护理杂志
Journal of Nursing
Volume 72 Number 02
ISSN: 0047-262X
DOI: 10.5281/zenodo.14864915

Test Results on the Biological Effectiveness of the Herbicide *Kataryus Bereke* against Annual and Perennial Weeds in Rice Fields in the Conditions of Tashkent Region

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Abstract

According to the results of the study conducted in this article, the application of the herbicide Kataryus bereke at a rate of 0.5 l/ha against annual weeds in rice crops led to the destruction of weeds, the biological efficiency was 94.9% compared to annual cereal weeds. In the experiment, when using the herbicide Kataryus bereke at a rate of 0.5 l/ha, the yield of rice grain was 11.4 centners higher than the control in the Tashkent region. Taking into account the biological efficiency of the herbicide Kataryus bereke , it is recommended to use 0.5 l/ha against annual cereal weeds in rice crops. It is recommended to carry out tillage work when weeds have developed 3-4 leaves in wet soil.

Keywords: *Rice, Water, Weed, Turmeric, Herbicide, Biological Effect, Yield, Productivity.*

INTRODUCTION

Rice (Oryza sativa L.) is a staple crop in Asia and the staple food for almost half of the world's population. More than 90% of the world's rice is produced in Asia (Kuenzer and Knauer, 2013). The area of land devoted to rice cultivation is second only to that devoted to maize, and it accounts for about a quarter of the total area devoted to cereal crops in China. Due to the continuous growth of the world population, it is necessary to increase rice production to ensure food security. Weeds are a major problem in crop fields due to their rapid growth rates and large soil seeds. They compete with crops for water, fertilizer, and space, and their presence reduces yields and quality levels. Consequently, weed control is a priority in crop production. Chemical treatments remain an important element of weed management because they offer user-friendly, highly effective, and sustainable weed control. Selective herbicides are used to control weeds in agricultural fields due to their non-phytotoxic effect on crops. On the contrary, the high target selectivity required for new herbicides limits the number of widely used ones.

Therefore, it is necessary to develop herbicides with new modes of action that would complement the current spectrum of existing products and delay the evolution of herbicide resistance.

One of the most important tasks facing agricultural workers is to sustainably provide the population of our region with food products and meet consumer demand at the expense of agricultural products grown in our country. In order to obtain high-quality, environmentally friendly and high

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yields from agricultural crops, it is necessary to protect them from diseases, weeds and pests in a timely manner.

Purpose of the research

Weeds are plants that damage crops and crops of agricultural crops and are ecologically adapted to grow together. They compete with cultivated plants for light, water, space, nutrients. They contribute to the spread of diseases, their sources, being an important link in the trophic chain of pests, complicate soil cultivation and crop care, reduce harvesting, and reduce its quality. Despite intensive weed control, losses from weeds are increasing (10% or more) [1, 2].

Over the past 12 years, herbicide-resistant (HR) Clearfield rice (Oryza sativa) has become increasingly popular for weed control and has accounted for about 60% of the rice fields in Arkansas, where most rice is grown in the United States. [16].

B.I. Rukavishnikov [3] reports that in 1956, 70 species of resistant insects and mites were known, and in the late 1980s, resistance was detected in 500 species of phytophages, 150 pathogens and 113 weed biotypes. [4, 5, 6].

According to the reports of V.V. Shvartau [7], in recent years, 461 resistant weed biotypes have been identified in the world, which is associated with the increased use of herbicides and the reduction of agrotechnical control methods. The increase in the use of herbicides, as well as other pesticides, leads to undesirable consequences: a decrease in efficiency and an increase in consumption, an increase in the risk of residues in the environment and plant products, the emergence of resistant weed biotypes, etc.

In the field, herbicide resistance can develop after 4–5 years if the same herbicide or herbicides of the same chemical class are used continuously [8].

More than 300 weed species have been recorded in the USA and Canada in biotypes. The International Data Bank (International Herbicide Resistant Weed Survey) contains information on 323 resistant biotypes of 187 species (112 dicotyledons and 75 monocotyledons) [15].

Since there are individual plants with genetic resistance to the herbicide in the existing population, after treatment, non-resistant plants die, while resistant plants produce viable seeds [6, 7, 14].

The most damaging weeds to rice are those belonging to the family of cereals: chamae, kurma and dogwood. These weeds are similar in biological characteristics to rice. They are widespread in all rice-growing regions. They are all annual spring plants, reproducing only from seeds.

Echinochloa phylolopogon (stapf) kossenko

It grows very strongly, 140-150 cm tall, relatively large seeds, 1000 grains weigh 4-7 g. It is difficult to separate the seeds from the rice in grain cleaning machines. The seeds do not go through a dormant period, germinate almost 100% in the first year, and retain their germination in the soil for up to 5 years. The shoots appear in moist soil in spring when the temperature reaches 14-150. In soft soil, they germinate at a depth of 15 cm without a water layer, and from a 15-18 cm water layer to a depth of 2 cm. Kurmak is a relatively late-maturing plant, ripening at the same time as rice in 100-125 days. Therefore, most of it mixes with the rice during threshing. Turmeric grasses can grow even if they are submerged in water for a long time, but they die within 5-7 days when the day gets hot and the water layer in the rice field reaches 25-30 cm.

Juncellus serotinus (Rotb) Clarke is a rhizomatous perennial plant belonging to the family of the sedges, the most dangerous weed growing among rice. The stem is three-sided, reaches a height

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of up to 1 m. The sedge reproduces by seeds and rhizomes. The seeds are small (1000-grain weight 0.4 g), ripen in 95-100 days, the seeds do not germinate in the year of planting rice, but only contaminate the soil. After the seeds on the surface of the earth emerge from the winter, in the spring, when the water layer in the rice field is 1-2 cm thick, 60% germinate, and when it is dry, 100% at 20oC. When the water layer is thick (10-20 cm), the grass dies.

The rhizome is one of the main organs that produce fruit, they are located at a depth of 12-15 cm in the soil. During autumn plowing, rhizomes that emerge from the ground and remain over winter freeze to death.

Tipha Latipolia L. is a rhizomatous perennial plant. It grows abundantly in irrigation systems, in ditches, ditches and on low banks developed in the first year, as well as on floors with sparse rice grass. The height of the stem of the cattail reaches 2 m, while that of the sedge is slightly lower. The width of the cattail leaf is 2 cm, that of the sedge is 0.5 - 1.0 cm. It is tuberous, cylindrical, with male flowers at the tip of the stem, and female flowers at the bottom. The biological stem dries out and dies from lack of water.

The seeds of the cattail are very small and are easily dispersed by the wind when ripe. The viability of the seeds in the soil is about 4 years. In May, when the temperature of the water applied to the rice plants approaches 20o, the seeds germinate.

In the first year, young plants produce 10-12 leaves and develop thick rhizomes, from which the stem and leaves grow. In the second and third years, a flowering above-ground stem appears. The plant blooms small, and its seeds ripen in August.

As can be seen from the above problems, in order to achieve high yields of rice in Agroclusters and rice farms engaged in rice cultivation today, it is of great importance to use highly effective herbicides that are harmless to the growth and development of new rice. Research work The test of the herbicide Kataryus bereke against annual multi-stem weeds in rice was carried out in the fields of the Rice Research Institute experimental farm.

MATERIAL AND METHOD

The Rice Research Institute is located in the Ortachirchik district of the Tashkent region. The main goal of the research work is to conduct research tests using Chillinger herbicide against weeds in small experimental plots planted with rice. The territory of Uzbekistan is characterized by a sharply continental climate, which is determined by its geographical location, which is expressed in sharp changes in daily and annual air temperatures. The climate of the research area (Tashkent region - Sholikorlik) is moderately continental (41021' north latitude, 69018' east longitude), located 15 km south of Tashkent, the soil is meadow-boggy.

The average monthly temperature in June is 26.2 °. According to observations, the actual temperature of the month: 28.8°. Deviation from the norm: +2.6 °.

Normal precipitation in June: 17 mm. Precipitation: 0 mm. This amount is 0% of the norm. The lowest air temperature (17.1°) was recorded on June 2. The highest air temperature (40.7°) was recorded on June 27.

The average weather in the experimental area in June 2024 was +29.5°C on June 19. The conditions were favorable for the implementation of weed control in rice with the herbicide planned for use in the experiment.

Phenological observations in the research work Methodological manual on the identification of diseases and pests of rice in Uzbekistan and measures to combat them” Tashkent., 1984. 12-b, [10],

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DOI: 10.5281/zenodo.14864915

“Manual on the study of herbicides in rice fields”, Krasnodar, 1979., [11], “Methods of conducting field experiments”. Tashkent-2007. [9], “Methodical manual for conducting state tests of herbicides against weeds in agricultural fields” [12], Methodological instructions for testing insecticides, acaricides, biologically active substances and fungicides. 2nd edition. Tashkent-2007 and biological efficiency was calculated using the Abbot formula [13]. Productivity was statistically analyzed by the Dospekhov method [8-380 p;].

Before sowing in the experimental field: autumn plowing - to a depth of 25 cm, spring - to a depth of 15 cm, chiseling, dry harrowing and water harrowing were carried out. In the second decade of May, rice seeds were sown in the field. In order for the rice seeds to germinate well, water was drained from the floors 10 days after sowing. After a week, the field was watered. When the rice seedlings were 20-25 days old, the floors were drained for herbicide spraying. Then, herbicide treatment was carried out.

Mineral feeding was also carried out in the experiment. In this case, feeding was carried out at the annual rate specified in the recommendations for mid-season varieties - N150P120K150. Ammonium sulfate was used as a nitrogen fertilizer, enriched superphosphate as a phosphorus fertilizer, and potassium chloride as a potassium fertilizer. Before planting, phosphorus, nitrogen and potassium fertilizers were applied (half the annual rate of 50% potassium, 70% phosphorus - 70%, nitrogen -30 - 35%, K -50%). The remaining amount of fertilizers (NPK) was applied in the form of the first feeding - at the germination stage (30-40% nitrogen fertilizers) and the second - 30% phosphorus, 50% potassium and 25-40% nitrogen fertilizers. The water regime was also maintained in the rice fields according to the recommendations developed by scientists of the Rice Research Institute. After herbicide treatment, a 15-20 cm water layer was maintained for 10 days.

In small field experiments to study the biological effectiveness of herbicides against weeds in rice, weed counts were conducted before and 15, 30 and 60 days after treatment. The effectiveness of chemical agents was calculated using the Abbot formula [13]:

$$BS = \frac{Av-Va}{Av} \times 100,$$

Here: BS – biological efficiency, %,

A – the number of weeds in the experiment before spraying,

a – the number of weeds in the experiment after spraying,

V – the number of weeds in the control before spraying,

v – the number of weeds in the control after spraying.

The research work took into account the dynamics of the development phases during the plant growth period, the height of the plants, the density of rice plants and weeds in the experimental field before treatment and 15, 30 and 60 days after treatment with herbicides, the biological effectiveness of the chemical agent was studied. When the grain was fully ripe, samples were taken for analysis of biometric indicators. In this case, the yield of rice was determined by analyzing the stem yield, plant height, main tiller length, the number of full and broken grains, and the weight of 1000 grains.

EXPERIMENTAL SYSTEM. 1. Kataryus bereke – 0.5 l/ha, Rice Planting(size) – 0.5 l/ha, Control (untreated)

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RESULTS

The trial experiments of the herbicide Kataryus bereke, issued by the Quarantine Agency in 2024, were conducted in the experimental fields of the Rice Research Institute. In order to determine the biological effectiveness of the herbicide under study in the experimental field, the number of rice seedlings that had sprouted in the experimental field, the types and quantities of weeds were calculated before treatment. (Table 1).

Table 1: Determination of the number of weeds before treatment with the herbicide Kataryus bereke in the experimental field

№	Options	Consumption rate of chemical agent in l/ha	Number of weeds before treatment, pcs/m^2
Annual sedge weeds			
3	Kataryus bereke	0,5	33,9
2	Template – Rice cultivation	0,5	30,6
1	Control	-	29,4

In the phenological observations conducted before treatment in the research work, it was found that in the control variant, on average, there were 260.3 rice seedlings per m2, and an average of 29.4 annual spike weeds (kurmak), in the standard variant, that is, in the variant where 0.5 liters of Rice Planting was planned to be used per hectare, there were 267.5 rice seedlings per 1 m2, and an average of 30.6 weeds (kurmak), in the variant where the new Kataryus bereke herbicide was planned to be used -0.5 l/ha, there were 256.5 rice seedlings per 1 m2, and an average of 33.9 annual spike weeds (Table 1).

In the research work, it was noted that in the standard variant, i.e., when treated with 0.5 l/ha of Rice Planting herbicide, an average of 12.0 annual grass weeds remained per 1 m2. In this variant, the biological effectiveness of the herbicide against annual grass weeds (kurmak) by 15 days was 67.9%, and when treated with 0.5 l/ha of Kataryus bereke herbicide, the number of weeds remained was 9.3, and the biological effectiveness of the herbicide against annual grass weeds was 69.4% (Table 2).

Table 2: Biological effectiveness of Katharus bereke herbicide against weeds in rice crops in the experimental field

№	Options	Consumption rate of chemical agent in l/ha	Before processing	15 days after processing	
			quantity, pcs/m^2	quantity, pcs/m2	biological effectiveness,%
Annual sedge weeds					
3	Kataryus bereke	0,5	33,9	9,3	69,4
2	Template – Rice Planting	0,5	30,6	12,0	67,9
1	Control	-	29,4	36,0	-

After 15 days of herbicide treatment, the results of phenological observations showed that annual grass weeds were killed by the herbicide. However, perennial and broadleaf weeds were not killed. Therefore, monitoring of these weeds was not carried out. In the herbicide-treated variants, weed growth was inhibited, root growth was stopped, and blackening was observed.

After application of the herbicide Kataryus bereke at a rate of 0.5 l/ha, in phenological observations conducted on the 30th day, the number of weeds in rice was reduced to 29.9. The biological effectiveness was 91.3% when used against annual grass weeds. In the standard variant, the variant

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treated with Sholi Kuram herbicide, it was observed that when used against annual grass weeds, it was 87.2%.

Calculations conducted before harvesting rice showed that in the variants treated with 0.5 l/ha of Kataryus bereke herbicide, the herbicide was found to have a biological effect of 94.9% against annual grass weeds.

In the standard variant, i.e., the variant treated with Sholi Kuram herbicide, the number of annual grass weeds decreased by 26.6 units, and the biological efficiency in this variant was 91.7% (Table 3).

Table 3: Biological efficiency of Kataryus bereke herbicide against weeds in rice crops in the experimental field

№	Options	Consumption rate of chemical agent in l/ha	Before processing	60 days after processing	
			quantity, pcs/m^2	quantity, pcs/m2	biological effectiveness,%
Annual sedge weeds					
3	Kataryus bereke	1,0	33,9	2,7	94,9
2	Template – Rice Planting	3,0	30,6	4,0	91,7
1	Control	-	29,4	46,6	-

At the end of the experiment, bundles were taken from the variants in the field test area for biometric analysis. Analyses were conducted in field and laboratory conditions. In the research work, the variant with the application of Kataryus bereke at a rate of 0.5 l/ha yielded an average of 66.7 t/ha, and in this variant, 11.4 centners of yield were saved due to the protection of rice from weeds with herbicides. (Table 4).

Table 4: Effect of Kataryus bereke herbicide on rice yield

№	Options	Consumption rate of chemical agent in l/ha	Yield by returns s/ha				Average yield in s/ha	Preserved crop per ha
			I	II	III	IV		
3	Kataryus bereke	0,5	67,7	65,8	66,0	67,1	66,7	11,4
2	Template – Rice Planting	0,5	61,8	62,4	61,7	63,3	62,3	7,0
1	Control	-	56,0	54,9	55,7	54,5	55,3	-
						NSR_{05} =*1,26*		s/ga
						NSR_{05} =2,0		%

In conclusion, it should be noted that based on the results obtained when the herbicide Kataryus bereke was applied to weeds in rice at a rate of 0.5 liters per hectare, it was found that it killed up to 94.9% of annual sedge weeds. These results can be used as a basis for recommending this herbicide.

CONCLUSION

1. According to the results of the study, the application of the herbicide Kataryus bereke at a rate of 0.5 l/ha against annual weeds in rice crops led to the destruction of weeds, the biological efficiency was 94.9% compared to annual cereal weeds.
2. In the experiment, when using the herbicide Kataryus bereke at a rate of 0.5 l/ha, the yield of rice grain was 11.4 centners higher than the control in the Tashkent region.
3. Taking into account the biological efficiency of the herbicide Kataryus bereke , it is recommended to include the chemical agent in the "List of Chemical Agents Allowed in the Republic of Uzbekistan" for the application of 0.5 l/ha against annual cereal weeds in rice crops. It is recommended to carry out tillage work when weeds have developed 3-4 leaves in wet soil.

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ISSN: 0047-262X
DOI: 10.5281/zenodo.14864915

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