



# A COMPARATIVE ANALYSIS OF FLAX FIBRE FOR INDUSTRIAL APPLICATIONS

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**Abstract:** This article provides an in-depth evaluation of a newly developed linen fabric used in shirt production. The analysis covers its distinctive properties, focusing on the material's strengths and potential drawbacks. Furthermore, the article delves into the manufacturing processes involved, assesses the environmental sustainability of the fabric, and discusses its potential market prospects, including emerging trends and consumer demand.

**Keywords:** linen, fibre, design, assortment, comfortable, durable, textile, material, clothing.

## **Introduction**

The assortment of sodas is very diverse. Our industry produces more than 4,000 articles of linen, wool, silk and thread fabrics. Almost all textile materials consist of textile fibres. The available range of soda is constantly changing. The production of out-of-fashion, out-of-consumer sodas will be discontinued. The product range is updated due to the creation of new fabrics in terms of fibre composition, structure, finish and properties.

Due to the fact that the dress is a multi-layered system, requirements should be set for all materials included in the product package: upper part, lining, and finishing work. The requirements for materials for different types of clothing will not be the same. It depends more on its importance, conditions of use of the dress and other factors.

## **Materials and methods**

The breathability of textile materials is very important when evaluating clothes from a hygienic point of view because it determines the ventilation of the air under the clothes and, to a large extent, the heat protection properties of the material.

**Linen.** The process of making linen for hot days takes a lot of time, but the result is worth it. This natural material cools in the heat and retains heat for cool weather. Zeren fibre is resistant to microbial damage and has antibacterial properties. The lightness of linen products is the norm. Usually, not only dresses but also summer jackets are made of linen fabric. Such a set is suitable for any situation, including the office. Linen fabric - Usually used to make casual clothes and work clothes. Its advantages are high strength, moisture absorption, thermal conductivity and air permeability. The appearance of this fabric is tough. It is a natural tissue of plant sources. Depending on the type of weaving, linen fibre is thick and thin, so it is widely used. Special demand is used for textile jackets, skirts, trousers, dresses, shirts and blouses. Clothes shrink when washed in hot water.

Linen threads are almost 2 times stronger than cotton and 3 times stronger than wool. It is hygroscopic - not only absorbs moisture but also "removes heat", providing excellent health, especially in hot and humid climates. Water evaporates from it at almost the same rate as the surface of the reservoir, as a result of which the linen is always fresh and cool. Flax does not cause allergies and delays the development of bacteria. Silica in linen protects it from decay. It is not for nothing that the Egyptian



priests wore clothes made of linen, a symbol of purity, light and devotion, and the mummies of the Egyptian pharaohs, wrapped in the best linen with incredible strength, have been preserved to this day. Linen is the most valuable, having truly unique hygienic properties, such as high breathability and the ability to remove heat and moisture [1]. Flax is good for residents of both southern and northern regions. In hot weather, the skin temperature of a person in linen clothes is 3-4 degrees lower than in clothes made of cotton or silk fabrics (not to mention synthetics). Features of linen fabrics: smoothness, medium hardness, ability to absorb drops of moisture from the surface in contact with it, minimal electrification, and low viscosity, its skin creates a pleasant feeling in a person when it comes into contact with linen fabric. Sufficient air permeability, hygroscopicity and moisture capacity ensure rapid removal of heat and moisture from the human body. The presence of even a small amount of flax fibre (up to 10%) completely eliminates the electrification of the fabric. Therefore, linen-blended fabrics are very popular now. Scientists have proven that the use of linen can prevent several diseases because linen has rare bacteriological properties - it contains neither bacteria nor fungi. This completely clean ecological fabric is a natural antiseptic [6]. Linen kills microbes, and infections, suppresses harmful microflora, and wounds under linen bandages heal faster. Flax contains silica that inhibits the growth of bacteria. Now, flax is the only plant material used in surgery for internal sutures: without rejecting it, our body accepts it and gradually dissolves it completely. Linen made of linen is the only correct one in all respects, especially for children. By the way, since ancient times there has been a tradition of receiving a newborn baby in linen clothes - as a guarantee of the baby's future health. Research conducted by the Ministry of Health of the Republic of Belarus has shown that the high hygiene, durability, and comfort of linen products help to activate blood circulation, stimulate the body, and reduce fatigue. Doctors believe that flax helps reduce colds. Recently, scientists conducted a very interesting experiment. As a result of comparative studies, it was found that sleeping on linen sheets helps to increase the amount of immunoglobulin A in the blood, which restores the immune system. As a result, a person feels more refreshed and healthier. Synthetics and cotton do not have this effect. Recent studies have shown that linen clothing reduces the level of radiation several times, reduces gamma radiation by half and protects against chemically aggressive environments. In addition, it turned out that linen can partially turn off electromagnetic waves, and radiation of household and industrial equipment. A linen shirt becomes almost a uniform for those who sit at the computer. For people prone to skin diseases and various allergies, bronchial asthma, rhinitis, dyes, bleaching agents, antistatic agents, artificial fibres and simply woollen fabrics are contraindicated; nothing can be compared to linen. Linen does not clog pores, provides better ventilation of the skin, and activates blood circulation. Scientists have proven that everything, every material has its own energy. Linen probably has the strongest energy of all materials. It evokes a sense of calm concentration, thoughtfulness and measure in a person. Psychotherapists are sure that flax fibres protect a person from depression, neurosis and mental illnesses. Therefore, flax is relevant now, in a period of constant stress. By the way, linen thread is an excellent filtering material that saves not only from chemically aggressive environments, noise, dust, and radiation but also from mental irritants.

There are the following flax fibre raw materials: straw-picked and dried stalks (these are without spikes), tresta - stalks (these are removed (restored) to separate the fibre connections from each other); lub - the part from which the stem is separated [2].

Flax is a long-fibre flax plant, from which fibre is obtained that is distinguished by its hardness and strength, and its ability to withstand heat and moisture. It is a crop typical of the moderate climate region with high air humidity. The flax plant (Fig. 1) is one of the most important fibres obtained from the plant stem (root).



**Figure 1: Flax seed and plant**

It is grown mainly for its seed and fibre. Flax is also grown in Turkey. However, its quality is low. The lustre of French linen is as famous as the whiteness of Irish linen. It is an annual plant. Wet and cold climates are resistant to sandy and deep soils.



**Figure 2. Flax harvest**

Flax is planted in spring and autumn. Its height is up to 1-2 m. It ripens between June and August, depending on the climate. Ripe flax is plucked from the ground by hand without reaping (Figure 2) [3].

#### **Flax stalk rotting**

Flax fibres are first decomposed to separate them from other tissues. The composting process is carried out in three different ways. These are composting with water and chemical composting.

##### ➤ **Rotting in damp air**

In places with high humidity, flax stalks are placed in meadows and left in humid air.

Decomposition of flax stalks occurs with the help of microorganisms. Microorganisms multiply under the influence of moisture, during this multiplication, wood fibres dissolve the pectin substance, bind it to the cells, and the fibres separate.

This process was completed in 1-1.5 months.



**Figure 3: Degradation of flax fibres from wood**



**Figure 4. Combed and bonded linen**

It is combed to separate the long and short fibres and smooth the fibres. Then the fibre is collected. The collected fibre is bound and then marketed [4].

Usually used in summer outerwear to keep the cold out. Shirts, jackets, pants, etc. in home textiles; it is used in dishes, decorations, bedding, etc. (Fig. 4) It is also used as a fibre in waterworks, rope making and quality paper production.

Flaxseed contains 40-45% oil, so oil is extracted. Known as linseed oil, this oil is used in dyeing. The waste from the oilseeds is used as animal feed.



**Figure 5. Materials of a new assortment of linen fibres**

Flax fibres are obtained from the flax plant and their main properties are as follows [5].

1. Characteristics: Flax fibres are very strong, soft and elastic. They absorb liquids well and dry quickly.
2. Benefits: Flax fibres are used in many fields, including textiles (fabrics, yarns), furniture production, medicine (medicines, wound dressings) and environmental products.
3. Environmental Aspects: Flax is considered environmentally friendly as it requires less fertilizers and pesticides and helps in improving the soil.
4. Health benefits: Flax fibre contains omega-3 fatty acids, lignans, and fibre, which make it useful for a healthy diet.

The unique properties and benefits of flax fibres make them widely used in various fields.

### Conclusion

In conclusion, this fabric is recommended for use as a shirt lining due to its remarkable combination of strength, breathability, and high hydrophobicity, which make it both durable and comfortable. Its ability to wick away moisture while allowing airflow ensures that garments made with this material are suitable for various climates, enhancing wearer comfort. Additionally, its strength and resilience make it ideal for long-lasting usage in clothing and other textile applications. Beyond fashion, the material's versatility extends to bedding and a variety of household items, where its durability and comfort contribute to its appeal. Given these characteristics, this fabric holds considerable promise for both the fashion industry and household textile markets, particularly for consumers seeking high-performance, eco-friendly materials.

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