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Influence of Working Conditions When Feeding Tracks Dynamics of Silkwine Functional State of the Body Working

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Abstract The results of the study of the working conditions of the breeders of silkworm caterpillars are presented. It was found that they are characterized by the presence of unfavorable production factors (dustiness, gas pollution, insufficient illumination, the severity and intensity of the labor process). Work in such conditions causes a hypertensive orientation of changes in the indicators of the cardiovascular system, to the development of a predominance of inhibitory processes in the central nervous system, to a pronounced decrease in the strength of the hands and muscle endurance and a decrease in the stability of the coordination function.

Keywords Silkworm caterpillars, Working conditions, Harmful production factors, Cardiovascular, Central nervous, Neuromuscular systems

In Uzbekistan, the production of natural silk is increasing from year to year, which is associated with the cultivation of breeding caterpillars of the silkworm. For the production of living cocoons, Uzbekistan ranks 4th in the world after China, Vietnam and India.

Breeding feeding of caterpillars to obtain high-quality cocoons is carried out on farms. Feeding is performed mainly by women. Feeding caterpillars is a laborious process, it consists of collecting and preparing mulberry leaves, feeding them with caterpillars, removing contaminated litter, cleaning the room, maintaining a certain temperature and humidity regime in it. Work is carried out around the clock and is associated with a violation of the normal daily work and rest. In addition, workers perform a number of laborious manual operations associated with static tension of the muscles of the trunk and limbs. Caterpillars are fed in adapted rooms.

The literature contains information about the factors of occupational risks in silk production. In the publications of Chinese scientists [9], the risk factors for silkworm rearing are described. This is carbon monoxide generated when heating rooms where cocoons are grown, diseases caused by unhygienic growing conditions due to the accumulation of leaves and silkworm excrement, disinfectants (slaked lime and paraformalin), leading to sensitization, eye inflammation (redness, watery eyes and itching), formalin, which is highly irritating to the eyes and nasal mucosa.

A review of the regional research station of the city of Miransahib in India in publications of scientists from the Indian Agricultural University [9,10] provides evidence that silkworm workers are susceptible to risk factors such as dermatitis, respiratory diseases, dizziness, fatigue, nausea, headache, eye irritation, adverse reproductive risks including an increased risk of miscarriage and endometrial cancer, vision problems, nervous disorders, and carcinogenic skin problems. The health hazards associated with the cultivation of silk worms are indicated in the publication of specialists from the Indian University of Jivanji [11]. The authors point out that the majority of workers suffer from health problems such as eye irritation, injury, back pain, allergies, and breathing problems.

The purpose of the research was to identify unfavorable production factors in worm breeding grounds when feeding silkworm caterpillars and their influence on the dynamics of indicators of the functional state of working women.

1. Research Objects and Methods

The research was carried out in the Azat, Uzbekistan and Khanka farms of the Akkurgan district of the Tashkent region, where women are engaged in feeding silkworm caterpillars and obtaining cocoons.

Working conditions were studied using traditional methods using a psychrometer, anemometer, aspirator,

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luxmeter in accordance with the requirements of the Sanitary Rules, Norms and Hygienic Standards of the Republic of Uzbekistan No. 0294-11 [1], 0141-03 [2], 0324-16 [3], building codes 2.01.05-96 [6], as well as the methodology "Methodology for assessing working conditions and certification of workplaces for working conditions" [5].

The physiological reactions of the workers' bodies were studied in the following order: before starting work, the initial, background characteristics of the indicators of the functional state of various body systems were recorded, and then the physiological reactions that develop during the working day. To assess changes in the central nervous system, the speed of the visual - motor reaction (MRS) was determined using a chronoreflexometer apparatus. The indicators of the cardiovascular system were studied by palpation of the pulse rate and sound measurement of blood pressure, followed by the calculation of pulse pressure, systolic and minute blood volumes, mean dynamic pressure and peripheral resistance in capillaries [4], the state of the neuromuscular system - by physiological tremor and muscle endurance. All measurements were taken directly at the workplace. We examined practically healthy women employed in the profession of breeders of silkworm caterpillars at the age of 16 to 66 years with work experience from 1 to 46 years.

2. Research Results

It has been established that the main sanitary and hygienic factors during the feeding period of silkworm caterpillars, which lasts up to 30 days, are the heating, humid microclimate of the worm, abundant microflora, increased content of carbon monoxide, hydrogen sulfide and ammonia vapors, air dustiness, irregular, intensive work with significant physical stress. The average daily air temperature in the worms ranges from 24 to 35.5℃, with a relative humidity of 26.2 to 55% and an insignificant air velocity equal to 0.12 ± 0.002 m / s. The air in the worm waters is polluted with dust, the average dust concentration is 6.74 ± 0.06 mg / m3, ammonia - 22.2 ± 0.7 mg / m3, hydrogen sulfide - 13.0 ± 0.56 mg / m3, carbon monoxide - 14.3 ± 1.4 mg / m3. The illumination of the working surfaces in the worm ducts is natural, the artificial light is switched on only in the dark, the illumination level in the examined worm ducts is uneven, ranging from 5 to 418 lux, the average level is 90.6 ± 5.8 lux, the natural light coefficient (KEO) ranges from 0, 45 to 3.79%, on average, KEO is 0.9 ± 0.3%.

The dynamics of indicators of the functional state of the cardiovascular, central nervous and neuromuscular systems has been studied. The data obtained show that from the beginning to the end of the work, the indicators characterizing the functional state of the cardiovascular system changed (table 1). There was a significant increase in maximum arterial pressure ($p < 0.05$). At the beginning of the work, the maximum blood pressure was on average 114.5 ± 3.1 mm Hg, and by the end of the work it increased to 123.6 ± 3.2 mm Hg. In addition, from the beginning to the end of the working day, there was a significant increase in the minimum blood pressure from 70.4 ± 2.0 to 77.0 ± 2.2 mm Hg. ($p < 0.01$), a tendency to increase in pulse pressure from 44.1 ± 1.7 to 46.6 ± 1.7 mm Hg. and a significant increase in the average dynamic pressure from 85.1 ± 2.3 to 92.5 ± 2.4 mm Hg. Such changes were accompanied by a tendency towards a decrease in systolic and cardiac output and an increase in peripheral resistance in capillaries, which indicates a weakening of the functional reserves of the cardiovascular system.

It was found that for all indicators of the cardiovascular system there is a high correlation dependence on air temperature (r –0.57–0.99) and on relative air humidity (r –0.67–1.0). It has been proven that the most pronounced negative effect on the functional state of the cardiovascular system is exerted by the temperature factor (the coefficient of determination is 98.0%, the coefficient of elasticity is 0.04-0.1%).

Table 1. Indicators of the dynamics of the cardiovascular system of women engaged in feeding silkworm caterpillars

Time	At the beginning of work	At the end of work	Credibility	
1	2	3	4	5
Indicators	M±m	M±m	t	$P<_{2-3}$
Pulse (beats per minute)	80,9±0,8	80,2±0,7	0,84	-
Blood pressure (mm Hg): -systolic	114,5±3,1	123,6±3,2	2,04	0,05
- diastolic	70,4±2,0	77±2,2	2,89	0,01
- pulse	44,1±1,7	46,6±1,7	1,04	-
- medium dynamic	85,1±2,3	92,5±2,4	2,22	0,05
Systolic blood volume (ml)	51,6±1,5	48,7±1,6	1,23	-
Minute blood volume (ml)	4136,4±118,6	3885,6±131,5	1,41	-
Peripheral resistance in capillaries (din)	1749,2±87,8	2187,2±213,5	1,89	-

Consequently, the working conditions when feeding silkworm caterpillars and the peculiar nature of production operations (monotonous manual work, repetitive operations, periodical being in an uncomfortable, fixed position, forced body tilts) lead to unfavorable changes in the functional state of the cardiovascular system of working women. According to the literature [7], the described changes in hemodynamic parameters can be the cause of the development of subsequent pathological changes.

The study of the dynamics of changes in the indicators of the central nervous system (table 2) (the rate of simple, complex and differentiating visual-motor reactions) showed that from the beginning to the end of the working day, the time of both simple and complex visual-motor reactions in the breeders of silkworm caterpillars increases, the number of errors on the differentiating stimulus also increases, Thus, the time of a simple visual-motor reaction (MRS) increases from 469.3 ± 14.9 to 509.8 ± 7.7 mlsec ($p < 0.001$), complex from 439.7 ± 23, 6 to 515.0 ± 18.6 mlsec ($p < 0.001$), the number of mistakes made per differentiating stimulus increases from 1.6 ± 0.27 to 2.8 ± 0.3 ($p < 0.001$), which indicates the development of inhibitory processes caused by production fatigue.

Consequently, from the beginning to the end of the working day, the predominance of inhibitory processes develops in silkworm breeders, indicating fatigue.

The study of indicators of the neuromuscular system showed (table 3) that from the beginning to the end of the working day in the surveyed women there is a significant decrease in the strength of the hands. The strength of the right hand decreases on average in the examined group from 24.4 ± 0.3 to 23.6 ± 0.4 kg ($p < 0.05$) or by 4.7% compared to the working background level. The strength of the left hand decreases on average in the examined group from 25.2 ± 0.3 to 23.3 ± 0.4 kg ($p < 0.001$) or by 9% in comparison with the working background level. Muscle endurance also decreases from 40.2 ± 0.5 to 35.0 ± 0.6 sec ($p < 0.001$) or by 30.5% in comparison with the pre-working background level.

A decrease in muscle endurance is the result of a decrease in performance, mainly of cortical cells, while protective inhibition plays an important role here. A decrease in muscular endurance in breeders with a certain degree of probability indicates that they are developing production fatigue, since the revealed shifts in indicators exceed the physiological standards of the maximum permissible amount of physical stress of the body during work.

In the course of work, an increase in hand tremor in women was also revealed - an indicator characterizing the stability of the coordination function, which develops from the beginning to the end of the working day. The number of touches when performing tasks on the tremometer increased from 11.2 ± 0.3 to 16.4 ± 0.2 ($p < 0.001$), while the time to complete the task also increased from 9.3 ± 0.3 to 14.1 ± 0.3 sec ($p < 0.001$), i.e. there was a change in indicators by an average of 5.1% of the permissible shift.

A decrease in the stability of the coordination function in working women can be associated with a violation of the normal ratio of the main nervous processes at various levels of the central nervous system, in particular, the motor analyzer, as a result of developing fatigue. Increased tremor of the hands by the end of the working day can be explained by the presence of physical overstrain of the hands during work, due to the nature of the production operations performed.

Table 2. Indicators of the speed of visual - motor reaction (MRS) of breeders of silkworm caterpillars (mlsec)

	At the beginning of work	Before lunch break	At the end of work	Credibility	
	M± m	M± m	M± m	t	$P<_{2-6}$
1	2	3	4	5	6
Simple	469,3±14,9	500,6±12,3	509,8±7,7	9,8	0,001
Complex	439,7±23,6	491,5±22,4	515,0±18,6	8,3	0,001
Errors	1,6±0,2	2,6±0,2	2,8±0,3	7,4	0,001

Table 3. Indicators of the neuromuscular system in female workers when feeding silkworm caterpillars

Indicators	At the beginning of work	Before lunch break	At the end of work	Credibility	
	M±m	M±m	M±m	t	$P<_{2-4}$
1	2	3	4	5	6
Power right arms (kg)	25,4±0,3	25,1±0,3	23,6±0,4	2,64	0,05
Power left arms (kg)	25,2±0,4	24,1±0,4	23,3±0,4	4,1	0,01
Muscular endurance (sec)	40,2±0,5	36,5±0,5	35,0±0,6	12,5	0,001
Tremometry:					
- number of touches	11,2±0,3	12,0±0,3	16,4±0,3	7	0,001
- task execution time (sec)	9,3±0,3	12,2±0,2	14,1±0,3	11	0,001

3. Conclusions

1. Working conditions of silkworm caterpillars breeders are characterized by the presence of unfavorable production factors (dustiness, gas pollution, insufficient illumination, the severity and intensity of the labor process.
2. From the beginning to the end of the working day, the breeders have a hypertensive orientation of changes in the indicators of the cardiovascular system, which manifests itself in an increase in systolic, diastolic, pulse, average dynamic blood pressure, as well as in an increase in peripheral resistance in capillaries and is accompanied by an increase in heart rate, as well as a decrease in both systolic and minute blood volumes.
3. From the beginning to the end of the working day, the predominance of inhibitory processes develops in silkworm breeders, indicating fatigue.
4. The work performed by the caterpillars' breeders leads to a pronounced decrease in the strength of the hands and muscular endurance, which indicates the developing production fatigue; in the process of work, their hands tremor increases, which indicates a decrease in the stability of the coordination function.

The data obtained indicate the need to develop and implement measures to improve the working conditions of worm breeders, including: mechanization of labor processes, regulation of work and rest regimes, provision of personal protective equipment.

REFERENCES

[1] Iskandarov T.I., Ibragimova G.Z., Iskandarova G.T., Feofanov V.N., Shamansurova Kh.Sh., Tazieva L.D. Sanitary rules, norms and hygienic standards of the Republic of Uzbekistan №0294-11 "Maximum permissible concentration (MPC) of harmful substances in the air of the working area." -Tashkent, 2004.-53 p.

[2] Iskandarov T.I., Ibragimova G.Z., Shamansurova Kh.Sh., Slavinskaya N.V., Iskandarova M.S., Demidenko N.M., Iskandarova G.T., Parsegova L.G., Feofanov V.N. Sanitary rules, norms and hygienic standards of the Republic of Uzbekistan No. 0141-03 "Hygienic classification of working conditions by indicators of harmfulness and danger of factors of the working environment, the severity and intensity of the labor process." -Tashkent, 2004. -53 p.

[3] Iskandarov T.I., Slavinskaya N.V. Sanitary rules, norms and hygienic standards of the Republic of Uzbekistan No. 0324-16 “Sanitary and hygienic standards of the microclimate of industrial premises. -Tashkent, 2016.-10 p.

[4] Likhnitskaya I.I. Assessment of the state of functional systems in determining the performance. -Leningrad, 1962. 112 p.

[5] Nichkasov V.M., Iskandarov T.I., Ibragimova G.Z., Slavinskaya N.V., Iskandarova G.T. "Methodology for assessing working conditions and certification of workplaces for working conditions." -Tashkent, 1996. -21 p.

[6] Building codes 2.01.05-98 "Natural and artificial lighting". -Tashkent, 1998. -48 p.

[7] Umidova Z.I., Glezer G.A., Yanbaeva H.I., King G.P. Essays on the cardiology of hot climates. Tashkent, 1975.

[8] Shi J, Mehta A.J., Zhang H. X. He-lian Dai H.L., Su L., Eisen E.A., Christiani D.C. Long-term Effects of Work Cessation on Respiratory Health of Textile Workers A 25-Year Follow-up Study. Am J Respir Crit Care Med Vol 182. pp 200–206, 2010 Originally Published in Press as DOI: 10.1164 / rccm.200903-0329OC on March 25, 2010 Internet address: www.atsjournals.org.

[9] Priyadharshini P., Maria Joncy A, Sivaranjani B, Mavilashaw V.P. Health risks in silk industry. Journal of international academic research for multidisciplinary Impact Factor 2.417, ISSN: 2320-5083, Volume 4, Issue 5, June 2016.

[10] Rakesh.K. Pandey. Occupational health problems in Silk production: A Review Saturday, 15 November 2014.

[11] Wani, K.A. and Y.K. Jaiswal (2011a) Health hazards of rearing silkworms and environmental impact assessment of rearing households of Kashmir, India. Nature Environment and Pollution Technology, 10, (1), 85-90.