

TO THE SAFE APPLICATION OF DEFOLIANT COTTON PHOSPHODEPHOSPHATE IN AGRICULTURE OF THE REPUBLIC

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Abstract. *The article presents the materials of experimental research on the new defoliant of cotton "Phosphodef". By parameters of acute toxicity the studied preparation belongs to low hazardous compounds, IV class of hazard. The irritating effect of the preparations on mucous membranes of eyes and skin; cumulative properties of the preparation have been studied in acute experiments. Hygienic standards of the preparation in air, water, soil and food products; sanitary protection zones, terms of employment are scientifically proved. According to the research results, the use of defoliant "Phosphodeph" in agriculture from hygienic positions is not objectionable.*

Keywords: *defoliant, toxicity, medium death dose, irritant effect, hygienic standard, environment, safety, water, air, soil.*

Introduction. One of the most important government tasks for the protection of the environment and human health is the prevention of pesticide pollution in the biosphere [1]. To solve it, a strict system of preventive state supervision over the use of pesticides is established [2]. Each new pesticide is scrutinized by hygienic institutions. Its introduction into agricultural production is carried out only after thorough discussion of the results of hazard study and assessment [3]. Long-term world experience in the use of plant protection chemicals has allowed improving the criteria of their sanitary and hygienic assessment and developing the requirements, strict fulfillment of which ensures the safety of applied pesticides for humans, useful fauna and flora. Great success in the field of development of hygiene of pesticides application was achieved by domestic science and practice. In recent decades, in-depth studies on widely used and newly recommended pesticide formulations have continued [3, 9]. The character of their action on various organs and systems was studied, the mechanism of action was specified, stability, transformation processes in living organisms and other objects of environment were studied. New preparative forms of pesticides and technologies of their application were evaluated.

Broad-ranging studies have been conducted to substantiate hygienic regulations for the use of pesticides in various agricultural sectors [8]. As a result of this work, new data on the hazard of used pesticides were obtained and preventive measures were improved. Some pesticides hazardous to the biosphere have been removed from the list of those permitted for use in agriculture. In return, they have been introduced or are being introduced into agricultural practices more efficient, cost-effective and less harmful to the environment and human health domestic remedies for plant protection. One of the important and topical issues in the chemistry of defoliant technology is the problem of obtaining complex defoliants containing nutritious and ethylene-producing components, in which it is possible to obtain good effects at defoliation [10]. Interest in the study of heterogeneous equilibrium in complex water systems taking into account sodium chlorate, monochloroacetic acid, urea, urea phosphate and monoethanolamine is due to the practical importance of the initial components. Urea phosphate is synthesized from phosphoric acid and urea. The role of phosphorus in carbohydrate metabolism determines the positive effect of phosphate fertilizers on sugar accumulation in sugar beet, starch in potato tubers, cereals, etc. An adequate supply of phosphorus to plants during the formation of reproductive organs is also important - accelerating their formation and maturation of plants, increasing yield and its quality. In this connection, in order to characterize the behavior of sodium chlorate with ethanolamine derivatives and nutrients at their joint presence in a wide temperature and concentration range, as well as for the purpose of physico-chemical justification of the technological process of obtaining defoliants with simultaneous physiological activity, the solubility of water systems with the above components has been studied. The Government of the Republic of Uzbekistan adopted Decree No. 21 of 14 January 2020 "On measures to increase the level of mechanization of cotton harvesting in the regions of the country", which will increase the introduction of new defoliants into agricultural practice [7]. The Decree approved the Plan of measures to increase the mechanization of cotton harvesting and organization of cotton harvesting machines production in 2020-2026. In this connection, one of the most important conditions for the successful and high-quality harvesting of agricultural food crops, including cotton, in the home-grown period is the processing of plants with low-toxicity preparations that accelerate physiological processes and ripening of fruits, which allows without reducing the yield to carry out a complete harvest of fruits in a short time. At present, a new cotton defoliant "Phosphodef" is recommended for introduction into agricultural practice of the country.

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Materials and methods. Scientific researches on establishment of toxicity parameters of preparations were carried out according to "Methodology of complex and accelerated normalization of pesticides in environmental objects". [4]. The degree of toxicity of the preparation was determined with the help of sanitary rules and norms № 0321-15 [5]. In this work hygienic, toxicological and statistical methods of investigation were used [6]. A new cotton defoliant, developed by the staff of the Institute of General and Inorganic Chemistry of the Academy of Sciences of the Republic of Uzbekistan, was studied in the work. Aggregate state: a transparent liquid. Color, odor: light yellow, with a slight smell. Specific weight - 1,431 grams per cubic centimeter. The temperature of crystallization - 80 C.

Research results. Experimental studies to determine the parameters of toxicity of the preparation were conducted according to the "Methodology of complex and accelerated normalization of

pesticides in the environment" on 3 types of laboratory animals: white rats, mice, rabbits. Signs of intoxication during administration of toxic doses of the preparation were characterized by reduced motor activity, respiratory disorders, heaping of animals in the corner of the cell, ruffled coat. Rats: doses from 2000.0 to 6000.0 milligrams per kilogram were taken into account. As a result of studies, an average lethal dose (LD50) of 4000.0 milligrams per kilogram, LD16 - 2600.0 milligrams per kilogram, LD84 - 6300.0 milligrams per kilogram was established. Mice: animals were given intragastric doses of 2000.0 to 5000.0 milligrams per kilogram. Statistical processing of the obtained results allowed to establish the average lethal dose (LD50) at the level of 3450.0 milligrams per kilogram, LD16 - 2300.0 milligrams per kilogram, LD84 - 4550.0 milligrams per kilogram. The setting of acute toxicity parameters on rabbits was carried out by the method of Deichmann Le Blanc. The average lethal dose of the preparation was established at the level of - 3900.0 milligrams per kilogram. Conclusion: according to the parameters of acute toxicity, the preparation belongs to the IV class of hazard - low-toxic compounds (SanPiN No. 0321-15 "Hygienic classification of pesticides by toxicity and hazard"). [5].

The irritating effect of the substance on the mucous membranes of the eyes was studied in laboratory animals - rabbits. The right eye of the animals was injected in the native form and the left eye served as a control. Observation of animals was carried out in dynamics in the following terms: 1, 4, 24 hours, 2 - 5 days. After inoculation of the preparation in the amount of 2 drops, frequent blinking was observed. In 30 minutes after the application - there was lacrimation. Hyperemia of conjunctiva, narrowing of the eye slot was observed after 1 hour. After 3 hours from the beginning of the experiment - signs of irritation decreased, but there was a slight hyperemia and a slight narrowing of the eye slot. After 24 hours from the beginning of the experiment a slight edema of the experimental eyes was observed. Observed signs of irritation completely disappeared by the end of the second working day (30 hours). Conclusion: The preparation has a slightly irritating effect on mucous membranes of the eyes. The local skin irritating effect of the preparation was studied on experimental animals - white rats. The preparation was applied to the shaved skin areas in the abdominal region (2x2 cm) in the native form. The observations were made in dynamics: immediately after the 4-hour exposure, in 1, 4 hours, 1 - 3 days of experience. After the application was removed and the preparation was washed off, skin reactions to stimuli were recorded. Immediately after washing off the preparation - hyperemia of the experimental sites was observed, accompanied by swelling. By the end of the working day there was a tendency to decrease the signs of irritation, which completely disappeared after 28 hours from the beginning of the experiment (mid-second day). Conclusion: The preparation has an irritant effect on skin blood. Cumulative properties of the preparation were studied in 40 white rats. The animals were divided into 2 groups of 20 animals each. The first group of animals received the preparation in a dose of 1/10 of the average lethal dose (LD50), the second group served as a control. Throughout the entire experience of animal death, there were no observed changes in some biochemical parameters of the blood of experimental animals. As a result of the biological effect of cotton defoliant "Phosphodeph" on experimental animals, a decrease in blood cholinesterase activity was observed, starting from 45 days of the experiment, which remained statistically reliable up to the end of the experiment; the activity of enzymes of aspartate and alanine transferase in blood serum increased after 30 days of animals' inoculation; the activity of the studied indicators normalized after 30 days of the recovery period. Conclusion: The preparation has weak functional cumulation. The studies of chronic toxicity of the preparation were carried out using mathematical modeling methods. Threshold and inactive doses were established at the levels: 10.0 and 2.0 milligrams per

kilogram, respectively. The permissible daily dose (PDD) at the level of 2.4 milligrams for a person per day was calculated and scientifically proved. The results of the conducted toxicological studies are presented in Table No. 1.

Table № 1: Toxicity parameters

Product Name	The average lethal dose (LD50), mg/kg	Skin and irritation effect	Irritating effect on eye mucous membranes	Hazard class
«Phosphodefus» is a defoliant.	rats – 4000,0 mice – 3450,0 rabbits - 3900,0	Irritates	faintly irritates	IV

To ration the preparation in water reservoirs, the influence of the preparation on organoleptic properties of water was studied. As a result of the experiments, it was established that the preparation gives the water a slight smell. Researches were carried out based on dependence "concentration - effect" taking into account the reaction of odorators. Studying of chemical substances influence on organoleptic properties of water is obligatory as for many substances exactly organoleptic sign of harmfulness is limiting at MPC substantiation. In order to establish threshold concentrations on odour and smell, a mass method of research was used, in which odorators participated. The studies were conducted with concentrations of the preparation from 0.125 to 10.0 milligrams per liter, with each of which 3 series of experiments were conducted with the participation of experienced odorists. It was established that the threshold of smell was determined at the level of 0.125 - 2.0 milligrams per liter, and the practical threshold (2 points) at the level of 1.0 - 4.0 milligrams per liter. Statistical processing of the data obtained made it possible to determine that the threshold concentration was 0.99 milligrams per litre for odour and the practical limit was 1.8 milligrams per litre. Graphic method of organoleptic data estimation was used to check accuracy and correctness of experiments. It allowed to establish that intensity of a smell of a preparation increases in proportion to logarithms of their concentration, i.e. the received data correspond to Weber-Fechner laws. When comparing the indicators of the preparation's odor intensity in water according to the data of different research methods, we can conclude that they are practically at the same level, which indicates the reliability of the conducted studies.

The results are presented in Table 2.

Table 2: Summary table on the effect of the preparation on organoleptic properties of water (odor) according to most odorators (1), results of graphic (2) and statistical treatment (3)

Indicator and its intensity	Data Analysis Methods		
	1	2	3
	Drug concentration, milligram per liter		

Sensing threshold	1,0	0,9	0,99
Practical range	2,0	2,34	1,8

At the established odour threshold concentration (0.9 milligrams per liter), the preparation did not affect water transparency, color and foaming. Based on the conducted experiments taking into account the data of sanitary and toxicological studies (2.4 milligrams per liter), MPC of the preparation in the water of reservoirs was recommended at the level of - 0.9 milligrams per liter (the limiting sign of harmfulness - organoleptic). Taking into account the generally accepted systematic approaches to the normalization of harmful substances in the air, based on the data on the toxicity of the preparation, physical and chemical properties, the estimated MPC of the preparation in the air - 0.2 milligrams per cubic meter; MPC in the air of the working zone - 3.0 milligrams per cubic meter. On the basis of methodological approaches to hygienic rationing of pesticides in food products of plant origin, the technology of application of the preparation, low concentration of the preparation, its supply to the products of plant origin is practically impossible. It is recommended to use the preparation in cotton oil at the level "not allowed", in fruits - 0.4 milligrams per kilogram, in vegetables - 0.45 milligrams per kilogram. Calculation of the approximate permissible concentration of the preparation in the soil was carried out according to the "Methodology of complex and accelerated rationing of pesticides in environmental facilities". [4], taking into account the CBM of the preparation in food products. UDC of the preparation in soil was recommended - 0.01 milligram per kilogram.

When the preparation is used in agriculture, hygienic regulations for use of the preparation should be observed (Table 3).

Table 3: Hygienic standards and regulations for use

№	Indicators	Value
1.	MPC in water reservoirs (milligram per liter)	0,9
2.	MPC in the air of the working area (milligram per cubic meter)	3,0
3.	MAC in atmospheric air (milligram per cubic metre)	0,2
4.	APC in soil (milligram per kilogram)	0,01
5.	MPL (milligram per kilo): in cotton oil vegetables fruits	«not allowed.» 0,45 0,4
6.	Sanitary Protection Zone (SPZ)	100 metres
7.	Time to go to work	3 days

Conclusion. The developed toxicological and hygienic indicators for the new cotton defoliant "Phosphodef" when introduced into practical health care will contribute to the reduction of morbidity in the population, prevention of acute and chronic poisoning, and better control over the environment. Taking into account the received data, the introduction of the new defoliant of "Phosphodef" cotton into the agricultural sector of the country has no objections from hygienic point of view.

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