2	99				TW2	23.51	12.01	11.49	1.05	**d**
							TW3	16.35	9.94	6.40	2.02	**b**
							TW4	16.02	7.94	8.08	1.21	**c**
ΔE*	WG	5998.9	4	1499.74	150.2	0.000	C	-	-	30.64	6.76	**c**
	BG	948.34	95	9.983			TW1	-	-	13.22	0.83	**b**
	T	6947.3	99				TW2	-	-	13.28	0.70	**b**
							TW3	-	-	10.75	1.25	**a**
							TW4	-	-	9.33	1.18	**a**

Results of L *, a *, b * and ΔE Values after 576 hours weathering: Simple analysis of variance (BVA), statistics and Duncan test (HG) results related to L*, a*, b* and ΔE values of test samples after 576 hours weathering are given in Table 9.

Table 9: BVA, statistics and HG test results after accelerated weathering first period (after 576 hours).

BVA							Statistics and HG					
		SUM	df	SQA	F	P	V	CV	LV	CH	SS	HG
L*	WG	10337.	4	2584.30	455	0.000	C	72.76	60.12	12.6	3.40	d
	BG	538.45	95	5.668			TW1	55.77	61.27	-	2.56	c
	T	10875.	99				TW2	49.65	60.93	-	2.14	b
							TW3	42.86	56.91	-	1.75	a
							TW4	39.66	54.53	-	1.57	a
a*	WG	971.10	4	242.77	524	0.000	C	5.70	7.52	-	1.29	a
	BG	43.994	95	0.463			TW1	8.32	4.31	4.00	0.35	b
	T	1015.0	99				TW2	9.64	3.92	5.72	0.38	c
							TW3	9.75	3.03	6.72	0.43	d
							TW4	8.89	2.76	6.12	0.39	c
b*	WG	593.41	4	148.353	95	0.000	C	23.85	14.41	9.43	1.37	a
	BG	147.26	95	1.550			TW1	24.8	9.08	15.7	0.88	d
	T	740.68	99				TW2	23.23	7.55	15.6	0.86	d
							TW3	18.55	5.57	12.9	1.01	c
							TW4	16.81	5.35	11.4	1.82	b
ΔE*	WG	300.16	4	75.041	25.42	0.000	C	-	-	16.1	2.53	a
	BG	280.37	95	2.951			TW1	-	-	17.2	1.64	b
	T	580.53	99				TW2	-	-	20.2	1.46	c
							TW3	-	-	20.3	1.30	c
							TW4	-	-	19.8	1.32	c

Results of L *, a *, b * and ΔE Values after 864 hours weathering: Simple analysis of variance (BVA), statistics and Duncan test (HG) results related to L*, a*, b* and ΔE values of test samples after 864 hours weathering are given in Table 10.

Table 10: BVA, statistics and HG test results after accelerated weathering first period (after 864 hours).

BVA							Statistics and HG					
		SUM	df	SQA	F	P	V	CV	LM	CH	SS	HG
L*	WG	17675.4	4	4418.86	1244.0	0.000	C	74.17	61.62	12.55	3.6	e
	BG	337.42	95	3.552			TW1	55.46	65.92	-10.46	0.7	d
	T	18012.8	99				TW2	50.83	68.20	-17.36	1.1	c
							TW3	39.27	63.90	-24.62	1.1	b
							TW4	36.99	58.52	-21.52	1.0	a
a*	WG	1059.68	4	264.92	791.82	0.000	C	4.70	6.40	-1.70	1.1	a
	BG	31.78	95	0.335			TW1	8.24	2.91	9.05	0.2	b
	T	1091.46	99				TW2	9.50	2.39	7.10	0.3	d
							TW3	8.86	2.01	6.84	0.1	d
							TW4	7.51	1.72	5.79	0.3	c
b*	WG	1035.06	4	258.76	354.04	0.000	C	25.02	12.34	12.68	1.5	b
	BG	69.43	95	0.731			TW1	24.72	7.28	17.43	0.5	c
	T	1104.49	99				TW2	24.24	6.13	18.11	0.7	d
							TW3	16.34	4.10	12.24	0.3	b
							TW4	13.31	3.57	9.73	0.5	a
ΔE*	WG	1280.47	4	320.11	233.34	0.000	C	-	-	18.29	1.7	a
	BG	130.32	95	1.372			TW1	-	-	21.03	0.7	b
	T	1410.80	99				TW2	-	-	26.08	1.3	d
							TW3	-	-	28.34	1.0	e
							TW4	-	-	24.34	0.6	c

4. Discussion

As can be understood from the Ra values determined after each weathering period, the surface has undergone less deformation in heat treated samples (Figure 4). According to Figure 4, it is seen that the difference of Ra between the C and heat-treated samples increases as the weathering time increases.

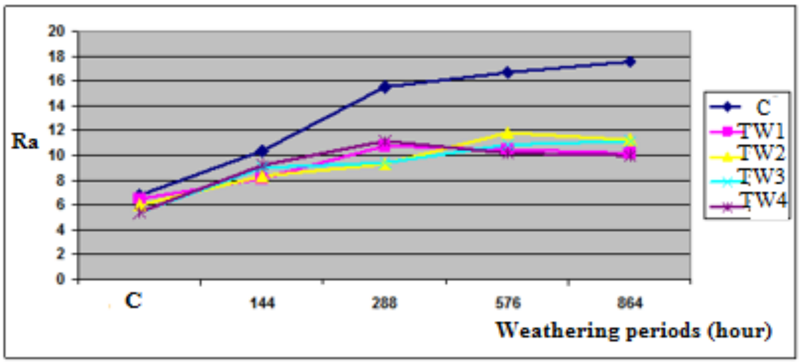

Figure 4: Change of Ra after accelerated weathering.

Huang et al. (2012), it has been stated that after 1500 hours of aging in heat-treated Jack pine (*Pinus banksiana*), the radial surfaces in IR and IIGTÖ are smoother and without cracks, and small cracks begin to form on the tangent surface after 672 hours of weathering.

The views of the trial samples used in the study after the accelerated weathering periods are given in Figure 5 a, b, c and d.

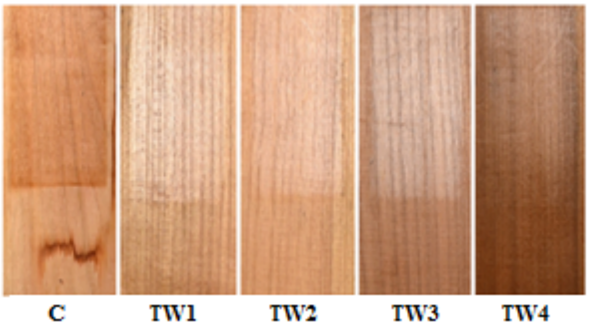

Figure 5a: Appearances after 144 hours

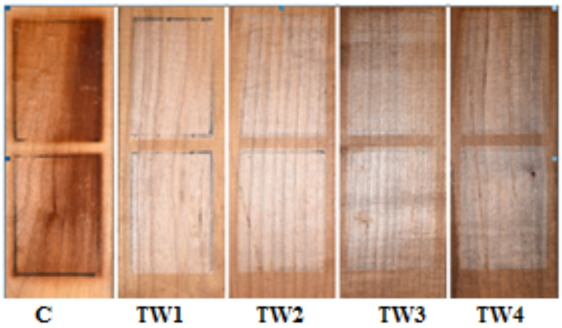

Figure 5b: Appearances after 288 hours

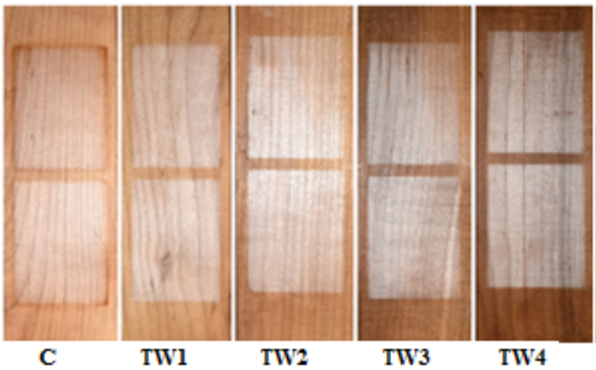

Figure 5c: Appearances after 576 hours

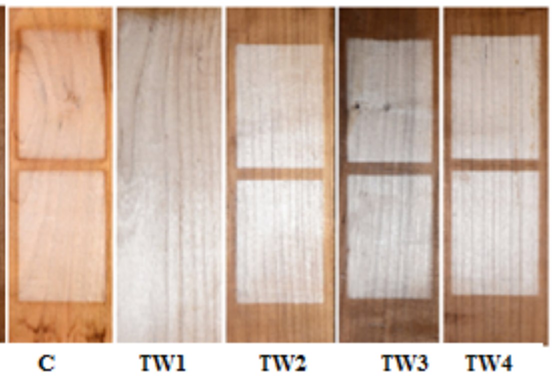

Figure 5d: Appearances after 864 hours

As can be seen in Figure 5a, it is seen that graying started in ThermoWood samples with 144 hours of accelerated aging. On the other hand, graying did not start in the control samples yet. Similarly, as seen in 5 b, it was understood that while graying continued in ThermoWood samples, it did not start in the control samples yet. In the third (576 hours) and fourth (864 hours) periods of accelerated weathering, graying was observed in both ThermoWood and control samples, and it was more noticeable in samples with higher heat treatment temperature and time.

It is seen that the total color difference starts to increase with weathering in all ThermoWood samples (Figure 6a). In the control samples, the high ΔE, which was considerably higher than the ThermoWood samples at the beginning, decreased as the aging periods increased and lower values were obtained. Figure 6 shows the E change.

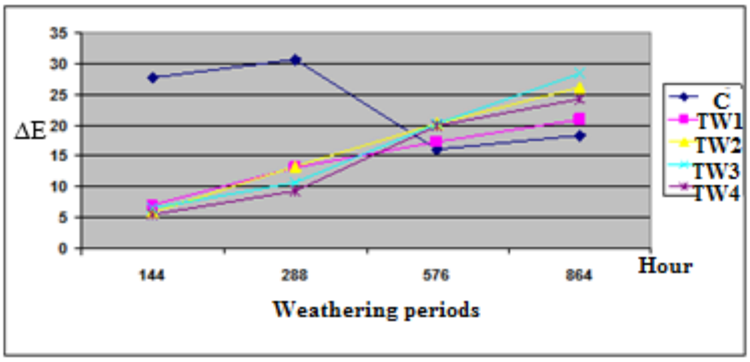

Figure 6: Total color change

When the literature is examined, it is seen that different results are revealed regarding the changes in color with aging in heat treated modified wood material.

As stated in Thermowood Handbook (2003), heat-treated wood materials that are not surface treated but are affected by UV rays similar to untreated wood materials, UV rays cause the surfaces to appear gray and gain an antique appearance over time. It is reported that surface treatment should be applied in order to preserve the natural appearance of the material. Similarly, Huang et al. (2012) reported that they obtained similar color values (L*, a*, b*) in IİGTÖ with IR at the end of 1500 hours of aging in heat treated Jack pine (*Pinus banksiana*). They stated that the color was obtained. On the other hand, Dubey et al. (2010) in their study examining the color change after 2100 hours of accelerated weathering in heat treated wood material, determined that more changes occurred in the control samples compared to the color of the heat-treated ones. They stated that although the color of the samples where heat treatment was applied at 160 and 180 °C temperatures did not fade after accelerated aging, it produced a small amount of fading in the heat-treated wood at 210 °C, and the color stability was better in the heat-treated wood. Ayadi et al. (2003), stated that the color stability of heat-treated test samples at the end of 835 hours was better than those that were not heat-treated in their accelerated weathering study. They stated that this is due to the changes in the structure of heat-treated wood (lignin modification and monomers of phenolic compounds) becoming more resistant to UV rays.

5. Conclusion

There is a significant difference in Ra values determined in ThermoWood Wild cherry wood with accelerated weathering compared to C samples. Ra results were lower in ThermoWood Wild cherry wood. This gives a clue that the surface smoothness of the heat treated ThermoWood Wild cherry wood samples may remain more stable under the influence of climatic conditions. This difference can be explained by the fact that the sprinkling and conditioning conditions are more effective on the control samples during the aging period. In ThermoWood samples, the deformations on the surface will be less since the wood-water relations will be restricted due to the degradation of hemicellulose and its decrease in quantity. On the other hand, due to the abundance and accessibility of free hydroxyl groups in the control samples, it is in an intense relationship with water and water vapor in the air, as a result, more degradation can be seen in the surface layers.

In the observations made in the samples that were aged in the wild cherry wood samples, it was determined that the surface layers except the control samples started to turn gray after the 144 hours aging application, and with 576 hours aging, a significant graying occurred. Considering that the amount of lignin decreased significantly in the aged samples and it was thought that it degraded hemicelluloses significantly in the heat treatment, it can be said that the presence of cellulose was responsible for the gray layer seen on the surfaces after aging. According to these data, when ThermoWood Wild cherry wood is desired to be evaluated under different atmospheric conditions, appropriate processes should be applied to the material in order to maintain the color values obtained after heat treatment.

6. Acknowledgments

This study is derived from the doctoral thesis "The Effect of High Temperature Application on Physical, Mechanical and Technological Properties of Wild Cherry (*Cerasus Avium* (L.) Monench) Wood" and presented as an oral presentation at the 6th International Furniture Congress.

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