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STUDY OF AMINO ACID COMPOSITION OF SILK AND WOOL FABRIC

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Abstract
Research has been carried out to determine the amino acid composition of wool and silk. On the basis of IR spectrometry, connections have been shown that have an essential role in the structure of proteins.

Аннотация
Проведены исследования по определению аминокислотного состава шерсти и шелка. На основе ИК-спектрометрии показаны связи имеющие существенную роль в строении белков.

Keywords: wool, silk, elemental composition, amino acids, IR spectra, Asparagine acids, Glutamine acids.

Ключевые слова: шерсть, шелк, элементный состав, аминокислоты, ИК-спектры, аспарагиновые кислоты, глутаминовые кислоты.

The content of amino acids in wool and silk samples was also investigated, the results are shown in Table 1. 17 amino acids were found in wool and silk samples [1-2]. Asparagine, glutamine and tryptophan were not detected in both samples. The total amount of amino acids in silk is 96.70825 mg/g. The highest contents in wool are phenylalanine (19.31486 mg/ g), glycine (16.00736 mg/g) and tyrosine (10.93829 mg/g). The lowest content in wool has lysine (1.584618 mg/g) and proline (0.722736 mg/g) [3-4]. The total amount of amino acids in silk is 413.5124 mg/g, which is much higher than in wool. The highest contents in silk are found for serine (105.6573 mg / g), glycine (72.85463 mg/g) and threonine (32.72677 mg/g). It is noteworthy that the amount of serine is greater than the total amount of amino acids in the wool. Proline (3.378736 mg/g) and histidine (3.631299 mg/g) have the lowest contents in silk. The following essential amino acids are found in wool and silk: threonine, methionine, isoleucine, valine, phenylalanine, leucine and lysine [5-6]. The total content of irreplaceable amino acids in wool is ~39 mg / g (37.7%), and in silk ~120 mg/g (29%). An aromatic hydrophobic amino acid containing the indole nucleus tryptophan was not found in silk and wool samples. Wool and silk proteins are also balanced in terms of nonessential amino acids. The content of hydroxyl-containing amino acids in silk

(40.5%) is much higher than in wool (22%). Judging by the sum of amino acids, silk proteins are much higher in quality (Figure 1).

Table 1. Amino acid composition of wool and silk proteins.

Amino acids	Wool	Silk
	Concentration mg / g	
Asparagine acids	1,913927	26,22601
Glutamine acids	5,333787	16,97671
Serin	7,055695	105,6573
Glycine	16,00736	72,85463
Asparagine	0	0
Glutamine	0	0
Cysteine	2,900615	6,661144
Threonine *	3,265892	32,72677
Argenine	2,245763	21,6813
Alanine	6,166583	7,43656
Proline	0,722736	3,378736
Tyrosine	10,93829	29,23522
Valine *	3,142891	16,66065
Methionine *	3,167436	8,011786
Isoleucine *	2,069429	6,492401
Leucine *	6,450528	9,761661
Histidine	4,427843	3,631299
Tryptophan *	0	0
Phenylalanine *	19,31486	27,42364
Lysine HCl *	1,584618	18,69656
Total	96,70825	413,5124

* - essential amino acids

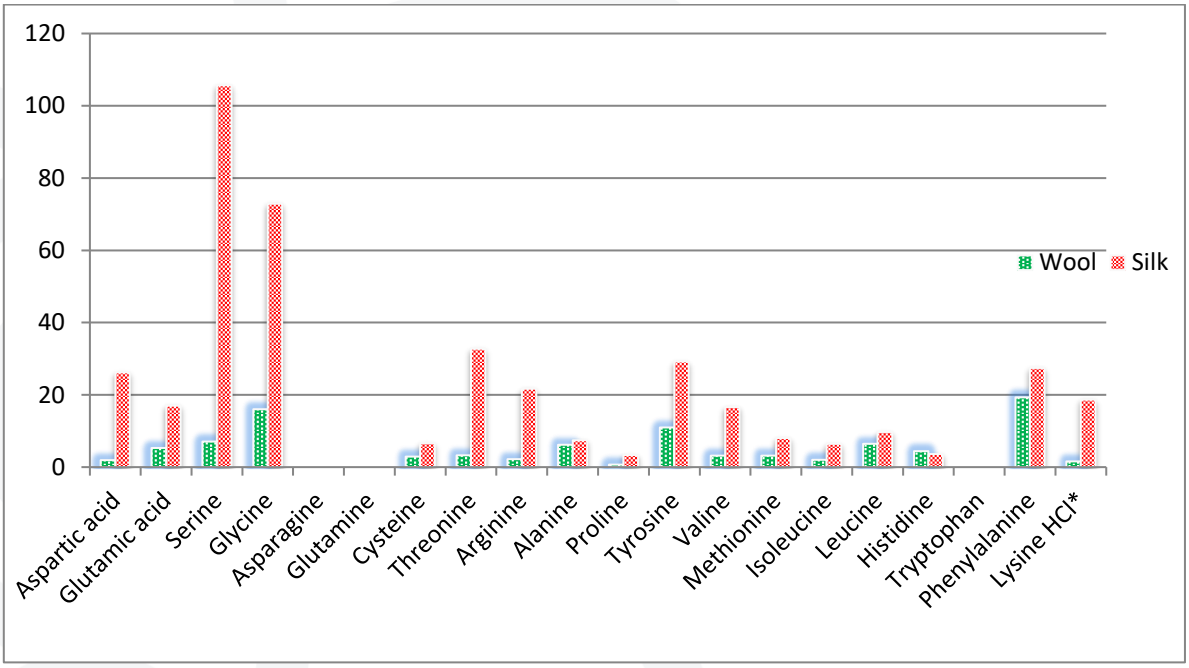

Fig. 1. Comparison of amino acid content in wool and silk samples.

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When analyzing the obtained IR spectra of proteins from wool and silk, it was noted that absorption bands at 3500–3000 cm^{-1} are associated with the stretching vibration of N-H [7]. The O-H stretch band is located at 3600-3200 cm^{-1}, which overlaps with the peak of the N-H stretching vibration at 3500-3000 cm-1 (for wool, the peak at 3423.59 and for silk, the peak at 3373.55 cm^{-1}) (Figs. 5 and 6). Absorption bands at 1656.02 cm^{-1} (Amide 1 band) for silk and 1569.25 cm^{-1} for wool due to deformation vibrations of aminocarbonyl (CO-NH) groups of the peptide bond [8-9]. As well as a decrease in the intensity of absorption bands at 1532.64 in the case of silk and 1418.23 cm^{-1} in the case of wool due to deformation vibrations of amino groups (-NH_2) and stretching vibrations of the carbonyl group (-CO) (band Amide 2).

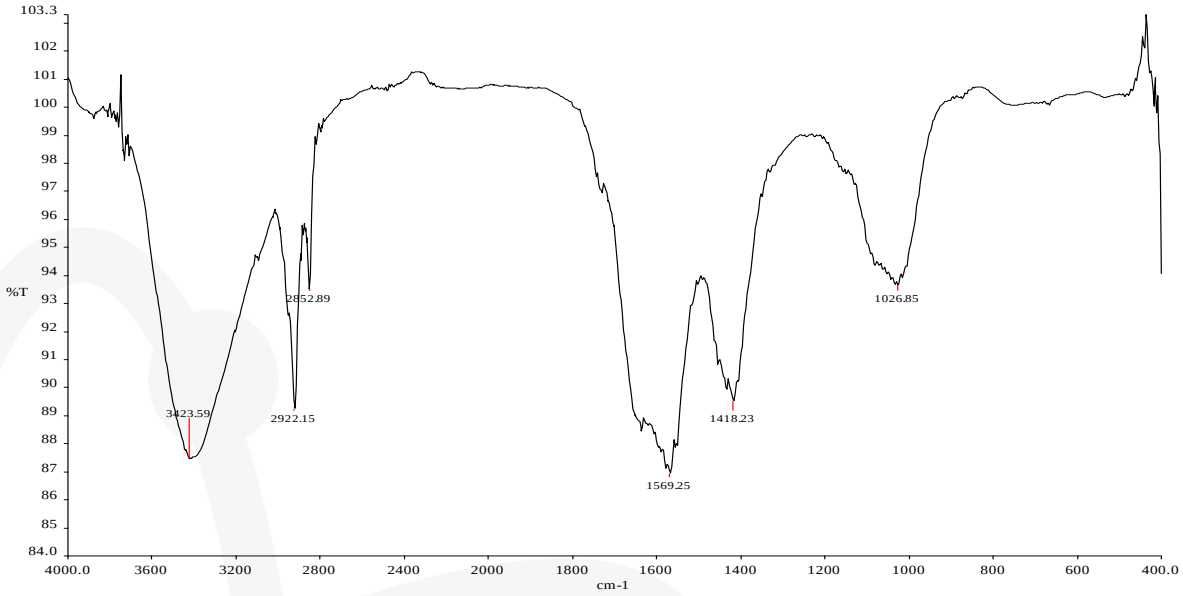

Fig. 2. IR - spectrum of wool.

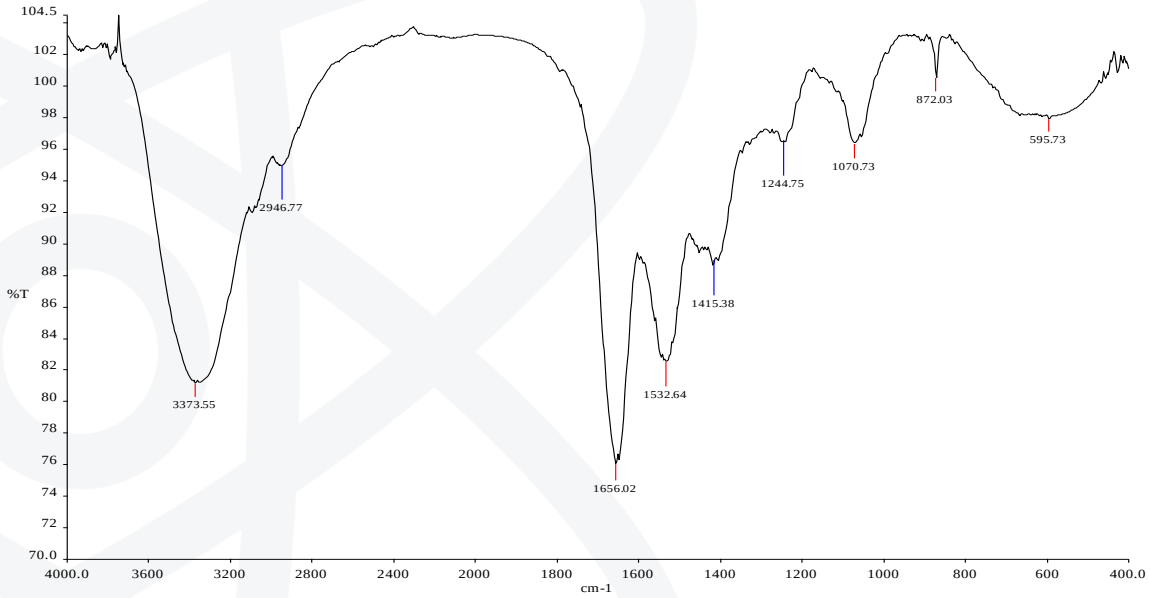

Fig. 3. IR spectrum of silk.

Conclusions:

Research has been carried out to determine the amino acid composition of wool and silk. On the basis of IR spectrometry, connections have been shown that have an essential role in the structure of proteins.

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