

BIOLOGICAL SCIENCES

THE EFFECT OF LETHAL CONCENTRATION HERBICIDES ON FISH BEHAVIOR

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Abstract

Herbicides were developed to affect the physiological processes of plants, and they are responsible for causing harmful effects on animals. The aquatic environment is a natural reservoir for herbicides, which, after being applied to crops, run off through the soil, reaching rivers, lakes, seas, and oceans. Fish are among the many organisms affected by aquatic pollution caused by herbicides. These animals play an important ecological role and are a major food source for humans. However, few studies have examined the effects of herbicides on fish. In this article, the effects of herbicides on the behavioral responses of fish are studied, using *Cyprinus carpio* as an example. The lethal concentration of Tarkor Super herbicides was determined for fish for the first time. As a result of the research conducted, it was found that they influence the behavioral reactions of fish.

Keywords: herbicides, Tarkor Super, behavior, *Cyprinus carpio*.

Introduction

Herbicides can disperse into the atmosphere and soil, but the aquatic environment is the ultimate reservoir for these compounds, as once applied to fields they can reach rivers, lakes, seas, oceans, and groundwater via leaching, precipitation, or infiltration. Fish are among the many organisms harmed by aquatic herbicide pollution. In developed countries, fish is a valuable source of protein and micronutrients such as omega-3, vitamins A, B, D, iron and zinc. However, due to the increasing discharge of pollutants into water, the maintenance of fish stocks in the wild and the availability of this food source are under threat. Therefore, our research aimed to determine the lethal concentration herbicide Tarkor Super acceptable for fish and how it affects the behavioral reactions of fish.

Material and research methods

The biological object of our research was six-month-old *Cyprinus carpio*, a freshwater fish. We purchased carp from the Khylli fish factory for sturgeon production. To avoid stress, the fish under study were placed in aerated containers and delivered to the aquarium of the A. I. Garayev Institute of Physiology for further research. First of all, lethal concentrations of the studied herbicides were determined using the Dj. Finney method (2). Behavioral reactions such as coughing, yawning, surface swimming, and restless chaotic movement (1) were determined in the norm and after exposure to the herbicide at a lethal concentration. It should be noted that the data obtained were determined after 96 hours of herbicide exposure.

Discussion of the obtained results

Pesticides can affect the behavior of aquatic organisms, leading to species extinction. In addition to target organisms, pesticide exposure also affects non-target organisms, leading to disruption of the food chain and ecological imbalance. Bioaccumulation of pesticide residues in plankton (the food source consumed by many marine organisms) can be transferred to fish and other invertebrates, thereby negatively affecting them directly or indirectly. Some herbicides

with generalized modes of action may also be relevant to fish and other animals. These include substances that interact with metabolic pathways, leading to the formation of reactive oxygen species and other free radicals that damage cells. However, this mode of action is not exclusive to herbicides and will mostly be observed in high-impact scenarios.

Pesticides sold and used in the environment are usually mixed with other substances to facilitate application to target organisms. These substances are known as formulation agents and serve the same purpose as the excipients added to some pharmaceuticals; that is, they help disperse the pesticide in the spray solution or facilitate penetration of the pesticide into the target organism. Since most herbicides must be transported through the xylem and phloem in these cases, surfactants are added to the formula to enhance penetration through the cuticle and into plant tissues (3).

Among the pesticides used in agriculture, herbicides are used in the largest quantities. These substances enter the aquatic environment in various ways, and monitoring studies show their constant presence in natural waters. Herbicides cause changes in many physiological parameters in fish, such as a decrease in the activity of acetylcholinesterase in internal organs, an increase in the activity of liver transaminases, or a violation of the oxidoreductive balance. Changes in hematological parameters are also observed, usually indicating anemia and an inflammatory process. The most frequently observed histological changes include hyperplasia and hypertrophy of the gill epithelium and changes in the microstructure of the liver, such as vacuolization of hepatocytes. Markers of herbicide exposure in fish are usually very sensitive but nonspecific. Analysis of metabolic, hematological, and histological tissue parameters can be useful in determining fish poisoning with herbicides, but they should always be confirmed by monitoring studies (4). In our studies, we looked at behavioral reactions. As a result of the studies, we found that Tarkor Super lethal concentration (17.32 mg/l) has a strong effect on the behavior of fish.

If coughing is normally 3.6 ± 0.67 dw/min, then after the influence of Tarkor Super it was 51.00 ± 3.48 dw/min, yawning is normally 2.6 ± 0.31 dw/min after exposure 21.00 ± 2.77 dw/min, surface swimming 4.8 ± 0.53 dw/min, under the influence of this indicator was 11.70 ± 1.15 dw/min, restless chaotic movement is normally 2.9 ± 0.38 dw/min, under the influence of Tarkor Super lethal concentration (17.32 mg/l) it became 9.10 ± 0.38 dw/min.

Conclusions

1. Lethal concentration of Tarkor Super herbicide for fish determined
2. Behavioural disturbances in fish were detected after exposure to herbicide

3. The studies conducted have proven that Tarkor Super causes disturbances in the nervous system of fish

References:

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