

Research and Design of Intelligent Early Warning System for Jujube Diseases and Pests in Northern Shaanxi

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Abstract: According to the historical data and rules of pests and diseases, this paper establishes a historical database and designs an intelligent early warning and defense system for jujube. The system designed in this paper generates early warning items by formulating appropriate early warning programs. The system will send relevant early warning messages to farmers according to the relevant content of early warning items. This system can monitor the diseases and insect pests of jujube in real time, so as to achieve the goal of early prevention, early detection and early treatment.

1. Introduction

The planting area of jujube in northern Shaanxi is more than 400,000 mu, and the annual output is more than 30,000 tons. The output of jujube in northern Shaanxi accounts for more than 60% of the total output of jujube in Shaanxi Province. However, in recent years, many jujube orchards have suffered from diseases and insect pests due to various factors. The number of jujubes affected by pests and diseases accounts for about half of the total jujubes in northern Shaanxi, even higher, sometimes up to 90%. For many years, because jujube farmers cannot clearly grasp the causes and regularity of pests and diseases, they cannot use pesticides timely and scientifically to prevent pests and diseases. This led to their repeated misuse of pesticides, which not only caused economic waste, but also caused environmental pollution to a certain extent, and affected the quality of jujube. Therefore, pests and diseases seriously affect the economic benefits of jujube farmers and the quality of jujube. Preventing pests and diseases in advance and reducing the incidence of pests and diseases is one of the effective ways to ensure high quality and high yield of jujube. Therefore, it is necessary to study the intelligent early warning system of jujube diseases and insect pests.

In agriculture, the research on intelligent early warning system of crop diseases and insect pests by foreign experts has been relatively perfect. Domestic research on this field started relatively late and is not sound enough. However, in recent years, the research on intelligent early warning system of crop diseases and insect pests has developed rapidly in China. China has initially established some intelligent early warning system of crop diseases and insect pests. The early warning system of jujube diseases and pests in northern Shaanxi includes database, Internet technology, global position system (GPS), remote sensing technology (RS), geographic information system (GIS), Internet of things (IOT) and many other technologies. It is an integrated agricultural system integrating computer, communication technology, geographic information technology and agricultural information technology.

2. Introduction of Early Warning System

The early warning system for diseases and insect pests is mainly to collect and collate the relevant data of diseases and insect pests in the past years, combine the existing experience, summarize the occurrence regularity of diseases and insect pests, find out the main factors of occurrence of diseases and insect pests in fruit trees, establish a series of indicators system to evaluate the occurrence and development degree of diseases and insect pests in fruit trees, and determine the early warning boundary according to the different development degree of diseases and insect PE Send out different early warning information, according to early warning information analysis and prediction of the causes of pests and diseases and occurrence time, occurrence degree

and occurrence area, so as to take timely preventive measures to achieve early prevention, early detection and early management of pests and diseases in fruit trees.

The main processes of the intelligent monitoring and early warning system for jujube pests and diseases in northern Shaanxi include the establishment of the early warning information platform for jujube pests and diseases, the establishment of the database of jujube planting areas in northern Shaanxi, the research and development of the intelligent collection system for pests and diseases and the monitoring and issuing system for pests and diseases. Through real-time dynamic monitoring and omni-directional positioning of pests and diseases, and timely transmission of information to the system platform through wireless network, the system can defend pests and diseases as soon as possible, and realize scientific and intelligent management of the overall situation of jujube planting areas. We mainly focus on early warning of pests and diseases and information dissemination to design.

3. Design of Intelligent Early Warning System

Early warning is the core function of early warning system. The main functions of early warning system are the establishment of evaluation index of pests and diseases, early warning analysis and prevention of pests and diseases. The system module is mainly divided into three parts to design, namely, the sub-module of alarm recognition, the sub-module of alarm evaluation and the sub-module of prediction and alarm.

3.1 Main process of early warning system

Logically speaking, early warning can be divided into five steps: determining the alarm situation, finding the source of the alarm, analyzing the warning signs, forecasting the alarm degree and eliminating the alarm situation. The flow chart is shown in Figure 1.

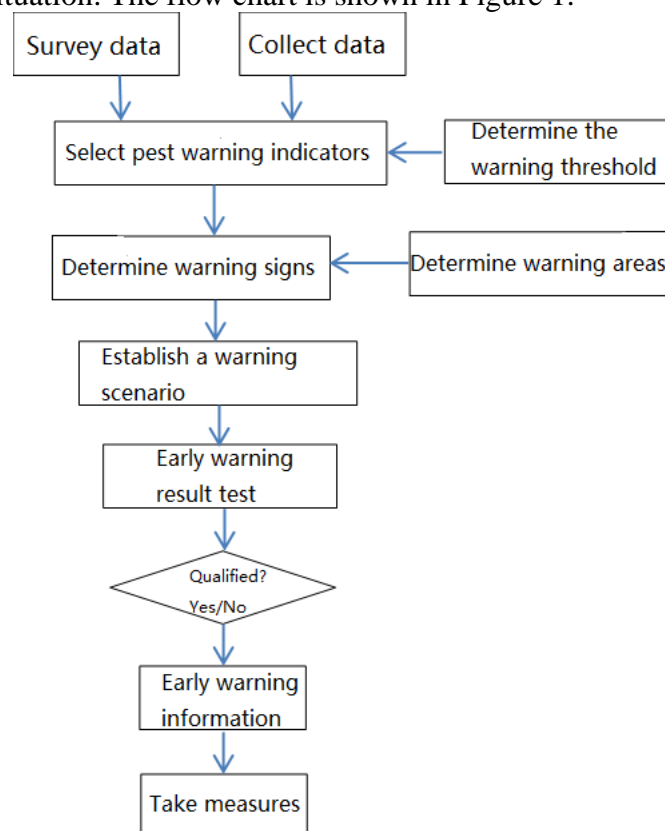


Fig. 1 Main flow chart of early warning system

The early warning index system of pests and diseases includes warning source index, warning sign index and warning situation index. Among them, the warning indicators are the object, the source indicators are the basis, and the warning indicators are the main body. The indicators of

warning sources are mainly affected by environmental factors such as temperature, humidity, rainfall, cultivation methods, pesticide use and other factors; the indicators of warning signs are mainly affected by the symptoms of pests and diseases, the number of larvae and migration conditions; and the indicators of warning conditions are mainly affected by disease index, occurrence amount, prevalence and other factors.

3.2 Design of Early Warning System Platform

Because of the system center data updating or some other reasons, when the early warning system is touched, the system will automatically analyze and predict a certain index of jujube tree by comparing the data in the previous database. If the index is not in the normal range, the early warning system will start the information release function and issue the results of early warning; if the index is in the normal range, it will continue to enter the next index. Line analysis and prediction, so it has been circulating, analysis and prediction of the indicators established in the database. The implementation of these early warning tasks is all stored in the system log, so that the administrator can manage the system data.

Each early warning task in the early warning platform can be divided into two parts, one is the early warning program, the other is the early warning items (i.e. early warning examples), the relationship between the two is one-to-many. Firstly, an early warning scheme is selected, which will produce one or more early warning items.

3.2.1 Early Warning Program

Early warning scheme can be divided into two kinds, one is fixed system scheme, the other is user-defined scheme. It is an Abstract and concrete relationship with early warning items. It contains some main framework contents such as scheme description, condition, threshold and so on in early warning items.

The early warning scheme mainly consists of four parts: early warning object, early warning condition, message setting and scheduling period.

(1) Early warning objects refer to the types of pests and diseases, the data and Tables in the database, and these specific data and Tables are early warning objects.

(2) The early warning condition may be an early warning document or expression. Early warning files are PHP files added by administrators through the management system. That is to say, every early warning entry is a specific PHP file. These PHP files can only be added or deleted by administrators. Every PHP file can run independently and be completed by programming, which is equivalent to a small plug-in in the system. The early warning rules are written in the file, and the system will execute these files regularly. It also contains triggering conditions, and can call the early warning results and choose the way of sending early warning messages.

(3) Message setting includes message receiver, message sending mode, message date and so on. Message recipients must be designated, which can be specific farmers. Message can be sent in the form of short message or email.

(4) Scheduling cycle is for periodic early warning, setting specific scheduling cycle, which can be one day, one week, one month, one year, etc. fixed cycle, can also be customized according to specific circumstances.

3.2.2 Early Warning Items

Early warning items are specific early warning events. It can be imported and exported, added or deleted. It is generated on the basis of early warning schemes. It is sent to farmers, but also can set specific items of the message recipient.

3.3 Ways of Early Warning

The early warning system can be divided into two ways: periodic early warning and immediate early warning. Periodic early warning is a periodic early warning in a period of time before the occurrence of a specific event. For example, in a season where pests and diseases occur frequently, the system has been scanning in real time for early warning inspection. This kind of real-time

scanning with the police is actually a system, every day or a week or a month or a year at a fixed time of early warning analysis. Immediate warning is an early warning caused by an action, such as data changes or changes in the data collected by the terminal. This kind of early warning is actually the system scanning all the time, every few minutes produces an early warning analysis.

The two early warning methods are essentially the same, but the scheduling cycle is different. Periodic early warning is a fixed early warning set by procedure, while immediate early warning is triggered by human. Early warning mode can be selected according to different task requirements.

3.4 Release of Early Warning Messages

The key points of early warning news release are divided into two parts, one is the content of early warning, the other is the degree of warning. Early warning content is based on the early warning program to generate pre-warning items related messages sent to farmers, such as jujube trees will appear or have problems, give prevention or treatment recommendations. Early warning degree is expressed in the form of indicator lamp in early warning system, such as green lamp indicating that there is no early warning, only need to continue supervision; yellow lamp indicating light early warning, need to take certain preventive measures; orange lamp indicating moderate early warning, problems have arisen, need to take timely measures; red lamp indicating severe early warning, serious problems, need to arouse great attention. And timely treatment.

4. Conclusion

On the basis of establishing the database of diseases and insect pests, this paper designs an intelligent early warning system for jujube. The system can monitor pests and diseases of jujube trees in real time, find problems in time, and publish information to remind farmers to prevent or treat them in time. This system realizes the intellectualization of agroforestry management. With the further development of information technology and agroforestry technology, Agroforestry Management will become more intelligent, and this kind of intelligent management will become more popular.

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References

- [1] Luo Chrysanthemum, Huangwenjiang, Wei Chaoliang et al. Preliminary establishment of crop pest early warning system based on GIS [J]. Journal of Agricultural Engineering, 2008, 24 (12): 127-131.
- [2] Li Xiaowen, Ma Jing, Haiyunrui et al. Study on monitoring and warning system of Lycium barbarum pests in Ningxia [J]. Plant protection, 2018, 44 (1):81-86.
- [3] Ji Yanbao. Development and Preliminary Application of General Platform for Monitoring and Early Warning System of Agricultural Main Pests and Diseases [D]. Beijing: China Agricultural University, 2014.
- [4] Zhang Shiyan. Influencing factors and control methods of jujube fruit cracking in northern Shaanxi [J]. Shaanxi Agricultural Science, 2012 (5): 162,280.
- [5] Gao Qijuan, Ji Xiaochuang, Leyi et al. Agricultural pest monitoring system based on Web GIS

[J]. Computer technology and development, 2010 (4): 224-227.

[6] Yu He-long, Liu Jie, Mary et al. Design and implementation of remote intelligent control system based on Web for the Internet of Things in Facilities Agriculture [J]. China Journal of Agricultural Machinery Chemistry, 2014, 35 (2): 240-245.