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# Applications Indigo (*Indigofera tinctoria* L.) as Natural Dyeing in Milkfish [*Chanos chanos* (Forsskal, 1775)] Skin Tanning Process

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**Abstract**

Dyeing is one of the stages in tanning process to apply base color on leather to avoid broken finishing coat. One of natural substance used in leather tanning is true indigo (*Indigofera tinctoria* L.). This substance has blue color and contains tannin to increase the quality of tanned Milkfish skin. The research was aimed to determine the effect of using different concentrations of true indigo application as natural substance to the quality of tanned milkfish skin. This research used completely randomized design (CRD) using three repetitions, the treatment were using the concentration of indigo 20 %, 25 % and 30 %. The result shows that different concentrations of true indigo has significant effect ($p < 0.05$) to rub resistance on wet and dry coating, fastness to perspiration, tensile strength, elongation, hedonic, and micrograph photos of skin tissue. Tanned milkfish skin using 25 % concentration of true indigo has the best quality based on the criteria: rub resistance on wet coating test (3.83 %) and dry coating test (4.42 %), fastness to perspiration (4.75 %), tensile strength (1 843.53 $N \cdot cm^{-2}$), elongation (47.61 %), and skin tissue micrograph photos showing better display of collagen fibers.


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*Keywords:* Coloring; indigofera (*Indigofera tinctoria* L.); quality of tanned Milkfish skin

## 1. Introduction

Skin tanning is identical to the leather from animals, but with technology advancement, fish skin also can be

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tanned and results in variations of texture. According to Pawiroharsono (2008), leather tanning process is the processing of animal skins through several stages of the process so that the raw animal skin is converted into tanned skin ready for the manufacture of downstream products such as shoes, purses, belts, seat and so on.

In general, the skin is not widely used, but once discovered that the fish skin has distinctive characteristics and good texture, and then if tanned, it will give wonderful results. Unutilized skin waste can be processed into leather tanned resulting in higher price and increasing state income through non-oil products.

Most of tanned skin use synthetic dye which is not environmentally friendly. There is a need of more environmentally friendly dyeing substance but can be compared to synthetic dye like Indigofera (*Indigofera tinctoria* L.). Indigofera is a small plant which is used as natural dyes. Indigofera allegedly is able to be used as dye in the milkfish skin tanning process and able to give effect to the physical quality of the skin because contain tannin. According to Muzayyinah (2012), indigo compound contained in the leaves of indigofera is a derivative of the enol form of colored glucosides indoxyl, known as indikan (indoxyl-β-D-glucoside). Indigo blue color can be formed from indikan that changes by the time of submersion. The nature of blue color, which does not fade and remain resistant to be referred to as "the king of colour".

## 2. Materials and methods

### *2.1. Materials and equipment*

The material used in the tanning process CLRP (2015) were milkfish skin, wetting agent, water, soda ash, $Na_2S$, lime, $NH_4Cl$, protolithic enzyme (*palqoubat*), *degreasing agent*, PP, salt, formic acid, $H_2SO_4$, BCG, Chrome, NaFo, baking soda, white syntan, indigofera extract powder, hydro, vinegar, and fish oil. These materials have been available in the great Center for Leather, Rubber and Plastics (CLRP) Yogyakarta, Indonesia. The equipment used in the tanning process are plastic bucket, scales, analytical balance, stirrer, scissors, fleshing knives, measuring cups, hot plate, beaker glass, pH meter, thermometer, jars, rope, spreader bar, and gloves.

### *2.2. Research methods*

#### *2.2.1. Prepararation of indigofera solution*

Dissolving indigo powder into water at 70 °C in a container and stir indigo powder and water to get perfect solution. Add 4.5 g of Hydro and 3.5 g of soda ash to the solution and then stir it slowly and evenly. Then seal the container for 15 min. If the solution is ready to be used, it has greenish blue color.

#### *2.2.2. Preparation milkfish skin sample* (*Hayati et al. 2013*)

Measure 500 g of milkfish skin, cut the sample of the stomach part then wash it thoroughly under running water, then preserve the skin using salting method with the ratio of 1 (fish skin) : 2 (salt). The preserved fish skin then was kept overnight to be processed in the following day.

#### *2.2.3. Milkfish skin tanning process* (*Mustika 2001*)

Milkfish skin tanning process was started by washing under running water, soaking in 100 % skin weight added by wetting agent 1 % and soda ash 0.5 % then stirred for 1 hour. The next step was scale removal using 2.5 % $Na_2S$ stirred for 5 min then stopped for 45 min for three repetitions. Next, liming using 300 % water added by 4 % lime for 5 min and stopped for 45 % in five repetitions. The next step was reliming by adding 2 % lime into 300 % water and soaked overnight. Fleshed using fleshing knife then deliming by solving $NH_4Cl$ into 200 % counted by bloten weight (after fleshing weight) stirred for 15 min then check the diameter using clear PP indicator. Next, bating by adding 0.5 % *palqoubat* and stirred for 1 h, continued by degreasing using 1 % degreasing agent and stirred for 15 %. Pickling was done by adding 10 % salt 0.5 % formic acid, 1 % $H_2SO_4$ in 100 % water then stirred for 1 h then cheching was done by using yellow BCD indicator, continued by stirring for 3 h. Tanning was the next step by adding 6 % chrome, stirred for 1 h and basifying using 1 % NaFo which stirred in the next 30 min then add 1 %