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LABOR HYGIENE ISSUES IN COTTON PRODUCTION: RISKS, IMPACTS, AND PROTECTIVE MEASURES

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Abstract

This article explores the occupational hygiene challenges faced by agricultural workers involved in cotton cultivation and processing. It identifies physical, chemical, and biological hazards—such as heat, dust, noise, and exposure to pesticides—that threaten the health of workers, particularly tractor operators, irrigators, and cotton pickers. The study emphasizes the need for improved sanitary-hygienic standards and working conditions to protect workers in the cotton sector.

Keywords: cotton cultivation, workers’ health, microclimate, heat, humidity, solar radiation, personal protective equipment, working conditions, safety, sanitation, labor hygiene

ПРОБЛЕМЫ ГИГИЕНЫ ТРУДА ПРИ ПРОИЗВОДСТВЕ ХЛОПКА: РИСКИ, ПОСЛЕДСТВИЯ И МЕРЫ ЗАЩИТЫ

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Аннотация

В данной статье рассматриваются проблемы гигиены труда, с которыми сталкиваются сельскохозяйственные рабочие, занятые в выращивании и

переработке хлопка. Выявлены физические, химические и биологические факторы риска — такие как высокая температура, пыль, шум и воздействие пестицидов, — представляющие угрозу для здоровья работников, особенно трактористов, ирригаторов и сборщиков хлопка. В исследовании подчеркивается необходимость совершенствования санитарно-гигиенических норм и условий труда с целью защиты работников хлопковой отрасли.

Ключевые слова: выращивание хлопка, здоровье работников, микроклимат, жара, влажность, солнечная радиация, средства индивидуальной защиты, условия труда, безопасность, санитария, гигиена труда

Introduction

The establishment and continuous monitoring of optimal working conditions in the agricultural sector are fundamental not only for preserving the health and efficiency of workers but also for ensuring the overall productivity and sustainability of agricultural enterprises. As agriculture remains a labor-intensive field, particularly in developing countries, the well-being of workers must be regarded as a strategic priority within national health and economic development frameworks.

In Uzbekistan, cotton cultivation plays a pivotal role in the national economy, contributing significantly to export earnings, employment, and rural livelihoods. Over the past decade, the introduction of modern agricultural technologies, mechanized equipment, and digital innovations has brought the sector into a new phase of development. These advancements have allowed for increased yields, more efficient land use, and enhanced control over production cycles. However, despite such progress, the working conditions of laborers involved in cotton production—especially those engaged in sowing, irrigation, pest control, and harvesting—remain physically demanding and are often associated with significant occupational health risks.[3]

Workers are regularly exposed to harsh environmental factors, including extreme temperatures, prolonged solar radiation, and physically strenuous tasks, which can lead to fatigue, dehydration, and long-term health complications.

Moreover, the use of agrochemicals such as pesticides, herbicides, and defoliants introduces additional hazards related to toxic exposure, respiratory disorders, and dermatological conditions. In many cases, insufficient use of personal protective equipment (PPE), inadequate workplace ventilation, and a lack of standardized safety protocols further exacerbate these risks.

Given the strategic importance of cotton production and the vulnerability of its workforce, it becomes imperative to explore and address the occupational hygiene challenges inherent in this sector. Ensuring worker safety through the development and implementation of effective sanitary-hygienic standards, technological adaptations, and policy reforms is essential for promoting sustainable agricultural development. This study aims to provide a comprehensive assessment of the current labor conditions in cotton production in Uzbekistan, identifying key risk factors and proposing practical recommendations for improvement.[1,2].

Materials and Methods

This research investigated the hygienic conditions of agricultural workers in various roles, including tractor drivers, irrigators, and crop maintenance workers. The study was conducted in collaboration with the District Sanitary Supervision Center, focusing on farms within the jurisdiction of local community committees.

Measurements were taken using the following:

- **Temperature**: Thermometer (SanPin RUz. 0324-16)
- **Noise and vibration**: VShV-003 sound level meter (SanPin RUz. 0325-16)
- **Dust levels**: Gravimetric method
- **Carbon monoxide**: ANT-3 gas analyzer (MU012-3/0015)
- **Pesticide residues**: Thin-layer chromatography (Kiev – 1985)

In addition to physical and chemical factors, observational techniques and sanitary-hygienic assessment tools were employed.

Results

Occupational Hazards Identified

Cotton production workers face multifaceted health risks during all stages of the agricultural cycle. The following hazards were identified:

- **Microclimate Extremes**: Workers are exposed to extreme heat and solar radiation, especially during the spring and summer months. Temperatures inside tractor cabins reached up to 58–59°C, while outdoor temperatures often exceeded 40°C.
- **Dust and Chemicals**: The use of herbicides, insecticides, acaricides, and defoliants during May–September contributes to harmful exposure. Airborne dust was measured at elevated levels in cotton-cleaning facilities.
- **Noise and Vibration**: Machinery such as cotton-cleaning equipment generates excessive noise and vibration, affecting hearing and musculoskeletal systems.
- **Inadequate Protective Measures**: Although protective equipment was provided, many workers reported insufficient thermal regulation in clothing, especially in subnormal temperatures during early spring.

Key Observations

- Tractor drivers, irrigators, and cotton pickers operate primarily in open fields.
- Seasonal climatic variability—particularly high summer heat—intensifies physical stress.
- Hygienic conditions in cotton-cleaning plants are significantly influenced by poor ventilation, persistent dust, and the lack of noise mitigation.

Discussion

This study demonstrates that cotton cultivation in Uzbekistan involves occupational hazards that directly impact the health and performance of agricultural workers. The combination of physical (temperature, humidity), chemical (pesticides), and biological (dust, microbes) exposures presents a significant threat, particularly when protective protocols are inconsistently followed[2,4].

The introduction of effective personal protective equipment (PPE), along with improved working conditions such as ventilated spaces and scheduled rest periods, is essential. Additionally, seasonal planning and climate-responsive measures must be

implemented to safeguard workers' health, especially during peak temperature periods[5,6].

Conclusion

The findings confirm that agricultural workers involved in cotton production are frequently exposed to harmful environmental factors, particularly during the summer season. To mitigate health risks, it is essential to:

- Enforce the use of personal protective equipment;
- Provide adequate hydration and rest breaks during work;
- Improve the microclimate at workstations with ventilation and cooling systems;
- Develop and apply sanitary-hygienic standards tailored for cotton-processing facilities.

The necessity for these interventions is further emphasized by the Decree of the President of the Republic of Uzbekistan No. PQ-5612 (February 3, 2021), which calls for modernization and innovation in agricultural services and worker protections.

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