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ТҮЙІН

Бұл мақалада «Қарасу» ЖШС қасапханасында полифаг препаратын өндірістік сынақтан өткізу нәтижелері келтірілген. Бақылауға нысандардың беткейінен 1 $см^3$ қа 10 $см^2$ есебінен бақылау және тәжірибелік деп бөлінген *E. coli* 1257 штамымен ластанған жұғынды алынды. Тәжірибелік тест-нысандар стерилді таза физиологиялық ерітіндімен өңделіп, ал бақылау тобы сыналып отырған 10% «Полифаг» дезинфекциялық затымен 1 $м^2$ –қа 0,2-0,3 л есебімен 1 сағаттық экспозицияда өңделіп, нәтижесінде сыналған нысандар бактериялардан 100% залалсыздандырылды. *E. coli* 1257 штамы санитариялық көрсеткіштері бойынша төзімділігі 1 топқа жатады. Жоғарыда жүргізілген тәжірибелік жұмыстардың нәтижесі бойынша, 10% «Полифаг» ерітіндісі төзімділігі 1 топқа жататын бактерияларды толығымен зарарсыздандыратындығына көз жеткізілді.

РЕЗЮМЕ

В данной статье приведены результаты исследования производственного испытания препарата «Полифаг» в убойном цехе ТОО «Карасу». В качестве контроля служили контаминированные 1 млрд. взвесью культуры бактерий *E. coli* шт.1257 из расчета 1 $см^3$ на 10 $см^2$ тест-объекты, которые были разделены на контрольную и опытную. Опытные тест-объекты обрабатывали стерильным физ.раствором, а контрольные были обработаны испытуемым 10% дезинфицирующим средством «Полифаг» из ручного распылителя из расчета 0,2-0,3 л на 1 $м^2$. 10% раствора дезинфицирующего средства «Полифаг» при норме расхода 0,2 л/$м^2$ и экспозиции 1 час, обеспечивает полное 100% обеззараживание всех испытуемых поверхностей от бактерий. Проведенные исследования 10% раствором дезинфицирующего средства «Полифаг» показали, что он обладает бактерицидными свойствами, т.е. полного 100% уничтожения микроорганизмов на тест объектах, контаминированных1 млрд. взвесью культуры бактерий *E. coli* шт.1257. *E.Coli* шт. 1257 по санитарным-показателям относится к 1 группе устойчивости. На основании проведенного эксперимента доказано, что 10% раствор «Полифаг» полностью обеззараживает бактерии, относящиеся к 1 группе устойчивости.

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ANALYSIS OF PROPERTIES OF SHEEP WOOL AND RESEARCH OF THE POSSIBILITY OF THEIR USE IN OTHER SPHERES TAKING INTO ACCOUNT VETERINARY AND SANITARY REQUIREMENTS

Abstract

The article presents the results of the analysis of the current state of sheep wool processing and it is established that about 70% of coarse wool, or 34% of the total wool production in Kazakhstan remains unrealized and can be considered as losses. A comprehensive analysis of the physical and

chemical properties of sheep wool was carried out in order to expand the scope of their use in other sectors of the economy. It has been established that one of the promising scientific areas is the use of sheep wool in the construction industry due to their unique properties, such as environmental friendliness, economy, lightness, affordability, high thermal insulation characteristics and as a source of renewable raw materials. In order to prevent the occurrence of human infectious diseases in direct contact with sheep's wool, sanitary-veterinary measures and requirements have been developed, including preliminary cleaning and disinfection before applying them to the main technological chain. Scientific and experimental studies have proved the possibility of using sheep wool as fiber in the composition of the cement-sand mixture in order to improve the heat-shielding and physico-mechanical properties of the finished product. The results of the preliminary scientific and experimental work open up a broad perspective on the integrated and rational use of sheep wool in other sectors of the economy.

Keywords: *wool, physical and chemical properties, veterinary and sanitary requirements, disinfection, sanitization, disease prevention, electron microscopy images.*

Introduction. The production of wool is the result of shearing animals, which is carried out in sheep farms of various types. In Kazakhstan, 533 agricultural enterprises, about 14,500 farms and farms, and about 2 million households (personal subsidiary farms) have such specialization. The marketable products of this segment are unwashed wool of the three main types, from the point of view of pricing: 1) coarse and semi-rough, 2) semi-fine, 3) fine wool, which can be further divided into smaller varieties.

The processing segment consists of two main production stages. Primary processing, which is usually carried out by specialized enterprises for the primary processing of wool, the so-called SEP factories (currently in Kazakhstan there are 7 such enterprises, some of which are idle). The final products of this industrial stage (washed wool) refers to the variety of the original wool, the key properties of the wool as a result of such processing remain almost unchanged. Deep processing is carried out by industrial enterprises.

They use either unwashed wool (in this case, the enterprises themselves carry out its primary cleaning) or a washed product (purchased from POSH factories), which is then used to produce semi-finished products or final products. In the current situation, about 70% of coarse wool, or 34% of total wool production, remains unrealized and can be considered as losses.

The country produces mainly coarse and semi-coarse wool (about 21-22 thousand tons annually), 70% of which remain unclaimed and destroyed, the rest is mainly used for domestic production of traditional goods, and only a small amount is exported; as well as thin and semi-thin sheep wool of mainly low quality (about 11-12 thousand tons), which is mainly exported both washed and unwashed (80-85%), the remainder in small quantities (15-20%) processed internally. Obtaining such volumes of wool is provided by a livestock of sheep with a total number of 14 million heads, mainly crossbred (outbred) (95%), which are concentrated in private farms (70%), almost 4,000 farms (25%) and, to a lesser extent , at large enterprises (5%). In accordance with market demand, sheep farms are oriented towards meat production, while wool is regarded as a by-product, which is only partially sold on the market through an ineffective trade and procurement system [1].

In such a situation, there is an objective need to use sheep wool in other sectors of the economy of Kazakhstan.

The purpose of the work is to conduct a comprehensive analysis of the properties of sheep wool and study the possibility of their use in other areas, taking into account veterinary and sanitary requirements.

One of the main measures for the effective use of wool is the preservation of its valuable properties at all stages of production during harvesting, storage and initial processing. Below is a brief analysis of the main properties of sheep’s wool [2,3].

Wool fiber consists almost entirely of protein compounds of the keratin group. A distinctive feature of keratin wool is a significantly higher (from 3 to 5%) sulfur content in it than in other proteins. For example, Cape Merino wool of the 1st grade contains 4% sulfur, Australian Merino wool - 3.82%, New Zealand crossbred - 3.22%, Lincoln - 3.10%.

The technological properties of wool are largely associated with its sulfur content. Wool fiber keratin consists of various amino acids (according to Barker), wt.%: Cystine 13.10, glutamine 12.90, leucine 11.50, arginine 10.20, histidine 6.90, tyrosine 4.80, proline 4.40, alanine 4.40, serine, 2.96, lysine 2.8, valine 2.8, asparagine 2.30, tryptophan 1.80, glycine 0.60; other compounds 18.6.

Consider the effect of water on the properties of wool. Cold water hardly changes the properties of the coat. However, with a long stay of wool in water, its slight hydrolysis is observed. So, with a 20-fold treatment of wool in cold water for 24 hours, extracted substances containing nitrogen were found in the latter. With long-term content of wool in hot water leads to slow dissolution.

The effect of air temperature on wool is also different. Thus, a heating temperature of 100–105 ° has almost no effect on the strength, stretching and color of the coat. This property of wool is used when drying it in drying ovens at the indicated temperature.

However, under the action of a higher temperature (120 ° and above), the strength and elongation of the coat are significantly reduced.

The physical properties of wool, which are essential in its processing into yarn and fabric, include: fineness, length, strength, elasticity, elasticity and crimp.

However, the main physical properties of wool are its fineness and length, since this is what determines the nature of its use.

To achieve the expected results on the use of sheep's wool in other areas, special attention should be paid to the fat content of wool. It is a product of the activity of the sebaceous and sweat glands that are in the skin of sheep. The fat secreted by the sebaceous glands envelops the wool fibers and protects them from the influence of the external environment. The quantity and quality of fat in sheep depends on the breed and the individual characteristics of the animals. Therefore, it is necessary to conduct research to determine the amount of grease for each batch of supplied sheep wool according to a special technique.

As a rule, wool of fine-wool sheep is more greasy, wool of semi-fine-grained and low-fat wool is medium-greasy and wool of semi-coarse and coarse-haired sheep.

As an analysis of the properties of sheep's wool shows, some properties of sheep's wool are very valuable for use in other industries.

So the author of the work has developed a technology for obtaining a feed product from wool waste, as well as identifying the possibility of its use as an additive in the diets of lambs in the suckling period [4-6].

The authors of the studies substantiated the optimal conditions of the technological process for processing wool wastes, which made it possible to develop a technology for obtaining a feed product based on protein hydrolyzate by processing wool wastes by the method of slightly alkaline hydrolysis during heat treatment under pressure, followed by neutralization, filtration, drying to dryness or thickening. According to the indicators of chemical and amino acid composition, physico-chemical properties, metabolic energy, gross nutrient content, biological value, toxicity, the hydrolyzate meets the zootechnical and sanitary-veterinary requirements for a sheep feed product.

Recently, in the construction industry, very much attention has been paid to the quality and naturalness of heat-insulating materials. Creating a human-friendly environment and comfortable climate in any room are the main requirements when designing any residential or public building. However, the indoor microclimate does not always work best for a person. Dry air, an increased concentration of volatile impurities from building materials (binders, varnishes, paints), increased noise background can often lead to various diseases. At the same time, a favorable indoor climate increases the feeling of comfort and, as a result, increases labor productivity [7-8].

An innovative solution in the use of heat-insulating materials is the use of material from natural sheep's wool [9]. These are environmentally friendly materials with excellent properties. Sheep's wool is a 100% natural material, it does not contain any impurities and is made from renewable raw materials. In addition, wool has a number of important undeniable advantages over other materials. The use of material made from natural wool reduces temperature and humidity differences, damps the sounds that appear in the air and structures, and also reduces the amount of pollutants, toxins and smells that spread through the air.

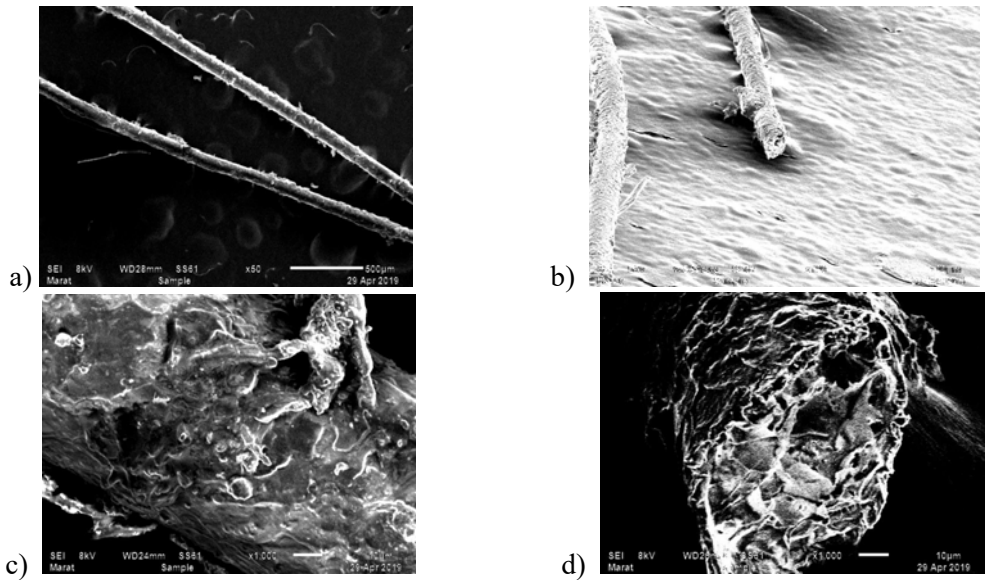
Recently, for several years, various types of fibers, both organic and inorganic, have been used in the industry, which will improve the performance of concrete, reduce the risk of cracks.

Fibers can be used for hydraulic structures, outdoor platforms, in floor slabs, petrochemical industry, bridges, etc. [10].

In this direction, one of the promising types of fibers is sheep wool, which annually forms in a significant amount in Kazakhstan.

Due to the unique properties of wool such as lightness, high tensile strength of fibers and high heat and sound insulation characteristics, it opens up a broad prospect of using them in the creation of new technologies for composite materials with a wide range of positive physical, mechanical and operational properties.

Materials and methods. To confirm the literary scientific information, we carried out electron-microscopic images of the fibers of coarse sheep wool of the West Kazakhstan region. For electron microscopy, a scanning electron microscope (SEM) of the JSM-6390LV brand (Japan) was used at the laboratories of physical and chemical analysis of general use of Kyzylorda State University named after Korkyt ata (Figure 1).



a) magnification x 50; b) hobby x 500; c) hobby x 1000; d) hobby x 1500

Figure - 1 Electron-microscopic images of sheep's wool

As electron microscopic images show, the fiber of sheep's wool has a fibrous scaly structure, which is an advantageous property for using them in other areas.Along with this, the use of sheep wool as a raw material in other industries, can serve as a source the spread of many infectious diseases in humans and animals, such as brucellosis, anthrax, smallpox, foot and mouth disease, listeriosis, dermatomycosis et al. [11]. Contact of workers with infected hair is accompanied by illness of workers with anthrax, brucellosis, tularemia, etc. Therefore, ensuring the veterinary and sanitary state in enterprises using sheep wool helps to prevent the occurrence of infectious diseases of humans and animals. One of the important aspects of the exclusion of infectious diseases is the development of sanitary and preventive measures, including preliminary cleaning and disinfection of wool before use in the main technological chain. Since the causative agent of the disease can retain virulent properties for a long time.

This is especially important when using sheep wool in housing. Preparations intended for washing and disinfecting wool should be with a wide spectrum of antimicrobial action in the absence of smell and moisture, environmentally friendly and capable of rapidly degrading in the environment without the formation of toxic compounds, low toxicity and safe operation, not reducing the commercial quality of raw materials.

Research results. Considering the specifics of using sheep's wool in other industries, we have developed sanitary and veterinary requirements regarding their use as raw materials for the creation of composite materials with improved thermal insulation properties.

Below is the algorithm of sanitary and veterinary requirements regarding the collection of wool from personal subsidiary and peasant farms, since at present it is they who have concentrated the bulk of the wool being cut (using the example of semi-coarse and coarse wool):

1. Preliminary disinfection of wool at the place of shearing;
2. Packing of disinfected wool in waterproof bags;
3. Transportation of wool to the place of use on special indoor machines;
4. Storage of wool in special warehouses previously sanitized against moths, ticks and other parasitic insects;
5. Secondary simultaneous disinfection and washing of wool in mobile technological equipment;
6. Drying of wool in special drying chambers at a temperature of 65-70 ^{0}C in order to preserve the original physical and chemical properties.

Compliance with the specified sanitary and veterinary requirements eliminates the possibility of workers becoming ill with the above diseases. In addition, the wool is freed from various blockages and grease. In order to study the possibility of using wool as part of composite materials, we carried out preliminary scientific and experimental work on the basis of the research laboratories of building materials.

For scientific experiments, the studied coarse wool samples were pre-disinfected and washed using a detergent.

After cleansing from wool fibers, fiber 10–12 mm long was manually cut to be used for further scientific and experimental studies.

As the second object of the study, a cement-sand mixture in the ratio of 1: 3 was chosen.

To establish the effect of fiber from coarse fleece on the basic physical and mechanical properties of the hardened samples, three batches of a cement-sand mixture were prepared at a water-cement ratio of 0.4.

The fiber content was taken at the rate of 15-30 g per 1 kg of dry mix.

To prepare the mixture, cement and sand were dosed in a ratio of 1: 3 and mixed dry in a spherical bowl, then wool fibers were added in the amount of the studied area and again mixed dry until the fiber was evenly distributed over the entire volume of the cement-sand mixture. Then water was added, and again thoroughly mixed until a homogeneous mass was obtained. From the resulting mixture, cubes (100x100x100mm) and beams (40x40x160mm) were molded using vibration on a laboratory vibrating table.



Figure 2 - Fragments for the manufacture of fiber from wool and the process of preparing a composite mixture

Molded samples were stored for 28 days in a bath with a water seal. After the expiration of the storage period, the samples had clear faces and smooth surfaces, without any cracks. After visual inspection, the samples were tested in physical and mechanical properties and studied the microstructure of the composite mixture with the addition of fiber from sheep's wool (figure 3).

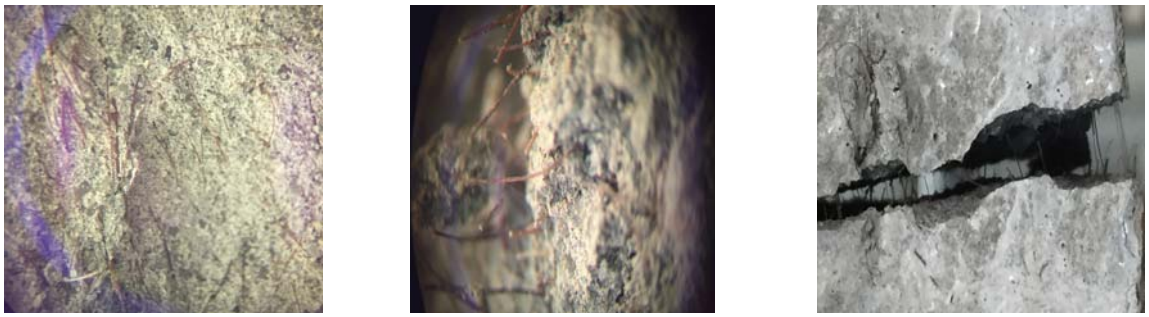


Figure 3 - Microscopic images of composite samples using fiber using sheep's wool

As the test results showed, with an increase in the fiber content in the study area, a uniform increase in the bending strength of the samples from 5.4 MPa to 5.9 MPa is observed. Compared to control samples, this increase is from 0.5 MPa to 1.4 MPa. At the same time, samples containing wool fibers retain compressive strength almost at the same level as control samples. This indicates the presence of a reinforcing effect of sheep wool fibers in the composite mixture. In addition, there is a uniform decrease in the average density of the samples and their thermal conductivity. Obviously, the content of light wool fiber contributes to a decrease in average density and thermal conductivity due to the formation of a microporous fibrous structure in the body of the hardened sample.

Conclusions:

- the current state of sheep wool processing was analyzed and it was found that about 70% of coarse wool, or 34% of the total wool production in Kazakhstan remains unrealized and can be considered as losses;
- a comprehensive analysis of the physical and chemical properties of sheep wool was carried out in order to expand the scope of their use in other sectors of the economy;
- it was established that one of the promising scientific areas is the use of sheep wool in the construction industry due to their unique properties, such as environmental friendliness, economy, ease, affordability, high thermal insulation characteristics and as a source of renewable raw materials;
- in order to prevent the occurrence of human infectious diseases in direct contact with fleece, sanitary-veterinary measures and requirements have been developed, including preliminary cleaning and disinfection before applying them to the main technological chain;
- scientific and experimental studies have proved the possibility of using sheep wool as fiber in the composition of the cement-sand mixture in order to improve the heat-shielding and physico-mechanical properties of the finished product.

Thus, the results of the preliminary scientific and experimental work open up a broad perspective on the integrated and rational use of sheep wool in other sectors of the economy.

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ТҮЙІН

Мақалада қой жүнін өңдеудің қазіргі жай-күйін талдау нәтижелері келтірілген және анықталған жүннің шамамен 70% -ы немесе Қазақстандағы жүн өндірісінің 34% -ы іске асырылмаған болып табылады және шығын ретінде қарастырылуы мүмкін. Оларды экономиканың басқа салаларында қолдану аясын кеңейту мақсатында қой жүнінің физико-химиялық қасиеттеріне кешенді талдау жүргізілді. Құрылыс индустриясында қой жүнін экологияға, үнемділікке, жеңілдікке, қол жетімділікке, жылу оқшаулаудың жоғары сипаттамаларына және жаңартылатын шикізат көзі ретінде ерекше қасиеттеріне байланысты пайдалану перспективалы ғылыми бағыттардың бірі болып табылады. Қойдың жүнімен тікелей байланыста болатын адамдардың жұқпалы ауруларының алдын алу мақсатында оларды негізгі технологиялық тізбекке қолданар алдында алдын-ала тазарту мен зарарсыздандыруды ескере отырып санитарлық-ветеринарлық шаралар мен талаптар әзірленді. Ғылыми және тәжірибелік зерттеулер дайын жүннің жылу қорғайтын және физика-механикалық қасиеттерін жақсарту үшін қой жүнін цемент-құм қоспасының құрамындағы талшық ретінде пайдалану мүмкіндігін дәлелдеді. Алдын ала ғылыми-тәжірибелік жұмыстардың нәтижелері қой жүнін экономиканың басқа салаларында кешенді және ұтымды пайдаланудың кең перспективасын ашады.

РЕЗЮМЕ

В статье представлены результаты анализа современного состояния переработки овечьей шерсти и установлено, что около 70% грубой шерсти, или 34% совокупного объема производства шерсти в Казахстане остаются нереализованными и могут рассматриваться как потери. Проведен комплексный анализ физических и химических свойств овечьей шерсти с целью расширения сферы использования их других отраслях экономики. Установлено, что одним из перспективных научных направлений, является использование овечьей шерсти в строительной сфере благодаря их уникальным свойствам, как экологичность, экономичность, легкость, доступность, высокие теплоизоляционные характеристики и как источник возобновляемого сырья. С целью предупреждения возникновения инфекционных болезней человека при непосредственном контакте с овечьей шерстью разработаны санитарно-ветеринарные мероприятия и требования, включающие предварительную очистку и дезинфекций до применения их в основную технологическую цепочку. Научно-экспериментальными исследованиями доказана возможность использования овечьей шерсти в качестве фибры в составе цементно-песчаной смеси с целью улучшения теплозащитных и физико-механических свойств готового продукта. Результаты проведенных предварительных научно-экспериментальных работ открывает широкую перспективу по комплексному и рациональному использованию овечьей шерсти в других отраслях экономики.