

EFFECTS OF FOUR-YEARS INTENSIVE ERADICATION OF THE FIRE BLIGHT IN POLAND

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ABSTRACT

Poland has been one of the first European countries affected by the fire blight. First foci of the disease were discovered in the North of the country in 1966. It has spread in short time to the southern regions. Bacteria *Erwinia amylovora*, the causal agent of the fire blight, has a quarantine status in Poland since 1962.

Intensive efforts aimed at eradication of the fire blight have been in force since 1996. These include high number of inspections conducted in various crops of the host plants. About 6-7 thousands of nurseries and commercial orchards of apples, pears and quinces are inspected each year. Small gardens attached to homesteads and wild fire blight hosts (hawthorn, sorb, rowan, etc.) are also subjected to inspection (25-26 thousands of crops per year).

Sample is taken from each crop suspected of the fire blight infection and then examined in the laboratory. Diagnostic of the fire blight includes the isolation of the bacterium on growing media and further identification using available methods (e.g. serological and biochemical tests, PCR).

Infested plants are removed and burned. Special treatment is applied in order to reduce the potential source of inoculum. Additional strict measures are imposed in the case of scions orchards or nurseries, e.g. prohibition of using whole plants or their parts for further propagation.

All these measures have resulted in significant reduction of the disease prevalence. The fire blight is only sporadically notified in nurseries and rarely in commercial orchards. Wild host plants, especially hawthorn, are affected the most frequently at the time being. Generally, the rate of the infestation of the fire blight host plants has been reduced more than twice during the last four years.

Keywords: *Erwinia amylovora*, fire blight, control, eradication, quarantine

IZVLEČEK

UČINKI ŠTIRILETNEGA INTENZIVNEGA IZKORENINJANJA BAKTERIJSKEGA HRUŠEVEGA OŽIGA NA POLJSKEM

Poljska je bila ena prvih evropskih držav, kjer se je pojavil bakterijski hrušev ožig. Prva žarišča okužb so bila odkrita na severu države leta 1966. Bolezen se je zelo hitro razširila tudi v južna območja države. Bakterija *Erwinia amylovora*, povzročiteljica bakterijskega hruševega ožiga, ima na Poljskem status karantenskega organizma od leta 1962 naprej.

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Od leta 1996 dalje se s ciljem izkoreninjenja bakterijskega hruševega ožiga intenzivno ukvarjamo. V ta namen smo opravili veliko število pregledov različnih gostiteljskih rastlin. Vsako leto smo pregledali med 6 in 7 tisoč drevesnic in pridelovalnih nasadov jabolk, hrušk in kutin. Predmet pregledov so bili tudi manjši vrtovi na kmetijah in številne samonikle gostiteljske rastline bakterije, ki povzročajo obravnavano bolezen (glog, jerebika, itn.) (25-26 tisoč rastlin na leto).

Z vsake rastline s sumljivimi znamenji smo odvzeli vzorce in jih laboratorijsko pregledali. Diagnosticiranje bakterijskega hruševega ožiga je zajemalo izolacijo bakterij na hranilnem gojišču in nadaljnjo identifikacijo s pomočjo razpoložljive metode (serološko in biokemijsko testiranje, PCR).

Okužene rastline odstranimo in sežgemo. Posebni naporji so usmerjeni v zmanjšanje potencialnega vira okužbe. Za matične nasade so uvedeni dodatni varnostni ukrepi; to je prepoved uporabe celotnih rastlin ali njihovih delov za nadaljnje razmnoževanje.

Vsi ti ukrepi so privedli do opaznega zmanjšanja razširjenosti te bolezni. Na bakterijski hrušev ožig v drevesnicah naletimo le občasno, v komercialnih nasadih pa ga opazimo le redkokdaj. Samonikle gostiteljske rastline, posebno glog, so trenutno okužene bolj pogostokrat. Okuženost rastlin z bakterijskim hruševim ožigom se je v zadnjih štirih letih zmanjšala za več kot dvakrat.

Ključne besede: *Erwinia amylovora*, hrušev ožig, zatiranje, iztrebljanje, karantena

1. INTRODUCTION

The fire blight disease, caused by *Erwinia amylovora*, is one of the most harmful diseases of some fruit crops. First foci of the disease were found in the United States at the end of XVIII century, from where it has been introduced to Europe. Currently, the disease is known to occur in almost all European countries.

Apple, pear and quince are the main cultivated hosts of the bacterium. Hawthorn is the main and most frequent infected wild host plant. Other species, such as whitebeam, mountain ash, photinia, pyracantha and cotoneaster are infected sporadically. Bacteria enter the plant through blossoms, natural openings (stomata, lenticels, hydathodes) or wounds, and are carried by insects or wind-driven rain.

Symptoms of the fire blight consist mainly of wilting and decay of flower clusters, withering and decay of shoots and twigs, as well as blighting of leaves, fruits, limbs and trunks. A whitish or golden (apple only) mucoid bacterial ooze may exude from infected parts of the plant (CABI/EPPO, 1997)

In case of early and heavy infection all flowers can be destroyed (the whole yield can be lost). Strong cancers can cause the death of the whole tree. Since the disease affects all upper parts of the trees, whole orchards can be destroyed.

2. OCCURRENCE OF THE FIRE BLIGHT IN POLAND

Poland has been one of the first European countries affected by the fire blight. First foci of the disease were discovered in the north of the country in 1966. Until 1975 it occurred irregularly in isolated foci, mainly along the Baltic coast. Since 1985 it has spread towards the center of the country. Since 1990, the disease has been found in a number of places in western and southern Poland. So far, it has never been found in eastern Poland (Sobiczewski *et al.*, 1998; Zandarski *et al.*, 2000).

The eradication of the disease has been conducted since its first appearance. This has consisted of uprooting and burning of all infected plants. Despite those measures, the pathogen has spread over significant part of the country.

Very intensive measures were introduced in 1996, when the Plant Protection Inspection Service as the uniform official plant protection service was established. It

enabled to develop the uniform operating procedures. In addition, a strict co-operation with Institute of Pomology and Floriculture has been set up, in order to develop new techniques of forecasting and more efficient manners of the disease eradication.

3. BASIC ASSUMPTIONS OF THE NEW STRATEGY

The new strategy of the fire blight eradication has been based on:

- common trainings of the Plant Protection Service staff;
- establishment of uniform procedures of inspections conducting and sampling;
- development of sensitive laboratory techniques for quick and reliable detection and identification of the pathogen;
- the increase of the number of crops inspected;
- building of the network of meteorological stations for collecting of the weather parameters from various regions of the country, subsequently used for the disease forecasting;
- strictly observed eradication.

The propagation of the information on the disease is very important task of the Plant Protection Service, also. Leaflets, guidelines and other materials are produced and distributed in order to inform producers about the threat. It enables prompter findings of the new disease foci, because the producers inform the Service about any suspicion.

4. DETECTION OF THE FIRE BLIGHT FOCI

Visual inspections of the host plants, carried out by plant protection inspectors during the whole vegetation period, followed by sampling and laboratory testing, are the basic measures of the detection of the fire blight foci. The following crops are subject to official inspections:

- scions orchards, rootstock crops and nurseries (all) as well as commercial orchards of apples, pears and quinces (as many as possible);
- small gardens attached to homesteads, allotment gardens (as many as possible);
- wild fire blight hosts (hawthorn, sorb, rowan, etc.), especially those surrounding cultivated host plants (as many as possible).

Appropriate sample is taken from each crop suspected of the fire blight infection and then examined in the laboratory. Over than 30 laboratories of the Plant Protection Service are prepared for the detection and identification of the *Erwinia amylovora*, using both microbiological (classical) and serological methods (ELISA, IF) (Lelliott and Stead, 1987; OEPP/EPP, 1992; Sobiczewski *et al.*, 1998). The PCR-based method of the detection of the pathogen directly in the plant material has been elaborated in Institute of Pomology and Floriculture at Skierniewice in co-operation with the Central Laboratory (Pulawska and Sobiczewski, 1997; Sobiczewski *et al.*, 1998).

5. THE ERADICATION

Appropriate quarantine measures are taken in case of positive testing results, in order to eradicate the disease and prevent its further spreading.

The following measures are undertaken for various crops:

a. Scions orchards:

- uprooting and burning of infected trees;
- special treatment of other trees in order to reduce the potential source of inoculum (copper fungicide);

- the prohibition of scions obtaining for grafting from the trees growing in the radius of 5 m from the infection point;
- in case of high rate of infection (at least 3 infection points) – three-years prohibition of scions obtaining.

b. Rootstocks crops and nurseries:

- uprooting and burning of infected plants as well as the plants surrounding them to a distance of 5 m;
- special treatment of other plants in order to reduce the potential source of inoculum (copper fungicide);
- in case of high rate of infection (at least 3 infection points) – destroying of the whole crop.

c. Commercial orchards:

- uprooting and burning of whole infected trees or infected shoots or branches only with about 50 cm reserve from necrosis/canker margin;
- disinfection of the used tools;
- protecting of wounds by painting with white latex with addition of 1% copper fungicide and 12% of Pomonit R10 (NAA);
- special treatment of other trees in order to reduce the potential source of inoculum (copper fungicide).

d. Small orchards, allotment gardens and wild fire blight hosts:

- uprooting and burning of whole infested plants.

6. EFFECTS OF THE MEASURES

The following results has been achieved:

- new foci of the disease are detected and eradicated very early – it prevents further spread;
- there is a good co-operation between the producers and the Plant Protection Service – the producers usually inform the Service about any suspicion of the disease;
- the fire blight is very sporadically notified in scions orchards, rootstock crops and nurseries (1-2 cases per year);
- significant reduction of the disease prevalence in commercial orchards and surrounding plantings; the number of infected trees in infested crop is usually low;
- wild host plants, especially hawthorn, are affected more frequently at the time being, only;
- generally, the rate of the infestation of the fire blight host plants has been reduced more than twice during the last four years (table 1).

Table 1: The percentage of the fire blight host crops infested by *Erwinia amylovora* during 1996-2000

Years	Commercial orchards	Small gardens, wild hosts
1996	2.0	63.05
1997	1.20	3.20
1998	0.96	1.50
1999	1.18	1.31
2000	1.04	1.34

7. CONCLUSION

The fire blight is very harmful disease. Its strength and destructiveness differ between individual years. The local and low prevalence of the disease in one year does not mean that it may not be more harmful during subsequent years. Various conditions influence the disease spread, especially weather conditions at the time of flowering (high temperature and humidity), as well as the presence of the inoculum source. These are the reasons of the permanent vigilance of the Plant Protection Service and producers. The complying with the preventive measures and eradication of the disease in case of their occurrence are the key elements.

The complete eradication of the fire blight in particular regions of the country is one of the main aims of the Service. It will allow demarcating the zones free from the disease, where propagative material will be produced. According to European Community requirements, the production of the propagative material of the *Erwinia amylovora* host plants can be undertaken in buffer zones only, free from this pathogen.

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