Innovation of Knit Fabric from Hemp Fiber Blended with Filagen Fiber

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Abstract

This research aims to study the development and innovation of knit fabric made from hemp fiber blended with Filagen fiber, which is a material with potential applications in the textile industry. The main objective is to investigate and develop the production process of knit fabric from these two materials, as well as to evaluate the physical properties of the resulting fabric, such as strength, elasticity, and durability. Additionally, the study explores the design approaches for various products, such as clothing and fashion lifestyle products, along with the environmental impact assessment of the knit fabric production process. The research findings reveal that blending hemp fiber with Filagen fiber enhances the fabric's strength and durability, making it suitable for use in fashion products that require high flexibility and resilience. This study is significant in promoting the use of natural materials in the development of the textile industry while also reducing the environmental impact of synthetic material production.

Keywords: Knit fabric, Hemp, Filagen, fiber, Innovation

1. Introduction

The development of a self-reliant, resilient community and sustainable progress through research outcomes and innovations in accordance with the 20-year National Strategic Plan, aiming to create a connection in the integration of technology with indigenous knowledge, culture, identity, and integrated spatial areas, both in terms of spatial issues and project-based approaches. This results in benefits in four key areas: academic, community, social, policy, and commercial. The research findings and knowledge can be practically applied, generating maximum benefits to communities, society, and the nation. The above strategy drives the development and learning of the roots of Thai wisdom in various fields, combining knowledge and technology. This includes the use of natural fibers in weaving processes to create fabrics that can be used in a variety of applications, in both handicrafts and the textile industry, contributing to the development at all levels and ensuring the sustainable growth of the Thai textile industry.

Currently, the Thai textile industry is facing challenges in producing materials that are both of high quality and environmentally friendly. This is because the production of synthetic fibers, which are commonly used today, has negative environmental impacts, such as high energy consumption and the release of toxic substances during the manufacturing process.

Additionally, these fibers are non-biodegradable, leading to a growing demand for the development and use of natural materials that can replace synthetic ones. (Pornmutawarong, T and Samleethong, S, 2022)

Hemp fiber is another type of natural fiber that is both interesting and derived from the hemp plant. It is characterized by long and strong fibers and is considered one of the natural materials with outstanding properties, widely used across various industries. This is due to its unique characteristics, such as durability, strength, and flexibility. Additionally, hemp fiber is an environmentally friendly material because hemp plants can grow well without the need for chemicals or pesticides, and the cultivation process does not damage the soil. Furthermore, hemp can absorb carbon dioxide from the air during its growth, making it a plant that helps reduce greenhouse gas emissions. The use of hemp fibers in the textile industry has gained increasing attention in recent years due to its ability to provide a sustainable natural material that reduces the environmental impact of producing synthetic fibers, which release toxins and are difficult to decompose (Sampath, V, 2017).

Filagen fiber is an environmentally friendly type of fiber with desirable properties. It is soft and moisturizing to the touch, helping to prevent the skin from becoming dry or rough. In addition to its fabric properties, Filagen can also help retain skin moisture, provide a cooling effect when worn, and eliminate unpleasant odors from the fabric. This makes it highly beneficial for individuals who sweat easily. Filagen is considered a relatively new innovation and is gradually gaining recognition in society. In the textile and apparel industry, Filagen fibers have been tested and applied in the production of a variety of products, such as bed sheets, pillowcases, sportswear, fashion clothing, and underwear. Therefore, the use of both hemp fiber and Filagen fiber, which are natural materials with interesting properties, is becoming more prevalent in the textile industry. Hemp fibers are strong and durable, while Filagen is an innovative fiber that has been developed to enhance softness, flexibility, and durability. The combination of both fibers can provide enhanced properties, making them suitable for the development of knitted fabrics that can be used in various products, such as clothing and lifestyle fashion products. These materials meet the demand for both physical properties and sustainability. (MenDetails' Editor, 2022)

In addition, budget for uniform management operations is a crucial to consider the first factor. Because there is a glaring issue with fabric and material procurement and suitable. (Supawadee Juysukha et al., 2023)
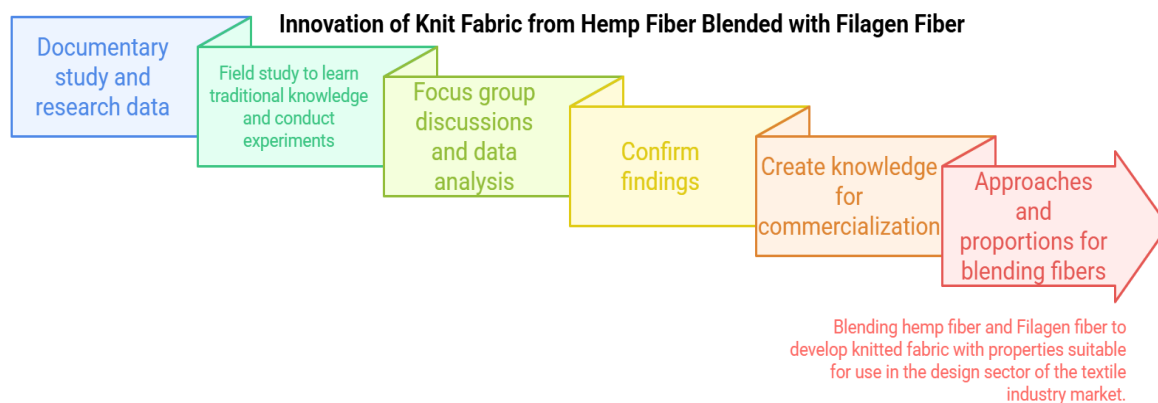
This research is therefore important for studying the combination of hemp and Filagen fibers to develop knitted fabrics with properties suitable for use in the textile industry. It also helps reduce the environmental impact of producing synthetic materials, thus responding to innovation in the textile industry and supporting the use of sustainable natural materials.

1.1 Research Objective

Study the approach to producing innovative knitted fabrics made from a blend of hemp fiber and Filagen fiber (Filagen) to enhance the efficiency of production and the properties of the knitted fabric, making it suitable for use and environmentally friendly.

1.2 Research Framework

Figure 1: Research Framework

Innovation of Knit Fabric from Hemp Fiber Blended with Filagen Fiber

Documentary study and research data → Field study to learn traditional knowledge and conduct experiments → Focus group discussions and data analysis → Confirm findings → Create knowledge for commercialization → Approaches and proportions for blending fibers

Blending hemp fiber and Filagen fiber to develop knitted fabric with properties suitable for use in the design sector of the textile industry market.

2. Body of paper

2.1 Method

This research aims to study the blending of hemp fiber (Hemp Fiber) and Filagen fiber (Filagen Fiber) to develop knitted fabrics with properties suitable for use in the textile industry, particularly to enhance durability, softness, and sustainability in the production of fabrics for various products such as clothing and lifestyle fashion items. This research will employ an experimental research method to examine the effects of blending both types of fibers and test the physical properties of the knitted fabric produced.

2.1.1 Research Design

This research will use an experimental research design, where the blending of hemp fiber and Filagen fiber will be tested in different ratios. These include Ratio 1: 50% hemp fiber and 50% Filagen fiber, and Ratio 2: 70% hemp fiber and 30% Filagen fiber. The knitted fabric will then be produced from these fiber blends to test the physical properties relevant to their use in the textile industry.
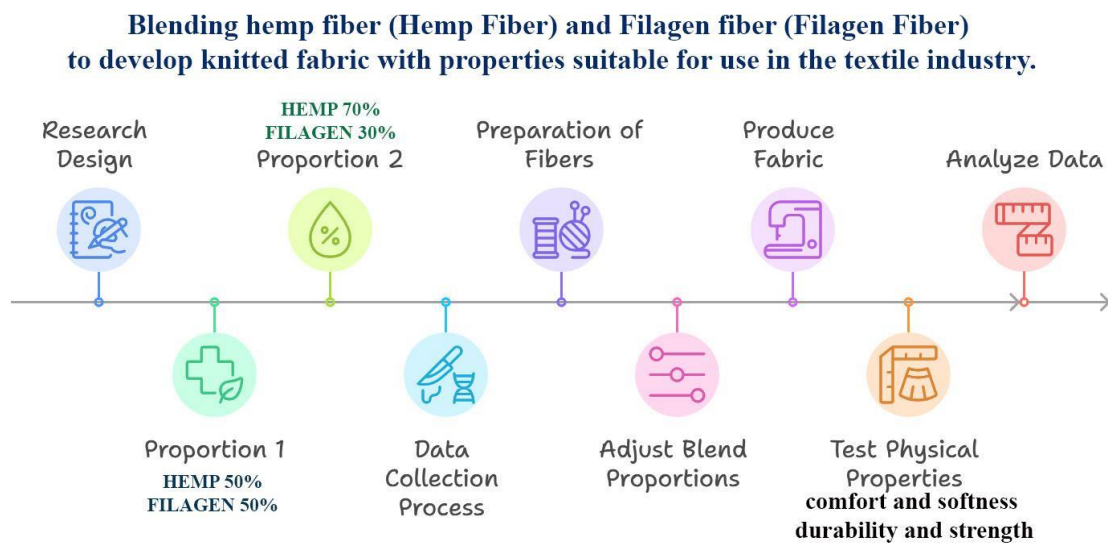
2.1.2 Data Collection Process

The data collection process will begin with the preparation of hemp fiber and Filagen fiber by adjusting the blending ratios. Then, machinery will be used to produce the knitted fabric. The testing will involve physical observations of the properties of each fabric sample after production, such as testing the softness and comfort of the fabric through real-world use and its durability from washing. Additionally, the environmental impact of using these natural materials will be assessed through an analysis of the production process.

2.1.3 Data Analysis

The data obtained from testing the various properties of the produced fabrics will be analyzed. The properties of the fabrics made from different blending ratios of the two fibers will be compared to determine the most suitable fabric ratio for initial production.

*Figure 2: Process of Development and Testing of Research*

**Blending hemp fiber (Hemp Fiber) and Filagen fiber (Filagen Fiber)
to develop knitted fabric with properties suitable for use in the textile industry.**

Research Design

HEMP 70%
FILAGEN 30%
Proportion 2

Preparation of Fibers

Produce Fabric

Analyze Data

Proportion 1
HEMP 50%
FILAGEN 50%

Data Collection Process

Adjust Blend Proportions

Test Physical Properties
comfort and softness
durability and strength

2.2 Results

### 2.2.1 Preparation Steps and Method of Fabric Knitting

The fabric knitting process in the industrial system is a complex procedure that involves the use of various technologies to produce high-quality fabric that meets the desired specifications for its intended use. This process consists of several steps, from material preparation to the production of the finished knitted fabric. The following are the main steps in the fabric knitting process in the industrial system:

Figure 3: Hemp Knitting Fabric Production
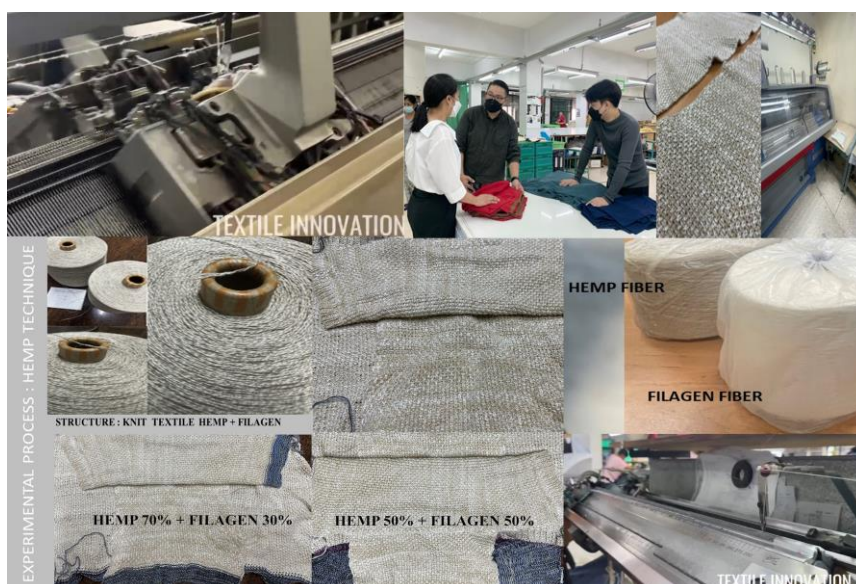
2.3 Result

Figure 4: Prototype Development and Preliminary Knitting Fabric Properties Testing
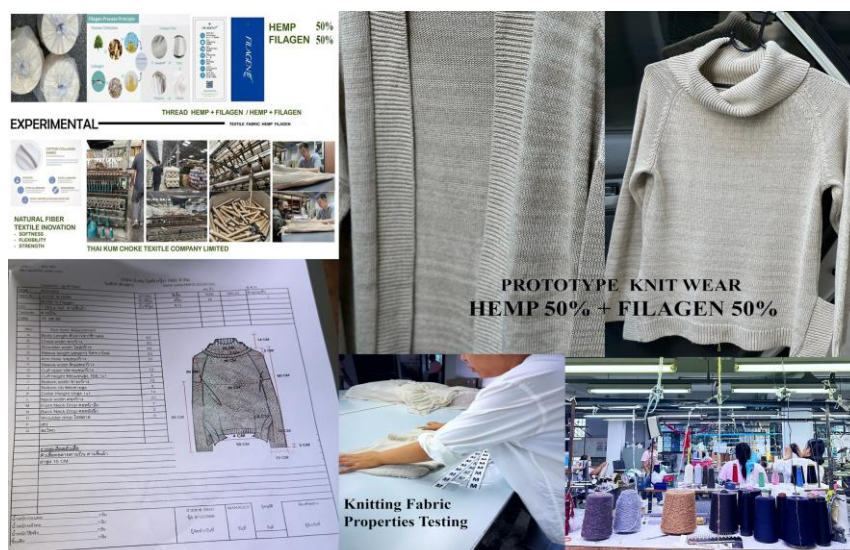
The results of this research are significant in the development of knitted fabrics blended with hemp fiber and filagen fiber for use in the textile industry, particularly in terms of durability, comfort, and sustainability. The findings highlight the key properties of the fabric produced from the blend of these two fibers in various ratios as follows:

2.3.1 Physical Properties of the Fabric   From the experiment blending hemp fiber and filagen fiber in different ratios—Ratio 1: 50% hemp fiber and 50% filagen fiber, and Ratio 2: 70% hemp fiber and 30% filagen fiber—the results of the physical property tests on the knitted fabrics showed the following differences in key characteristics:

- Softness and Comfort Test: The fabric produced from the blend with Ratio 1 (50% hemp fiber and 50% filagen fiber) was found to be the softest and most comfortable to the touch. This blend is particularly suitable for applications requiring comfort, such as clothing and lifestyle fashion products. Real-world usage testing showed that this fabric provided greater comfort compared to the fabric made from Ratio 2 (70% hemp fiber and 30% filagen fiber), which, although stronger, did not provide the same level of softness and comfort.

- Durability Test: In terms of durability, the fabric from Ratio 1 (50% hemp fiber and 50% filagen fiber) demonstrated high strength and durability. It was able to withstand multiple washing cycles without showing signs of shrinkage or deformation, which is a crucial quality in textile manufacturing. Furthermore, tests on colorfastness and fabric integrity revealed that the blended fabric maintained its shape and durability even after frequent washing.

2.3.2 Environmental Impact Test   The research also assessed the environmental impact of natural fibers, particularly the use of natural materials such as hemp fiber, which has a lower environmental impact compared to synthetic materials in the textile industry. The study found that the use of hemp fiber in knitted fabric production resulted in lower greenhouse gas emissions and is biodegradable, making it an environmentally friendly option. This supports

the use of natural materials for sustainable production and environmentally responsible manufacturing.

2.3.3 Comparison of Fabric Properties in Different Ratios From the experiment with both ratios, it was found that:

• **Ratio 1 (50% hemp fiber and 50% filagen fiber)**: The test results indicated that the fabric produced from this ratio displayed balanced properties in all aspects, including softness and comfort to the touch, durability against washing, and sustainability in fabric production. This type of fabric is considered more suitable for textile industry applications as it offers a good overall performance.

• **Ratio 2 (70% hemp fiber and 30% filagen fiber)**: Although the fabric produced from this ratio showed high strength and durability, it had lower softness and comfort to the touch compared to the fabric from Ratio 1. Therefore, while it offers superior durability, it is less suitable in terms of comfort

2.4 Discussion

The results of this research can be applied to the development and production of knitted fabrics with properties suitable for use in the textile industry. The findings suggest that the blend of both fibers in appropriate ratios can be considered based on the specific application, such as for garments requiring softness and comfort, or products that demand high durability. Additionally, further experimentation with other fiber blend ratios or the study of other fiber types with similar properties and environmental benefits can be explored. This will help increase the diversity of applications and advance the development of efficient, environmentally-friendly production technologies.

Tuenta Pornmutawarong and Siratcha Samleethong, 2022, who studied the guidelines for developing woven fabric dyed with natural dyes from all community cultures to enhance income and self-reliance of Kiri Wongkot Village in Udon Thani, Suan Sunandha Rajabhat University, discussed an issue consistent with the development of textiles and environmentally friendly natural dyeing. As a result, the researchers applied this approach to further develop the research by selecting natural fibers with minimal environmental impact, namely hemp fiber and filagen fiber. They focused on the properties and functionality of the

3. Conclusion

This research can be concluded that the blend of hemp fiber and filagen fiber in Ratio 1 (50% hemp fiber and 50% filagen fiber) is the most suitable and has a positive impact on the physical properties of the resulting fabric, particularly in terms of softness and durability. Additionally, this blend promotes sustainability in textile production by using natural materials that have a low environmental impact. These results will contribute to the development of consumer- and environmentally-friendly products in the textile industry, supporting sustainable practices in the long term.

fibers, ensuring that they met the needs of consumers who seek products that are sustainable and do not harm the environment.

4. Acknowledgment

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