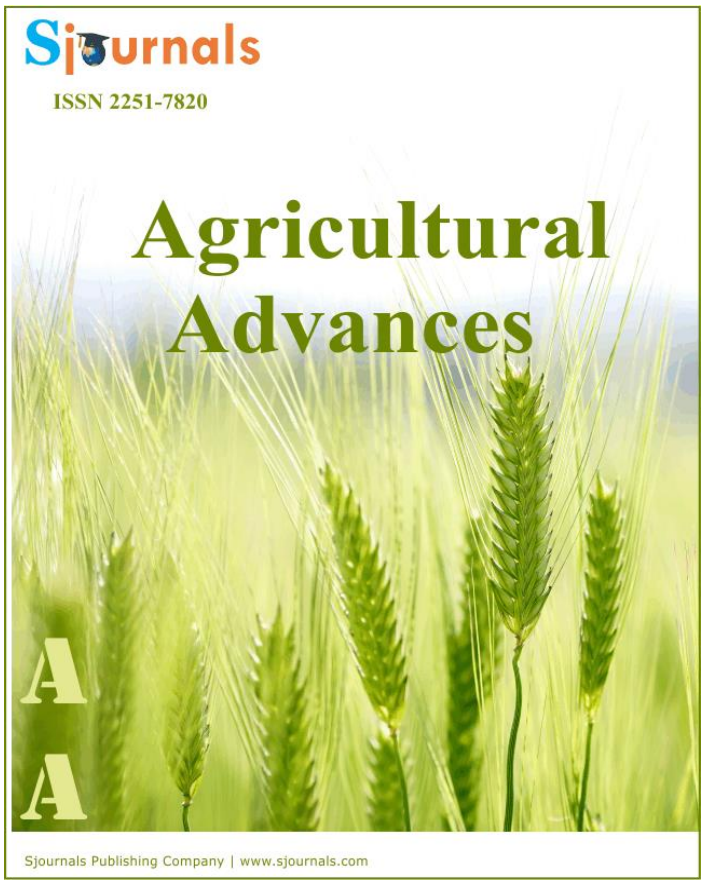

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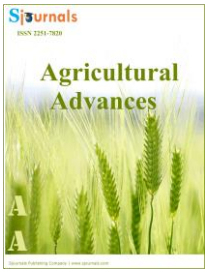

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Review article

Protection of rice from pests of rice seedlings in the Kyzylorda region of the republic of Kazakhstan

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ABSTRACT

Rice is an amazing grain, the oldest crop on Earth. Rice has been known as a valuable grain-producing plant for more than 10 thousand years. The genus name Oryza comes from a Chinese word meaning "good grain for food, breadwinner of the human race". Indeed, rice is one of the most valuable food crops. Rice groats consist mainly of carbohydrates, are low in protein, fat and ash, have excellent taste qualities, are highly digestible, and are nutritionally superior to other cereals. Rice protein contains an increased amount of essential acids such as lysine, valine, and methionine, so it is well absorbed by the human body. Currently, rice is cultivated in 114 countries on an area of more than 155 million hectares. The largest rice producers are India and China. Together, they produce 62% of Asian rice and 57% of the world's rice grain. The average yield in the world is 2.5 t/ha. High humidity attracts insects to rice fields that are adapted to survival and reproduction in special conditions. Most often, it is specific moisture-loving insects that harm rice crops. Such as rice weevils, mosquitoes, pyavits, aphids and others. Pests damage both the surface and underwater parts of plants.

1. Introduction

Let's get acquainted with some of them.

- **Rice weevil**-*Sitophilus oryzae L.*
- Order: Coleoptera*Coleoptera*
- Family name: Weevils-*Curculionidae*

Rice weevil is a malicious pest of cereals. It is found mainly in the southern regions. They feed on grains of rice, wheat, barley, rye, corn. This species should not be confused with the barn weevil. Rice has a dark brown color and causes more damage to grain crops. Insects fly well. Females are fertile, capable of laying up to 600 eggs per season. The insect harms at the stage of larvae and imago, actively feeds on grains. In rice crops, it is attracted to moist soil and swollen seeds. Once inside the seeds, the weevil enters barns, where it continues to feed and reproduce. Crop losses can be up to 75 %.

- **Rice mosquito**-*Endochironomus tendens*
- Order: Diptera *Diptera*
- Family: Ringer mosquitoes - Chironomidae *Chironomidae*

Rice gnat specializes in rice. It is widespread in all areas of rice cultivation. It has a pale yellow color. Females are prolific, laying up to 100 eggs per season. Komarik is characterized by rapid development. The pest stage is larvae, which develop in water and feed on young leaves and stems. They are most harmful during the period of emergence before tillering. Damaged leaves turn yellow and die, young shoots die. Three generations are developed per year. Common in wetlands.

- **Rice piavica**-*Lema suvorovi Jacobs*
- Order: Coleoptera*Coleoptera*
- Family name: Leaf beetles-*Chrysomelidae*

Rice piavitsa is the most voracious pest. It is distributed in the European part of Russia, the Caucasus, Central Asia, and Siberia. A beetle with shiny blue elytra. Females can lay up to 200 eggs per season. Larvae and beetles are harmful. The larvae skeletonize the leaves, destroying large areas of rice crops. Beetles appear in early April, causing damage to seedlings, gnawing a significant part of them.

- **Common grass aphid**-*Schizaphis graminum*
- Order: Equidistant wings-*Homoptera*
- Family: Aphids-*Aphididae*

Aphids are an amazing insect. Under unfavorable conditions, it is able to produce a new generation of larvae without the process of fertilization. It is widespread in the southern regions of Russia. It has a light green color. Larvae and adult insects are harmful, sucking the juice from grain plants, including rice. Damaged leaves curl, turn yellow, and die. The most vulnerable phase of rice is the exit to the tube. The largest number of aphids is observed in late June-July. During the growing season, rice develops up to 12 generations.

- **Coastal fly**-*Ephydra macellaria*
- Order: Diptera*Diptera*
- Family name: Shorebirds-*Ephydridae*

The coastal fly is a very specific pest of rice. The adult insect has a green metallic color. The larvae are white and yellowish. It is distributed in the steppe zone of Russia. Reproduction occurs 2-3 days after flooding of the fields. The female lays up to 100 eggs per season on moist soil and the basal part of rice shoots. Larvae gnaw on roots, destroy young shoots and leaves. Especially harmful are the first-generation larvae, which start feeding at the end of May.

Pest	Phase of plant development	Economic threshold of viability
Rice weevil	shoots	1.5-2 beetles per 1 m^2
Rice mosquito	shoots	1 larva per plant
Rice piavitsa	shoots-tillering	of 3-5 beetles per 1 m^2
Common grass aphid	tillering-trubkovanie	10-15 aphids per stem when settling more than 50% of plants
Coastal fly	shoots	35-40 larvae per 1 m^2

Rice diseases can also significantly reduce the quality and quantity of the crop. There is a wide range of diseases in this culture. Let's look at the most common ones.

Piriculariasis

- The causative agent of the disease is *Piricularia oryzae*
- Class: Deuteromycetes-*Deuteromycetes*
- Order: Hyphomycetales-*Hyphomycetales*

The most dangerous rice disease. It is widespread in all areas of rice cultivation. Пирикуляриоз Rice piriculariasis tops the TOP 10 most phytopathogenic fungi and is one of the causes of famine in Asia and Africa. The fungus develops on living plants from spores that have overwintered on plant remains and weeds. Spores that fall on the plant under favorable conditions (low temperature and high humidity) they are able to germinate withinи 3 hours. Crop losses can range from 15 to 40 %. There are three known forms of rice piriculariasis: leafy, nodular and paniculate.

The leaf shape appears on the leaf blades in the form of roundish-oblong spots of gray color with a brown border along the edges. With a strong lesion, the leaves curl and dry out, the plant dies before being swept out.

The nodular form occurs during the flowering and waxy ripeness phases, forming brown spots on the lower nodes of the stem. In this case, the node tissues begin to rot, becoming covered with a gray coating, the stem breaks.

The paniculate form affects the base of the panicle axis, and the flow of water and nutrientsis reduced. The panicle dries up or produces puny seeds.

Fusarium infection

- The causative agent of the disease is *Fusarium graminearum Schwab.*
- Class: Deuteromycetes-*Deuteromycetes*
- Order: Hymophycetes-*Hyphomycetales*

It is widespread in all rice-growing areas. The fungus overwinters on seeds in the form of mycelium, on the remains of plants - in the form of mycelium and sclerotia. Favorable conditions for the development of the fungus - high temperature and humidity of more than 85 %. Crop losses are 10-15 %. The disease affects seedlings, seedlings and adult plants. Sprouts turn yellow, curl and dry out. On shoots, the root neck rots, the leaves turn yellow and die. In adult plants, the nodes turn black and rot, надламываниеthe stems break, the panicles are underdeveloped. The seeds are small, dirty gray or brown in color.

Alternariasis or olive mold of rice

- The causative agent of the disease is *Alternaria tenuis Nees*
- Class: Ascomycetes*Ascomycetes*
- Order: Pleospores - *Pleosporales*

It is widespread everywhere. Pathogens of the disease persist on seeds and affected plant remains in the form of mycelium and conidia. The disease develops with high humidity, wind and high soil fertility. In wet years, crop losses can reach up to 40 %. It usually appears in the second half of the growing season. It affects the leaves and stems, forming an olive velvety coating. Panicle elements acquire an earthy color. Due to toxins, the quality of grain worsens.

Helminthosporiosis

- The causative agent of the disease is *Helminthosporium oryzae B. de Haan*
- Class: Deuteromycetes-*Deuteromycetes*
- Order: Hyphomycetes-*Hyphomycetales*

The disease is widespread in Japan, China, India, and in recent years has been seen in Russia. The fungus affects all aboveground parts of plants. The most dangerous sources of infection are seeds and plant residues. Shoots rot and plaque forms at the root neck. Oval gray-olive spots appear on the leaves. There are dark spots on the panicles. The crop shortage is 5-10 %. It is difficult to fight pests and diseases on rice, but it is possible.

In the fight against rice pests, the company "Chemagromarketing" recommends the use of drugs: of FostranEC (dimethoate 400 g/l) with a flow rate of 1.0-1.5 l/ha, Nurimet Extra, CE (chlorpyrifos 500 g/l +

cypermethrin, 50 g/l) with a flow rate of 0.75-1.0 l/ha, Operkot Acro, COP (imidacloprid, 300 g/l + lambda-cyhalothrin, 100 g/l) with a flow rate of 0.05-0.1 l/ha. Spraying is carried out during the growing season. It is known that about 60 arthropod species are damaged in the Republic of Central Asia and in the Primorsky Territory, and 25 in the Krasnodar Territory.

22 species of insects and crustaceans that cause harm to this crop were found in rice crops of the Kyzylorda region. The greatest damage is caused by the coastal fly, rice gnat, barley miner, Swedish crustacean fly schiten and leptesteria Zh. Abildaeva (2008). In addition to these pests, multi-eater insects are widely distributed on rice crops, whose natural reserve sites are weeds in checks, inter-check rollers, channel slopes and roads. These include the stem moth, Swedish fly, bear moth, Asian locust, dark cicada, leaf-eating scoops, and grass aphid.

2. Research methodology

Field experiments were carried out on the old-irrigated meadow-marsh soils of the Karaultyubinsk stronghold of the Kazakh Research Institute of Rice Breeding LLP. Plot$^{area\ -100\ m2}$ repetition - four times. Accounting was carried out according to the method of Kotlyarova (1988) on sites of 25x25 cm, the number of accounting sites in the experiment was 160. Threshing of the crop-subdivided, with a thresher. Before sowing, the treated rice seeds with insecticides were analyzed in the laboratory.

3. Results and discussion

Much attention is paid to the study of diseases, pests and weeds of rice plants abroad. In Japan, Russia and other countries, considerable attention is paid to the study of pests and the development of measures to control them. Rice plants are exposed to biological stresses: diseases, insects and weeds, which are most often controlled by chemical means. In the CIS, the first special study of rice pests was conducted by Engelhardt and Mishchenko (1931) in the Far East. They identified 27 types of pests that can cause serious damage to the rice crop if their numbers are high. Among the most dangerous, the authors include the rice water moth-Nymphula isitalis Brtm, rice gnat-Chiromonus sp., barley miner-Hydrellia griseola Fal, rice thrips-Phloeothrips oryzae M, dark cicada-Delphax atriatella, corn moth-Phyrausta nubila.

Further study of the species composition of insect pests was continued by Shagaevymм (1940) in Uzbekistan. The work of this author, in fact, was the first popular summary on rice pests in Central Asia. Based on a report by A. Elizarova (1938), the coastal fly Ephydra macellaria Egg. was assigned to the number of insects damaging rice in the CIS for the first, отнесена прибрежная муха - Ephydra macellaria Eggtime,and a brief morphological description of the biology of such insects as rice gnat, barley miner, locusts, etc. was given.

The work of Lee Den Hwa (1954), who tested the pre-sowing treatment of rice seeds with hexachlorane in the control of coastal fly and caddisfly larvae, is devoted to measures to control rice pests in Uzbekistan. A number of works devoted to rice pests in Uzbekistan belong to Sborshchikova (1964). The main attention of the author was given to such pests as water rice weevil, coastal fly, pike crustacean, rice mosquito, barley miner. A significant study of the biology and harmfulness of the crustaceanTriopscancriformisSchaff. прowas conducted by K.I. Beaver in Kyrgyzstan. The study of its biology and harmfulness in IDA was continued by Bobkova (1949) in Tazhikstan. This author has proved that the greatest extent of sorrel harms late rice crops. In the Kuban region, the species composition of rice pests was studied by Kosmachevsky (1957). Kasyanov (1967) adds mosquito to the list of rice pests in Kuban Cricotopussp.,which damages rice crops by 57 % in some years.

In Kazakhstan, special studies of harmful rice fauna were not carried out until recently. Nevertheless, some information on the biology of the coastal fly is mentioned in the annual report of the Kyzylorda Observation Post for 1941. Since 1957, pests of rice have been periodically reported in the annual republican publications published by the Ministry of Agriculture of the Kazakh SSR (1958-1969), which speak about the ways of spreading pests and diseases of agricultural plants. Starting from 1964, some original information on distribution, timing of occurrence, and degree of damage is provided in the annual reportsof the Kyzylorda Forecast Sect (1964-1970). From 1970 to 1992 Kotlyarova (1988) developed agrotechnical and chemical measures to control rice pests in the KazNII of Rice.

In the years of research, the beginning of the summer of the coastal fly overwintering was noted from the end of the third decade of April. The flies that flew out first populated the ditches of the discharge network, various small reservoirs. Settlement of experimental crops by coastal fly is noted for 2-3 days after flooding of

checks. On 1 m^2 of the water surface of the rice check and in the coastal zone, the number of flies ranged from 7 to 30 specimens. The average is -20.

Agrometerological conditions for rice cultivation in 2017 were unfavorable. The hottest days were June and July. Their average monthly temperature was 40.7 and 40.3 °C, which is 5-6 °C higher than the long-term average values. The amount of precipitation during the summer period ranged from 2-3 to 8-9 mm, which was 10-30 % of the norm. The spring of 2020 was characterized by relatively warm and very dry weather. The average temperature for spring was 12.4 °C, i.e. 3.5 °C higher than the average values. Precipitation was low -16.3 mm (48-69% of normal).

Field experience in pre-sowing seed treatment against pests of seedlings is based on permanent sowing of rice. The seeding rate at the experimental site is 250 kg/ha. The Marzhan variety. Before sowing, rice seeds were treated with Actellic 500 K.E. insecticides -0.5 l/t and Celestine at two consumption rates of 1.0 and 1.8 l/t of seeds. Analysis of rice seeds treated with insecticides after pre-sowing treatment did not show a negative effect on either germination energy or germination (GOST 12038-66).

The results of surveys during the period of germination and germination of rice showed that in the variant where Actellic was treated, the number of damaged plants by the coastal fly decreased by 5.5 %, and with the rice mosquito by 5.8 % compared to the control of 21.9 and 23.3 %. In the variant where Celestine 312.5 C.K. was treated, in both consumption rates, the number of damaged plants by coastal fly was 6.5 and 9.8 %, rice gnat 6.9 and 11.4 % compared to the control (21.9 and 23.3 %). Pupae of the coastal fly were found on damaged rice seedlings. On the registered plants, pupae accounted for 9.4%, and rice gnat larvae for 16.5 %. As well as in the experimental plots of rice, shellfish and leptesteria were found from crustaceans. During the period of germination, the number of shields in the check was 4.1-4.7 copies per 10 strokes of a water net, and leptesteria 1.5-1.8.

The greatest biological effect obtained from the use of Actellic 500 K. e - 0.5 l/t against coastal flies and 42.5%, rice Midge -52,2% and Celeste Top with the drug consumption rate -1.0 l/t seeds vs coastal flies was 68.8 %, rice Midge -73,2%, respectively, in the norms of consumption of 1.8 l/t seeds amounted 80,0% and 82,8 %.

During the rice harvesting period, the influence of rice seed protectants on rice yield was determined. It was found that the treatment of rice seeds before sowing against pests of rice seedlings provided an increase in yield with Actellic 500 K. e -0.5 l/t -27.5 c/ha, treatment with Celestine 312.5 C. k in both doses from 38.8 and 42.3 c/ha. As a result, the economic efficiency from the use of insecticides was 70.1%, 98.9% and 100%, respectively, compared with the control.

4. Conclusion

- The main pests of rice seedlings during the growing season in the rice crop rotation are the coastal fly and rice mosquito.
- Pre-sowing treatment of rice seeds against harmful organisms with insecticides reduces the number of damaged plants by half, while the biological effect increases to -80-82.8%. Also, the economic efficiency increased by 70.1-100% compared to the control without treatment.

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