

THE STUDY OF CONSUMER PROPERTIES OF DUAL-LAYER WEFT KNITTED FABRIC USING ECO-RAW MATERIALS

Liudmyla Halavska¹, Oleksandra Batrak²

¹ Kyiv National University of Technologies and Design, Street Nemirovich-Danchenko, 2, Kyiv, Ukraine, 01011, e-mail: galavska.ly@knuvd.com.ua

² Kyiv National University of Technologies and Design, Street Nemirovich-Danchenko, 2, Kyiv, Ukraine, 01011, e-mail: sasha01021@gmail.com

Abstract: In today's world, more and more people pay attention to various aspects that can maintain and improve their health and quality of their life. So nowadays such interest in expanding the range of ecological knitwear for functional purposes produced using natural raw materials is increasing again.

The structure and the proposed fueling data to develop an integrated knitted fabric, which is due to the use for the formation of a one coat of dual-layer fabric with hemp and nettle yarn can be used as a functional textile material for the underwear manufacturing with therapeutic and preventive action, including underwear for wounded soldiers during their treatment and rehabilitation.

The designed structure is a two-layer fabric with the forged connections between layers in the main thread. In forging load canvas connectors are arranged in a checkerboard pattern. In the areas of connecting load the non-cross-cutting holes are formed. They provide ventilation and rapid water removal from under the clothes.

The studies determined the impact of eco-type materials in integrated layers of a dual-layer fabric to replace the linear dimensional jersey, relaxation characteristics, level of capillarity and fluid change level in time.

Keywords: eco-textiles, environmentally friendly knitwear, yarn, hemp, nettle, multifunctional knitwear.

1 INTRODUCTION

A variety of chemical composition, physical and mechanical properties provide knitted materials with pre-defined properties. In our laboratories were conducted a series of experiments to study the different physical and mechanical properties of knitted fabrics with natural yarns and changing of their properties when combined with modern, artificially produced components for creating multifunctional jersey.

Along with widely known types of natural materials like cotton and wool, the products from lesser-known, but still insufficiently studied types of environmentally friendly materials are getting more and more attention – such as yarn from eucalyptus, banana, coconut, soy, bamboo, corn, hemp and nettle. Such materials have positive preventative and sometimes even therapeutic effect on people, along with antibacterial and antiseptic properties. In terms of eco-tactile materials they don't irritate the skin and don't electrify.

2 MATERIAL

Hypoallergenic properties of mentioned yarn are achieved through plant material in the absence of toxic chemicals used to control weeds, pests and diseases of crops. The cost of growing hemp and nettle is relatively low and the therapeutic and environmental effects are very attractive.

Nowadays the products from hemp yarn are becoming common enough. Along with high consumer properties they are hypoallergenic and create temperature and energy balance, have antiseptic, wound healing and anti-allergic function. Due to the porous structure of hemp fiber retains heat better and absorbs moisture (giving body to breathe during the heat). Contact with the endocrine glands has a beneficial effect on the nervous and cardiovascular system. Hemp fiber can reflect

ultraviolet radiation. Medical scientists found out that the treatment of small wounds and scars with fibers from hemp accelerates healing processes three times faster. This is because hemp fiber maintains up to 20% of oil, which is an effective healing instrument [1].

Unfortunately hemp fiber is tough enough and isn't uniform in thickness. The large debris only compounds the situation. These factors are reduced by repeated yarn rewinding through waxing where it becomes more uniform. The moisturizing is needed to improve of hemp knitting yarn ability.

Along with this the little-known raw nettle also has effective medicinal properties. It is proved that nettle products help with many ailments: headaches and joint pain. Nettle products improve blood circulation, have a calming effect on the nervous system and beneficial effect on sleep to overall health and even the mood (give the light joy, feeling of peace and confidence appears), causing pleasant sensations. It helps to cope with depression, loss of strength and fatigue. Also positively affecting the acupressure points, that harmonizing the work of internal organs. It has a warming effect, thus contributing to the elimination of stagnant and inflammatory processes in the body. Therefore nettle zones and overlays are popular for quick relief from pain. Raw nettle is treated the same way as flax. Nettle yarn production technology is not complicated, but is very time consuming [2].

The abovementioned suggests the high hygiene properties of knitted fabrics made from hemp and nettle yarn. High-medical properties of eco-materials and hemp nettle determine the importance of further expansion of their use, including the production of underwear for therapeutic and preventive usage. Along with this equally important are changes in linear dimensions after washing, relaxation properties and capillarity.

3 EXPERIMENTAL

Despite all the positive features hemp and nettle fibers are very irregular in thickness and rather tough.

This exactly complicates the widespread use of these types of materials in the knitting industry. The large debris of materials makes it almost impossible to process hemp and nettle on knitting equipment. Though, these factors are reduced through repeated rewinding yarn on winding equipment. Also, moisturizing can improve the process. All of these points on the need for research of processing conditions to identify parameters that ensure the normal course of loop formation process.

The technology was developed to produce dual-layer fabric with forge-connected layers in main thread on double-bar knitting machine. As the raw material for one of two layers of fabric it is suggested to use hemp or nettle yarn that provides curative properties of knitted fabric.

To form another layer it is suggested using anti-allergenic polyester filament with high resolution capillary that provides elasticity, maintaining the shape and temperature control, and increases the final appeal of these products to consumers. In addition, this raw material is inert to the development of pathogenic organisms because of its hydrophobic abilities. It does not absorb odors and ensures easy removal of dirt during washing.

Graphic recording double-layer weave structure of dual-layer weft knitted fabric is presented in "Fig. 1".

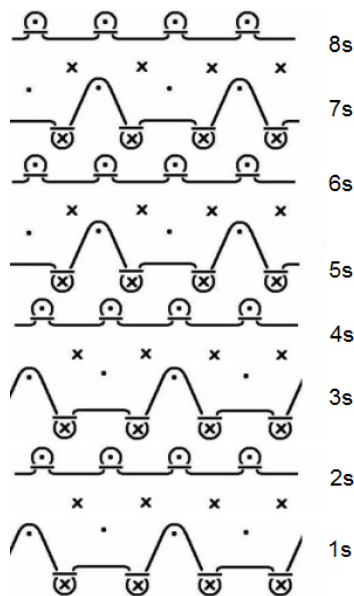


Figure 1 Graphic weave record

To produce samples it is suggested to use a 16th class double-bar knitting machine with interlock needles. To improve its ability the knitting hemp and nettle yarn materials need to be rewind three times. Yarn rewinding has eliminated debris and uneven thickness. Before knitting the yarn is moisturized in order to reduce bending rigidity.

Table 1 below shows the data for functional canvases.

Table 1 Filling data

Sample number	Filling data for loop forming systems
1	1, 3, 5, 7 s – Hemp yarn 25X2 tex
	2, 4, 6, 8 s – Polyester thread 16, tex
2	1, 3, 5, 7 s – Nettle yarn 31X2 tex
	2, 4, 6, 8 s – Polyester thread 16, tex

4 RESULTS

During the research were identified the effects of eco-type materials to replace the linear dimension samples of integrated knitted fabric, were determined relaxation characteristics. The results allow predicting the behavior of knitted fabric at operational loads. Research of capillarity makes it possible to determine the influence of eco-type materials at the level of capillarity prototypes and the nature of the changes in the fluid raising on functional layers of dual-layer knitted fabric.

5 REFERENCES

- [1] Halavska L., Batrak O.: The properties of weft knitted fabric medical and preventive treatment action using eco-raw materials. IOP Conference Series: Materials Science and Engineering, Vol. 141, No.1. – 012013., 2016. Access mode: <https://www.scopus.com/authid/detail.uri?authorId=57191413261>
- [2] Halavska L.: Research of double-layer bicomponent knit content of hemp yarn on the capillarity. ISSN 1813 – 6796, VISNYK KNUVD №5 (90), 2015.- pp.183-191. Access mode: <http://er.knutd.com.ua/handle/123456789/618>