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MONITORING AND DIAGNOSING SYSTEM FOR THE DEVELOPMENT OF APPLE WORM IN UZBEKISTAN

Rakhimov Mansurbek Movlonjonovich
Independent Researcher, Plant Protection Department, Andijan branch of Tashkent State Agrarian University, Andijan, Uzbekistan

ABSTRACT
Proven hereby the ways and principles of creating monitoring and diagnosing system for the development of apple worm in the condition of the republic of Uzbekistan. Worked out mathematical model for the development of apple worm and mobile application to identify appearing period of pests and implemented in apple gardens of the republic.
KEYWORDS: *monitoring system, diagnosis, apple worm, mobile application.*

INTRODUCTION

Nowadays, due to the increase in the world population a number of problems are relatively increasing on growing further the capacity of fruit production, provision with qualitative fruit products regularly, increase productivity, decrease the loss amount caused by harmful organisms. The loss of 20-40% of fruit products caused by pests and diseases requires to develop harmful organisms control system. Therefore, in order to control harmful organisms of fruit gardens it is expedient to automize the processes of using modern information technology, collecting and processing related data fast and in required level and making decisions basing on them, and finally delivering them to user. The elaboration of information system and identification of the data which affects to the development and the spread of pests and diseases hold crucial scientific-practical significance in collecting, storing and processing of information.

Technology elaboration of monitoring of the main pests and diseases in agriculture, particularly, in horticultural crops, requires further measures on the study of these topic-related biological, ecological and economical questions. Moreover, the results of works linked with the protection of horticultural crops and the practice of progressive economy allow to formulating the line of positions on them and to save product quality.

Elaboration of monitoring of harmful organisms intends firstly their specific diagnosis considering development stages. Therefore, except morphological signs of pests and pathogens, an important diagnostic significance has a position and character of caused harms.

MATERIALS AND METHODS

The surveys were conducted by methods accepted in plant protection. Also used V.V.Yakhontov pheno-calendar making methods and other methods by Babienko, G.Ya.Bondarenko and N.V.Glushenko. Elaborated the system of automated prognosing of development and spread of apple worm.

RESULTS AND DISCUSSION

Monitoring nodal moment is regarded the control over the development and quantity of harmful organisms. The practice shows that for achieving it in a necessary level in each horticultural farm, it is expedient to hold agronomists of plant protection and recruiting them in the period of pest study by a worker per 100-120 ha. Authenticity and quality of data increase in the performation of this work by constant researchers. Except agronomists, there is a need for agronomist-prognosticator of plant protection in fruit gardens of over 400 ha [1].

Automated system of monitoring of main pests and diseases of agricultural crops has been developed in plant protection research institute of the republic of

Uzbekistan in order to determine the place and development of apple worm. System functioning is based on the present hydrometerological service of the republic, which is connected to local net [4]. The most crucial task in the elaboration of monitoring system is projecting information provision, which is to encompass all mass of information in the system, and its performation methods, storage and processing. Projecting of information provision is regarded as complicated and independent stage of elaboration of information system. Hereby is to be noted the next main tasks, caused by creation of information provision:

- identification of data content – necessary for solving complex of tasks and determining forms and volume of data;
- formulation of presenting information – the choice of structure and presenting methods;
- elaboration of the form of input and output documentation;
- selection and base of information storage medium;
- elaboration of classifiers and codification of data;
- elaboration of the methods of accumulation, renewal and search of mass data;
- elaboration of information languages of user contact with computing technology.

Monitoring system includes 4 basic types of activities: diagnosis (identification) of controlled elements of environment, systematical observation of their condition (specific control), prognosis of changes in elements of environment, measures on regulation of the state of elements [2]. One of examples of the elements in environment is harmful organisms in agrobiocenosis. Furthermore, the phase of development and the state of protected plant, quantity and activity of other components of biocenosis and measure of weather condition relate to controlled elements of environment.

Phytosanitary monitoring also involves complex observations of biological, agro-ecological and economical factors, determines possibility and intensity of the development of harmful organisms, efficiency and productiveness of protection measures, including the same monitoring [2].

In the frame of this system worked out algorithm and computer programme to identify the period of appearing and egg-laying of apple worm moths, which allow to preparing necessary amount of useful entomophags (trichogramma wasps, green lacewings, braconids) and planning the work of biological factories and laboratories.

In further development of horticulture the elaboration and use of mathematic models for prognosis of main pests and diseases of apple plays a great role. Therefore, mathematic models created by Kh.K.Yakhyaev were used in the surveys. In result, mathematic models were developed which can define the relations (Y1) between the quantity of apple worm moths on the pheromone traps and damage of apple fruits by pests, the impact of damage of apple fruit by pests on daily mean temperature (Y2), powdery mildew disease on apple leaves weight (Y3), weather temperature on incubation duration of scab disease (Y4). Table-1 presents mathematic models of these processes.

Table-1
Mathematic models describing apple pests and diseases

№	Form of mathematic model	Coefficient of correlation	Mean difference
1.	$Y_1 = -12,2 + 4,45x_1$	r =0,81	0,36
2.	$Y_2 = -593,9 + 30,51x_2$	r =0,79	0,41
3.	$Y_3 = 6,8 - 1,01\ x_3$	r =0,71	0,77
4.	$Y_4 = 20,5 - 0,76\ x_4$	r =0,73	0,94

CONCLUSION

Moreover, from the beginning of apple growing till apple yield maturation an important significance is held on control over harmful organisms. Considering this, mobile application has been worked out for Android type telephones in order to identify development period of apple worm, and obtained approval of «Republican agency for intellectual properties».

From the developed models created chances for identifying damaging level of fruits by elaboration of prognosis of pest development in fruit gardens and improving fruit forms in the gardens in future.

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