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FINISHING TECHNOLOGIES FOR NATURAL LEATHER USED IN MODERN GARMENTS

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Abstract: *The paper presents modern finishing technologies using various auxiliaries in order to obtain semi-processed leather (nappa) for garments, with advanced esthetic and functional properties. Retanning auxiliaries based on acrylic polymers, tanning resins, synthetic tanning agents and fatliquoring and dyeing auxiliaries were used, providing leather with characteristics such as: drumming fastness, uniform dyeing, softness, low weight, dimensional stability, water vapour permeability. Finishing is done using disperse systems containing as auxiliaries: pigments, binders, natural and synthetic waxes, preservatives, plasticizers, thickeners, fillers, odorizers, penetrating agents, solvents. Essential oils, known for their particular scent and therapeutic qualities, are highly concentrated in biologically active compounds with different properties. These essential oils can be used to provide leather with fragrance. The composition of essential oils were analyzed by gas chromatography coupled with mass spectrometry - GC-MS. The framework dry finishing technology was developed for brown nappa sheep for clothing. The most powerful and persistent fragrance effect, determined by sensory test, is that of product containing a mixture of 60% essential oils. New shapes and lines were promoted in the design of leather garments to improve the quality of fashion design and modernize production of garments and leather goods. The developed technologies gives garment leather producers the possibility to diversify their product range and increasing quality, strengthening market confidence in the product.*

Key words: *sheepskins, essential oils, polyurethane binders, fragrance, quality, environmental protection.*

1. INTRODUCTION

Retanning auxiliaries based on acrylic polymers, tanning resins, synthetic tanning agents and fatliquoring and dyeing auxiliaries were used, providing leather with characteristics such as: drumming fastness, uniform dyeing, softness, low weight, dimensional stability, water vapour permeability.[1, 2]

Finishing, the last operation in natural leather processing determines, to a large extent, the appearance and value of finished product. Finishing is done using disperse systems containing as auxiliaries: pigments, binders, natural and synthetic waxes, preservatives, plasticizers, thickeners, fillers, odorizers, penetrating agents, solvents.[3]

Essential oils, known for their particular scent and therapeutic qualities, are highly concentrated in biologically active compounds with different properties.

These essential oils can be used to provide leather with fragrance.[4, 5]

2. EXPERIMENTAL

2.1. Materials

• The sheepskins nappa assortments, dyed brown (National Research and Development Institute for Textiles and Leather – Division Leather and Footwear Research Institute Bucharest, Romania);

• Roda Casicolor Brown R (Triderma, Germania), viscous and homogenous fluid, dry substance – 38%, pH (10% solution) – 7, ash – 28%;

• Roda wax MONO (Triderma, Germany), wax emulsion for ground coat: dry substance – 36.87%, pH (10% solution) – 4.2, Ford cup viscosity Φ4 – 12, kinematic viscosity, cSt – 8.97, density – 0.957 g/cm^3;

• Roda-cryl 87 (Triderma, Germany), acrylic binder for ground coat, dry substance – 34.50%, pH (10% solution) – 6.0, Ford cup viscosity Φ4 – 14, density – 1.025 g/cm^3;

• Roda-pure 302 (Triderma, Germany) polyurethane binder for ground coat: dry substance – 30.87%, pH (10% solution) – 7.5, Ford cup viscosity Φ4 – 15, density – 1.076 g/cm^3;

• Roda pur 5011 (Triderma, Germania), dry substance – 40%, pH (10% solution) – 5.5, Ford cup viscosity Φ4 – 7, density – 1.053 g/cm^3;

• Lavender essential oil (Solaris Plant, Bucharest), containing 36.57% linalool, 35.60% linalyl acetate, 7.67% α-terpineol, camphor, carbitol, cineol, etc.;

• Orange essential oil (Solaris Plant, Bucharest), containing 94.7% limonene and small amounts of pinene, linalool and linalyl acetate;

• Ethanol (Chemical Company, Germany), density – 0.789 g/cm^3 at 20^{0}C, boiling point – 78^{0}C, melting point –114^{0}C, water solubility – in any proportion;

• Polyethylene glycol 600 (Merck, Germany), density – 1.13 g/cm^3 at 20^{0}C, ignition point – 270^{0}C, pH (10% solution) – 4-7; melting point – 17-22^{0}C, hygroscopic;

• Hexadecyl-trimethyl ammonium bromide (Merck, Germany), water solubility – 3g/L, pH (10% solution) – 5-7, melting point – 237-243^{0}C, hygroscopic;

• Nonionic emulsifier – lauryl alcohol ethoxylated with 7 moles of ethylene oxide (Elton, Bucharest), melting point -15^{0}C, ignition point over 170^{0}C, density – 0.97 g/cm^3 at 40^{0}C, pH – 5-7, viscosity – 25 mPa x s.

2.2. Methods

Fragrance products were obtained at 30-35^{0}C in a glass flask, using a heating and homogenization installation (Velp) under mechanical stirring for 15-20 min. An ultrasound bath (Elmasonic S 15H) was also used, at 25^{0}C for 10 min.

2.2.1. Obtaining fragrance products based on essential oils

GC-MS analysis of orange essential oil shows that the limonene compound is predominant, in proportion of 94.7%.[6]

Lavender essential oil containing 36.57% linalool, 35.60% linalyl acetate, 7.67% α-terpineol, camphor, carbitol, cineol, etc.

Fragrance product preparations contain: 10-30% lavender essential oil, 10-30% orange essential oil, 20% ethyl alcohol, 10% lauryl alcohol ethoxylated with 7 moles of ethylene oxide, 9-10% polyethylene glycol 600, 1% hexadecyl-trimethyl ammonium bromide (cationic emulsifier) and deionized water.

The resulted products were marked P- LP-1(contain 30% lavender essential oil, 30% orange essential oil), P- LP-2 (contain 20% lavender essential oil, 20% orange essential oil) and P- LP-3 (contain 10% lavender essential oil, 10% orange essential oil).

2.2.1.Finishing technologies for sheepskins into nappa assortments using fragrance products

The framework dry finishing technology was developed for brown nappa sheep for clothing.

Finishing technologies for sheepskins into natural grain nappa assortments are shown in Table 1.

Table 1: *Framework technology for dry finishing of sheepskins into natural grain nappa assortments*

Operation	Composition of dispersion/Method of application
Applying dispersion I (basecoat)	40-60 g/L pigment paste (Roda Casicolor Brown R) 20-30 g/L wax emulsion (Roda wax MONO) 100 g/L acrylic binder (Roda-cryl 87) 150 g/L polyurethane binder (Roda-pure 302) 660-690 g/L water Application by spraying (2 passes of dispersion I)
Intermediate pressing	In hydraulic press using mirror or steam plate, parameters: - temperature – 50-60°C; - pressure – 50-100 bar
Applying dispersion I	By spraying (2-3 passes of dispersion I)
Applying final dressing (fixing)	Emulsion/dispersion with the following composition: 700 g/L polyurethane binder (Roda pur 5011) 300 g/L water Application by spraying (2 passes of final dressing)
Final pressing	In hydraulic press using mirror plate, parameters: - temperature – 70-80°C; - pressure – 50-100 bar.

The finished furs nappa samples were additionally treated with polyurethane final dressing in the composition of which the P-LP-1, P-LP-2 and P-LP-3 product was added in different proportions.

Some technological variants of treating sheepskins into Nappa assortments for clothing for samples PN1-PN9 are shown in Table 2.

Table 2: *Technological variants of treating sheepskins into nappa assortments*

Sample	***Final dressing composition***
PN1	500 g/L Roda pur 5011 and 500 g/L product P-LP-1
PN2	300 g/L Roda pur 5011 and 700 g/L product P-LP-1
PN3	1000 g/L product P-LP-1
PN4	500 g/L Roda pur 5011 and 500 g/L product P-LP-2
PN5	300 g/L Roda pur 5011 and 700 g/L product P-LP-2
PN6	1000 g/L product P-LP-2
PN7	500 g/L Roda pur 5011 and 500 g/L product P-LP-3
PN8	300 g/L Roda pur 5011 and 700 g/L product P-LP-3
PN9	1000 g/L product P-LP-3

3. RESULTS

3.1. Characterization of fragrance products by physical-chemical analysis

Products P-LP-1, P-LP-2 and P-LP-3 are homogenous yellowish white fluids with with 19-22% dry substance, pH – 5.2-6.2, density – 0.844-0.863 g/cm^3, total nitrogen – 0.39-0.57%.

3.2. Characterization of fragrant sheepskins nappa assortments

To monitor the fragrance effect and concentration of volatile perfume in the treated furs, samples PN1-PN9 in table 2 were tested using the sensory test.

The most fragrant leathers nappa are samples PN3, PN6 and PN9, treated with products as such. Of these, PN3, treated with product P-LP-1, has the most intense fragrance, and its effect is preserved for 15-20 days.

The fragrance effect of product P-LP-1, with 30% lavender essential oil and 30% orange essential oil, is stronger than that of products with lower amounts of oils, namely P-LP-2 (containing 20% lavender essential oil and 20% orange essential oil) and P-LP-3 (with 10% lavender essential oil and 10% orange essential oil).

New shapes and lines were promoted in the design of leather garments to improve the quality of fashion design and modernize production of garments and leather goods.

The developed technologies gives garment leather producers the possibility to diversify their product range and increasing quality, strengthening market confidence in the product.

4. CONCLUSION

- Products with fragrance properties are aqueous emulsions of lavender and orange essential oils mixtures in various ratios, ethyl alcohol and polyethylene glycol stabilized with ethoxylated lauryl alcohol, with homogeneous yellowish-white appearance.
- The most powerful and persistent fragrance effect, determined by sensory test, is that of product containing a mixture of 60% lavender and orange essential oils 1/1.
- Samples PN3, PN6 and PN9, treated with fragrance products as such, are the most fragrant, and of these, sample PN3, treated with P-LP-1 (product containing a mixture of 60% lavender and orange essential oils 1/1), the effect lasting for 15-20 days.
- The fragrance effect and persistence decrease when reducing the percentage of natural oils in the final dressing composition.

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