USING SIMULATING MODELS TO PREDICT THE APPEARANCE OF BROWN ROT, AND POWDERY MILDEW ON PEACHES

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Abstract

A rational and cost-effective policy of fungicide use must consider the effects of environment, host, fungicide, and pathogens on the efficacy of Brown Rot and Powdery Mildew management. The main aim of this study was the development of appropriate, for the Central Macedonia County, simulating models to predict the appearance of the Brown Rot and Powdery Mildew diseases.

The results showed that the number of spray applications against Powdery Mildew, based on the model signal, was reduced in comparison to those applied in commercial orchards. In addition, the percentage of disease in trees sprayed according to simulating model was significant less than unsprayed control. No significant difference was found between trees sprayed according to model signals and those sprayed according to the programme followed by growers.

It was also found that the sprays applied against Brown Rot following the model signal, reduced significant the number of blight shoot.

Generally, the results of this study showed the possibly use of simulation models to develop a low – risk strategy to suppress Brown Rot and Powdery Mildew of peach trees as a basic part of the Integrated Fruit Production System

Key words: brown rot, powdery mildew, peaches

INTRODUCTION

The use of fungicides (systemic or protectant), normally applied on a regular schedule throughout the growing season, to control Brown Rot and Powdery Mildew is an essential component of peach production in many parts of world. However, raising cost, environmental pollution and food safety has driven governments to force producers to consider more efficient approaches to the use of fungicides. A rational and cost-effective policy of fungicide use must consider the effects of environment, host, fungicide, and pathogens on the efficacy of Brown Rot and Powdery Mildew management. Analysis with plant disease models may aid these considerations.

The main aim of this study was the development of appropriate, for the Central Macedonia County, simulating models to predict the appearance of the Brown Rot and Powdery Mildew diseases.

MATERIALS AND METHODS

The disease forecast models described by Luo *et al.* (2001) for Brown rot and Xu (1999) for Powdery Mildew were used.
All the experiments were conducted in the experimental field of Pomology Institute, Naoussa (Imathia Prefecture), where a telemetric meteorological station was established at the orchard level.

The experimental design was completely randomized. There were 4 replicates of 3 trees for each treatment. Results were collected by recording the number of blighted shoots per tree for Brown and the percentage of infection for Powdery Mildew.

RESULTS

The results showed that the number of spray applications against Powdery Mildew, based on the developed model (Table 1), was reduced in comparison to those applied in commercial orchards. In addition, the percentage of disease in trees sprayed according to model signals was significant less than unsprayed control (Table 2). No significant difference was found between trees sprayed according to model signal and those sprayed according to the programme followed by growers.

Table 1

Dates of spray applications applied in the experimental field

Treatments (Brown rot)	**Date of Spray Applications**		
Control			
Low Risk	12/3/2007	29/3/2007	
Moderate Risk	12/3/2007	29/3/2007	
High Risk		29/3/2007	

Treatments (Powdery Mildew)	**Date of Spray Applications**		
Control	-	-	-
Growers' Spray Programme	26/4/2007	12/5/2007	28/5/2007
Model Signal 1-20	-	10/5/2007	26/5/2007
Model Signal 21-40	-	10/5/2007	26/5/2007
Model Signal 41-60	-	10/5/2007	26/5/2007
Model Signal 61-80	-	14/5/2007	26/5/2007
Model Signal 81-100	-	14/5/2007	26/5/2007

Table 2

Disease severity in the experimental field applied according to model signal

Treatments (Brown rot)	**Percentage of Disease (%)**
Control	5,11 a
Low Risk	0,96 c
Moderate Risk	0,78 c
High Risk	3,02 b

Treatments Powdery Mildew)	**Percentage of Disease (%)**
Control	45,14 a[z]
Growers' Spray Programme	6,17 b
Model Signal 1-20	5,09 b
Model Signal 21-40	7,06 b
Model Signal 41-60	2,19 b
Model Signal 61-80	2,24 b
Model Signal 81-100	9,13 b

[z]Values in the same column followed by different letters are significantly different ($P < 0.05$) according to Wald Test.

It was also found that the sprays applied against Brown Rot following the model signals, reduced significant the number of blight shoot.

DISCUSSION

Disease forecasting has become an established component of quantitative epidemiology. The mathematics of disease dynamics is the core of several disease forecast models that have been developed in the last four decades. Although it is difficult to predict disease incidence at an exact value with current techniques, estimating a possible range of disease intensity can be relatively easy. Different from conventional or general disease predictions, which provide only possible disease intensity at a certain time (predictions based on the life cycle of pathogen and growth stage of trees without considering the climate conditions of each year), this study introduced an approach to provide a possible range of disease intensity with a probability of occurrence of this range (considering the climate conditions). This improvement will provide the decision makers with valuable information. When the possible range of disease intensity and the corresponding probability are estimated, decision making will become easier because the probability of a certain risk may also be determined. The

results of this study showed that this model showed good adaptation in the environmental conditions of Imathia Prefecture.

As weather forecasts improve together with more accurate estimations of micro environmental variables useful for plant disease models, as such precipitation and leaf wetness duration, it will be possible to provide seasonal estimates of disease likelihood and forecast outbreaks. This is especially interesting for field crops for the reason that unnecessary sprays has a significant impact on production costs, and no timely applications may result in inadequate control.

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