EFFECT OF SOME PHYSICAL PROPERTIES ON NIGERIAN ANIMAL FIBRES AND THEIR FELT FABRICS (SHEEP AND GOAT)

E.S. Nwadiokwu, C. S Ezeanyanaso, C.C. Igwe & G.N. Elemo
Federal Institute of Industrial Research, Oshodi,
P.M.B. 21023, Ikeja,
Lagos, Nigeria.
esnwadiokwu@gmail.com

ABSTRACT

The effect of some physical properties (moisture content, ash content and water absorption) on Nigerian animal fibres and felt fabrics have been studied; the fibres were pre-treated, separated, carded and felted. It was observed that the felt fabrics of the goat and sheep fibres have higher moisture content (21.93 % -22.45%), ash content (3.21% -3.48%) and water absorbency (29.8% -31.4%) compared to the pretreated, separated and carded fibres as shown in the results. This was attributable to the fact that the felt fabrics are dense and has higher surface area caused by the interlocking of the fibres; this was followed by the pre-treated fibres, separated fibres and finally the carded fibres. However this process is higher in the sheep fibres compared to the goat fibres as also stated in the discussion of results.

1.0 INTRODUCTION

Animal fibres are natural fibres that consist largely of proteins. The animal fibres most commonly used both in the manufacturing world as well as by the hand spinners are wool from domestic sheep and goat and silk from silk worm. fibres such as Angora wool from rabbits and Chiengora from dogs also exist, but are rarely used for mass production. (Mark Carwardine, 2008).

Australia is the leading producer of wool which is mostly from Merino sheep. Although sheep were domesticated some 9,000 to 11,000 years ago (Ensminger and Parker, 1999; Weaver, 2005) with the earliest woven wool garments having only been dated to two to three thousand years later (Smith, 1997).

Nonwoven fabrics have been known as one of the oldest and simplest textile fabrics. It is a fabric that can be produced by a variety of processes other than weaving and knitting. Its classic example is felt. Felt fabrics are mainly obtained from animal fibres such as wool gotten from sheep and it requires neither the weaving technology, nor the sophisticated knitting technology.

It was made from hairs of various animals (Müller and Saathoff, 2015). It is a unique property of many animal fibres and can be highly desirable particularly in manufacturing felted products, which account for about 5% of the wool market in Australia (Schlink, 2002).

This paper gives detailed insight on the effect of some physical properties on Nigerian animal fibres and their felt fabrics (sheep and goat), and results obtained.

2.0 MATERIALS AND METHOD

2.1 Materials

- Sheep fibres
- Goat fibres
- Porcelain crucible,
- Muffle furnace,
- Desiccators
- Digital analytical weighing balance
- Moisture analyzer (m/s-70),
- Moisturizer
- Felting table
- Wooden pole
- Roller

2.2 METHOD

2.2.1 Raw fibres preparation

The fibres of the sheep and goat were obtained locally, it was pretreated by scouring, washing, rinsing and drying to remove the inherent and acquired impurities such as sweat, dirt, manure, straw, urine e.t.c. it was then separated, carded and felting process was carried out on the fibres which involves carding, web laying, moisturizing, pressing, rolling and drying to obtain the felt fabrics.

2.2.2 Moisture content:

2g each of the fibre samples of sheep and goat and their felt fabrics samples were weighted into tray of moisture analyzer (m/s-70), closed and monitored, to determine the amount of moisture present in the sample. The temperature, time and the %moisture regain was recorded automatically by the machine. The test was done three times and average result was taken.

2.2.3 Ash Content:

2g each of the fibre samples of sheep, goat and their felt fabrics were weighed into a porcelain crucible, transferred into the muffle furnace, set at 5500^0C and left for 4hours. The crucible and its content were cooled at 100^0C in air, then at room temperature in desiccators and weighted. The percentage ash content calculated from the formular below.

% Ash content = weight of Ash / original weight of sample × 100/1

2.2.4 Water Absorbency Capacity

The test samples were weighed 1g each, submerged in distilled water at room temperature for 1hour. Then removed and drained for 2-3minutes. The percentage water absorbed is calculated from the formular below;

Water absorbed % = Y-X/X × 100/1

Where X= initial weight of the fibre Y= final weight of the fibre.

3.0 DISCUSSION OF RESULTS

3.1 RESULT OF MOISTURE CONTENT

3.1.1 TABLE 1: MOISTURE CONTENT OF THE PRE-TREATED, SEPARATED, CARDED AND FELT FABRICS OF GOAT AND SHEEP FIBRES

	GOAT FIBRES (%)	**SHEEP FIBRES (%)**
PRE-TREATED	**19.43**	**19.97**
SEPERATED	**18.75**	**19.00**
CARDED (WEB)	**16.08**	**16.82**
FELT FABRICS	**21.93**	**22.45**

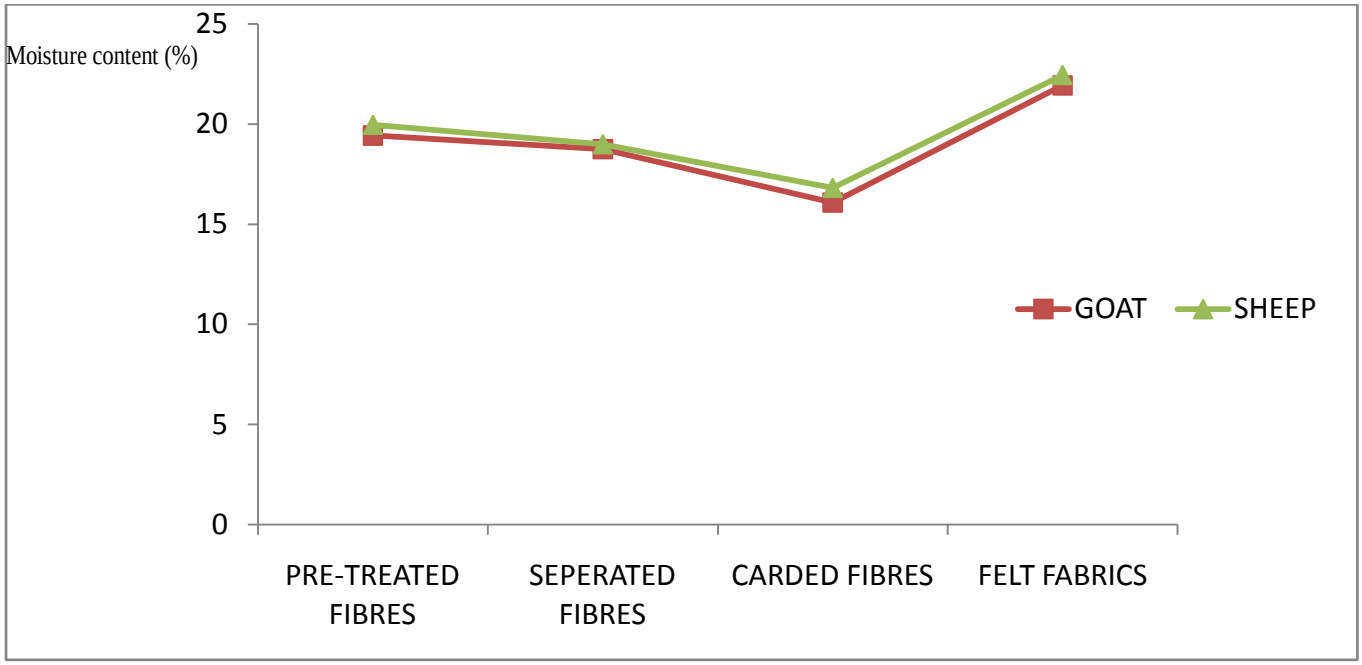


FIG 1 : GRAPH OF MOISTURE CONTENT

The table 1 and fig 1 above show the result of the moisture content of the pre-treated, separated, carded and felt fabrics of the sheep and goat fibres. It was observed that the felt fabrics of the fibres have higher moisture content (%) followed by the pre-treated and carded fibres respectively.

This can be attributed to the fact that the felt fabrics have higher ability to retain moisture because of its wider surface area thus increasing the already existing hydrophilicity of the fibres which increases the moisture content. This is followed by the pre-treated fibres that retain more moisture compared to the separated and the very light carded fibres. However, it was also noticed that the pre-treated, separated, carded and felt fabrics of the sheep have a little higher moisture content compared to the goat fibres.

3.2 RESULT OF ASH CONTENTS

TABLE 2: ASH CONTENT OF THE PRE-TREATED, SEPARATED, CARDED AND FELT FABRICS OF GOAT AND SHEEP FIBRES

	GOAT (%)	**SHEEP (%)**
PRE-TREATED FIBRES	**3.05**	**3.38**
SEPERATED FIBRES	**2.82**	**2.95**
CARDED FIBRES (WEB)	**2.34**	**2.43**
FELT FABRICS	**3.21**	**3.48**

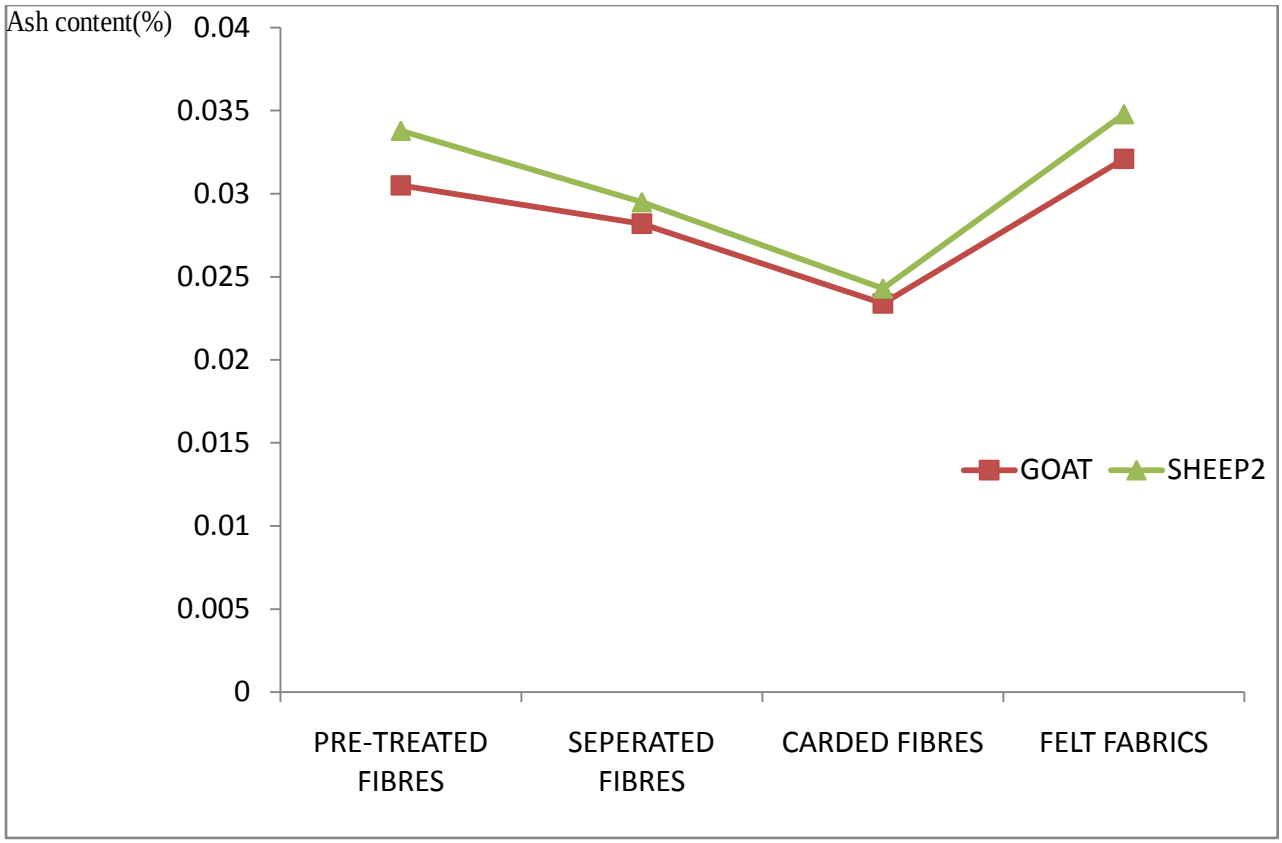


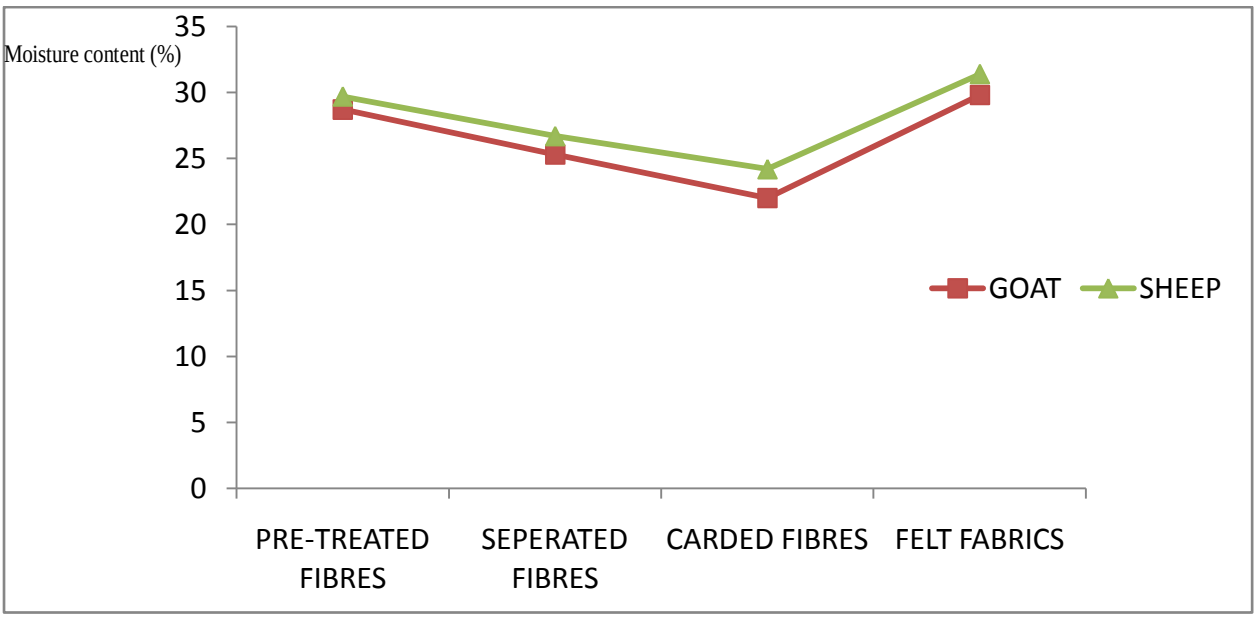
FIG 2 GRAPH OF THE ASH CONTENT

Table 2 and Fig.2 above show the result of the ash content of the pre-treated, separated, carded and felt fabrics of the sheep and goat fibres. It was observed that the felt fabrics of the fibres have higher ash content followed by the pre-treated, separated and carded fibres respectively. This can be attributed to the fact that the felt fabrics have bulkier and denser fibres interlocked with each other giving it a higher ash content. This is followed by the pre-treated fibres that have high ash content compared to the separated and the very light carded fibres. It was also observed that the pre-treated, separated, carded and felt fabrics of the sheep have higher ash content than the goat fibres.

3.3 RESULT OF WATER ABSORBENCY

TABLE 3: WATER ABSORPTION OF THE PRE-TREATED, SEPARATED, CARDED AND FELT FABRICS OF GOAT AND SHEEP FIBRES

	GOAT	SHEEP
PRE-TREATED FIBRES	28.7%	29.70%
SEPERATED FIBRES	25.3%	26.70%
CARDED FIBRES (WEB)	22.0%	24.20%
FELT FABRICS	29.8%	31.40%



The above result is similar to the moisture content of the pre-treated, separated, carded and felt fabrics of the sheep and goat fibres. It was observed that the felt fabrics of the fibres have higher water absorption followed by the pre-treated separated and carded fibres respectively. This can be attributed to the fact that the felt fabrics have bulkier and denser fibres interlocked with each other giving it a wider surface area thus increasing its water absorption ability which is followed by the pre-treated fibres that absorbs more compared to the separated and the very light carded fibres. Normally, when these fibres absorb moisture, the water molecules steadily force sufficient polymers apart to cause a significant number of hydrogen bonds to break. The water molecules also hydrolyze several salt linkages in the amorphous regions of the strand. Breakage and hydrolysis of these inter-polymer forces of attraction causes the fibre to swell.

This is higher in the sheep fibres as compared to the goat fibres because the sheep fibres and felt fabrics have higher surface area compared to that of the goat fibres.

CONCLUSION

This research shows that moisture content, ash content and water absorbency have higher effect on the felt fabrics of both the sheep and goat fibres followed by the pre treated, separated and carded fibres, mainly because of the dense nature and the large surface area of the felt fabrics caused by the interlocking of the fibres.

However, the sheep fibres show higher ability to absorb more moisture and have higher moisture content and ash content due to the nature and composition of their fibres especially the higher keratin content compared to that of the goat fibres.

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