



## Research of Obtained Shaped Threads From Raw Silk and Chemical Threads Using a New Method

Zakirova Dilfuza Khabibullaevna<sup>1</sup> Islambekova Nigora Murtozaevna<sup>2</sup> Khadjiev Djavohir<sup>3</sup>  
Toshpulatov Diyorbek<sup>4</sup>

<sup>1,2,3,4</sup>Tashkent Institute of Textile and Light Industry

**Abstract:** The article studies a new method for producing fancy threads from raw silk and polyester thread. Options were obtained in different ratios of threads and a torsion process was carried out from 100 to 250 kr/m. The physical and mechanical properties of the resulting twisted threads were studied. By boiling the twisted threads, a reduction in length of the twisted threads was achieved. The technology for producing fancy yarn from twisted thread has been selected and recommended.

**Keywords:** Silk, volume, shrinkage, processing, Raw silk+polyester.

### INTRODUCTION

Based on the research and analysis of literature sources, it was established that in our republic there are practically no assortments of shaped threads made from natural threads. This led to research into producing shaped thread from natural thread. Natural fibers are known to include fibers such as cotton, silk, linen, bamboo and wool. In our republic, the cultivation of cotton, silk and wool fibers is highly developed, and their share among natural textile fibers significantly exceeds the share of other natural fibers. For this reason, research is being carried out to obtain shaped threads from expensive, durable and shiny silk fiber, and chemical threads by mixing them.

**METHODOLOGICAL PART.** Due to the fact that natural silk does not shrink significantly and does not stretch during heat treatment, research has been carried out on obtaining a shaped thread by mixing it with another fiber. From our research cited earlier, it is clear that it is possible to obtain a fancy thread by mixing natural silk with chemical threads. Since the heat treatment process of polyester thread showed the greatest shrinkage compared to other chemical threads. Raw silk and polyester thread were selected as raw materials for producing shaped thread by mixing natural fibers. The technological sequence for producing fancy thread by mixing raw silk and polyester thread differs significantly from the sequence for producing fancy thread from chemical threads. Because the processes of preparation and heat treatment of raw silk include several stages.

Our republic produces the most raw silk with a linear density of 2.33 and 3.23 tex. Raw silk with a linear density of 3.23 tex and polyester thread with a linear density of 17.4 tex were selected as raw materials for the production of shaped thread. Raw silk from silk reeling factories is supplied in bales of 32 kg in the form of skeins. For further processing, it should be rewound into convenient packages, i.e., reels. Before rewinding, the raw silk is emulsified and cured. When preparing the emulsion, soap and chemicals are used in different proportions depending on the sealing of the skeins. Raw silk is soaked by sprinkling emulsion and wrapped in napkins. After soaking, the skeins

of raw silk are aged for 4-6 hours. After curing, the skeins of raw silk are carefully straightened, plucked and rewound onto spools on rewinding machines. The raw silk is rewound and the polyester thread is wound onto one bobbin on a FADIS machine. Table 1 shows the characteristics of rewound raw silk thread and polyester thread.

Table 1

**Technological parameters of rewinding raw silk and polyester**

Indicators	Raw silk+polyester (2+1)	Raw silk+polyester (4+1)	Raw silk+polyester (6+1)
Number of folds	2+1	4+1	6+1
Linear density, tex	23,86	30,32	36,78
Rewinding speed, m/min	180	170	160
Package weight, g	200-250	200-250	200-250
Type of package	spool	spool	spool

After rewinding the threads, the twisting process is performed on a machine type VTS-07/-08/-09. From the above studies it is clear that in threads with a twist above 250 kr/m it becomes more difficult to form loops, spirals, knots, etc. Therefore, mixed threads were given 100, 150, 200, 250 r/m twists. To obtain twisted threads for fancy threads, several variants of twisted threads of different proportions were obtained and their properties were studied. The physical and mechanical parameters of twisted threads obtained in different versions are presented in Table 2.

Table 2

**Physico-mechanical parameters of twisted threads from a mixture of raw silk and polyester**

Indicators	Linear density, tex	Number of torsions, cr/m	Breaking load, cN/tex
Raw silk+polyester (2+1)	23,86	108	15,16
	23,95	142	15,34
	24,02	212	15,65
	24,11	261	15,95
Raw silk+polyester (4+1)	30,32	104	17,11
	30,45	152	17,21
	30,51	208	17,47
	30,65	247	17,89
Raw silk+polyester (6+1)	36,78	102	18,01
	36,89	156	18,61
	36,97	211	18,75
	37,09	256	18,95

It is known that natural silk fiber consists of sericin and fibroin. The substance sericin plays an important role in the formation of raw silk. However, the substance sericin gives the thread hardness and roughness. Some sericin is usually washed off to achieve softness, elasticity and shine of the thread. To achieve these properties, it is necessary to boil the twisted thread obtained from raw silk and polyester. To carry out this process, the twisted thread must be rewound into skeins. Therefore, twisted threads are rewound from spools or bobbins to skeins using an MG-1 rewinder. Technological parameters of the rewinding process are presented in Table 3.

Table 3

**Technological parameters of the process of rewinding twisted thread from reels to skeins**

Indicators	Raw silk+polyester (2+1)	Raw silk+polyester (4+1)	Raw silk+polyester (6+1)
Type of input package	spool		
Linear density, tex	23,86	30,32	36,78

Rewinding speed, m/min	200	220	240
Reel perimeter, mm	1500		
Number of reels in the machine	96		
Weight of skeins, g	150		
Type of package	skein		

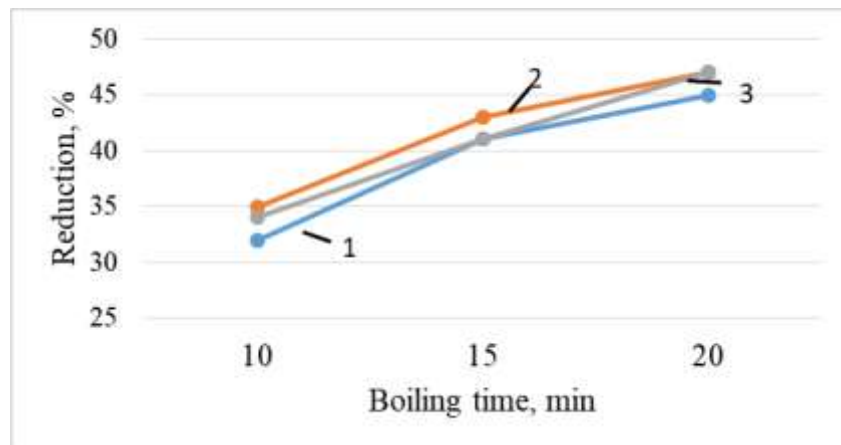
**RESULTS.** As described above, the twisted threads in skeins are boiled in soap and soda water to dissolve some of the sericin. The process of fixing the twist of the twisted thread was also carried out directly during the boiling process. Since it was observed that the chemical thread shrinks during heat treatment, the sericin content in raw silk was simultaneously reduced by 5-9% by boiling the twisted thread and shrinkage of the chemical yarn was achieved. After boiling, spinning is done in a centrifuge and drying in dryers. The research results in different versions are presented in Table 4.

Table 4

**The results obtained from boiling twisted thread with a twist of 100 kr/m**

Indicators	Temperature, 0C	Boiling time, min	Shrinkage of threads along the length, %	Linear density, tex	Number of twists, cr/m	Breaking load, cN/tex
Raw silk+polyester (2+1)	92-98	5	32	23,89	100	16,65
		10	41			
		15	45			
Raw silk+polyester (4+1)	92-98	5	35	30,34	100	18,13
		10	43			
		15	47			
Raw silk+polyester (6+1)	92-98	5	34	36,81	100	19,61
		10	41			
		15	47			

As can be seen from Table 4, the shrinkage of the twisted thread after boiling at different durations showed different results.



**Fig.1. Graph of the dependence of thread length reduction on boiling time at a twist of 100 kr/m**

- 1-raw silk+polyester (2+1);
- 2-raw silk+polyester (4+1);

3-row silk+polyester (6+1).

Table 5

The results obtained from boiling twisted thread with a twist of 150 kr/m

Indicators	Temperature, 0C	Boiling time, min	Reduction of threads along the length, %	Linear density, tex	Number of twists, cr/m	Breaking load, cN/tex
Raw silk+polyester (2+1)	92-98	5	30	23,97	150	16,78
		10	38			
		15	41			
Raw silk+polyester (4+1)	92-98	5	33	30,65	150	18,62
		10	39			
		15	43			
Raw silk+polyester (6+1)	92-98	5	32	37,18	150	19,87
		10	39			
		15	44			

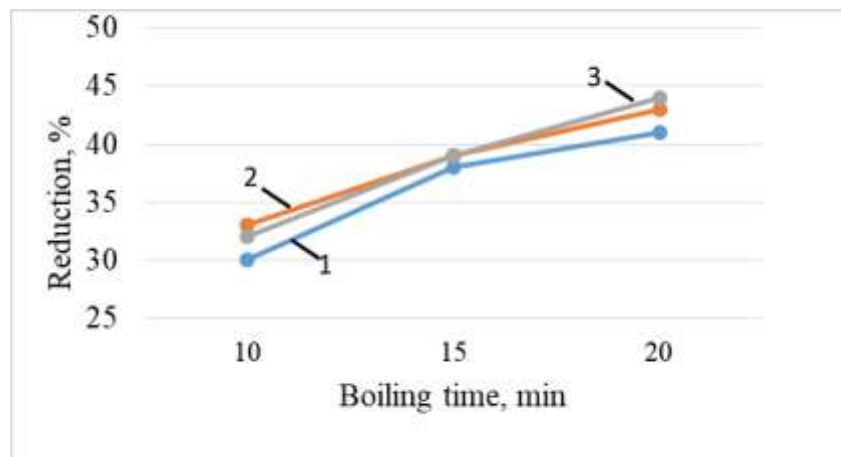


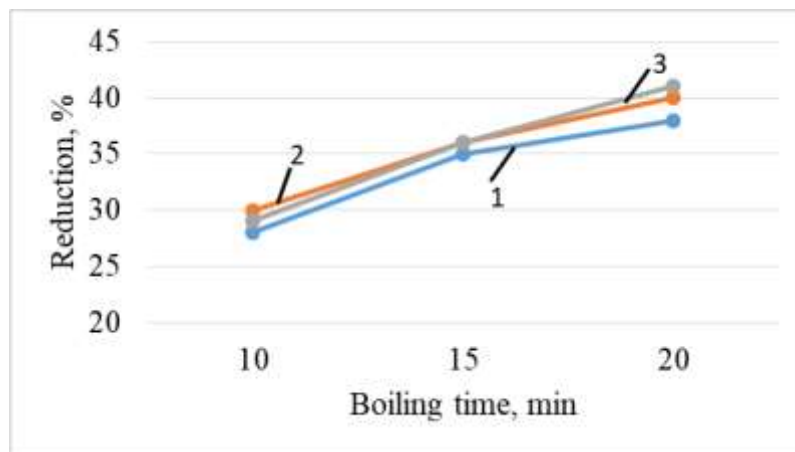
Fig.2. Graph of the dependence of thread length reduction on boiling time at a twist of 150 kr/m

- 1-row silk+polyester (2+1);
- 2-row silk+polyester (4+1);
- 3-row silk+polyester (6+1).

Table 6

The results obtained from boiling twisted thread with a twist of 200 kr/m

Indicators	Temperature, 0C	Boiling time, min	Reduction of threads along the length, %	Linear density, tex	Number of twists, cr/m	Breaking load, cN/tex
Raw silk+polyester (2+1)	92-98	5	28	24,19	200	17,19
		10	35			
		15	38			
Raw silk+polyester (4+1)	92-98	5	30	31,06	200	19,14
		10	36			
		15	40			
Raw silk+polyester (6+1)	92-98	5	29	37,54	200	20,18
		10	36			
		15	41			



**Fig.3. Graph of the dependence of thread length reduction on boiling time at a twist of 200 cr/m**

- 1-raw silk+polyester (2+1);
- 2-raw silk+polyester (4+1);
- 3-raw silk+polyester (6+1).

From the analysis of the results obtained for the three options, it is clear that threads with different linear densities showed shrinkage of up to 15 minutes. Shaped threads obtained from a mixture of natural raw silk and chemical threads, with a twist of 100 cr/m, thread shrinkage is 32-47%, with a twist of 150 cr/m 30-44%, with a twist of 200 cr/m 30-41%.

**CONCLUSIONS.** It became known that it is possible to produce fancy threads in a new way from a mixture of raw silk and chemical threads. The equipment used to produce shaped thread using the new method and the sequence of technological processes have been determined. The technology for producing fancy yarn from twisted thread, boiling duration, spinning and drying modes were selected and recommended.

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