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Study The Synergistic Properties Of Difenacin-Based Rodenticidal Agent

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ABSTRACT

The article presents the data of laboratory studies on the study of the complex action of the first-generation anticoagulants zoocoumarin and difenacin to combat synanthropic rodents.

Keywords: deratization, anticoagulants, synergists.

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INTRODUCTION

Scientific and technical progress - the construction of new settlements, an increase in the railway network, an increase in the speed and volume of traffic, land reclamation, development of deserts, the development of irrigated agriculture, the construction of large livestock farms, the organization of subsidiary, horticultural and farm enterprises, etc. - promoted and contributes to the expansion of the range of rodents and especially its synanthropic representatives - rats and mice.

Due to its multiplicity, rats destroy a large number of a wide variety of food products suitable for human nutrition and feed for farm animals, attack young rabbits and nutria, newborn lambs and suckling piglets, steal eggs of birds and devour their corpses.

Often, rats cause damage by their digging activity. Breaking through the holes in the body of earthen dams and embankments, they lower the water in the ponds or change the direction of water during irrigation.

The damage caused by the constant gnawing activity of rats is especially great. They spoil with their teeth containers and books, furniture and equipment, clothing and footwear, carpets and rubber products, building materials and houseplants.

Being a source or carriers of more than 60 infectious diseases of humans and animals, including plague, tularemia, anthrax, brucellosis, tuberculosis, listeriosis, foot and mouth disease, salmonellosis, toxoplasmosis, etc., they contribute to the spread of epidemics and pandemics

All the above causes the need for deratization - a system of extermination and preventive measures aimed at reducing and keeping the number of rodents at a level that is safe for people in economic, sanitary and epidemiological terms, taking into account causing minimal damage to the environment.

Currently, the most effective and promising is the chemical method of disinfestation, based on the use of various poisons in the fight against rodents.

Since the mid-40s, various preparative forms of anticoagulants - warfarin (zo coumarin), racumin, chlorophacinone, difenacin, ethylphenacin, etc. - have begun to be applied to rodent control in rodent control. These are anticoagulants of the first generation.

Even when small amounts of these poisons are ingested into rats, the symptoms of poisoning practically do not manifest, however, with repeated consumption of anticoagulants, their toxicity significantly increases not only as a result of the accumulation of poison in the body but rather as a decrease in the level of prothrombin causing a violation of blood coagulation, which is accompanied by an increase in vascular permeability, hemorrhage in many internal organs and skin, causing subsequent death.

In the 1970s and 1980s, anticoagulants of the second generation were developed - bromadiolone, brodifacoum, difithialon, isoindan (tetrafenacin), etc., differing from anticoagulants of the first generation with a higher rodenticidal activity upon a single admission to the organ rodent rodent.

With all the advantages of anticoagulants, specialists are concerned about the emergence of separate resistant to them populations of rodents. For the first time, the resistance of rats to zocoumarin anticoagulant was noted in 1958 in Scotland and registered in a number of countries (in Denmark, the USA, Germany, Russia, and others).

Recently, in literary sources, there are more and more reports about the resistance of rodents, not only to anticoagulants of the first but also of the second generation. These adaptations arise inevitably as a response to the continuous action of chemical factors of extermination, which become factors of selection of an extreme nature.

According to most scientists, one of the possible ways to overcome the resistance of rodents is the joint use of anticoagulants with synergists.

The purpose of this work is to study the synergistic properties of the first generation anticoagulant difenacin with respect to zoocoumarin.

MATERIALS AND METHODS

For research, we selected the first generation anticoagulant drugs: zoocoumarin - C₁₉H₁₆O₄ - 3- (alpha-phenyl-betaacetyl ethyl) -4-oxycoumarin belonging to the 4-oxycoumarin group, and difenacin - C₂₃H₁₆O₃ - 2-(diphenylacetyl) -indan-1, 3-dione is from the class of indandions.

The rodenticidal activity of the developed complex compound was carried out according to the "Methodological recommendations for evaluating the efficacy, toxicity, and danger of rodenticides" (approved by GCSEN No. 01-19 / 127-17, 1995). To conduct experiments, rats weighing 180-340 g were seated in cages of three each. The experiment began with the feeding of animals - in both feeders, the animals were offered non-poisoned food. Daily feed from both feeders was weighed and filled to the original weight (up to 100g); feeders periodically changed places. After 3 days, the non-poisoned feed in one of the feeders was replaced with a test bait. Water was given in plenty. Each series of experiments was carried out in three multiple sequences. Daily consumption of rats by both bait and alternative (not poisoned) feed was taken into account.

Feeding the rats with poisoned bait was carried out for 1-3 days, after which the animals were transferred to standard food. Observation of rodents was conducted for 2 weeks.

Along with the main experiments, the controls were set up, that is, separately set up experiments with each of the drugs used.

To establish the causes of death of rats conducted an autopsy. The rodenticidal activity of baits was determined by the percentage of the death of rodents.

RESULTS AND DISCUSSION

The results of experiments on the study of the rodenticidal activity of the complex action of first-generation anticoagulants (warfarin plus difenacin) are presented in table 1.

Table 1: Experiment results of the study the rodenticidal activity of the complex action the first-generation anticoagulants of zoocoumarin with difenacin on white rats with alternative feeding

The content of DV zoocoumarin (%)	Content of DV difenacin (%)	The number of rats in the experiments	Frequency of feeding bait (days)	Rodent death%
0,02	0,01	9	1	100
0,02	0,005	9	1	88
0,02	0,01	9	2	100
0,02	0,005	9	2	88-100
0,02	0,01	9	3	100
0,02	0,005	9	3	100
Control				
0,02		9	1	55
0,02		9	2	88
0,02		9	3	88-100
	0,01	9	1	33
	0,005	9	1	22
	0,01	9	2	55
	0,005	9	2	44
	0,01	9	3	77
	0,005	9	3	66

As shown by the results of the studies, feeding rats with baits containing 0.02% of the active substance (DV) of zoocuramine with 0.01% of the active substance of difenacin for 1-3 days in the presence of alternative food lead to the death of 100% of experimental animals. Whereas in control experiments when feeding rodents with baits with zoocoumarin anticoagulant alone, the death of rodents was 55% with one-day, 88% with 2-day, and 88-100% with the 3-day feeding of poisoned baits with an alternative feed. In control experiments with difenacin, the death of rodents did not exceed 77%.

With a decrease in the concentration of DV of defenacin in the bait from 0.01 to 0.005%, the death of rodents in the experiments decreased and amounted to 88% with a one-day, 88-100% with a two-day, and 100% with a 3-day feeding of poisoned baits with an alternative feed. In control experiments with difenacin, the death of rodents was 22-66%.

The effectiveness of the developed complex compound of zoocoumarin with difenacin compared with the use of one of the anticoagulants is higher by 45-67% with one day, 12-45% with 2 and 12-23% with the 3-day feeding of poisoned baits to experimental animals with alternative feed.

CONCLUSION

Based on the results of laboratory studies, we can draw the following conclusions:

1. The drug difenacin has synergistic properties with respect to the anticoagulant zoocoumarin.
2. The most optimal ratio of poisons in the bait is 0.02% of DV zoocoumarin with 0.01% of DV difenacin, leading to the death of 100% of rats even when fed one-day poison in the presence of alternative food.

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