The use of gambier as a tanner for fur-tanned rabbit skin

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Abstract. Rabbit fur skin is an exotic skin group and a by-product of slaughtering animal houses. The tanning process is a process for processing. This vegetable tanning can be used as vegetable tanning materials derived from materials obtained from nature. examples of vegetable tanners are gambier and mimosa. The material used for research was rabbit fur 15 pieces and gambier. The research used in this experiment was a completely randomized design with 5 treatments and 3 replications, and there were significant influences would be tested by Duncan's Multiple Range Test Method. The treatment of this research used mimosa 4% (T0), gambier 3% (T1), 4% (T2), 5% (T3) dan 6% (T4). The result showed that using gambier as tanning material has a significant effect on tensile strength, tear strength, thickness, and flexibility. The best result of this research was T4 using 6% of gambier as a tanning agent. The tanned skin had 34,43 N/mm^2 tensile strength, 8,25 Kg/cm, tear strength of 2,33 mm thickness, and 77,09% flexibility. The conclusion of this research is gambier can be added as a tanning agent for rabbit fur and gives good quality.

1 Introduction

Rabbit fur skin is a type of livestock product which is currently used as a trade commodity with a high price. Leather is often used as a material for making jackets and several products are produced by using rabbit skin as a raw material. Leather commodities are classified into raw hides and tanned leather. Raw hides are the raw material for leather that has just been removed from the animal's body until the skin has undergone several preservative processes or is ready to be tanned.

Rabbit fur skin is a group of exotic skins and a by-product of slaughtering animals in slaughterhouses (RPH) and outside slaughterhouses. This by-product can be utilized so that it has high economic value [1]. The process is intended to change the properties of raw hides prone to decay and damage by microbial activity into tanned leather resistant to microbial activity and putrefaction [2].

Gambir or gambier comes from hot water extracted from the leaves and twigs of the gambir plant (*Uncaria gambir* Roxb.) which is then precipitated, drained, molded, and dried. The extraction process is carried out by pressing both traditionally and using

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hydraulic pressed [3]. The main chemical components of Gambir are catechins and tannins. Catechins are monomers of tannins where according to Fengel and Wegener [4] if 3 to 8 catechin molecules form a polymer, the polymer formed belongs to tannins, to be precise tannin condensation. This plant has been ~~widely~~ used in medicine, leather tanning, ink, and dyes. Gambir consists mostly of flavanol monomers such as catechins, epicatechins, and alkaloids [5].

Gambier gives tanning results that are soft, smooth, and light in color. The use of gambier as a tanning agent in recent years has declined rapidly since the early seventies. The tannins produced in the world, including gambier in it, 90% of which are used as leather tanning agents [6]. Mimosa is the essence of acacia bark, which is the result of filtering from the processing of acacia bark (Acacia aureus) which is processed through an evaporation or chemical process. Acacia juice contains several kinds of ingredients, including 63% tanning agent, 16% non-tanning substance, 19.5% water, and 1% dregs (Suparno, Covington and Evans. 2010). Mimosa tanning can affect the quality of the tanned leather. So it is necessary to determine the concentration of the mimosa tanning agent [7]. Gambier is very likely to replace mimosa. This is supported by the availability of gambier which is an agricultural product in the area of West Sumatra [3]. According to Markmann [8], gambier is categorized as a special type of extract for tanning leather as the tannin compounds contained in gambier combine quickly with skin proteins to produce tanning products which are suitable as the basis for belts and bags.

2 Research Materials and Methods

This research is located at the Yogyakarta Leather, Rubber and Plastics Center (BBKKP) and some tests were carried out at the BBKKP and the Leather Waste Development and Processing Laboratory (LP3K).

2.1 Research Materials

The research material used 15 sheets of rex rabbit skin obtained from the RPH in the city of Yogyakarta as well as gambier obtained from the Yogyakarta Leather, Rubber and Plastic Center (BBKKP).

2.2 Research Method

This study used an experimental method with a completely randomized design (CRD) and four treatments, namely the use of mimosa percentages of 4% (P0), the use of gambier percentages of 3% (P1), 4% (P2), 5% (P3) and 6% (P4). Each treatment was repeated three times. The variables tested include tensile strength, tear strength, thickness, and malleability.

3 Results and Discussion

The results of the tensile strength, tear strength, thickness, and malleability tests can be seen in Table 1.

Table 1. The physical characteristics of rabbit skin that tanned with gambier.

Treatment	Tensile strength (N/cm2)	Tear strength (Kg/cm)	Thickness (mm)	Malleability (mm)
T0	28.25±0.96^{a}	7.45±0.31^{b}	2.10±0.05^{b}	82.53±0.99^{b}
T1	30.51±1.13^{a}	5.85±0.46^{a}	1.80±0.1^{a}	86.26±1.63^{cd}
T2	32.31 ± 1^{b}	6.19±0.32^{a}	2.04±0.05^{b}	84.58±0.83^{c}
T3	33.59± 0.77^{b}	7.94±0.39^{b}	2.23±0.05^{c}	81.22±1.34^{b}
T4	34.43±0.61^{b}	8.25±0.30^{b}	2.33±0.15^{b}	77.09±1.38^{a}

3.1 Tensile Strength

The results of analysis of variance showed that between treatments had a very significant effect ($p < 0.01$) on the tensile strength of rabbit skin. The best test result of the tensile strength test of tanned rabbit skin was in the P4 treatment with a value of 34.43 N/cm^2. The test results used a gambier tanning agent with a concentration of 6%. Other results in the study were P0 which was 28.25 N/cm^2, P1 which was 30.51 N/cm^2, P2 which was 32.31 N/cm^2 and P3 which was 33.59 N/cm2. The factor that can affect the tensile strength of tanned rabbit skin is the type of skin used. Purnama [9] states that the high composition of collagen fibers in the skin will affect the high physical strength of the skin, namely the elongation and tensile strength of the skin. The level of tensile strength of the skin is affected by the thickness and thickness of the skin, the density of collagen protein, the angles of the collagen bundles, and the thickness of the corium. The wider the angle of the collagen fiber bundle, the thicker the corium, and the higher the skin fat content, the lower the tensile strength of the skin and the lower the elasticity.

3.2 Tear Strength

The results of analysis of variance showed that between treatments had a very significant effect ($P<0.01$) on the tear strength of rabbit skin. The tear strength obtained from the results of this study were P0, which was 7.45 kg/cm, P1, which was 5.85 kg/cm, P2 was 6.19 kg/cm, P3 was 7.94 kg/cm and P4 was 8.25 kg/cm when compared to the tear strength of chrome tanned goatskin of at least 17.5 kg/cm. This is because rabbit skin is different from goat skin from the nature of the skin, the thickness, and the bonding of protein fibers to the skin. According to Farid et al. [10], thin skin has loose collagen fibers so it has lower tearing power when compared to thicker skin. Collagen fibers are arranged in interwoven collagen bundles. The angle formed by the webbing and the density of the collagen fibers determines the high and low tensile strength. According to Untari et al. [11] the size of the tear strength is in line with the level of tanner contained in the leather and the physical appearance of the leather will reflect the content of tanning substances in the leather. This means that the tear strength indicates the degree of stability between the tanner and the leather layer.

3.3 Thickness

The results of the analysis of variance showed that between treatments had a very significant effect ($P<0.01$) on the thickness of the rabbit's skin. The results obtained from testing the skin thickness at P0 was 2.10 mm, P1 was 1.80 mm, P2 was 2.04 mm, P3 was

2.23 mm, P4 was 2.33 mm, the thickness of the tanned skin is very important to note because affect the quality of leather products and the purpose of making the product. Hak [12] states that leather is a potential by-product to be used as a raw material for the tanning industry because it has a specific shape and pattern on the surface of the skin is different from other skins and has a thickness and breadth that allows it to be made into leather products such as wallets, bags, etc. accessories and so on.

3.4 Malleability

The results of the analysis of variance showed that between treatments had a very significant effect ($P<0.01$) on the malleability of the rabbit's skin. There was the highest score in the tanning treatment using gambier P1 with a percentage of gambier 3% of 86.26 mm and the lowest value in treatment P4 with a percentage of gambir 5% of 77.09 mm, and the average in treatment P3 with a percentage of gambir 4% showed a softness value of 81 .22 mm, P2 with a gambier percentage of 3% showed a suppleness value of 84.26 mm while P0 with a mimosa percentage of 4% showed a value of 82.53 mm. The P1 treatment had high laxity due to the inclusion of tannins into the collagen which was less, so that the resulting tannin structure was less dense resulting in the skin becoming softer and weaker.This occurred because there were spaces that were not filled with tannins. Treatments P4, P3, and P0 have lower laxity due to tannins that enter and fill more spaces between collagen fibers so that the resulting tannery structure will become denser and the skin will become more rigid [13].

4 Conclusion

The conclusion from research on tanned rabbit skin using gambier has an effect on tensile strength, tear strength, thickness, and malleability with the best treatment being P4 using gambier 6% showing a tensile strength value of 34.43 N/cm^2, tear strength 8.25 kg/cm, a thickness of 2.33 mm and a softness of 77.09 mm.

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