ECOLOGICAL WAYS TO REDUCE THE NUMBER OF IXODID MITES AND THE ROLE OF RED FOREST ANTS IN THIS

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At the present time, chemicals that are used in the fight against parasitic insects are being replaced and used in preparations that do not possess aggressive actions on warm-blooded animals. And, nevertheless, such drugs have a negative impact on humans and animals. As an alternative, the use of biological methods that exist in nature. These include red forest ants and their properties used in their livelihoods of other insects, including ixodid mites.

Keywords: red forest ants, ixodid mites, parasitic insects, biological methods of struggle.

In the world, various measures and their entire systems designed to reduce the number of parasitic insects, including ixodids, have been developed and successfully applied. A person incurs huge economic losses on preventive actions, which, in addition to direct acaricidal treatments, include agro- and forestry measures. Landscaping, including concreting the tracks, installing and equipping places for household waste, and a number of other construction and economic activities.

Disinfestation (use of insecticides) and deratization (destruction of small rodents as the main feeder of Ixodes ticks) or their combination are costly and without selective action. In addition, all, without exception, insecticides, and along with them, preparations for the destruction of rodents, pose a danger to living objects that are in the zone of application of these chemicals.

In connection with the foregoing, it is advisable in the recreational zones of cities to use ecological methods of fighting with ixodids, that is, changing the habitual habitats of mites and creating conditions unsuitable for their life, regulating the number of basic feeders of the preimaginal stages of ixodids-small mammals, and using predators and food competitors . To one of such insects belong colonies of red forest ants. It is no accident that people have long been paying attention to them, and the ants have become the first insects, which people began to use to combat pests [1, 2, 3]. The rapid development of the chemical industry, the widespread use of insecticides and acaricides, especially in the 50-80s of the last century, almost completely distracted man's attention from environmentally friendly methods of destroying parasitic insects.

At the moment, information about the biological significance of forest red ants as regulators of the number of ixodid ticks is not enough, therefore, for a convincing reasoning of this fact, consistent scientific research is needed. The fact that in the food objects of forest red ants are included and ixodid mites at all stages of their development is beyond doubt. But how many nests with their population can provide visitors with a forest-park zone (for example, the city of Minsk) with security in terms of attacking them with ticks. This issue remains unrevealed also for the reason that the anthill itself is the most complex living organism that a person is not yet able to control [4].

Thus, the problem of tick-borne infectious diseases is quite urgent and by itself will not disappear, if only because ticks parasitic objects and in the process of evolution have perfected their adaptive reactions to perfection. In this connection, a person is forced to conduct research in the field of detection and use of biological control agents against ixodic ticks.

Considering the urgency of this problem, we, for carrying out the research, chose the recreational zones of Minsk, characterized by high rates of relative abundance of ixodids. The data obtained showed that red forest ants have a significant effect on the abundance and distribution of ixodid ticks. A definite tendency has been found to reduce the number of ixodids from 30–25 m towards the anthill. At a distance of 0-10 m from the anthill of ixodid ticks, we were not found. In many ways, these indicators affect the state of the ants family, the age of the anthill, and the environment in terms of well-being to the life of the anthill as a whole organism.

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MATHEMATICAL SIMULATION OF SYSTEMS WITH MOVING OBJECTS

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Different methods of movement simulations to optimize and plan moving of object in a system are described in this current work.

Keywords: movement, simulations, transport flow.

Movement optimization and planning for different systems is an important issue. A transport infrastructure is one of the most crucial infrastructures, therefore a lot of works are done in these area. However movement optimization and planning can be applied to biological systems for migrations, elements and pollutants transfers and etc. For the reason that movement simulation in transportation systems are well developed, it is better to use this theory as a foundation. The main task of mathematical models is to determine and prognosis all parameters to support systems functioning, such as traffic intensity it all elements of the system, transportation amount, average movement speed, delays, time lost and others.

There are a lot of different mathematical models that can be applied to analyze transport systems. Those models can solve different tasks, use variousmathematical approaches and have specific accuracy. It can be determined three classes of mathematical models based on their functions, they are: forecasting models, imitation models and optimization models.

Forecasting models are used to resolve tasks when a geometry, transport system properties and location of sources of transport flow are determined. It is required to forecast transport flow in such system. Forecasting includes calculation of bulk characteristics of the system. It can be calculation of average value of movements between different areas, traffic intensity, transport objects distribution and others.Imitation models are aimed to reproduce all details of the transport flow, including time processes. In that case distribution of objects on the routes are determined and used as a source data. Forecasting and imitation models are supplement to each other. Optimization models are used to resolve transport flow distribution to minimize costs for the whole system.

To build a mathematical model it is required to describe its elements. The base elements is a road graph, nodes of a graph describe street crosses and curves describe element of roads. Another elements are arrival and departure points. Fundamentals for modeling are criteria of evaluating route, that criteria called generalized costs. The main property of simulation of transport systems is reverse interaction, whenroutes chosen by users effect on another users chose, that is called reverse interaction

To simulate transport systemsa calculation of correspondences model can be used. Numerical amount of movement in the system is a matrix of correspondences. Elements in this matrix are rates of transport flow between different areas. All trips can be derived in different groups in dependence on the means and the purpose of movement, different matrix for different groups. Input information is an amount oftransport flows in arrival and departure points. All users are derived into classes, for each class matrix of correspondences is calculated and distributed on the transportation system. The most common calculation of correspondences models are gravity models, entropy models, and models of competitive possibilities.

Another group of models to simulate transport systems are models of distribution of transport flows. Traffic load is determined by all transport objects that move on elements of the system (routes). An input data is a matrix of distribution of transport objects on routes andarrival and departure points. Those models differ from correspondence models because locations and routs of every user is considered. There are various models of distribution of transport flows. A model that determines a transport system loads based on behavior strategies is called a model of optimal strategies. The most effective model that considers interaction between objects is a model based on equilibrium distribution.

Movement simulation of different systems is important issue , because planning and optimization of movement objects flow can help to decrease expenses for movement in means of time and materials.