



REFLECTIONS OF ECOLOGICAL TEXTILES (GREEN TEXTILE) ON CLOTHING DESIGNS

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Abstract: *With the understanding of the effects of the natural thing on the environment and human health, the importance given to ecological products by manufacturers and end-users has increased. While fashion designs vary depending on time and place, affected by the cultural environment, social behaviors, and economy. Today's fashion designers try to use raw materials that are organic and/or can be recycled in works. Reasons such as low water and energy consumption and no use of chemicals during production have intensified research on nettle fiber and fabrics. Its most important features are that it has a feeling of coolness, irons quickly, and does not cause allergic conditions in contact with the skin thanks to its natural antibacterial properties. The use of chemicals is prohibited in the production of organic cotton, so clothes made of organic cotton are less likely to cause allergies. This women's capsule collection study which focuses on sustainable design approaches presents life-cycle processes. Hand-knitted details from hand-spun nettle yarn are used, the main fabric content is organic cotton and nettle fiber, and organic buttons used as accessories are obtained from coconut shells.*

Key words: *Nettle fiber, organic cotton, sustainability, fashion design*

1. INTRODUCTION

Sustainability is a systemic concept related to the continuity of the economic, social, institutional, and environmental aspects of human society. Sustainability aims to be a means of structuring civilization and human activities to protect biodiversity on the one hand and to meet the needs of society and the economy on the other. Sustainability, the ability to sustain these ideals indefinitely, affects every level of the organization, from the local environment to the entire planet [1]. Directly or indirectly, we must take care of our environment if we want to live in prosperity; this is the simplest principle of Sustainability [2]. Sustainability is making it possible for us to have water, energy resources, and materials both today and in the future to protect human health and the environment.

2. SUSTAINABILITY COMPONENTS

For sustainability to be realized, it must be in balance by providing three main elements, namely environmental, social/ethical, and economic [3].

Environmental Sustainability is the realization of human activities with the economic use of soil, air, and water resources in the world. It is the fact that people take care of the needs of nature while meeting their own needs [4]. Social Sustainability, which is the need to protect the integrity of society, can also be defined as the ability to work for the common goals of social values, relationships, and identities [5]. Efforts to reuse natural resources with depletion potential in alternative ways are within the scope of Economic Sustainability, which deals with the justice between human-human and human-nature [6].

3. LIFE CYCLE PROCESSES FOR A TEXTILE PRODUCT

The “Product Lifecycle” is a process that refers to the successive and interconnected multifactorial stages of a product or service system, from its extraction from its natural resources to its final destruction.

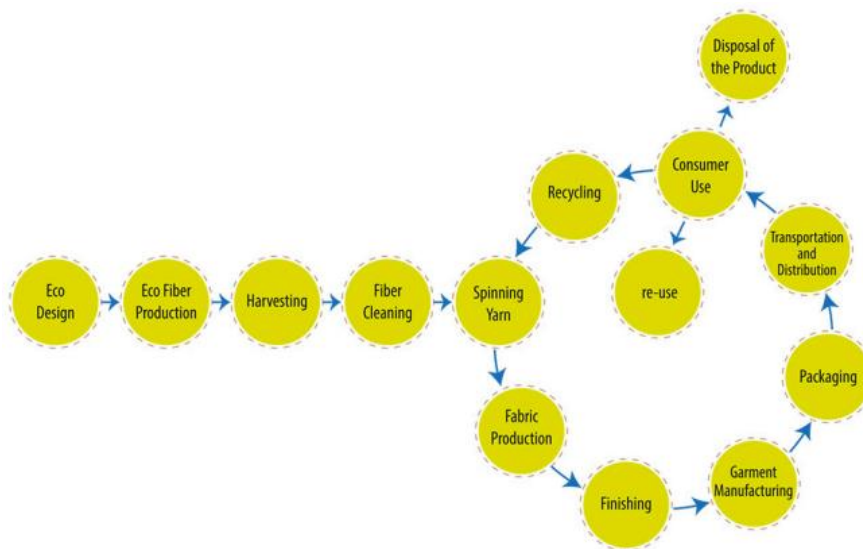


Fig. 1: Life cycle processes for a textile product [7]

4.1. NETTLE FIBER

In our age when ecological textiles are prominent, the Stinging Nettle, which is widely grown in the geography of Turkey and the highest quality ones are grown in the Black Sea Region, is an important plant that can set an example for natural fibers.

4.1.1. Structure

Its family is Nettles, known as Urticaceae in Latin; there are 48 genera and 1050 species known [8]. Three types of Stinging Nettle can be mentioned, which spread in the Anatolian geography and can be used as a textile fiber; these are the annual *Urtica urens*, *Urtica pilulifera*, and the perennial *Urtica dioica* [9].



Fig. 2: Female (a) and Male (b) flowering stinging nettle (*U. dioica*) [9]



Fig. 3: General view of plants *Urtica dioica* (a), *Urtica urens* (b) and *Urtica pilulifera* (c) [9]

Nettle fibers are cellulose-based, fibers obtained from plant stems such as jute and ramie, namely bast fibers. It is difficult to distinguish bast fibers such as flax, nettle, hemp, jute, and ramie, but easy to distinguish from fibers such as wool, silk, and cotton. To distinguish the bast fibers from each other, the "method of detecting calcium oxalate crystals under polarized light microscope" found by Holst and Bergfjord in 2010 is the most advantageous [10].

4.1.2. General Features

Due to its morphological structure and varying length, it does not have a mechanized production. Cutting and sliding tools, which are also used in the harvest of hemp, are used in the harvest of Stinging Nettle. For these reasons, its production is technically difficult and costly. Its strength is strong due to the high fiber content it contains. It is a natural insulation material due to the gaps in its fiber structure [10]. It has natural antibacterial properties like bamboo. It is protective against ultraviolet rays. It is sensitive to heat and can be ironed quickly [8].

The comparison of nettle fibers with vegetable fibers such as flax, hemp, ramie, jute, and cotton, and animal fibers such as wool, in terms of some physical parameters, are as follows:

Thickness: Thicker than Linen and Jute, thinner than Ramie

Tensile Strength: Stronger than Hemp, more brittle than Flax and Ramie

Elongation: More than Flax, Hemp, and Ramie

Roughness (Irritation in contact with the skin): It has a softer texture than Hemp and Ramie, but it is more needle-like than Linen

Moisture Conductivity: Better than Wool, Cotton, Hemp, Linen, and Ramie

Evaporation of Water: Same as Flax and Hemp, lower than Wool and Ramie [10].

4.1.3. Usage Areas

Stinging Nettle is a natural plant used in the treatment of many diseases such as diabetes, kidney, and intestinal disorders, hair diseases, and rheumatism.

The fibers obtained from the stems of the plant are used in textiles; the remaining parts are used in industries such as pharmaceuticals, cosmetics, and food. Summer clothes are produced by twisting the fibers of Stinging Nettle, which is used as an insulation material, and winter clothes are produced by preserving their natural structure without twisting the fibers.

The roots of Stinging Nettle are used as a natural dye; yellow and green colors are obtained. Green-colored commercial dye known as E140 is obtained from chlorophyll extraction [10].

4.1.4. Methods of Obtaining Fiber From Stinging Nettle

I. Harvest: The best time is in the third year, but it can also be done around August of the second year. Side sprouting is undesirable, this does not affect the fiber quality, but it prolongs the processing time as it will require sorting. *II. Softening & Rotting: Using "water" (the process takes about 1 month, the stems of the plant are used), Using "Rain or Dew" (the most superior method in terms of the color of the fiber obtained, the processing time is about 2 months, the stems and herbs

are used together), Using “Chemicals” (high cost requires, it is the shortest method, but it is also the method most damaging to the fiber, the stems of the plant are used). *III. Glue Removal: Physical and chemical processes are carried out together; they are boiled in water, treated with acid, and washed in the water again, the gum is removed by using the pectin enzyme, and the enzyme is removed by washing with water, the gum is removed by using a chemical containing sodium hydroxide and sodium silicate and it is cleaned from residues by washing again, The fibers are mixed by pounding and combed. *IV. Crushing and Cleaning *V. Scanning: Centrifugation, bleaching, and lubrication processes are carried out. *VI. Spinning [10].



Fig. 4: Raw, shelled nettle fiber (a), Raw, processed nettle fiber (b) [12]

4.2. ORGANIC COTTON

No chemicals are used in the production of organic cotton, only natural fertilizers and natural medicines are used, so clothes made of organic cotton are less likely to cause diseases such as allergies. Organic cotton is the right choice in terms of health as well as the environment. Clothes that use organic cotton in their production are more flexible and much softer than those made from regular cotton [11].



Fig. 5: Organic Cotton [12]

5. FIGURES AND TABLES WOMEN'S CLOTHING DESIGNS FROM FABRICS MADE FROM NETTLE AND ORGANIC COTTON FIBER

Clothing design; It is a disciplined phenomenon that aims to meet people's need for dressing and that occurs with the interaction of elements such as technology and art. From the drawing of a garment to its sewing, it is a process work done by considering fashion trends and user requests [13].



Fig. 6: Design Process in 9 Simple Steps [14]

In this study, modular, seasonal, and timeless women's clothing was designed from fabrics made of organic cotton and nettle fiber. The product consists of 4 parts; each piece is removable. The main fabric consists of 93% organic cotton and 7% organic nettle fiber. 100% organic cotton was used as lining. Nettle yarn obtained from 100% nettle fiber was used as a garnish. Functionally used button details are made of organic coconut shell.

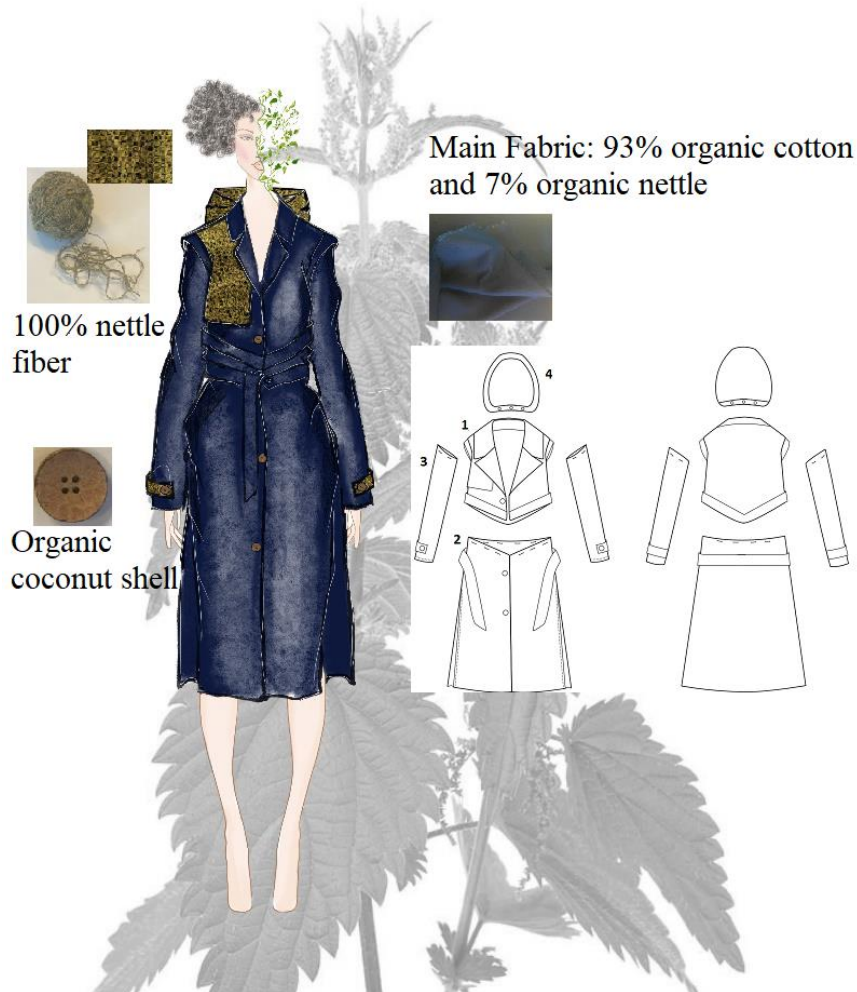


Fig. 7: Designed clothing silhouette forms

The first piece is a tailor-made collar cropped vest. Its closure is with a single button in the front center. There are organic buttons on the armhole and hem that allow the 3D pieces to be combined with the sleeves underneath. The collar on the left front is hand knitted from organic nettle. The second piece is the hem with slits on both sides. There is a belt made of its fabric at the waist. Its closure is with the front center button. The piece connects to the upper body with buttons to lengthen the jacket. The third piece is the arms. The vest turns into a jacket when it is combined with the arm sleeve in the body. There are hand-knitted belt details from organic nettle yarn at the ends of the sleeves. The piece sewn between the arms at one end is fastened with a button on the front. The 4th piece is a hand-knitted hoodie from organic nettle yarn. The piece can be attached and removed under the collar of the jacket with the help of buttons.



6. CONCLUSIONS

In the design of this product, whose starting point is sustainability, completely organic fabrics, yarns and accessories were used. It is aimed to reduce the need-based purchasing action with the option of adding or removing different parts according to the user. A removable hood detail has been added to the product, which is designed as a vest. With this modular design, which transforms into itself and offers various style alternatives, a seasonal and timeless women's clothing product is designed that adapts to different weather conditions and occasions. These functional ready to wear women's design using ecological textile materials; it is considered for the production of garments such as vests, coats and overcoats.

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