# Study on the main damaging pests in rice germination period in Uzbekistan

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**Abstract.** Rice pest, disease, and weed control measures play a crucial role in ensuring the successful cultivation of rice and achieving high yields. In Uzbekistan, where rice cultivation is an important agricultural activity, it has been observed that approximately 5-6% of the rice harvest is lost due to pests. This loss underscores the importance of effective pest management strategies in rice farming. Pests, diseases, and weeds can significantly impact rice crops, leading to reduced yields and lower quality. Pest infestations can cause direct damage to rice plants, while diseases can weaken the plants and make them more susceptible to other stresses. Weeds compete with rice plants for nutrients, water, and sunlight, further reducing yields. To address these challenges, farmers in Uzbekistan and elsewhere employ various pest, disease, and weed control measures. These may include the use of chemical pesticides, biological control methods, and cultural practices such as crop rotation and mulching. Integrated Pest Management (IPM) approaches, which combine multiple strategies to manage pests, are also gaining popularity among rice farmers. Analyzing and studying the impact of pests, diseases, and weeds on rice crops can help farmers make informed decisions about pest management strategies. By understanding the specific challenges faced by rice farmers and the factors contributing to pest and disease outbreaks, researchers and policymakers can develop targeted interventions to improve rice yield and quality.

## 1. Introduction

Today, the development of the rice industry is a priority for scientists and agricultural experts in many countries, including China, India, Vietnam, Indonesia, Japan, and Korea. Increasing productivity and improving grain quality are key objectives of research and development efforts in these countries [1, 2]. Scientists are also focusing on studying the species composition of rice pests, their bioecological characteristics, and developing effective methods to combat them [3-5].

In recent years, there has been a growing emphasis on developing integrated pest management (IPM) strategies to control pests in rice fields [6]. These strategies aim to minimize the use of chemical pesticides and instead promote the use of biological control agents, cultural practices, and resistant rice varieties [7].

One of the major challenges in rice cultivation is the presence of gnawing and sucking pests that can cause significant damage throughout the plant's growth stages [8]. These pests can affect rice crops from seed germination to ripening, leading to yield losses if not properly controlled. Rodent pests are also a common issue in irrigated rice fields, where they can damage young plants from seeding to the tillering stage [9].

In Uzbekistan, rice fields are also affected by pests such as the shield crab, Bakoplav crab, coast fly, and larvae of the barley borer [10]. These pests can cause damage during different stages of rice growth, impacting yield and quality.

To effectively manage these pests, farmers and researchers in Uzbekistan are exploring various control methods, including the use of chemical pesticides, biological control agents, and cultural practices [11]. However, there is also a growing interest in sustainable pest management practices that minimize environmental impact and promote long-term rice production [12].

The development of effective pest management strategies is crucial for ensuring the productivity and sustainability of the rice industry in Uzbekistan and other rice-growing countries. Through continued research and collaboration, scientists aim to address these challenges and enhance rice production worldwide.

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## 2. Materials and Methods

A thorough review of existing literature was conducted to identify the main damaging pests affecting rice during the germination period in Uzbekistan. Online databases, scientific journals, and relevant books were searched using keywords such as "rice pests," "germination period," "Uzbekistan," and specific pest names including "*Apus concriformis* Sh.", "Ephydra macellaria Egg.", "Cryllotalpa unisoina Saus" and others. The search was limited to articles published in English, Russian, and Uzbek languages.

The review focused on gathering information on the taxonomy, biology, distribution, host range, damage symptoms, and management strategies of the main damaging pests of rice during the germination period. Data on the life cycle of each pest, including egg-laying behavior, larval development, pupation, and adult feeding habits, were also collected.

Data on the occurrence and distribution of damaging pests in rice during the germination period in Uzbekistan were compiled from various sources, including scientific studies, government reports, and local observations. Information on the prevalence of each pest in different regions of Uzbekistan, as well as the impact of pest infestations on rice germination and early growth, was recorded.

The compiled data were analyzed to identify patterns in pest occurrence and distribution, as well as trends in pest damage and management practices. The effectiveness of current management strategies, including cultural, mechanical, biological, and chemical control methods, was assessed based on available literature.

## 3. Results and Discussion

The shield crab belongs to the class *Crustacea*, order *Phillapoda*, family *Apedeae*, species Apus concriformis Sh. (Figure 1). In addition to damaging rice grasses, the shield crab moves quickly during the day, when the air temperature reaches an average of 22.4-22.9°C, and damages the plants by tearing off the roots of rice. Damaged sprouts float to the surface of the water and die. Especially late planted rice is more affected by this pest.

**Fig. 1.** *Apus concriformis* Sh.

| Development periods and air temperature of rice | Growth period of the rice plant and the shield crab forms and periods of development | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | April | | | May | | | June | | | July | | | August | | | September | | | October | | |
| | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III |
| Seed germination | (O) | (O) | (O) | O | ✷ | ✷ | ✷ | | | | | | | | | | | | | | |
| Seedhead | | | | | | | | ✷ | O | (O) | (O) | | | | | | | | | | |
| Branching | | | | | | | | | | | (O) | (O) | (O) | (O) | | | | | | | |
| Sprouting | | | | | | | | | | | | | | (O) | (O) | | | | | | |
| Graining | | | | | | | | | | | | | | | (O) | (O) | | | | | |
| Rawly ripening | | | | | | | | | | | | | | | | | (O) | (O) | | | |
| Moderately ripening | | | | | | | | | | | | | | | | | | | (O) | (O) | |
| Ripening | | | | | | | | | | | | | | | | | | | | (O) | (O) |
| Average temperature, °C | 16.5 | | | 22.5 | | | 26.9 | | | 28.2 | | | 26.7 | | | 22.1 | | | 14.8 | | |

*Note:* **O** *– crab eggs,* **(O)** *– egg in diapause,* ▬ *- larvae,* ✷ *- mature breed*

**Fig. 2.** Phenological calendar of the shield crab

The shield crab thrives in stagnant or slow-flowing waters and reproduces quickly. Its movement slows down in the evening, but it is very active in the afternoon.
The female shield crab lays up to 100 eggs in clumps in the soil in mid-June. After the eggs dry up, they overwinter in the soil for several months. According to our data, the shield crab begins to develop in sholipoya areas when the average air temperature exceeds +14 °C. In the 3rd decade of May and 1st decade of June, when the average air temperature reaches +23.4+29.7°C, it starts to damage the germinated rice seedlings (Figure 2).
Coast fly (*Ephydra macellaria* Egg) can be found in almost all rice fields of Tashkent region in Uzbekistan (Figure 3). The shore fly is 4.5 mm long and metallic green in color. Eggs are white, oval, 0.57 mm long, and larvae are pale yellow, 7 mm long.

**Fig. 3.** *Ephydra macellaria* Egg.

Larvae of the shore fly crawl at the bottom of the sedge and gnaw the grass. Larvae pupate in rice root and lower stem. Fungi can be found on young leaves in years when the pest is very numerous. The shore fly gives three generations in a year. But the first generation causes particularly severe damage to rice.
The body of the bokoplav crab (*leptesteria Leptestheriaco*. Sa) is covered with a jointed, long, shiny cover, and the ventral side is open. The back of his body was split in two. It has two loops in each part. Sholipoya appears at the same time as the shield shrimp, that is, after the water is suppressed.
The harm caused: it causes the upper layer in the rice field, it makes the water muddy, they cut the roots of the grasses, separate them from the ground and die. It gives birth once a year. One female bokoplav lays up to 2-2.5 thousand eggs in the soil.
The fly of the barley moth (Hydrelliagriscolla Fall) is gray in color and has large eyes on its head. The body is covered with a dark shield and the legs are dark brown in color. The horn has 6 joints. The wings are large and shiny. The larva is egg-shaped, discharge is yellow, the body is divided into 13 joints. The head has well-developed (strong) jaws. The size of the mature larva is 3-3.8 mm. This pest appears in mid-June and lays eggs on the upper side of the leaves.
Damage: The larvae of the barley borer bore into the leaf, pierce the parenchyma tissue or the young plant stem, and thus completely dry out the rice. One female miner lays 75-88 eggs.
Springworm (Trichoptera sp.) goes through full development cycles. It has 3 facetted eyes on its head, multi-jointed, stringy whiskers, two pairs of wings, and sparse veins. Corn is divided into 10 joints. The mouthparts of the larva are rodent-type, and there are three pairs of legs on the thorax. Spring worms live in a tube - sheath, made of plant parts. The size of the cases is 12-20 mm. The pest clings tightly to the sheath and moves with it.
Damage: Larvae appear after rice is planted and crawl on the surface of the soil, gnawing the germinating seed and the root of the plant.
The tailed calf's head (*Cryllotalpa unisoina* Saus) is covered with short brown hairs (Figure 4). The paws of the forelegs are widened, and the paws have 5 pairs of sharp tooth-like spikes adapted for digging the ground (Figure 4). Wing length is 12-18 mm, brown veins are visible. As a side effect, the mature calf burrows close to the soil surface and gnaws the roots of plants.

**Fig. 4.** *Cryllotalpa unisoina* Saus.

The rice locust (*Exya fuscoovitata* Marsch) is found in weedy areas. The length reaches 33 mm. The body is green with black stripes. Mustache and legs are reddish-brown in color, Larvae are green. They do not live in groups, they appear in rice paddies in July. It lays eggs in soil cracks in the form of bumps on rice stalks.
Damage: It eats the leaves and the husk of the grain starting from the edge. One female locust lays 75-80 eggs.
The mature insect of the flower thrips (*Hanlotrips aculatus* Farb) is dark brown and 1.4-1.7 mm long. The last joint of the abdomen is a tube-like extension, twice as wide at the tip as at the base. The body is thin and elongated, the wings are clear, without veins, but covered with long hairs. Thrips larvae are yellow, the joints of the abdomen are red. It has long bristles on the lower part of its abdomen.
The size of the larvae is up to 1.8 millimeters. Transverse lines can be seen on a rice leaf infected with thrips. The first generation of thrips develops on weeds: sorghum, sedge, zupturum and sorrel. The second generation damages the rice paddy before it emerges. The tip of the damaged pod is pale when it emerges from the leaf sheath. The female thrips lays her eggs in clusters between the spikes and in the cluster of spikes. Larvae develop within two weeks. Therefore, it is important to remove the straw and other residues from the field after the rice harvest is completed. This is important and serves as the main source of pest development and reproduction in rice fields the following year.

| Development periods of rice | Growth period of rice and the forms and periods of development of thrips | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | April | | | May | | | June | | | July | | | August | | | September | | | October | | |
| | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III |
| Seed germination | (★) | (★) | ★ o | ★ o | ★ o — | ★ o — | | | | | | | | | | | | | | | |
| Seedhead | | | | | | ★ o — | ★ o — | | | | | | | | | | | | | | |
| Branching | | | | | | | ★ — | ★ — | ★ o | ★ o — | ★ o — | | | | | | | | | | |
| Sprouting | | | | | | | | | | ★ o | ★ o | ★ — | ★ — | | | | | | | | |
| Graining | | | | | | | | | | | | ★ o — | ★ o — | ★ o — | ★ o — | | | | | | |
| Blooming | | | | | | | | | | | | | | | o o — | | | | | | |
| Ripening | | | | | | | | | | | | | | | | ★ o — | ★ o — | ★ o — | ★ o — | (★) | (★) |

*Note:* **o** *– egg form of thrips,* **—** *- larval form of thrips,* **★** *- mature thrips,* **(★)** *– wintering mature breeds*

**Fig. 5.** Phenocalendar of seasonal development of thrips

Flower thrips begins to develop in spring, when the average air temperature exceeds +14.5°C. If rice causes damage by feeding on its leaves at the time of germination, the damage will be stronger at the end of the tuber period and during the fruiting period (Figure 5).

Aphids (*Phididae*) are among the main pests that cause great damage to grain crops. Rice is mainly affected by the grain plant aphid (Shiraphis oraminum Rond). The body of the winged is green, 1.2-2 mm long. The length of his whiskers exceeds half of his body. The length of the sap-sucking tubes is about one-sixth of the length of the body. They appear in July.

Forms a dense colony on leaves, stems and buds. They suck plant sap and slow down its growth and development, as a result of which the spikes do not bear grain or even the grain that has been born is wasted.

Natural entomophages in rice agrobiocenosis, their species composition. Coccinellids are among the natural insects found in rice agrobiocenosis, that is, insects belonging to the Coccinellidae family of the Coleoptera family. Representatives belonging to the coccinellid family are widespread, and they are of great importance in the elimination of dangerous pests that fall on crops (Table 1).

**Table 1.** Density of natural weeds in different stages of development of rice

| Natural predator types | Developmental phases of rice | | | | | | |
|---|---|---|---|---|---|---|---|
| | Germination | Seedhead | Branching | Sprouting | Graining | Blooming | Ripening |
| **Coccinellids** | + | + | + | ++ | ++ | + | + |
| **Dragonfly (adults and larvae)** | + | ++ | + | + | + | + | - |
| **Mantis** | - | - | + | + | + | + | - |

*Note: - - No prey; + - Low number of prey; ++ - Increased number of prey*

## 4. Conclusions

In the agro-technical fight against rice pests, several key recommendations can help manage and control these damaging organisms. It is advised to plow the land to a depth of 20-25 cm in November-December, which can help disrupt the life cycles of pests and reduce their populations. Weeding the edges of rice paddies, known as valik, is also recommended to eliminate potential habitats and food sources for pests.

Timely planting and alternating planting can also be effective strategies in pest management. Timely planting can help ensure that rice crops are at their most vigorous stage of growth when pests are most active, reducing the likelihood of damage. Alternating planting can help disrupt pest populations by creating a less favorable environment for their development.

In cases where specific pests such as the shield crab, Bakoplav crab, larvae of the shore fly, larvae of the barley miner, rice locust, and aphids are present, chemical control methods may be necessary. It is recommended to treat affected areas with pesticides such as Fufanon 57%, Tsyperphos 55%, and Karate 5% to effectively manage these pests. However, it is important to use these chemicals judiciously and according to recommended guidelines to minimize environmental impact and ensure the safety of rice crops.

In conclusion, a combination of agro-technical practices, timely planting, and targeted pesticide use can help manage and control rice pests effectively, ensuring healthy and productive rice crops.

## References

1. Kimsanbaev K, In vitro mass reproduction of parasitic entomophages Braconidae Trichogrammatidae, *E3S Web of Conferences* **389**, 03100 (2023)
2. Jumaev R, Invitro rearing of parasitoids, *E3S Web of Conferences* **371**, 01032 (2023)
3. Lebedeva N, Akhmedova Z, Kholmatov B, Revision of stoneflies insecta: plecoptera fauna in Uzbekistan, *E3S Web of Conferences* **258**, 08030 (2021)
4. Axmatovich JR, In vitro rearing of trichogramma Hymenoptera: Trichogrammatidae, *European science review* **9-10**, 11-13 (2016)
5. Dalabaevna MR, Shavqievich MK, Axmatovich JR, The development of russet mite in various plants and effectiveness of pesticide, *European science review* **1-2**, 21-23 (2018)
6. Abdushukirovich SB, Xamraqulovich KX, Axmatovich JR, Karimbaevich SS, Rearing of Trichogramma species T evanescens T pintoi T chilonis in vitro culture, *European science review* **1-2**, 29-31 (2018)
7. Gazibekov A, Sulaymonov O, Sobirov B, Representatives of Lepidoptera groups occurred in forestry and agricultural crops and their effective entomophage types, *E3S Web of Conferences* **244**, 02020 (2021)
8. Kimsanboev K, Rustamov A, Usmonov M, Euzophera Punicaella Mooze Lepidoptera bioecology and development of host entomophagic equilibrium in biocenosis, *E3S Web of Conferences* **244**, 01003 (2021)

9. Jumaev RA, Kimsanboev XX, Adilov MM, Rustamov AA, The technology of rearing Braconidae in vitro in biolaboratory, *European Science Review* **3-4**, 3-5 (2017)
10. Axmatovich JR, Karimbaevich SS, Qizi NB, O'g'li BSS, Bioecology of generations of Trichogramma diluted by different methods, *European science review* **3-4**, 25-28 (2018)
11. Rustamovich SI, Xamrakulovich KX, Axmatovich RA, Nozimxon J, Axmatovich JR, Bioecology harm of tobacco trips for the cotton plant and measure of counteraction, *European science review* **3-4**, 29-31 (2018)
12. Ruzmetov R, Abdullaev I, Gandjaeva L, Matyakubov Z, Razzakov K, Iskandarov A, Ibragimov S, Fundamentals of using Geographical Information Systems in predicting the distribution of Helicoverpa armigera Lepidoptera: Noctuidae, *Biodiversitas Journal of Biological Diversity* **23**, 6 (2022)