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Modern Approaches to Improving the Functional Properties of Canvas Fabrics

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Abstract: in this article, the research work was carried out in the enterprises of the cluster system of "ZAMIN ANGOR CLUSTER" LLC and "DENOV TEXTILE CLUSTER" LLC in Surkhandarya region. For him, the degree of contamination of the fiber of the seed obtained from promising selection varieties Surkhan-9, Surkhan-101, Termez-49, Termez-208 and Surkhan-102 grown in some farms of Denov and Shorchi districts was studied in the laboratory of the Department of "Textile materials Science".

Keywords: bruised or damaged seeds, half-seeded seeds, discolored seed kernel, seed chalaza, side and micropyle parts, mechanical damage of seed, hairiness, residual hairiness, seed coat migration with fiber, number of cracked seeds.

The history of tarpaulin fabric goes back to ancient times. Archaeological finds indicate the existence of materials similar to tarpaulin as early as the 3rd millennium BC. These primitive analogues, made from roughly processed plant fibers, were used primarily to create strong ropes and simple woven fabrics needed for construction and household needs. With the development of navigation, starting with the era of the sailing fleet, tarpaulin became widespread in shipbuilding, becoming an indispensable material for making sails for caravels, frigates and other sea vessels. The high strength and water resistance of tarpaulin were decisive factors in ensuring the safety and efficiency of sea voyages. Historically, the quality of sails directly affected the fate of expeditions, and therefore the physical, mechanical and operational properties of the material were of particular importance. In addition to sails, tarpaulin was used to create awnings that protected cargo from bad weather, and various rigging elements. Today, despite the advent of modern synthetic materials, tarpaulin continues to be in demand. Its unique properties make it indispensable in a variety of areas. Firefighters and rescuers use tarpaulin to create temporary shelter, protection from fire and debris. Builders use it as a protective covering for materials and structures. Road services use tarpaulin to clean streets and protect equipment from bad weather. Tourists and summer residents value tarpaulin for its practicality and reliability when creating tents, awnings and other tourist accessories. Even in agriculture, tarpaulin is used: to create shelters for agricultural crops, protect crops from bad weather and create temporary structures. What is tarpaulin in terms of its structure and production? It is a dense, coarse fabric made from thick natural or blended yarn. Traditionally, flax, cotton, hemp and jute were used as raw materials. Linen provides high strength and durability, cotton provides softness and some elasticity, hemp provides high resistance to rotting, and jute provides availability and low cost, often being an additional component. Modern tarpaulin production also includes the use of synthetic fibers such as polyester or polypropylene, which are added to improve water resistance, strength, and resistance to UV radiation. The percentage of natural and synthetic fibers varies depending on the intended use of the tarpaulin. The tarpaulin production process includes several stages. First, the fibers are carefully cleaned and processed, then spun into strong threads. Plain weave is used to create the fabric - the simplest and most durable type of weave. The use of different types of threads, their thickness and weave density allows you to get a tarpaulin with different characteristics: from light and flexible to very dense and rigid. There are various GOSTs regulating the characteristics of tarpaulin depending on its purpose (for example, fire tarpaulin, tent tarpaulin, awning tarpaulin). To improve water-repellent properties, strength and resistance to external factors, the tarpaulin is impregnated with special compounds. These impregnations can make the tarpaulin fire-resistant, waterproof, antiseptic, protect against mold and mildew, and also increase resistance to UV radiation. The choice of impregnation depends on the area of use of the fabric. For example, fire tarpaulins are treated with fire retardants, while tent tarpaulins are treated with water-repellent and antiseptic agents. The quality of the impregnation directly affects the durability and functionality of the tarpaulin fabric. The main advantages of tarpaulins include: high tear and abrasion strength; good water resistance (depending on the impregnation); resistance to mechanical stress, such as twisting, bending and friction; durability; resistance to most chemicals; relative cheapness (compared to some modern materials); environmental safety (when using natural fibers without synthetic impregnations). However, tarpaulins, especially those based on natural fibers, are sensitive to aggressive chemicals and may shrink after washing.

Modern technologies make it possible to create tarpaulins from a variety of plant fibers, including jute, sisal, hemp, and cotton threads. Moreover, combining different fibers in different proportions is widely practiced to achieve optimal properties of the final product. The density of the canvas weave, measured in grams per square metre (g/m²), is also an important parameter, varying from 350 g/m² for lightweight fabrics to 900 g/m² and even more for heavy fabrics designed for extreme conditions. The evolution of tarpaulin production technologies is impressive. In the early stages of development, the main focus was on improving the spinning and weaving processes, finding the most efficient ways to interweave the fibers. Today, the emphasis has shifted to developing new fabric processing methods that would significantly improve its performance characteristics, expand the scope of application and increase the service life. The key stage in this process is the impregnation of the tarpaulin with various chemical compounds. Impregnation is a long process where rolls of fabric are immersed in special baths filled with impregnating solutions. Depending on the required properties, various chemicals are used: water-repellent compounds based on silicones, acrylates or polyurethanes; antiseptics that prevent the growth of mold and mildew; fire-retardant impregnations; impregnations that increase resistance to ultraviolet radiation. The impregnating solution can penetrate the fibers to different depths, affecting the final properties of the material. Modern technologies make it possible to create nanocoatings that provide high water resistance while maintaining some air permeability. However, despite the undeniable advantages of impregnation, it also has a number of disadvantages that must be taken into account. One of the most common is a decrease in air permeability. Many impregnations, while providing water resistance, simultaneously create a "greenhouse effect", preventing the natural evaporation of moisture. This can lead to the accumulation of condensation inside the tarpaulin product, especially when used in high humidity conditions. In addition, the impregnation can change the color and texture of the fabric, giving it a shine or, conversely, a matte shade, which may be undesirable in some cases. Another significant drawback is the need for regular renewal of the impregnation. Over time, under the influence of ultraviolet radiation, precipitation and mechanical damage, the impregnation layer wears out, losing its protective properties. This requires re-treatment of the tarpaulin, which increases the overall costs of its operation. The cost of high-quality impregnations, especially specialized ones, can be quite high. Therefore, the choice of impregnation should be made taking into account the balance between price and the required properties. An important aspect is the environmental safety of the impregnation. Some chemical compounds can be toxic to the environment and pose a danger to human health. Therefore, research and development in the field of environmentally friendly impregnations based on natural components are becoming increasingly relevant. For example, waxes, oils and plant extracts are used that have water-repellent properties, but do not harm the environment. Applying the impregnation also requires certain skills and equipment. To obtain a uniform and high-quality coating, special impregnation machines are required to ensure uniform distribution of the solution over the entire surface of the fabric. Uneven application can lead to a decrease in the efficiency of the impregnation in certain areas.

To solve problems related to improving the performance characteristics of tarpaulins and other textile materials, scientists from various fields, including: materials science, chemistry, nanotechnology, have worked and continue to work.

In 1980, in his work [1], Ivanov A.I. described in detail the processes of tarpaulin production. At that time, tarpaulins were made mainly from natural fibers, most often from cotton. However, with the development of technology, synthetic materials began to be used in production, which significantly increased the physical and mechanical strength and water-repellent properties of tarpaulins. By the 1990s, such materials were widely used in heavy industry, construction and the army. Works of Nefedov N.P. [2] and Orlov S.A. [3] showed that the new types of tarpaulin were suitable not only for shelters and construction, but also for use in extreme conditions.

In the early 2000s, there was a breakthrough in the use of polymer coatings. Walter Fang and Mike Hardcastle [4] analyzed methods that significantly improved the water-repellent properties of tarpaulins. The use of polymers improved the material's resistance to external influences and increased its service life. In 2005, V.P. Gusev described [5] the transition from traditional tarpaulin production methods to innovative technologies. The main focus was on improving characteristics such as strength, water repellency, and fire resistance, which became possible thanks to synthetic materials and chemical coatings. In the 2010s-2020s, A.D. Tillyaev was actively engaged in research in the field of water-repellent tarpaulins. He developed new polymer materials and composites based on them that improved the strength, waterproofing, and air permeability of tarpaulins. In his works [6,7] A. Tillyaev also paid attention to the environmental safety of materials, striving to create tarpaulins and technologies for their production that do not harm the environment. This made it possible to improve the quality of tarpaulins and extend their service life. The studies of Zhumanov A.T. [8] and Nazarov K.R. [9] confirmed that chemical treatment can significantly improve the water-repellent and fire-resistant properties of tarpaulins. Today, tarpaulin production technologies have reached a high level of development. In addition to polymers and nanomaterials, much attention is paid to the use of environmentally friendly materials and technologies. This not only meets the needs of industry, but also contributes to environmental protection.

In conclusion, it should be noted that the production and processing of tarpaulins is a complex process that requires taking into account many factors, from the choice of raw materials to the choice of impregnation and the technology for its application. Modern technologies make it possible to create tarpaulins with unique characteristics adapted to specific operating conditions. However, it is necessary to constantly seek a compromise between the required characteristics, cost and environmental safety. Continuous research in this field aims to create more durable, strong, environmentally friendly and multifunctional tarpaulins that can meet the growing needs of various industries and everyday life.

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