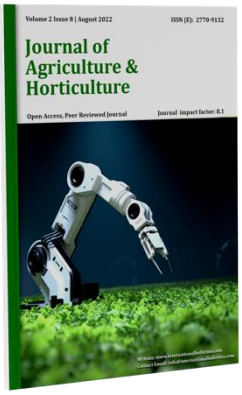

THE ROLE OF SPIDERS IN THE BIOCONTROL AND MONITORING OF SOIL PESTS IN WHEAT FIELDS OF THE KHOREZM REGION

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Abstract: This study investigates the natural biocontrol role of spiders in the monitoring and management of soil pests in wheat fields located in Urgench and Khiva districts of the Khorezm region, based on field experiments conducted during 2024–2025. It was found that the higher abundance of spiders in Khiva district significantly reduced the population of soil pests. The findings highlight the ecological importance of spiders in maintaining balance within agroecosystems.

Keywords: Spiders (Araneae), Lycosidae, Theridiidae, biological control, pest monitoring, soil fauna, wheat agroecosystem, ecological balance.

Introduction.

To ensure efficiency in wheat cultivation, it is essential to monitor and control harmful soil organisms. The extensive use of insecticides often leads to adverse ecological and economic consequences. Therefore, biological control agents, including spiders, serve as vital alternatives. Spiders (Araneae) are natural predators that inhabit soil and plant environments, preying on numerous pest species. Their abundance and activity are crucial factors in maintaining ecosystem stability [1].

The study was carried out during 2024–2025 in wheat fields of Urgench and Khiva districts. Three square plots (1x1 m) were selected in each district. Soil samples were taken monthly from a depth of 15 cm and analyzed in laboratory conditions. The number of spiders (ind./1000 cm^2) and pests (leaf beetles, stink bugs, slugs, beetles) was recorded separately. The data were statistically analyzed using means, variances, and Pearson correlation coefficient.

Figure 1. Spider Density in Khiva and Urgench Districts (ind./1000 cm²)

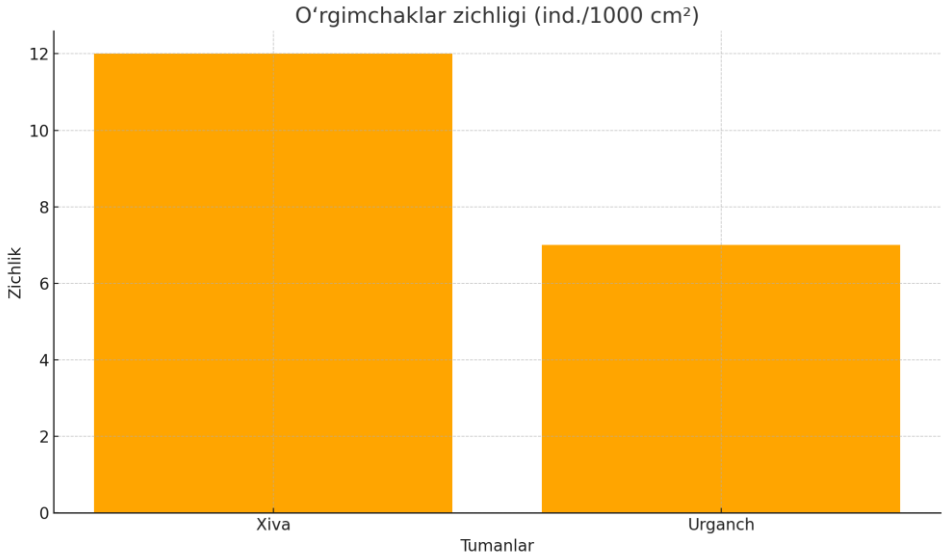

Figure 1 shows the average spider density in the studied wheat fields. Khiva district recorded a significantly higher density, indicating an active predatory population that likely contributed to pest suppression.

Figure 2. Comparison of Pest Abundance by District (ind./m²)

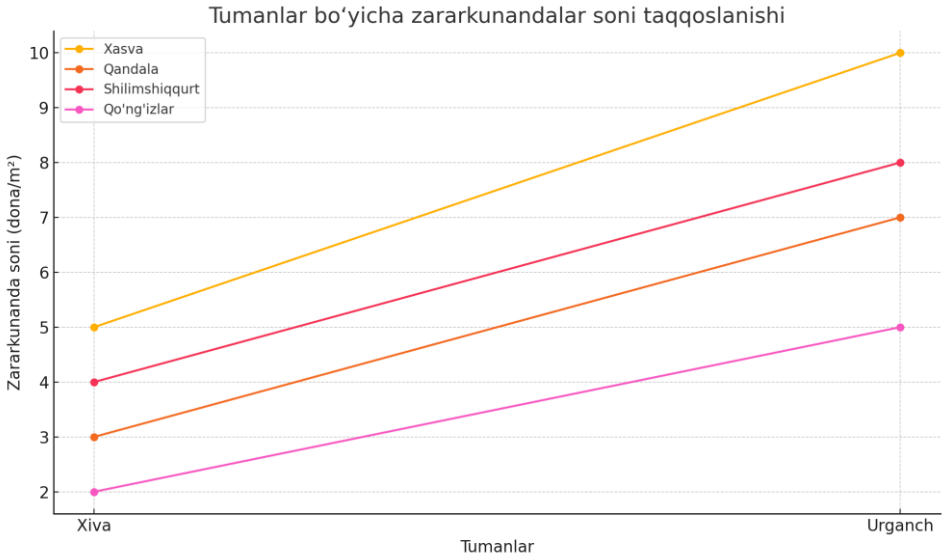

Figure 2 presents the comparative abundance of key soil pests across the two districts. The Urgench district consistently showed higher pest populations for all species, aligning with the lower spider density observed in that area.

In 2025, the average spider density in Khiva district was 12 ± 2.3 ind./1000 cm², while in Urgench it was 7 ± 1.8 ind./1000 cm². Higher spider abundance correlated with a decrease in pest populations. In Khiva, pest numbers were as follows: leaf beetles – 5 ± 1.2, stink bugs – 3 ± 0.8, slugs – 4 ± 1.0, and beetles – 2 ± 0.6 ind./m². In contrast, Urgench showed higher values: 10, 7, 8, and 5 ind./m² respectively. Pearson correlation analysis revealed a strong negative relationship between spider density and pest abundance ($r = -0.85$, $p < 0.01$).

Spider Fauna Recorded in Khorezm Region

- Family: Lycosidae;
- Genus: Pardosa C.L. Koch, 1847;
- Species: Pardosa nebulosa (Thorell, 1872);

- Family: Theridiidae;
- Genus: Steatoda Sundevall, 1833;
- Species: Steatoda paykulliana (Walckenaer, 1806).

These species play a dominant predatory role in soil fauna, contributing to the natural suppression of pest populations. Notably, Steatoda paykulliana builds webs to capture prey, while Pardosa nebulosa actively hunts without web construction.

Spiders occupy a high trophic level in agroecosystems and play a significant role in regulating insect populations naturally [2]. Studies suggest that spiders can consume between 400 to 800 million tons of biomass annually [7]. Species belonging to the families Lycosidae and Theridiidae are known natural enemies of various agricultural pests [4][5]. The decline in pest numbers in Khiva district due to higher spider populations demonstrates a stabilized ecological balance, which aligns with previous findings by Smith et al. [2]. Furthermore, a detailed analysis of the morphology and behavior of Pardosa and Steatoda species confirmed their crucial role in maintaining agroecosystem stability [4][6][8].

Conclusion.

1. A higher spider population in Khiva district led to a noticeable reduction in soil pests.
2. Correlation analysis confirmed the effectiveness of spiders as biocontrol agents through a strong negative relationship.
3. Spiders are essential ecological regulators in agroecosystems and should be preserved for sustainable pest control.

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