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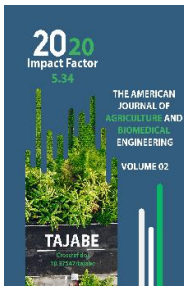

The Methods Of Intellectual Struggle Against Pest And Disease In Apple Orchards

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ABSTRACT

The article reports about the measures of intellectual struggle for the use of modern information technologies against pests and diseases in apple orchards, the use of mathematical models and the use of computer software to prevent the prediction of harmful organisms.

KEYWORDS

Apple, pest, damage, apple fruit-eater, damaging, disease, fruit, mathematical model

INTRODUCTION

Globally, fruit growing is one of the leading industries in agriculture in many countries. Apples are grown on more than 5 million hectares of land in the world every year. The production volume was 76 million tons in 2017. The total volume of apple production was decreased by 2.6 million tons in 2017-2018. In particular, 46% of the total apple production in Germany, 23% in Italy and 8% in France is destroyed by pests. Accordingly, the use of modern information technologies in the protection of apple crops from pests and diseases is a pressing issue.

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MATERIALS AND METHODS

There are a number of problems in increasing the world's population, increasing the volume of fruit products and providing them with quality fruit products, increasing productivity, reducing the damage caused by diseases and pests. The loss of an average of 20-40% of cultivated fruit products under the influence of pests and diseases requires the improvement of the system of control of these pests. It is necessary to use modern information technologies in the fight against pests of orchards, to collect relevant information quickly and as required, to automate the process of collecting, processing this information and making optimal decisions based on them and delivering them to the consumers. The development of information systems for the collection, storage and processing of information is of great scientific and practical importance in determining the data affecting the development and spread of pests and diseases. An extensive introduction of agricultural production is required. An additional 8-10% of intensive orchards are established annually in the country, of which apple orchards make up a large part.

The horticultural collective organization "Vinogradar" and "Krasnyi sad" of Azov district and Rostov region and "Pioneer" of Kagalnits district tested the automated meteorological station KMS-R of Anton Paan to report on the timing of the fight against the main pests and diseases of apples [1; 158-165-p.]. The device works on the Apple program and every 15 minutes informs about air temperature and relative humidity, as well as moisture in the form of dewdrops on the surface of the trunk, leaves and twigs and the amount of moisture in the garden under the influence of precipitation, cycles, reporting the degree of damage during periods of contamination with squid. When the corresponding button is pressed, information about the current weather conditions will appear on the display. The collected data can be copied to computer memory using special devices and equipment. Among the above and other information, AMS records information on the sum of useful temperatures in ascending order from the beginning of the season on paper tape and in the device memory. The advantage of AMS equipment over meteorological data collection offices is that AMS allows horticultural professionals to have complete, fast and varied data.

Russia has also tried to create its own ASMs and has achieved some success in this regard, and the information-consulting system of agrometeorologists called "Elagr" by the All-Russian Meteorological Research Institute (VNII) meteorology can work in 10 different programs. Automatic collection of data on air and soil temperature, relative humidity, duration of wax and dew-like humidity, the sum of precipitation, allows for continuous monitoring. It is small in size, requires low power, and is equipped with a permanent and removable memory device. AMS "Elagr" collects data that allow to make preliminary conclusions about the main phenophases of post-winter generation of apple orchards, such as resumption of life activity, egg laying, worm hatching, worm evolution, butterfly flight. The information-consulting system of agrometeorologists "Elagr", tested in 1995-1999 at the experimental horticultural farm named after IV Michurin, allowed to recommend this device for use in industrial gardens with simplicity and reliability [2; p. 41-42].

RESULTS AND DISCUSSIONS

In addition, the development and use of mathematical models that represent the prognosis of the development of the main pests and diseases of apples during the research conducted in 2016-2018 will play an important role in the further development of fruit growing.

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1- Picture: Apple fruit larvae and damage of its mature

Mathematical models developed by Professor H.K. Yakhyaev and used to predict the development of pests in orchards. As a result, the dependence of apple pest infestation on pheromone traps depends on the number of apple worm infestations (Y1), apple worm infestation on average daily temperature (Y2), un-dew disease on apple leaf weight (Y3), and air temperature on apple squid incubation period (Y4) mathematical models representing the effect were developed. An overview of the mathematical models representing these processes is given in Table 1.

Table 1

Mathematical models representing pests and diseases of apples.

№	Mathematical models	Correlation coefficient	Medium deviation
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

In our observations, the correlation between the number of butterflies falling on pheromone traps over 4 years, including crop loss or loss of young fruit spilled, was that butterfly flight rates were lower despite higher butterfly flight intensities (Figure 2). Instead, it was found that the relationship between the average daily air temperature between May and August and crop loss or crop loss was evident (Figure 3).

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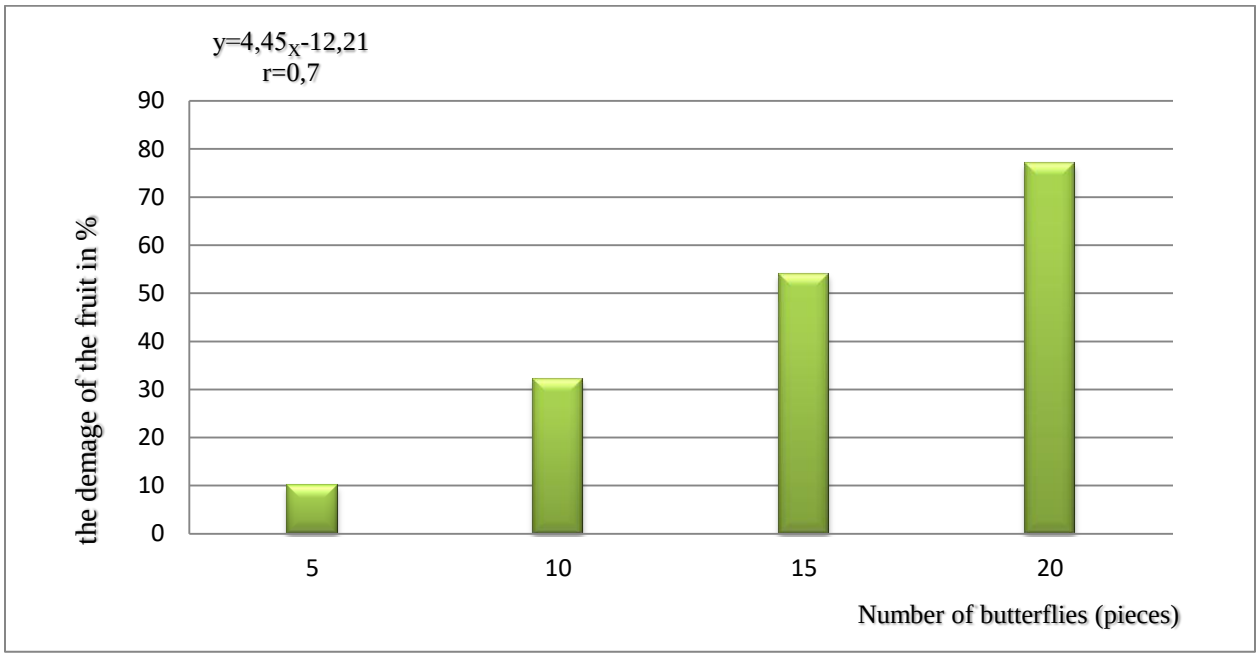

Figure 2. The relationship between the number of butterflies falling on the pheromone handle and the damage to the fruit.

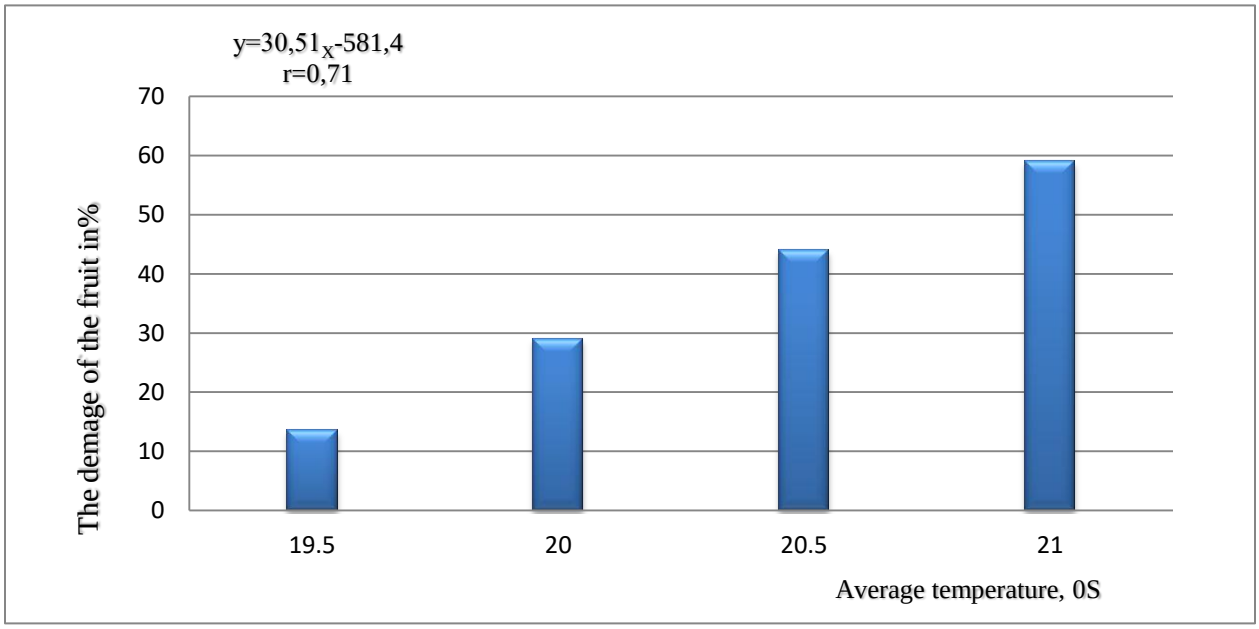

Figure 3. Temperature dependence of apple fruit damage

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CONCLUSION

In summary, mathematical models have been developed to represent the effect of apple pest infestation on pheromone traps, the average daily temperature of apple fruit damage, the effect of flour dew disease on apple leaf weight, and the effect of air temperature on the incubation period of apple squid disease.

The ways and methods of monitoring and forecasting of the main pests of apples have been identified, an algorithm for monitoring their development periods has been developed, and a computer program "Apple worm development time detection method" running on Android-type mobile phones has been developed. and tested on farms specializing in horticulture.

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