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Review

Analytical Methods for the Identification and Quantitative Determination of Wool and Fine Animal Fibers: A Review

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Abstract: The identification and quantitative determination of wool and fine animal fibers are of great interest in the textile field because of the significant price differences between them and common impurities in raw and processed textiles. Since animal fibers have remarkable similarities in their chemical and physical characteristics, specific identification methods have been studied and proposed following advances in analytical technologies. The identification methods of wool and fine animal fibers are reviewed in this paper, and the results of relevant studies are listed and summarized, starting from classical microscopy methods, which are still used today not only in small to medium enterprises but also in large industries, research studies and quality control laboratories. Particular attention has been paid to image analysis, Nir spectroscopy and proteomics, which constitute the most promising technologies of quality control in the manufacturing and trading of luxury textiles and can find application in forensic science and archeology.

Keywords: wool; cashmere; fine animal fibers; analytical methods; identification

Citation: Zoccola, M.; Bhavsar, P.; Anceschi, A.; Patrucco, A. Analytical Methods for the Identification and Quantitative Determination of Wool and Fine Animal Fibers: A Review. *Fibers* **2023**, *11*, 67. https://doi.org/10.3390/fib11080067

Academic Editor: Damien Soulat

Received: 3 May 2023
Revised: 21 July 2023
Accepted: 27 July 2023
Published: 2 August 2023

1. Introduction

Fine animal fibers, also known as specialty or luxury fibers or hair, derive from animal species other than sheep and have been selected according to their characteristics and performances and their possibility of being spun with traditional systems. These fibers are generally employed to obtain valuable and luxury textile items due to their characteristics of finesses, softness, gloss, luster, color, wear comfort properties and even rarity. The limited production quantities and sometimes the difficulties of supply make their price relatively high compared to wool [1]. The relatively non-damaging production of animal fibers in comparison with synthetic fibers and their biodegradability instead of microplastics pollution production make them a partial replacement for synthetic fibers, even if in small amounts in terms of quantity [2]. Moreover, the production and commercialization of some animal fibers like cashmere, alpaca, camel and cashgora have a great impact on the rural economy, preventing migration to cities and protecting mountain areas in remote pastoral regions [3,4]

Labeling textiles to show their composition necessitates the use of analytical control methods not only for the finished product but also for the raw materials and the material throughout all stages of production. Aside from the legal labeling problems, the price difference between the constituents of many popular fiber blends is a primary motivator for developing precise analytical processes.

Other fields of interest are forensic science, textile care and laundry services, archeology and other investigative sectors [5–9].

Following Annex I (list of the textile fibers names) of EU Regulation No 1007/2011 of 27 September 2011 and the consolidated version of 15 February 2018, fine animal hair is classified in the number 2 category as alpaca, llama, camel, cashmere, mohair, angora, vicuña, yak, guanaco, cashgora, beaver and otter, followed or not by the word 'wool'