

DEVELOPMENT TECHNOLOGY OF COTTON-SILK JACQUARD KNITTED FABRICS

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Abstract: *This article substantiates the technology for producing jacquard cotton-silk knitted fabrics, aimed at expanding the range of knitted products. Knitted fabrics from cotton and silk yarns with linear densities of 20 and 14.3 tex were produced and studied on a LONGXING 252 double-bed flat knitting machine.*

Keywords: *knitting fabric, technology, jacquard, structure, assortment.*

ТЕХНОЛОГИИ ПОЛУЧЕНИЯ ЖАККАРДОВЫХ ХЛОПКО ШЕЛКОВЫХ ТРИКОТАЖНЫХ ПОЛОТЕН

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Аннотация. *В данной статье обоснована технология производства жаккардовых хлопко-шелковых трикотажных полотен, направленная на расширение ассортимента трикотажных изделий. Образцы трикотажных полотен из хлопчатобумажной и шелковой пряжи линейной плотности 20 и 14,3 текс были выработаны и исследованы на плосковязальной машине LONGXING 252.*

Ключевые слова: *трикотажное полотно, технология, жаккард, структура, ассортимент.*

Introduction. The complexity of the pattern plays a significant role in the production of knitted garments. This is due to the specific requirements associated with the arrangement, cutting, assembly, and sewing of garment components [1,2].

All knitted patterns can be conventionally divided into three categories: simple, medium-complexity, and large-repeat patterns.

More than ten classifications of patterned knitted fabrics have been proposed in scientific studies. In this research, the technology of producing cotton-silk jacquard knitted fabrics manufactured by weft-knitting and warp-knitting methods is considered [3–5].

Products made from natural silk possess excellent consumer properties. However, it is impossible to fully satisfy the textile industry's demand for this raw material; therefore, the use of other natural fibers becomes necessary.

Despite the superior quality characteristics of silk, the production cost of silk products remains relatively high due to the complexity of the technological process. Traditionally, silk products have mainly been manufactured using woven fabric technologies.

At present, consumer requirements for textile products have increased considerably, creating new challenges for manufacturers and specialists in the industry. Taking these factors into account, scientific research is being conducted on the rational utilization of natural raw materials in the production of cotton-silk patterned knitted products, as well as on the improvement of equipment and technologies for manufacturing new types of knitted fabrics.

Method and Results. To address these issues, new structures and methods for producing cotton-silk jacquard knitted fabrics have been developed [6,7]. Variants of cotton-silk jacquard knitted fabrics were produced on a flat knitting machine. The samples were manufactured using cotton yarn with a linear density of $20 \text{ tex} \times 3$ and silk yarn with a linear density of $14.3 \text{ tex} \times 4$. The resulting cotton-silk jacquard knitted fabrics differ in raw material composition ratios and structural parameters.

The cotton-silk jacquard knitted fabrics were developed according to the following technological sequence.

In this knitting technology, the knitting needles located on the rear needle bed of the machine play an important role, as they also participate in the loop-forming process.

During the knitting of variant I cotton-silk jacquard fabric with longitudinal stripes, the carriage moves from left to right. Due to the operating position of the raising cam, the selected needles 4' and 9' of the rear needle bed, as well as needles 1, 2, 3, 6, 7, 8, and 11 of the front needle bed, are raised and participate in loop formation, creating a row of jacquard loops.

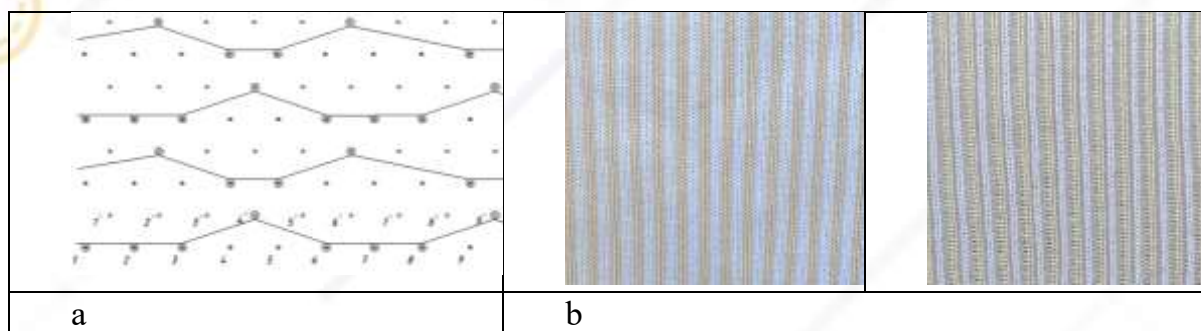


Figure 1. Graphical record (a) and photograph (b) of cotton-silk jacquard knitted fabric (variant I).

In this case, needles 4, 5, 9, and 10 of the front needle bed and needles 1', 2', 3', 5', 6', 7', 8', 10', and 11' of the rear needle bed do not participate in loop formation because the raising cam is disengaged from the operating position.

As a result, three consecutive jacquard loops made of cotton yarn are formed on the selected front-bed needles, after which no loops are formed on the next two needles.

On the selected rear-bed needle, one loop is formed, while no loops are formed on the following three needles.

Thus, the first course of the knitted fabric sample is formed by knitting loops from cotton yarn in a rib structure on the selected needles of the front and rear needle beds (figure 1, course I of the repeat).

During the knitting of the second course of the repeat, the carriage also moves from left to right. Due to the operating position of the raising cam, selected needles 2', 6', and 11' of the rear needle bed, as well as needles 4, 5, 9, and 10 of the front needle bed, are raised and participate in loop formation, producing a jacquard course.

At the same time, needles 1, 2, 3, 6, 7, 8, and 11 of the front needle bed, together with needles 1', 3', 4', 5', 7', 8', 9', and 10' of the rear needle bed, do not participate in loop formation.

Discussion. Consequently, two consecutive jacquard loops made of silk yarn are formed on the selected front-bed needles, after which no loops are formed on the next three needles. On the selected rear-bed needle, one loop is formed, while no loops are formed on the subsequent three needles.

The second course of the knitted fabric sample is formed by knitting silk yarn loops in a rib structure on the selected needles of both the front and rear needle beds (figure 1, course II of the repeat).

The third course is knitted in the same manner as the first course, while the fourth course is knitted similarly to the second course.

Variant II of the cotton-silk jacquard knitted fabric is produced according to the same sequence as Variant I (figure 2).

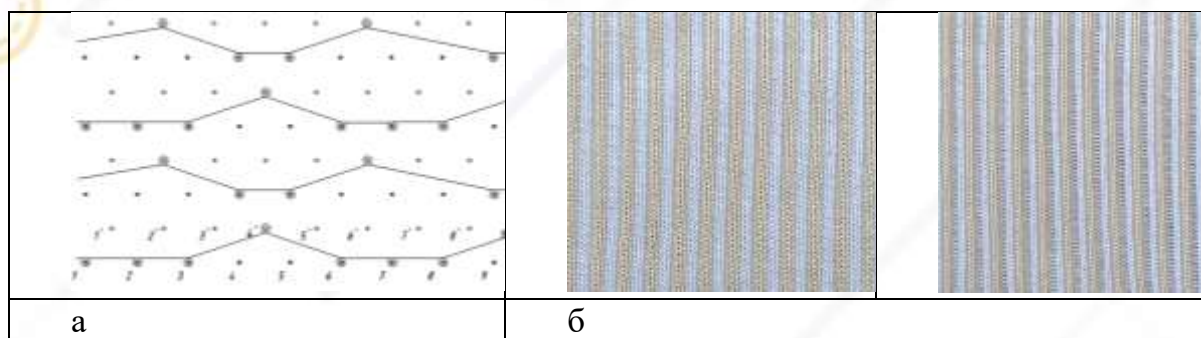


Figure 2. Graphical record (a) and photograph (b) of cotton-silk jacquard knitted fabric (variant II).

The only difference lies in the sequence of feeding cotton and silk yarns within the courses.

Conclusion. As a result, a technology for producing cotton-silk jacquard knitted fabrics has been developed through the formation of jacquard loop courses from cotton and silk yarns. The developed samples can be recommended for the production of lightweight outer knitted garments for women and children. The proposed technology expands the possibilities of using natural fibers in patterned knitted structures while maintaining high aesthetic and performance characteristics.

References

1. Chen, W., He, M., Zhang, M., Tang, Z. Wearing Performances of Floret Silk/Cotton Blended Sports Socks. *Advanced Materials Research*, 2011, pp. 284–287.
2. Prakash, C. Effect of Loop Length on the Dimensional Properties of Silk and Modal Union Knitted Fabric. *Journal of the Institution of Engineers (India), Textile Engineering Division*, Vol. 89, August 2008, pp. 11–15.
3. Yang, L., Jin, Z., Tao, J. Appearance and Performance of Mulberry Silk Seamless Knitted Fabric. *Journal of Silk*, Vol. 54, No. 8, 2017, pp. 20–25.
4. Musaev, N.M., Nurmatov, R.N., Mukimov, M.M. Investigation of Technological Parameters of a New Type of Patterned Cotton-Silk Knitted Fabric. *Proceedings of the International Scientific Conference Dedicated to the 135th Anniversary of Professor V.E. Zotikov, Part 2*, Russian State University named after A.N. Kosygin, Moscow, 2022, p. 64.
5. Musaev, N.M., Musaeva, M.M., Mukimov, M.M. Development of Technology for Producing Longitudinal Patterned Knitted Fabric. *Universum: Technical Sciences*, Vol. 3, No. 3 (120), 2024, pp. 68–70.

6. Musaev, N., Turdiev, I., & Mukimov, M. M. (2019). Investigation of the physical and mechanical properties of cotton-silk knitted fabric. // BBK, -1, p. 55.

7. Musaev, N. M., Gulyaeva, G. Kh., & Mukimov, M. M. (2020). A comprehensive evaluation of patterned knitted fabric produced from cotton and silk yarns. // Design. Materials. Technology, (1), p. 83-87.