Comparison of Properties of Leather Made using Plant Oil and Fish Oil as Fatliquors

D.M.H.E. Dunukedeniya, A.M. Samaraweera, R.M.H. Tharangani
Uva Wellassa University, Badulla, Sri Lanka

and

W. Wickramasingha
Ceylon Leather Products PLC, Kalani Ganga Road, Mattakkuliya, Sri Lanka

Introduction

The skin of animal which has been processed to retain its flexibility, toughness, and water proof nature is known as leather (Deluca and Longley, 2008). Leather is a durable and flexible material created via the tanning of animal raw hide and skin, primarily cattle hide. In shoe making process flexibility of the leather is very important. In addition to that leather should be water proof to avoid wearing leather clothes, shoes, hand bags and etc. Major leather making processes involves soaking, tanning, retanning, fatliquoring and finishing (Anon, 2011). Among the steps, fatliquoring is the most critical step in the leather manufacturing procedure. Fatliquoring is the process of introducing oil into a skin following tannage but before the leather is dried (Sivakumar *et al*., 2007). Therefore, this research was carried out to introduce Castor oil and Gingerly oil as fat liquors as a replacement for high cost fish oil.

Methodology

This study was carried out at Ceylon Leather Products PLC (CLPLC). The laboratory analysis was done at CLPLC and Uva Wellassa University laboratories. For the fatliquoring purpose, castor oil and gingerly oil were selected according to the lubrication power and unsaturation level of the oil. Then, the selected oils were sulfated using 10% and 20% sulfation levels (Anon, 2011) and were used for the fatliquoring purpose, where fish oil was used as the control. The wet blue of cow hides were selected which used for manufacturing of cow tung lining leather. Fifteen cow hide pieces with 1 ft^2 surface area were selected and divided into five samples. After fatliquoring, retanning, toggle drying and staking was carried out for all treatments with equal time and relevant chemical recipe. Finally, the finishing of leather was done by applying color using hand pad and wax using spray machine.

Finally the tensile strength and distention were measured using a universal testing machine and a lastometer, respectively. Then sensory evaluation was conducted to evaluate the softness, fullness, loose grain, oiliness in leather surface and the overall acceptability using 10 trained panelists. The sensory data were analyzed using non-parametric procedure, using the Friedman test incorporated in MINITAB 16 software package. Complete Randomized Design (CRD) was used and data obtained were analyzed using analysis of variance (ANOVA) incorporated in MINITAB 16 with 95% confidence level ($p=0.05$).

Results and Discussion

There is no significant difference in distension of the leather versus different fat liquors used ($p>0.05$). However, the highest and the lowest mean values for distension were given by gingerly oil with 20% sulfation level (according to the weight of the oil) and castor oil with 10% of sulfation level (according to the weight of the oil), respectively (Figure 1). Higher sulfation levels in oil resulted in higher values in distension due to increased penetration ability of oil into the hide (Anon, 2011). Further, all treatments are not significantly different in distension of the

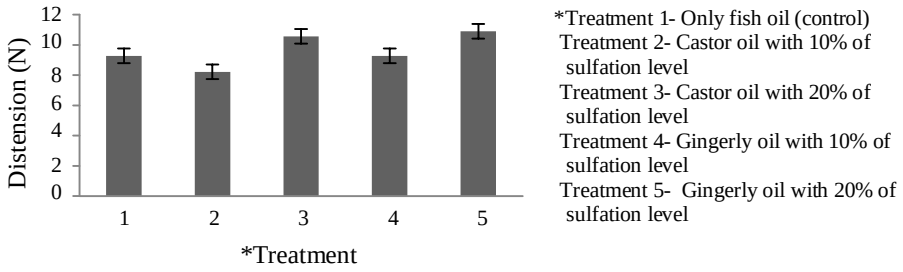

Figure 1. Distension of the leather versus treatment used

There is no significant difference in tensile strength of the leather versus treatment used ($p>0.05$). However, the highest and the lowest mean values for distension were given by gingerly oil with 20% sulfation level (according to the weight of the oil) and castor oil with 10% of sulfation level (according to the weight of the oil), respectively (Figure 2). Higher sulfation levels in oil resulted in higher values in distension due to increased penetration ability of oil into the hide (Anon, 2011). Further, all treatments are not significantly different in tensile strength of the leather according to the grouping information using Tukey method ($p>0.05$).

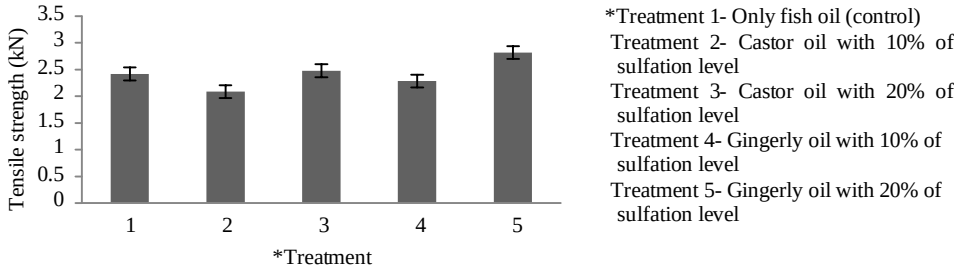

Figure 2. Tensile strength of the leather versus treatment used

Therefore, leather made using gingerly oil with 20% sulfation level (according to the weight of the oil) had higher distension and tensile strength than leather made using castor oil. The leather made using fish oil also had good distension and tensile strength. Gingerly oil had higher iodine value than castor oil. Therefore, it had higher penetration than castor oil (Anon, 2011). According to the analysis there were no difference between tensile strength and distention ($p<0.05$) with the sulfation level of the oil.

However, in the sensory evaluation there is a significant difference in softness among treatments. Leather made using fish oil had higher softness and it was the best leather compared to other leathers. However there is no significant difference in fullness among treatments ($p>0.05$). Leather made using gingerly oil with 20% sulfation level (according to the weight of the oil) had higher fullness and it is the best leather compared to others. In addition, there was a significant difference in loose grain among treatments ($p<0.05$). Leather made using gingerly oil with 10% sulfation level (according to the weight of the oil) had higher number of loose grain than others. However, there is a significant difference in oiliness ($p<0.05$). In addition the leather made using gingerly oil with 20% sulfation level (according to the weight of the oil) is the best because it had less oiliness on the leather surface. There was a significant difference in overall acceptability among treatment ($p<0.05$). Therefore, leather made using gingerly oil with 20% sulfation level had higher overall acceptability and it was selected as the best.

Figure 3. Web diagram of leather for treatment 1,2,3,4 and 5

Conclusion

These results indicate that gingerly oil with 20% sulfation level (according to the weight of the oil) was the best fatliquoring method because, and it has the highest distension, tensile strength and overall acceptability in sensory evaluation.

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