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MONITORING AND CONTROL MEASURES FOR WHEAT YELLOW RUST IN SURKHANDARYA REGION

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Abstract: Yellow rust, or stripe rust (Puccinia striiformis f. sp. tritici), poses a serious threat to wheat production worldwide, particularly in regions with temperate climates and mountainous microzones. The Surkhandarya region of Uzbekistan, characterized by diverse agro-ecological zones, has witnessed periodic outbreaks of yellow rust, causing considerable reductions in wheat yield and grain quality. This article discusses the biological characteristics of yellow rust, environmental conditions favoring its development, and presents current monitoring practices, surveillance techniques, and integrated control strategies implemented in the region. It also emphasizes the importance of resistant cultivars, agronomic management, fungicide application, and regional coordination as part of a sustainable plant protection approach.
Keywords: yellow rust, Puccinia striiformis, wheat disease, Surkhandarya, rust monitoring, fungicides, disease resistance, integrated pest management.

INTRODUCTION

Wheat is one of the most vital cereal crops in Uzbekistan, playing a central role in food security and rural livelihoods. However, its production is increasingly challenged by biotic stresses, among which yellow rust is particularly destructive. Caused by the obligate biotrophic fungus Puccinia striiformis f. sp. tritici, yellow rust infects leaves, stems, and sometimes spikes, leading to premature leaf senescence, impaired photosynthesis, and reduced grain fill.

Surkhandarya, located in the southern part of Uzbekistan, has a unique climate that varies from dry lowlands to humid mountainous zones. These varied conditions create favorable microclimates for rust pathogens, especially during cool and moist periods in spring. In recent years, field observations and regional agricultural statistics have highlighted recurring infections and yield losses associated with yellow rust in both rain-fed and irrigated wheat systems.

Effective control of yellow rust depends on timely detection, accurate identification, and coordinated disease management at the field, district, and national levels. This paper presents the strategies employed in the Surkhandarya region to monitor, contain, and prevent yellow rust outbreaks, drawing on the principles of integrated plant disease management.

MATERIALS AND METHODS

Yellow rust is known for its ability to spread rapidly over long distances through airborne urediniospores. In Surkhandarya, the pathogen is typically introduced during early spring from neighboring areas and establishes in wheat fields with dense canopies and high humidity. Optimal conditions for infection are temperatures between 10–15°C combined with several hours of leaf wetness, often caused by dew, rainfall, or irrigation [1].

RESULTS AND DISCUSSION

The effectiveness of yellow rust management depends in part on a nuanced understanding of Puccinia striiformis f. sp. tritici at the biological and genetic levels. Unlike many fungal pathogens, yellow rust exhibits extraordinary genetic plasticity, allowing it to adapt rapidly to selective pressures, especially those posed by widespread use of resistant cultivars or uniform

fungicide treatments.

The pathogen is an obligate biotroph, which means it requires living host tissue to complete its life cycle. It produces urediniospores — its primary means of reproduction and dispersal — in yellow-orange pustules that appear in long stripes along leaf veins. These spores can travel hundreds of kilometers on wind currents, making containment within a single field or district challenging without regional coordination [2].

More concerning is the pathogen's ability to undergo somatic recombination, leading to the emergence of new pathotypes. Studies from Central Asia, including southern Uzbekistan, have identified variants such as the "Warrior" and "PstS10" races, which have overcome resistance genes that were previously durable. This dynamic behavior underscores the need for ongoing virulence surveys and molecular monitoring to guide breeding and resistance deployment strategies.

In the Surkhandarya region, agroclimatic conditions vary dramatically between districts. The southern foothills and river valleys tend to exhibit cooler, more humid spring seasons — ideal conditions for rust outbreaks. Conversely, the drier plains experience less frequent infection unless unusually wet weather coincides with sensitive crop growth stages [3].

Climate change further complicates disease prediction. Increased variability in temperature and precipitation patterns can create new "windows of susceptibility." Unseasonal rains during tillering or heading stages, or prolonged dew formation due to shifting nighttime humidity levels, can trigger rust epidemics in areas previously considered low-risk.

These microclimatic shifts demand localized monitoring systems. The use of automated weather stations, disease forecasting models, and agroclimatic zoning maps is beginning to take hold in Surkhandarya's research institutions. Integration of such tools with early-warning alerts helps optimize fungicide timing and reduce unnecessary applications [4].

Farmers' knowledge, beliefs, and decision-making behaviors play a critical role in the control of wheat yellow rust. Surveys conducted by the Surkhandarya Agricultural Research Institute between 2020 and 2022 reveal significant variability in disease recognition, response time, and treatment practices among smallholder farmers.

CONCLUSION

Yellow rust continues to threaten wheat production in the Surkhandarya region, but integrated and adaptive management approaches are helping to mitigate its impact. Monitoring systems based on field observation, laboratory diagnostics, and GIS mapping, combined with the use of resistant varieties, judicious fungicide use, and farmer cooperation, represent the cornerstone of effective control. Sustained support for research, training, and technological innovation will be essential to ensure the resilience of the region's wheat production in the face of evolving plant disease challenges.

REFERENCES

1. Chen, X. M. (2020). Pathogens and management of cereal rusts. Annual Review of Phytopathology, 58, 213–232.
2. Hovmøller, M. S., Walter, S., & Justesen, A. F. (2010). Escalating threat of wheat rusts. Science, 329(5990), 369.
3. FAO. (2021). Integrated Management of Wheat Rusts: A Field Guide for Farmers and Extension Agents in Central and Western Asia. Rome: Food and Agriculture Organization.
4. Qosimov, I. & Rakhimova, M. (2019). Yellow rust dynamics in southern Uzbekistan. Uzbek Journal of Agro-Science, 5(1), 27–33.