

## EXPERIENCES IN CONTROLLING FIRE BLIGHT (*ERWINIA AMYLOVORA*) IN CROATIA

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### ABSTRACT

In Croatia Fire Blight was observed for the first time in 1995 in the village of Nuštar not far from the Yugoslav border. Soon after we found several other foci. After these discoveries the Osječko-baranjska and Vukovarsko-srijemska counties were proclaimed quarantine areas.

In accordance with legal regulations all quarantine measures were undertaken. The trees began to be eradicated. Until 1998 the Ministry of agriculture and forestry paid (covered the expenses) for each eradicated tree so that until that time we have an exact picture of eradicated trees. Until that time 199 432 apple trees, 142 479 pear trees, 148 quince trees and 152 medlar trees were eradicated and burned. Despite the measures undertaken in 1998 individual infections were found in the Požega valley, in the region of Slavonski Brod, Virovitica and so these areas were also proclaimed quarantine areas. Soon after we had identified *E. amylovora* it became clear that we would have to learn how to grow pomme fruit in its presence. Therefore we tested the efficacy of some bactericides, namely: Flumequine (Firestop), streptomycin sulphate, copper hydroxide (Champ F-2) and fosetil-aluminium (Aliette). Among the tested bactericides Firestop proved the most efficient followed in descending order by Champ F-2 and streptomycin sulphate.

Even before the appearance of Fire Blight in Croatia in 1993 on the basis of climatological indicators according to Billing's method we determined the areas that were risky regarding the appearance of this disease. In 1997 the forecasting programme MARYBLIGHT 4,3 was acquired and should be used in areas in which Fire Blight is present.

This year we set up a pilot orchard in Osijek with less sensitive apple cultivars in order to be able to recommend in the future certain less sensitive varieties with good economical features.

Keywords: *Erwinia amylovora*, forecasting, identification, Croatia, bactericides.

### IZVLEČEK

#### IZKUŠNJE PRI ZATIRANJU BAKTERIJSKEGA HRUŠEVEGA OŽIGA (*ERWINIA AMYLOVORA*) NA HRVAŠKEM

Bakterijski hrušev ožig smo v Republiki Hrvaški prvič opazili leta 1995. v mestu Nuštar, nedaleč od meje z Jugoslavijo. Kmalu smo našli še nekaj žarišč. Po tem odkritju sta bili za karantensko območje razglašeni Osječko-baranjska in Vukovarsko-srijemska županija.

Skladno z zakonskimi predpisi so bili izvedeni vsi karantenski ukrepi. Okužena drevesa so bila izkrčena. Do leta 1998. je Ministrstvo za kmetijstvo in gozdarstvo RH pokrivalo vse stroške za vsako izkrčeno drevo, tako da imamo natančno sliko o številu izkrčenih dreves. Do tedaj je bilo izkrčenih in sežganih 199 432 jablan, 142 479 hrušk, 148 kutin in 152 skoršev. Kljub tem ukrepom smo v letu 1998. še vedno maleteli na posamezne okružbe na območju Požeške kotline, Slavonskega Broda in Virovitice, tako da so bila tudi ta območja proglašena za karantenska. Kmalu po tem, ko smo ugotovili zastopanost *Erwinia amylovora*, nam je postalo jasno da se bomo morali naučiti gojiti pečkarje tudi ob njeni zastopanosti. Zato smo preizkušali učinkovitost nekaterih baktericidov in sicer: flumequine (Firestop), streptomycin sulfat, bakrov hidroksid (Champ F-2) in

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fosetil-aluminium (Aliette). Med preizkušenimi sredstvi je bil najučinkovitejši Firestop, sledijo ostali v padajočem vrstnem redu: Champ F-2 in streptomycin sulfat.

Že pred pojavom bakterijskega hruševega ožiga smo na podlagi klimatskih kazalcev po metodi Billinga določili najbolj rizična območja za pojav te bolezni. V letu 1997. je bil nabavljen program za prognozo MARYBLYT™ 4.3., ki naj bi ga uporabljali na območjih, kjer se pojavlja bakterijski hrušev ožig.

Letos je bil v Osijeku posajen sadovnjak z manj občutljivimi sortami jablan, da bi lahko v prihodnosti priporočali sorte, ki so manj občutljive na bakterijski hrušev ožig in imajo hkrati dobre pomološke lastnosti.

Ključne besede: *Erwinia amylovora*, prognoza, identifikacija, Hrvaška, bactericidi.

## 1 INTRODUCTION

Fire Blight was not observed in Croatia until 1995 when the first symptoms were reported in villages bordering Serbia. Today it has spread to the eastern part of Croatia. The distribution map shows areas in which the disease has been determined (Map 1.). In regions in which the disease has been determined we have outlined a programme in four directions: I) Determination of *Erwinia amylovora*, II) Eradication, III) Testing bactericide efficacy and IV) Introducing a forecasting service.

## 2 MATERIAL AND METHODS

### 2.1 Determination of *E. amylovora*

In order to determinate the infection we used classical determination methods (Calzolari *et al.*, 1992) and tested the pathogenity on fruits of pear and quince and the hypersensitivity reaction on tobacco leaves. Diagnostic and pathogenity tests were performed with several isolates of bacteria isolated from infected pears and apples.

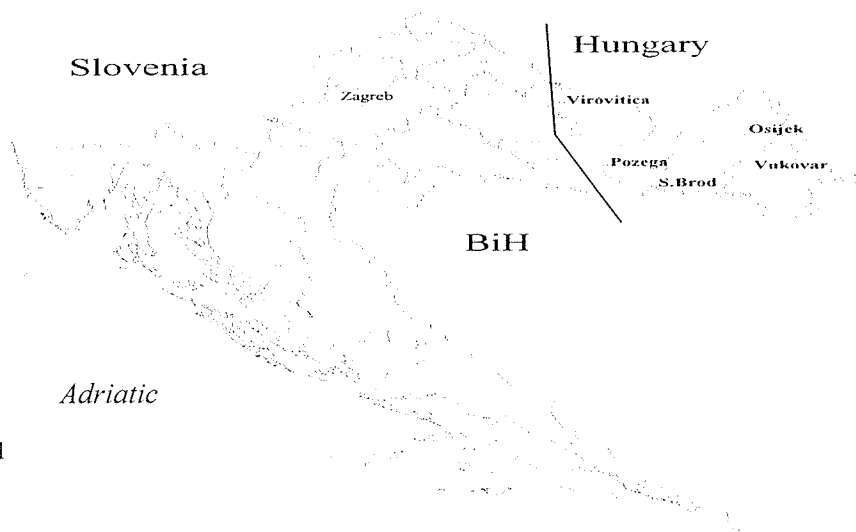


Fig. 1

## 2.2 Eradication

Clearing and burning was performed in orchards and on individual trees after it had been proved that they were infected with *E. amylovora*.

## 2.3 Testing bactericide efficacy

The trial was set up in Osijek on the pear variety Santa Maria in 4 repetitions with 5 trees each so that each tested chemical was tested on 20 pear trees. The whole trial, excluding the control trees, was sprayed with copper hydroxide 50% (8<sup>th</sup> April) before the beginning of vegetation (Champion WP 50 in the concentration of 2%). After that it was sprayed twice: I) at the beginning of flowering (4<sup>th</sup> May) and II) in full bloom (11<sup>th</sup> May 1997). Pesticides in trial were: Firestop 0,03% (flumequine 80%), Streptomycin 0,01% (streptomycin-sulphate 17,5%), Champ F-2 0,07% (copper hydroxide 35%) and Aliette 0,4% (fosetil-aluminium 80%). The assessments were performed according to the OEPP Recommendations (Anonymous, 1997).

## 2.4 Introducing a forecasting service

Based on the meteorological data the potential possibilities for infection were calculated. Here we used the Billing method - BIS (Berrie *et al.*, in press) and in the final year we used the MARYBLYT™ 4.3. forecasting system, too (Steiner *et al.*, 1996).

# 3 RESULTS AND DISCUSSION

## 3.1 Determination of *E. amylovora*

Using the methods mentioned we proved the presence of *Erwinia amylovora* on various cultivars and on several locations in eastern Croatia. There were characteristic colonies on D3 medium (Kado *et al.*, 1970) and these colonies did not produce fluorescent pigment in to the King B medium (King *et al.*, 1954). Several other tests were performed (tobacco hypersensitivity, growth at 36 °C, growth on crystal-violet medium (Crosse *et al.*, 1973)) and all results have indicated that the pathogenic bacteria is *Erwinia amylovora*. Bacterial ooze was produced on immature pear fruit.

Medlar and quince had the highest percentage of infected trees. The infection on pears and apples depended on the cultivar. Pear cultivars Passe Crassane, Santa Maria and Poire de Cure were the most susceptible and they were followed in descending order by Comice and Abate Fetel, and then by the least sensitive cultivars - Precoce de Trevoux and Coloree de Julliet.

Out of all the mentioned species, apple was the least sensitive, but there are significant differences in sensitivity. In Croatia Gloster and Idared proved the most sensitive especially on dwarfing rootstock (M9 and M26).

## 3.2 Eradication

The infected trees were eradicated according to quarantine measures. We eradicated and burned 199 432 apple trees, 142 479 pear trees, 148 quince trees and 152 medlar trees. When the disease first appeared the Ministry of Agriculture and Forestry indemnified for each destroyed tree. Despite this, the disease did not stop spreading so the indemnification was revoked.

### 3.3 Testing bactericide efficacy

Among all tested bactericides, Firestop was most efficient followed in descending order by Champ F-2 and streptomycin sulphate. Aliette gave the poorest, but acceptable protection. Champ F-2 did not show phytotoxicity on leaves, but the petals on treated trees dropped off sooner.

### 3.4 Introducing a forecasting service

Based on the Billing's method, even before *E. amylovora* appeared it was determined (Cvjetković, 1993) that every year in all parts of Croatia conditions did not exist for the development of this disease. The forecasting models, *MARYBLYT*<sup>TM</sup> 4.3. and BIS, were introduced. In the 1998 there were none favourable conditions for disease development in Eastern Slavonia region, nor in the Western region of Croatia, where inoculum of *E. amylovora* do not exists. These results were proved both by forecasting model BIS and Maryblyt.

## 4 CONCLUSIONS

1. Eradication does not give satisfactory results especially when the disease spreads onto a large number of plants.
2. Quince and medlar are the most sensitive fruit species in our climate probably due to their late flowering.
3. Among the tested chemicals Firestop proved the most efficient, followed by Champ F-2.
4. The forecasting models, *MARYBLYT*<sup>TM</sup> 4.3. and BIS, were introduced to determine their compatibility and to estimate their usefulness in our conditions. The obtained results have verified the compatibility of these forecasting methods.

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