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# Effect Of Certain Pesticides On Certain Indicators Of Rice Plants

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**ABSTRACT**

The results obtained show that the activity of the catalase enzyme varies during the germination periods of rice plants, and the highest activity was detected on the 5th day of the germination period in both varieties of the harvested plant. Under the influence of pesticides Dnox and Karat, the germination rate of rice seeds decreased, that is, the germination process slowed down, and of the pesticides, Karat pesticide had a greater effect on the Iskandar variety, and Dnox pesticide had a greater effect on the Arpa-Sholi variety.

On the activity of the peroxidase enzyme, which is involved in the process of lipid peroxidation during the germination, growth of the stalk and root of rice seeds, under the influence of pesticides Dnox and Karat, a decrease in the activity of the peroxidase enzyme was observed in both stalks and roots compared to the control.

The activity of the catalase enzyme during the germination periods of the Arpa-Sholi (devzira) and Iskandar (alanga) varieties of rice plants was different, and the highest activity of the enzyme was determined on the 5th day of the germination period in both varieties of the harvested plants. When comparing the results of both varieties with the control indicators, it was observed that the activity of the catalase enzyme decreased under the influence of the pesticides Dnox and Carats on all studied days compared to the control.

***Keywords:*** *rice, Arpa-sholi variety, Iskandar (alanga) variety, pesticide, dnox, carat, seed, germination, enzyme, peroxidase, catalase.*

## 1. INTRODUCTION

Rice is the most important food crop in the world, ranking second in terms of cultivated area in world agriculture, and first among cereal crops in terms of productivity. Extensive theoretical and practical research is being conducted to create and cultivate new high-yielding, pest-resistant varieties of rice.

In many countries of the world, rice is one of the oldest food crops. It is the main food product of the population of China, India, Japan, Pakistan, Indonesia, Vietnam, and especially tropical countries. Rice is distinguished by its high quality and rapid digestion for the human body.

Rice is a plant belonging to the Poaceae family, Oryza tribe, Oryza genus, and was first described by K. Linnaeus in 1735 [22].

Rice is a plant of tropical countries, therefore it is very demanding on heat. Its seeds begin to germinate at 10-14 ° C, but this process is slow. It germinates well at 14-15 ° C. The most favorable temperature for seed germination is 22-25 ° C. It germinates at 30-34°C. 42-46°C is considered a high temperature for rice seed germination, if it is higher, the seeds will die. The maximum high temperature for seed germination of rice varieties planted in Uzbekistan does not exceed 40°C. The most favorable temperature for the growth and harvesting of grasses is 20-30°C. During the growth period of rice, the temperature

should be 25-30°C, but not more than 40°C. The lowest temperature during the flowering period of rice should be 18-20°C, at least 15-18°C during the milk maturity period, and not less than 12-15°C during the wax maturity period. If the temperature drops to 10°C during the milk maturity period, the growth and ripening process of rice stops. Sudden temperature changes, especially during the flowering period, have a negative effect on the rice plant. Mild frosts of 0.5°C are dangerous for rice, and at 1°C, rice dies at all stages of development [1,2,6,7].

Rice contains nutrients necessary for the body: protein, phosphorus compounds and vitamins. Rice contains 75.2% carbohydrates (mainly starch), 7.7% protein, 0.4% oil, 2.2% fiber, 0.5% ash and 14% water. Food prepared from rice is digested very quickly and is completely absorbed. The absorption coefficient of rice is the highest - 96%, and its caloric content is 3594 kcal [8].

Rice grains are white, red, and black in color, nutritious, and contain 76.1% starch, 17-24% amylase, 2.6% protein, 3.9% sugar, 1.8% dextrin, 1-1.5% fat, 1.4% ash dry matter, and 0.2% binding agent.

Rice contains 8 amino acids necessary for the formation of new cells in the human body. 7-8% of rice grains are protein. Another positive factor in rice is that, unlike other cereals, it does not contain a plant protein called gluten, which causes allergic reactions in humans. There is no product that is equal to rice in terms of the high content of aluminum and copper [3,6,9].

According to data, more than 100 species of pests have been recorded in the rice fields of the republic. According to the data of the Uzbekistan Plant Protection and Rice Research Institutes of Uzbekistan, there are 33 species of pests that regularly damage rice and cause significant economic losses, which belong to the 2nd class, 9 orders and 15 families. Pests cause significant damage to rice plants throughout the entire growing season [10].

In the soil and climatic conditions of our country, in the 30s-90s of the 20th century, research was conducted on pests that damage rice plants and their control (agrotechnical, biological, chemical). According to V.P. Shagaev, more than 30% of the world's crop yield is lost annually due to the influence of harmful organisms. Therefore, it is emphasized that it is necessary to use intensive technologies, widely use chemical agents in plant protection and ensure their effectiveness [12].

The most comprehensive research on rice pests in Uzbekistan was conducted by M.P. Sborshikova in the 70s of the last century, and the most important pest control measures were developed and recommendations were given [7].

One of the conditions for obtaining high yields of agricultural crops is their protection from pests. [3,6,9] It is an urgent need to identify pests and their damage at different stages of development of newly created rice varieties and take important measures against them.

It is known that pesticides, like any xenobiotics, affect the lipid layer of cell and organelle membranes, changing their permeability. This is mainly due to the acceleration of peroxidation of lipids and the increase in free radicals.

In order to correct the adverse processes that occur in the body when poisoned with various pesticides and prevent such situations, it is also relevant to study the effect of plant antioxidant factors (PAFs).

Materials and methods: The goals and objectives of the study are as follows. The aim of the study was to determine the effect of pesticides Dnox and Karat on the growth and development of rice plants, in particular, on the germination efficiency of the plant and the activity of catalase and peroxidase enzymes during the germination and growth of the plant's shoots. To achieve this goal, the following tasks were set: - to study the effect of pesticides Dnox and Karat on the germination of rice seeds; - to determine the activity of catalase and peroxidase enzymes in the shoots of the plant and, on this basis, to study the importance of antioxidant factors (AOF) in plants;

The harvested seeds of rice plants, shoots and pesticides - Dnox and Karat were used as the objects of research.

Dnox is a systemic fungicide with contact intestinal insects-acaricides for use in fruit, grain and vegetable crops, against diseases and pests. It is used in granaries, non-loading warehouses and equipment of grain processing enterprises.

Karat is a broad-spectrum insecticide approved for use on all crops. It acts quickly on pests. Mechanism of action: contact, intestinal, has pronounced repellent properties even in sublethal doses.

The studies were conducted on grains of the varieties Arpa-sholi (devzira) and Iskandar (alanga) of the rice plant of the Poaceae family, Oryza genus.

The mid-ripening rice variety is Iskandar (alanga). Created by single selection from the Alanga variety at the Uzbekistan Rice Research Institute Zoned in 2009.

The growing season is 115-120 days, plant height is 120-125 cm, ear length is 18-20 cm, husk content is 18-18.5%, yield is 90-95 t/ha, rice yield is 71-72%, whole rice yield is 92-95%, glassiness is 98-100%, 1000 seed weight is 33-34 g [12].

Early ripening variety of rice - Arpa-Sholi (devzira). Local folk selection. In 1939, it was zoned in all regions of the Republic of Uzbekistan where rice cultivation is allowed. Botanical type - Vulgaris (ssp. vulgaris). The growing season is 90-95 days, plant height is 90-100 cm, ear length is 18-20 cm, husk content is 19-20%. Yield 40-50 t/ha, rice yield 69-70%, whole rice

yield 75-80%, vitreous 98-100%, 1000 seed weight 32-34 g. [12,13].

For the experiment, the seeds were soaked in distilled water for 24 hours, first in plain water, then in a 10% solution of pesticides Dnox and Karat, and then in Petri dishes at 20-25oC. During seed soaking, 10 ml of water and solutions were poured into each Petri dish. The number of grains in each dish was 100 grains. The experiments were carried out in three biological replicates. Samples for analysis were taken at the same time of the day [14,15].

Determination of the activity of the peroxidase enzyme. To determine the activity of the peroxidase enzyme, inorganic and organic substances are used, in which the formation of colored products is observed under the conditions of hydrogen peroxide oxidation. In this research, 0-dianisidine and potassium ferrocyanide were selected as the substrate of the peroxidase enzyme, and the absorption maximum of the oxidation products in the peroxidase characteristic is equal to 460 and 420 nm [21].

Determination of the activity of the catalase enzyme. The determination of the activity of the catalase enzyme was determined using the method described by M.A. Korolok, L.I. Ivanova, I.G. Mayorova, V.E. Tokaryev (1988) [21], based on the formation of a stable colored complex of hydrogen peroxide with molybdate salts.

The results obtained and their analysis. Study of the effect of Dnox and Karat pesticides on the germination of seeds of Iskandar (Alanga) and Arpa-Sholi (devzira) varieties of rice.

V.P. According to Shagaev, more than 30% of the world's agricultural crop is lost annually due to the effects of harmful organisms. Therefore, it is necessary to use intensive technologies, widely use chemical agents in plant protection and ensure their effectiveness [4,11].

In this research, two varieties of rice plants - Iskandar (Alanga) and Arpa-Sholi (devzira) varieties, as well as chemical agents used against pests - Dnox and Karat pesticides were used as research objects.

In the experiments, each rice variety was divided into 3 groups:

Group 1 - control group (rice seeds were germinated in distilled water);

Group 2 - rice seeds were germinated in a 10% solution of Dnox;

Group 3 - Rice seeds were germinated in a 10% solution of Karat;

These preparations were applied to rice seeds in a single dose, first in distilled water for a day, then in a 10% solution of pesticides for a day, then in distilled water and the germination of the seeds was observed.

At the beginning of the experiments, the weight of 100 grains of each variety of rice and one seed was measured. The following results were obtained when studying the weights of rice seeds.

**Table 1 Quantitative index of seed of studied rice varieties**

| № | Name of the rice variety | Weight of 1 seed | Weight of 100 seeds |
|---|---|---|---|
| 1 | Iskandar (alanga) | 0,034 | 3,0205 |
| 2 | Arpa-Sholi (devzira) | 0,036 | 3,147 |

**Table 2 Quantitative index of rice varieties seeds after pesticide exposure**

| № | Seed weight | Control | | Dnoks | | Karat | |
|---|---|---|---|---|---|---|---|
| | | Iskandar (alanga) | Arpa-Sholi (devzira) | Iskandar (alanga) | Arpa-Sholi (devzira) | Iskandar (alanga) | Arpa-Sholi (devzira) |
| 1 | 1 piece | 0,05 | 0,06 | 0,05 | 0,045 | 0,043 | 0,049 |
| 2 | 100 piece | 4,7 | 5,3 | 4,45 | 4,35 | 4,48 | 4,7 |

In the experiments, the weight of 1 grain and 100 grains of the seeds of the rice varieties under study was initially measured. When the seed weight was measured, the indicators of the Arpa-Sholi (devzira) variety were higher than the seeds of the Iskandar (alanga) variety (Table 1). In the subsequent experiments, the seeds of the rice varieties under study were soaked in solutions of pesticides Dnox and Karat for one day, and then the weight of 1 grain and 100 grains was measured again. When the weight of the soaked seeds was measured, the indicators of the Iskandar (alanga) variety were slightly lower than the indicators of the seeds of the Arpa-Sholi (devzira) variety. From these results, it can be seen that when the rice seeds were soaked, the weights of the seeds in the control group were higher than those in both experimental groups. From this,

we can conclude that the adaptive or protective mechanism of the seeds was activated, and the absorption of pesticides, i.e. chemicals, was low. (Table 2)

In our next experiments, the germination process of rice varieties was studied. The results obtained were analyzed in relation to the control group. Seed germination was measured on the 5th, 7th, 9th, and 11th days of germination.

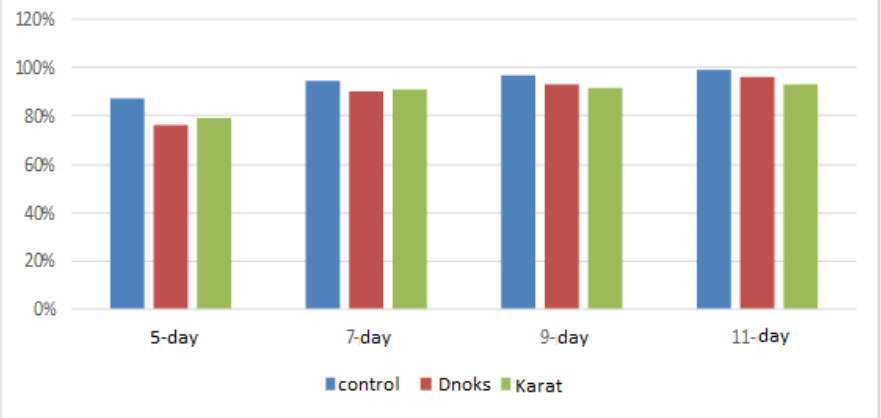


**Diagram 2 Germination of Iskandar (Alanga) rice seeds under the influence of pesticides.**

The results showed that the germination rate of Iskandar (alanga) rice seeds when incubated in a solution of the Dnox preparation was 76.5% on the 5th day, 90% on the 7th day, 93.5% on the 9th day, and 96% on the 11th day. When the seeds of this variety were incubated in a solution of the Karat preparation, the germination rate was 79% on the 5th day, 91% on the 7th day, 92% on the 9th day, and 93.5% on the 11th day.

In the next experiments, Arpa-sholi seeds were incubated in a solution of the Dnox preparation. The germination rate was as follows. On the 5th day - 40%, on the 7th day - 61%, on the 9th day -71%, and on the 11th day - 94%. When the seeds of this variety were soaked in a solution of the Karat preparation, the germination rate of the seeds was 42% on the 5th day, 66% on the 7th day, 72% on the 9th day, and 95% on the 11th day.

## 2. CONCLUSION

Based on the results obtained, it can be said that under the influence of pesticides used against pests, the germination rate of rice seeds decreased, that is, germination slowed down. Of the pesticides used, Karat pesticide had the greatest effect on the Iskandar variety, and Dnox pesticide on the Arpa-Sholi variety (diagrams 1-2).

Under the influence of these pesticides, it was observed that the germination rate of rice seeds decreased, that is, the germination process slowed down, and of the pesticides exposed, the Karat pesticide had the greatest effect on the Iskandar variety, and the Dnox pesticide had the greatest effect on the Arpa-Sholi variety.

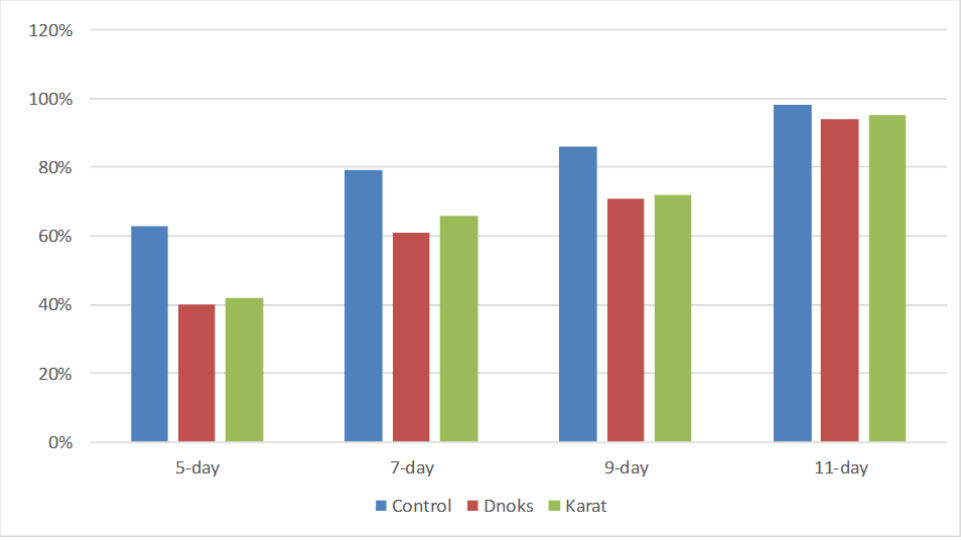


**Diagram 3. Germination of seeds of the rice plant Arpa-Sholi (devzira) variety under the influence of pesticides.**

After treatment of rice seeds with chemicals used to protect them from pests, it was observed that the germination and growth of plant seeds were later than those of untreated seeds.

In conclusion, it can be said that the decrease in germination of seeds of rice varieties exposed to pesticides may be the result of disruption of certain biochemical processes in the cells of these seeds. For this, there is a need to study certain biochemical processes in seeds.

Studying the effect of pesticides on the activity of the peroxidase enzyme in the cells of rice seeds and roots.

Wheat, Arpa and rice seeds, which belong to the group of orthodox seeds, are in a state of hypobolism during dormancy, which is associated with a low water content and, accordingly, the inactivation of a number of enzymes. The decrease in respiration is based on a change in the fatty acid composition of mitochondrial membranes and the enzyme system that provides oxidative phosphorylation. However, some activity of oxidative processes is detected in all dormant seeds [23].

In the first hours of seed swelling, a change in the activity of oxidase enzymes, including peroxidase, is noted. This stimulates the oxidation reactions of free radicals, which, in turn, initiate LPO (lipid peroxidation), which increases the respiratory activity of mitochondria. Currently, an increase in peroxidase activity indicates its participation in the processes of seed germination at the earliest stages [2,15].

The role of peroxidase in ensuring the metabolic functionality of dormant seeds has been proven. As a result of the sequential catalysis of oxygen to water, the seed is supplied with water to the main organs of the embryo, which increases its viability [16,17,18].

Based on the above data, in our next experiments, the effect of pesticides Dnox and Karat on the activity of the peroxidase enzyme, which is involved in the process of lipid peroxidation during the germination, growth of the rice seed, and the growth of the rice stalk and root, was studied.

In the initial experiments, the effect of Dnox and Karat pesticides on the activity of the peroxidase enzyme in the seed stalks and root cells of the harvested rice variety Arpa-Sholi (devzira) was studied.

The results obtained showed that, on the 10th day of seed germination, a decrease in the activity of the peroxidase enzyme in the cells of the stalks was observed under the influence of the Dnox preparation. At the same time, on the 10th day of the germination period of the seeds of the studied rice variety Arpa-Sholi, the activity of the peroxidase enzyme decreased by 13.1% under the influence of the Dnox preparation and by 16.7% under the influence of the Karat pesticide. When the effects of these pesticides were examined on the roots of rice plants, it was observed that the enzyme activity decreased by 0.2% under the influence of the pesticide dnox, and by 1.4% under the influence of the pesticide karat.

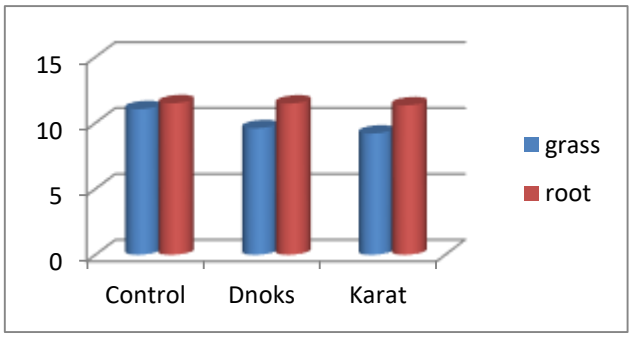


**Diagram 4. The effect of pesticides on the activity of the peroxidase enzyme in the blades and roots of the Arpa-Sholi (devzira) variety of sprouted rice.**

Compared to the control, these indicators showed a decrease in enzyme activity in both blades and roots under the influence of both pesticides.

In experimental experiments, the effect of both pesticides on the activity of the peroxidase enzyme in the blades and roots of the Iskandar (alanga) variety of rice was studied.

On the 10th day of the germination of the rice seeds, a decrease in the activity of the peroxidase enzyme was observed in the blades under the influence of the Dnox pesticide. At the same time, on the 10th day of the germination period of the seeds of the Iskandar (alanga) variety of rice under study, the activity of the peroxidase enzyme in the blades was observed to decrease by 0.1% under the influence of the Dnox preparation, and by 2.4% under the influence of the Karat pesticide. When the effects of these pesticides were observed on the roots of rice plants, a 6.5% decrease in enzyme activity was observed under the influence of Dnox pesticide, and an 8.9% decrease in activity under the influence of Karat pesticide. These indicators also indicate that both pesticides reduced enzyme activity in plants and roots compared to the control. (Diag. 5)

Peroxidase is involved in maintaining the viability of grains during dormancy, as it sequentially catalyzes the oxidase and peroxidase oxidation reactions of various organic compounds.

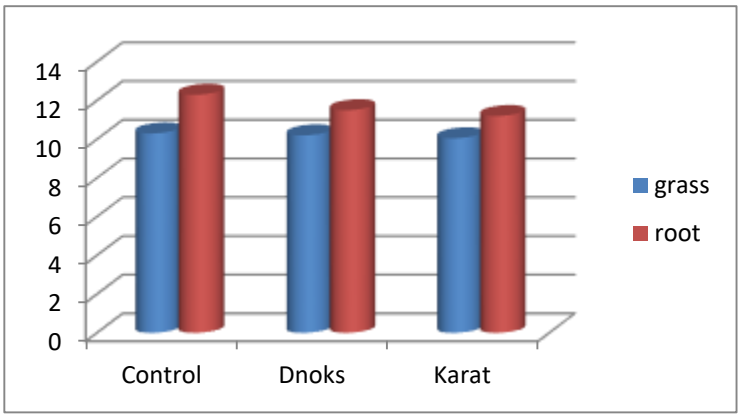


**Diagram 5. Effect of pesticides on the activity of the peroxidase enzyme in the grass and roots of the Iskandar (Alanga) variety of germinated rice.**

The increase in peroxidase activity during the germination period of grains indicates that the enzyme is involved in the activation of germination mechanisms and the activation of mitochondria. A relationship between the degree of lipid peroxidation and the content of antioxidants in the seedlings of cereal plants has been established [5,15,17,19].

High activity of the enzyme is detected in plant organs with a low content of antioxidants, and vice versa, low activity of the enzyme indicates a high content of antioxidants in plant organs. In the case of hypobiosis in grains, the respiratory activity of mitochondria decreases, in which case peroxidase, together with other oxidases, can play the role of a "water pump" that provides water needs in grain cells [4,14,18]. The decrease in the activity of the peroxidase enzyme under the influence of pesticides indicates that it regulates the amount of hydrogen peroxide and the amount of antioxidants during the germination and growth stages by reducing the synthesis of enzymes in the cell, especially in the membrane [14,19].

The peroxidase enzyme is actively involved in the formation of the initial mechanisms for the germination of rice seeds. In the peroxidase oxidation reactions of various substrates, including antioxidants, free radicals can be formed that can accelerate the processes of free radical oxidation that initiate lipid peroxidation in the early stages of seed germination. Peroxidase is a redox enzyme that controls the amount of hydrogen peroxide and the amount of antioxidants in rice seeds and seedlings, while antioxidants accumulate in tissues and participate in reactions that suppress the formation of free radicals, the excess of which can inhibit the activity of the enzyme [20].

The results obtained show that the activity of the peroxidase enzyme, which is part of the antioxidant enzyme system, depends on the germination period of the harvested plants, and its activity is different. In this case, when rice seeds were exposed to pesticides Dnox and Karat, a significant decrease in the activity of the peroxidase enzyme involved in the process of lipid peroxidation was observed. In the grasses of the Arpa-Sholi variety, under the influence of the Karat pesticide, the enzyme activity decreased by 16.7%, and in the roots of the Iskandar (flame) variety, the enzyme activity decreased by 6.5%.

Study of the effect of pesticides on the activity of the catalase enzyme in the grasses of rice seeds. The structure and function of biological membranes depend on the peroxidation of lipids.

Catalase (Greek catalysis - breakdown) is an enzyme belonging to the class of oxidoreductases, catalyzing the decomposition

of hydrogen peroxide ($H_2O_2$) into water and oxygen. Catalase is present in all animal and plant tissues and in aerobic microorganisms.

Catalase enzymes have been studied in many plants and animals, and it has been found that their amount varies depending on time, conditions, and the type of organism.

One of the main goals of our scientific research is to determine the activity of the catalase enzyme, which has an antioxidant effect, during the germination period of seeds of the harvested rice varieties Arpa-Sholi (devzira) and Iskandar (alanga).

The activity of the catalase enzyme is determined by the amount of milligrams of hydrogen peroxide decomposed by the enzyme in 1 gram of the tested material for 30 minutes.

Research results: The activity of the catalase enzyme, which is included in the antioxidant enzyme system, depends on the germination period of the harvested grain and legume plants, and its activity varies.

The results showed that catalase activity in the rice plant Arpa-Sholi (devzira) variety under the influence of Dnox pesticide on the 5th day of germination was 0.217 µg.at/l, on the 7th day - 0.178 µg.at/l, and on the 9th day - 0.191 µg.at/l. When the same variety was exposed to Karat pesticide, catalase activity on the 5th, 7th, and 9th days of germination was 0.269 µg.at/l, 0.184 µg.at/l, and 0.224 µg.at/l. When the results were viewed, it was observed that the catalase enzyme index was high on the 5th day of germination, decreased slightly on the next day, and increased again on the 9th day. The highest catalase activity occurred on the 5th day of the germination period (diag. 6).

In the experiments in Gal, the effect of pesticides on catalase activity was studied in the Iskandar (Alanga) variety of rice. In this case, under the influence of the Dnox pesticide, the catalase activity of the Iskandar (Alanga) variety on the 5th day of germination was 0.180 µg.at/l, on the 7th day - 0.152 µg.at/l, and on the 9th day - 0.169 µg.at/l. When exposed to the Karat pesticide, the catalase activity was 0.196 µg.at/l on the 5th day of germination, 0.168 µg.at/l on the 7th day, and 0.187 µg.at/l on the 9th day of germination. In this experiment, the catalase enzyme index was also high on the 5th day of germination, decreased slightly on the next day, and then increased again. The highest catalase activity occurred on the 5th day of germination (diag. 7).

In both experiments, when comparing the results of both varieties with the control indicators, the results showed that under the influence of the pesticides Dnox and Karat, the activity of the catalase enzyme decreased compared to the control on all studied days. The greatest decrease in enzyme activity was observed in the Arpa-Sholi (devzira) variety under the influence of the Dnox pesticide on the 5th day - by 67%, on the 7th day - by 75%, and on the 9th day - by 65%.

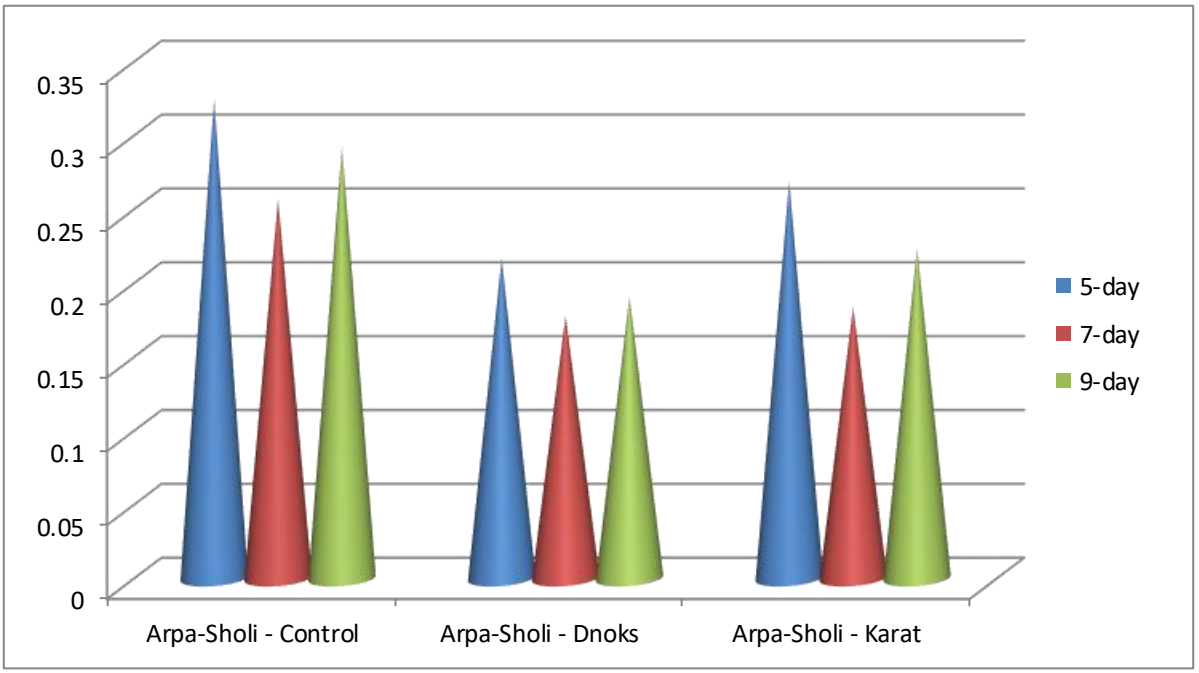


**Diagram 6. Effect of pesticides on catalase enzyme activity in the grass of the cultivated rice variety Arpa-Sholi (devzira).**

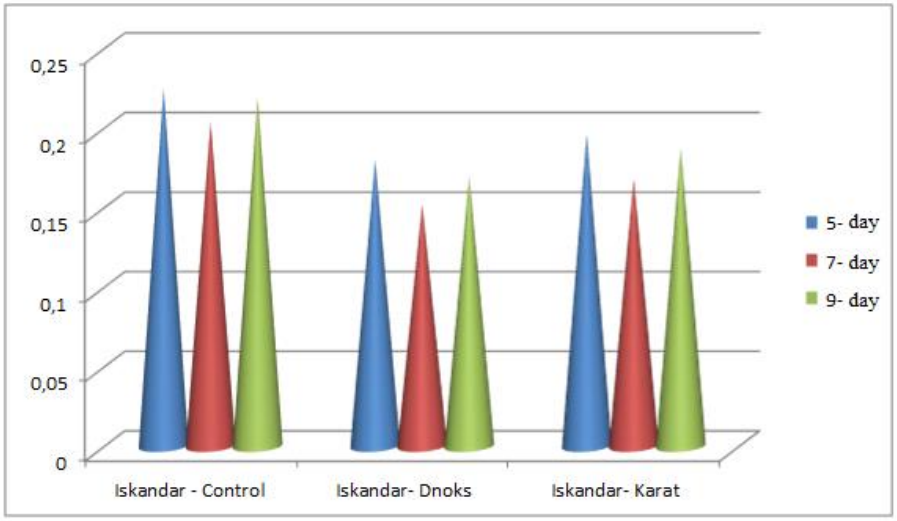


**Diagram 7. The effect of pesticides on the activity of catalase enzyme in the sprouted rice of the Iskandar (Alanga) variety.**

A number of scientific studies have shown that changes in the activity of antioxidant enzymes depend on metabolic processes in the cells of cereal plants during germination [18].

## 3. CONCLUSION

The results obtained show that the activity of catalase enzyme varies during the germination period of rice plants, and the highest activity was determined on the 5th day of germination in both varieties of the sprouted plant. Under the influence of pesticides Dnox and Karat, the germination index of rice seeds decreased, that is, the germination process slowed down, and of the pesticides tested, Karat pesticide had a greater effect on Iskandar variety, and Dnox pesticide had a greater effect on Arpa-sholi variety.

The activity of the peroxidase enzyme, which is involved in the process of lipid peroxidation during the germination, growth of the stalk and root of rice, was reduced by the pesticides Dnox and Karat, compared to the control.

The activity of the peroxidase enzyme in the stalk and root cells of the Iskandar (alanga) variety of rice was reduced by 6.5% under the action of the Dnox pesticide, and by 8.9% under the action of the Karat pesticide. The greatest decrease in the activity of the peroxidase enzyme was observed in the stalks of the Arpa-sholi variety under the action of the Karat pesticide, and the greatest decrease was observed in the roots of the Iskandar (alanga) variety.

The activity of the catalase enzyme during the germination periods of the Arpa-Sholi (devzira) and Iskandar (alanga) varieties of rice plants was different, and the highest activity of the enzyme was detected on the 5th day of the germination period in both varieties of the harvested plants. When comparing the results of both experiments with the control indicators of both varieties, a decrease in the activity of the catalase enzyme was observed under the influence of the pesticides Dnox and Karats on all studied days compared to the control.

The activity of catalase, one of the main enzymes involved in the utilization of hydrogen peroxide, does not show dose dependence and is characterized by a wide range of values. A statistically significant increase in the activity of this enzyme was detected only on the 5th day of germination. The fact that the change in enzyme activity is not dose-dependent is probably due to the fact that the highest catalase activity is observed on the first day of germination, during seed swelling [31]. Also, catalase, unlike peroxidase, has a low affinity for the substrate and reacts only with a sufficiently high concentration of $H_2O_2$.

The results of assessing the activity of antioxidant system enzymes indicate the presence of oxidative stress in the seedlings of poisoned seeds at the early stages of ontogenesis. The work of the antioxidant system in seedlings on the 3-5th day after seed germination with pesticides is determined by the activities of peroxidase and catalase [18].

In conclusion, it can be said that when pesticides are used in excess of the officially recommended dose or concentration, when the method and timing of application are incorrectly selected, as well as when climatic conditions are not taken into account, they cause plant burns, reduced pollen viability, seed death and, as a result, a decrease in yield. Pesticide contamination of plants, as well as their accumulation on the surface of plants, can be dangerous for humans and animals. Due to the regular use of pesticides, harmful organisms often develop resistance to them. In order to prevent the emergence of varieties of pests resistant to certain pesticides, there should be a large number of types of preparations intended for each pest, and they should be used alternately.

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