Utilization of Egg Yolk as an Alternative Fatliquoring Agent for Fur Tanning of Rabbit Skin

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Abstract. Rabbit skin as a by-product has potential value in producing fur skin for making hats, clothes, wall hangings, bags, upholstery for household furniture. Fatliquoring is one of the final operations of post tanning process that influenced the physical characteristics on fur leather. Egg yolk is suitable as fatliquoring agent because it contains a natural emulsifier (lecithin) which works as an emulsion stabilizer so that the fat can be penetrated into the collagen fibers perfectly. This study aims to determine the effect of utilize egg yolk as a fatliquoring agent in rabbit fur tanning. Egg yolk was used as a fatliquoring agent, with concentrations of 8, 10, and 12%. The concentration of egg yolk as a fatliquoring agent affected the physical properties of the rabbit fur leather. Increasing the concentration of egg yolk can increase the tensile strength, elongation, sewing strength, and tear strength significantly. This rabbit fur leather suitable to use as gloves

INTRODUCTION

Rabbits have the ability to reproduce and grow fast. Maintenance is simple and inexpensive and can be adapted for small and commercial scales[1]. The products obtained from raising rabbits are meat and fur skin, as well as other parts, all of which are utilized through certain processing stages[2]. Rabbit skin as a by-product has potential value in producing fur skin, with certain processing steps, the skin can be used as a leather product that can be used as raw material for making hats, clothes, wall hangings, bags, upholstery for household furniture[3], scarves, seat covers, wallets, dolls and other high-priced leather crafts[4].

Leather making technology consists of many phases which can be divided into processes of beamhouse, tanning, post tanning, and finishing. Fatliquoring is one of the final operations of post tanning process[5]. The fatliquors used in this phase influenced the physical characteristics of leather such as flexibility, feel, and stitch tear resistance[6]. The commonly used fatliquors are synthetic oils and natural oils such as fish oil and palm oil. The natural materials must be sulfonified to become fatliquoring agents. The sulfonation process can lead to environmental pollution as a result of the liquid waste from the tanning process. In addition, the sustainability of natural materials are determined by its abundance, existing usage.

In Indonesia, eggs are an abundant natural material, easy to find, cheap, and have a high fat content in egg yolks. Egg yolk contains a natural emulsifier (lecithin) which works as an emulsion stabilizer so that the fat can be penetrated into the collagen fibers perfectly, so that the tanned skin becomes weak and soft[7]. This study aims to determine the effect of utilize egg yolk as a fatliquoring agent in rabbit fur tanning.

MATERIAL AND METHODS

The materials used are local rabbit skin, egg yolk, and tanning materials. This research was conducted with an experimental method. Egg yolk was used as a fatliquoring agent, with concentrations of 8, 10, and 12%. The fatliquoring process is based on Nkwor & Ukoha[7] method. The physical characteristic of leather was tested including tensile strength, elongation, sewing strength, and tear resistance[8]. The data obtained were analyzed by analysis of variance (ANOVA) using IBM SPSS Statistics 25.

RESULT AND DISCUSSION

Based on the results in table I, it can be seen that the higher the concentration of the fatliquoring agent, the higher the physical properties of the fur significantly. Based on Indonesian national standards (SNI), this fur is not suitable for jackets, but can be used as gloves. Tensile strength of fur skin with fatliquoring agent 12% yielded 116.51 kg/cm^2. SNI 4593-2011[9] regarding leather jacket standards requires a minimum tensile strength of more than 141 kg/cm^2, while SNI 06-0237[10] regarding gloves standards requires a minimum of 75 kg/cm^2.

Fur skin with a concentration of 12% fatliquor agent produces an elongation percentage of 77.10%. This value is higher than the study by Yorgancioglu[11], which used 15% fatliquoring agent from tymol (58%). The same applies to the leather with the fatliquor agent from *Afzelia africana Aril Cap* Oil which has elongation properties of 40.42%. The value of sewing strength on fur with fatlioring of egg yolk ranged from 50.21 kg/cm^2 to 58.65 kg/cm^2. Kanagy[12] stated that sewing strength is also influenced by skin thickness, collagen protein content and density, the angle of the bundle of collagen fibers, and the thickness of the corium.

TABLE 1. *Physical characteristic of rabbit fur leather*

Parameter	Fatliquoring agent concentration (%)		
	8	10	12
Tensile Strength (kg/cm^2)	84,89±6,18^a	98,62±5,26^b	116,51±7,40^c
Elongation (%)	68,47±1,66^a	73,10±1,01^b	77,10±2,76^c
Sewing Strength (kg/cm)	50,21±2,82^a	55,83±0,59^b	58,65±0,77^c
Tear Resistance (kg/cm)	18.67±0.56^a	20.18±0.06^b	21.76±0.37^c

Results are given as mean ± standard deviation

^{abc}Different letters within the same row indicate statistical significance at $p<0.05$ level

Based on the results of the tear strength assay, the fur leather with 12% fatliquoring agent has a tear strength of 21.76 kg/cm. This value is lower than that of leather that has been fatliquified with natural ingredients such as flax (83.2 kg/cm) and soy (87.1 kg/cm)[5]. However, the value of the tear strength in this study was higher than that of Alfawal et al[13], which used 12% fatliquoring agent from Jatropha oil (18,7 kg/cm).

CONCLUSION

The concentration of egg yolk as a fatliquoring agent affected the physical properties of the rabbit fur leather. Increasing the concentration of egg yolk can increase the tensile strength, elongation, sewing strength, and tear strength significantly. This rabbit fur leather suitable to use as gloves.

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