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Extraction and Characterization of NILEST-Tan for Leather Production

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ABSTRACT:
The research problem identified from literature to the best of our knowledge was the challenges associated with the extraction and preservation of the tannin extract *Acacia nilotica* (Bagaruwa). Therefore, this research provides a solution to the growth of molds on the tannin extract. The shelve life of the tannin extract was improved through this research. The NILEST-Tan has a tannin content of 35.30% tans with tannin purity of 0.80. In addition, the physical and mechanical properties of the leather tanned with NILEST-Tan was found to be better in comparison to the crude tannage. The tensile strength of the leather tanned with the crude bagaruwa powder was found to be 16.24 MPa at 30% offer. The tensile strength of the leather tanned with NILEST-Tan are: 18.04, 23.14 and 23.33 MPa at 5, 7.5 and 10% offer. The shrinkage temperature of the leather was also found to be 77ºC. This product has proved to be environmentally friendly, improved exhaustion time, clean product and unique colour shade impact on the leather. This project is geared toward green and clean leather production, harnessing of local resources and reduction of over dependence on importation and consequently, contributing to Nigerian Economy.

KEYWORDS: *NILEST-Tan, Acacia nilotica, Bagaruwa, FTIR.*

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I. INTRODUCTION

NILEST-Tan is a natural product developed through research by the Directorate of Research, Development (DR&D), NILEST; Zaria. It is a vegetable product obtained from an indigenous plant material, *Acacia nilotica* (Bagaruwa) for leather production. Tannins are water-soluble phenolic compounds having molecular weights between 500 and 3000 capable of precipitating alkaloids as well as gelatin and other proteins from aqueous solution (Bate-smith, 2008). Traditionally, tannins are widely used as agents of converting animal hides/skins to leather ("tanning") by precipitating proteins found in the animal skins (Hagerman, 2002). *Acacia nilotica* (Bagaruwa) is one of the most important tannin-bearing trees. Leather processing technology has evolved naturally from traditional practice to an industrial activity.

II. MATERIALS AND METHODS

2.1 Materials

i. Bagaruwa pod powder
ii. Goat skins

2.2 Method

2.2.1 Method of Extraction

Cold maceration method was used in this research. 500g of the powdered sample material was transferred into 1000ml conical flask and soaked with distilled water/organic solvent in the ratio of 8:2. The mixture was agitated mechanically at different intervals and finally allowed to stay overnight. Thereafter, the mixture was filtered into 1000ml beaker using a finer sieve material to obtain the filtrate and residue. Subsequently, the beaker was placed on thermostat water bath at temperature of 45°C and the evaporation process continue until the syrup extracts was obtained (Bayram *et al*., 2017). The extractions were done in three (3) different portions.

2.2.2 Determination of tannin content

Determination of tannin content was done using hide powder method as stated in the SLC 116 official method of analysis (SLTC, 2001). The non-tannin was subtracted from the soluble solids and the total tannin content was obtained. The tannin content is expressed as a percentage of the soluble solids.

2.2.3 Tensile strength
The tensile strength was measured Instron universal tester 3369 model (IUP/6, 2001).

2.2.4 Shrinkage temperature
The shrinkage temperature of the leather obtained using the NILEST-Tan was measured using the SATRA STD 114 test apparatus in accordance to the official method (IUP/16, 2001)

III. RESULTS AND DISCUSSIONS

Table 1: Analysis of the Bagaruwa crude

Parameters	Values
Moisture content	11.00%
Total soluble	43.00%
Non-tans	6.00%
Total insoluble	51.00%
Tannin strength	5.10
Tannin purity	0.80
pH	6.00

The pulverized pods of the *Acacia nilotica* (Bagaruwa) has 43.0% total soluble solids, 51.00% total insoluble and a tanning strength of 5.10 which was found to be higher than the one reported by (Dennis *et al.*, 2016).

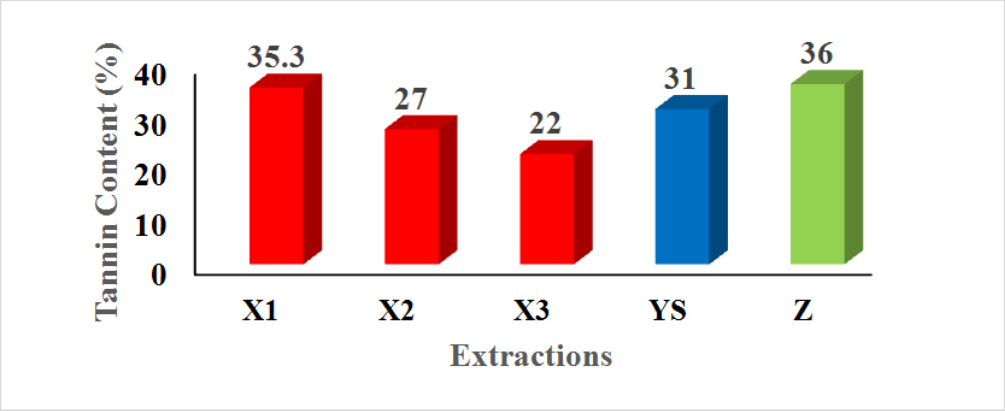

Fig 1: Tannin content in percentage at different extractions

According to figure 2, the tannin content tends to decreases as the continuous re-extraction of the tannin was done. This could be due to the decrease in solvent leading to decrease in solubility. The tannin content in X1 extract was found to be very close to the tannin content in crude sample. The optimum tannin content of the extract from the whole Bagaruwa pod was observed at X1 with a Tannin content of 35.30% which is higher than 31.00% reported by Mustapha and Nendza, (1996).

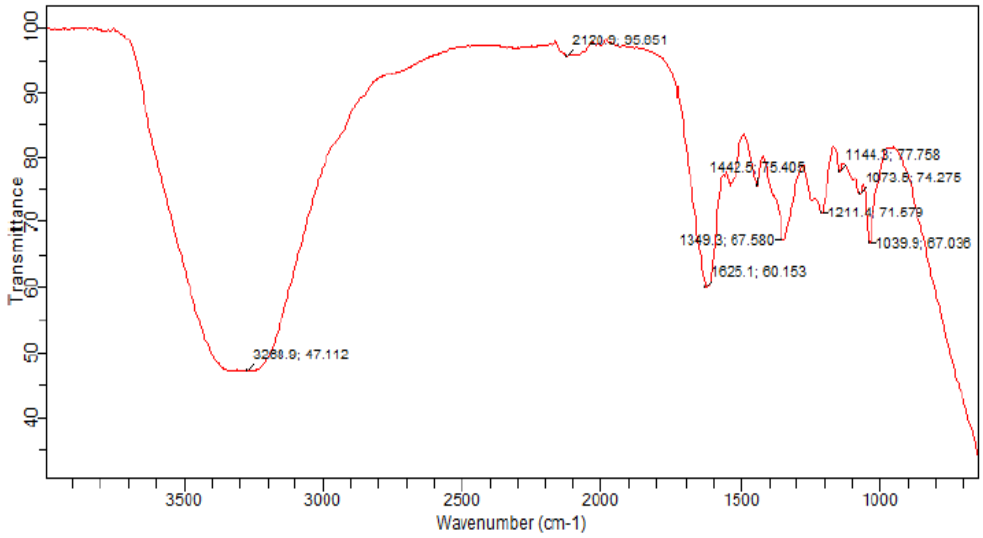

Figure 2: FTIR Spectrum of NILEST-Tan

Figure 2 indicated the FTIR of the visible functional group of the NILEST-Tan. The sharp broad peak located at 3268.9 cm-1 depict the present of –OH functional group. This shows that, NILEST-Tan product has polyphenolic groups which can be utilize for tanning processes. Similar results have been reported by (Combalia *et al*., 2016).

IV. CONCLUSION

The tannin content of NILEST-Tan was found to be 35.30% and the optimum tensile strength was achieved at 7.5 and 10% offer with a tensile strength of 23.14 MPa and 23.33 MPa as compared to 16.24 MPa at 30% offer of the crude bagaruwa. This indicated that NILEST-Tan, can be used for leather production of desired properties.

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