Comparison of Properties of Vegetable Tanned Leather made from Imported Mimosa and Locally Available Tanning Agents

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Introduction

Leather is a product produced by skins and hides that have been treated to preserve them and make them suitable for use. Leather is a major by-product of meat industry. In Sri Lanka, buffalo, cow and goat hides are used mainly for leather industry producing leather products such as shoes, bags, belts. There are two methods of tanning used in leather production such as vegetable tanning and mineral tanning. In vegetable tanning, plant extracts are used as tanning agent/ tannin and mimosa, an imported product at a high cost is used. In vegetable tanning process there are two types of tannin as catechole and pyragallol (Reed, 1972). Mimosa and tea waste contain catechole tannin and king coconut contains pyragallol tannin. This study was undertaken to find out the properties of locally available tanning agents as an alternative for leather tanning compared to commercially used mimosa.

Methodology

This study was carried out at the Ceylon Leather Products PLC, Mattakkuliya. Laboratory analysis was done at CLP and Uva Wellassa University laboratories. Cow and buffalo hides were used separately for the leather tanning process. Three tanning agents, mimosa powder, tea waste extract and extract from king coconut husks were used as treatments with three replicates for each treatment.

Leather production process (tanning, bleaching, fat liquoring, drying and plating) was carried out changing only the tanning agent while maintaining the same tanning media density (1.4 gcm^{-3}). Tannin extraction from both tea waste and king coconut husk was done manually. King coconut husk was chopped to get tannin extract and tannin density was increased by boiling. Tea waste was boiled to extract tannin from the waste and increased density using high amount of tea waste. During tanning period density and pH of tanning media were adjusted at four days intervals according to the requirement. Tanning penetration and pH changes of the media was measured.

Yield, thickness reduction, water absorption, hardness, shrinking temperature and tensile strength were measured in final leather. The sensory evaluation for softness, fullness and overall acceptability of final leather was done using 10 trained panelists. The sensory data were analyzed using non-parametric procedure, according to the Friedman test using Minitab 16 software. Complete Randomized design was conducted and data from tannin absorption, pH changes and properties of leather were analyzed using analysis of variance (ANOVA) procedure of Minitab 16 software.

Results and Discussion

Tannin absorption was different with treatments. Mimosa has the highest absorption rate both in cow and buffalo hides (Figure 1). However, absorption rate was low compared to other treatments from 8 th day. But considering tea and king coconut it absorption was low at the beginning and then gone high and again low with the time (Figure 2). That could be due to type of tannin and purity of them.

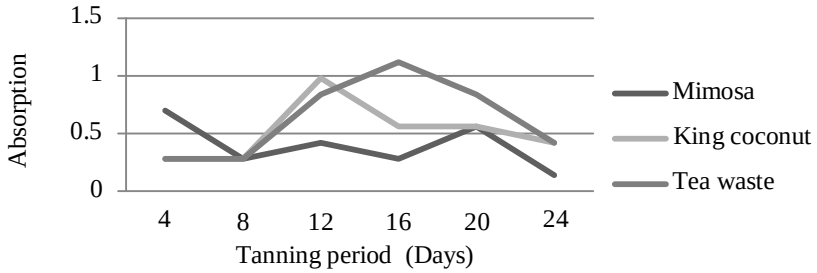

Figure 1. Tannin absorption during cow hide tanning period

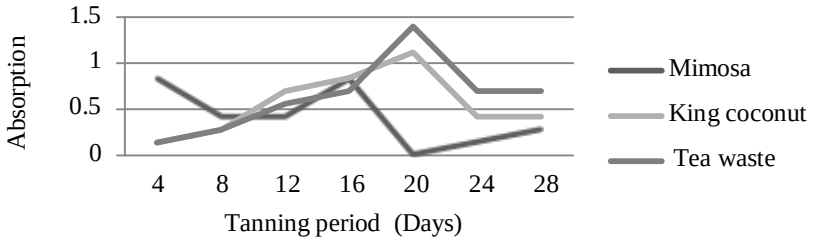

Figure 2. Tannin absorption during buffalo hide tanning period

In cow hide tanning, there was no significant difference among three treatments regarding yield, water absorption and tensile strength. Considering hardness, thickness reduction and shrinking temperature there is a significant difference among treatments ($p<0.05$). In buffalo hide tanning, according to the ANOVA, there is no significant difference among three treatments regarding tensile strength and shrinking temperature ($P>0.05$). There is a significant difference between treatments in yield, hardness, water absorption and thickness reduction ($p<0.05$).

However, the mean yield of leather both cow and buffalo, treatment 2 shows the highest yield. That could be due to tanning type, weight and penetration of tannin molecules. Hardness of both cow and buffalo leather was high in mimosa tanned leather.

Thickness reduction was high in mimosa tanned cow and buffalo hides. Binding of higher number of tannin molecules with more collagen groups leads to less emptiness in the leather (Anonymous, 1996). Therefore due to less emptiness in the leather, thickness of the leather was not much reduced with high pressure and temperature. According to that king coconut has filling ability than other two treatments. Water absorption also high in treatment 2 that used king coconut husk extraction as tanning agent. Tensile strength of both cow and buffalo, treatment 3 shows the highest value. That could be due to stronger bond between tannin in tea waste and collagen molecules (Anonymous, 1996). Shrinking temperature of the leather was high in treatment 2. That could be due to high heat stability of leather which tanned from king coconut husk extraction (Kite and Thomson, 2006).

According to the sensory evaluation of cow leather, fullness was same in leather tanned using mimosa and tea waste extract. Softness and overall acceptability of leather were high in mimosa tanned leather. Considering sensory evaluation of buffalo leather, softness and overall acceptability were same in leather tanned using mimosa and tea waste extract. This shows in figure 3 and 4 separately.

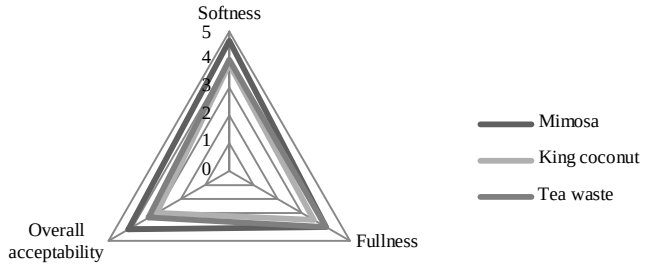

Figure 3. Web diagram of cow leather for Treatment 1, 2 and 3.

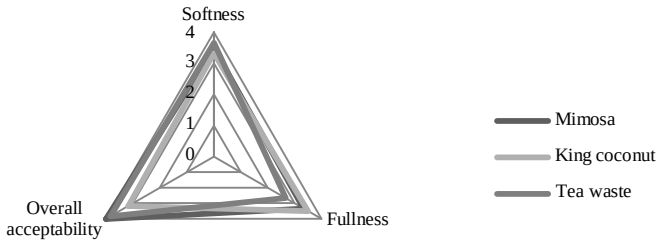

Figure 4. Web diagram of buffalo leather for Treatment 1, 2 and 3.

Conclusions

Mimosa and tea contain catechole tanning and king coconut husk contain pyragallol tanning. According to this study most of the good properties such as yield, shrinking temperature, thickness reduction and water absorption were obtained from leather tanned using king coconut extract. Therefore tanning extract from king coconut husk can be used for leather tanning instead of mimosa powder. King coconut tanned leather is better than leather tanned using tea waste and mimosa.

References

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