APPLICATION OF L-ASCORBIC ACID AS AN ANTIOXIDATIVE COLORMENT IN LEATHER FINISHING

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ABSTRACT

In this study, chrome tanned bovine crust leathers were dyed white during finishing process. Experiments with 1%, 2%, 3%, 4% and 5% L-ascorbic acid addition were performed on the finishing layer of the finishing application. L-ascorbic acid was not added to the control group and processed according to the standard method. After these processes, color measurement analyzes were performed on Konica Minolta CM 3600d spectrophotometer. In order to investigate the effects of L-ascorbic acid on other performance properties of leather, light fastness test according to TS 1008 EN ISO 105-B02 (2001 TS EN ISO 11640 2001) and dry rub fastness test according to standard method were performed. The results of the study were statistically evaluated according to the NCSS (Number Cruncher Statistical System) method. As a result of the research, it was observed that L-ascorbic acid gave a pearly pink color to the leathers. It was found that the dry rubbing fastness of the leathers treated with L-ascorbic acid improved. In the light fastness tests, the results of the experimental group leathers were recorded better by the blue scale.

Key words: Leather, L-ascorbic acid, color, antioxidant

1 INTRODUCTION

L-ascorbic acid is a powerful water-soluble antioxidant. It is widely used in the food and cosmetic industry. Chemicals such as pigments are used to give color in leather finishing. Many of these are known for their harmful effects on the environment and human health. For this reason, new options are being explored. Therefore, in this study, it is aimed to benefit from the coloring ability of L-ascorbic acid, a green chemical, as an alternative to pigments.

2 MATERIAL and METHODS

In this research, chrome tanned undyed bovine crust leathers were used. L-Ascorbic acid powder form were used in experiments. The finishing recipe is shown Table 1.

Table 1: Finishing recipe used in application

CHEMICALS	APPLICATION 1.Coat (gramme)	2. Coat (gramme)	EXPLANATIONS
Akral PU Soft	220		Mixture of acrylic and polyurethane binders(Alpa Kimya)
Ground Plus A	50		Synthetic wax (Alpa Kimya)
Akrederm 1193	100		Acrylic Binder (Alpa Kimya)
SFT-MV-1	85		Wax-polyamide mixture(Alpa Kimya)
RPU 2260	50		Polyurethane Binder(Stahl Kimya)
PP 25838	100		White pigment(Stahl Kimya)
HM 443	7	10	Silicone touch (Stahl Kimya)
Water	290	100	
LW 21016		100	Hydrolacs (Stahl Kimya)
L-Ascorbic Asid		X	
1) 6xspray- Roto Press(80 °C, 150 Bar)-4xspray- Roto Press (80 °C,70 Bar)-3xspray			
2) 2xspray- Roto Press(90 °C- 70 Bar)			

After the first coat application of the finishing recipe, each leather divided into three parts. The amount indicated by X in the second coat solution, the total solution and 0%, 1%, 2%, 3%, 4% and 5% of the leathers were added. Each experiment has three replicates was carried out. All leathers are conditioned for reproducible tests in the laboratory under equal conditions (20 ± 2 ºC 65 ± 2).

3 RESULTS AND DISCUSSION

After the use of L-ascorbic acid, different tones from yellow to pink were observed in the leathers.

Figure 1: Color change observed in leather samples after finishing

Table 2 shows the dry rubbing fastness values of leather and felts evaluated according to the gray scale.

Table 2: Evaluation of dry rub fastness test results

		Control n(%)	Experimental n(%)	*Test Value*	*p*
Leather	**3**	3 (100)	0 (0)		
	4/5	0 (0)	3 (20)		
	5	0 (0)	12 (80)	***11,889***	***0,002*****
Felt	**3/4**	3 (100)	0 (0)		
	4	0 (0)	3 (20)		
	4/5	0 (0)	12 (80)	***11,889***	***0,002*****

FisherFreemanHaltontest ***p<0,01*

Table 3 shows the color measurement average results of the leathers. L lightness, +a red direction, -a green direction, +b yellow direction, -b blue direction and DE*ab are numerical values showing the size of the color difference.

Table 3: Color measurement evaluation results

	Control Median (min-max)	Ort+SD	Experimental Median (min-max)	Ort+SD
L*(D65)	93,3(90,9/94)	93,19±0,74	90(86,2/91,5)	89,6±1,24
a*(D65)	-1,1(-1,3/-1)	-1,09±0,06	1,1(-0,1/2,6)	1,18±0,75
b*(D65)	2,5(1,7/3,2)	2,44±0,3	9,3(6,1/15,4)	9,69±2,34
dL*(D65)	-4,9(-8/-2,9)	-4,66±1,25	-8,3(-12,6/-5,4)	-8,25±1,6
da*(D65)	-1(-1,2/-0,9)	-0,98±0,07	1,2(0/2,7)	1,29±0,75
db*(D65)	2,8(2/3,4)	2,74±0,3	9,6(6,5/15,7)	9,99±2,34
dE*ab(D65)	5,7(4,1-8,5)	5,54±1,05	12,3(8,8-20,2)	13,08±2,67

Table 4 contains the light fastness results evaluated according to the blue scale.

Table 4: Light fastness assessment results

		Control n(%)	Experiment n(%)	*Test Value*	*p*
Blue scale	1	3 (100)	0 (0)	***11,717***	***0,001*****
	1/2	0 (0)	1 (6,7)		
	2	0 (0)	7 (46,7)		
	3	0 (0)	7 (46,7)		

4 CONCLUSION

In this study, the applicability of L-ascorbic acid, an antioxidant, as an alternative to colorment used in the leather industry was investigated. For this reason, chrome-tanned undyed crust leathers are dyed white in the finishing process. In the finishing layer, L-ascorbic acid material was added to the finishing solution at the rates of 1%, 2%, 3%, 4% and 5% L-ascorbic acid. These processes were repeated 3 times and compared with leathers treated according to the standard method without L-ascorbic acid. In these comparisons, visual evaluation, color measurement, rubbing fastness and light fastness were analyzed according to standard methods. Analysis results show that L-ascorbic acid gives the leather a pearly pink color tone while improving dry rubbing fastness and light fastness properties. For this reason, it has emerged that it can be used as a new colorment in leather finishing.

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