APPLIED PLANT RESEARCH
WAGENINGEN UR

Dutch preparations for upcoming phytoplasma diseases

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Introduction

As result of a maritime climate with cold winters, phytoplasma infections in The Netherlands did not previously result in high economic losses. Phytoplasma infections were generally limited to small scale 16SrX phytoplasma infections in pear and apple and small-scale 16SrI infections in bulbous crops like hyacinth and gladiolus. However, most likely due to global warming, recent Dutch winters were milder and average summer temperatures have increased. Interestingly, in the last few years phytoplasma infections in hyacinth and gladiolus have occurred more frequently and small-scale 16SrI phytoplasma infections were also detected in several other ornamental crops. It is likely that the increase in vector survival rates during Dutch winters will result in increased vector population during the Dutch summers. As a consequence, economic losses may increase if the Dutch agricultural sector is not prepared, informed or educated about phytoplasma infections.
In collaboration with a governmental institute and inspection services, our research institute runs several studies on phytoplasma-vector-crop interactions, vector monitoring and diagnostics. Three examples will be presented.

Example 1 - Epidemiology of Pear Decline

Pear Decline in Pyrus and pear trees correlates with the presence of the phytoplasma *Candidatus* Phytoplasma pyri (CPp). The phytoplasma is transmitted by the pear psylla (*Cacopsylla pyricola*). Current research concentrates on a better understanding of the epidemiology of Pear Decline in The Netherlands and to formulate agricultural practices to avoid Pear Decline in the future. Research topics are:

- Susceptibility and tolerance of pear cultivars, interstocks and rootstocks for Pear Decline disease are studied using the tritrophic interaction between the pear tree, the 16Sr-X phytoplasma and the pear psylla.
- Pear Decline infected trees are used to investigate location and distribution of CPp during annual seasons. Currently, the mode and timing of infection by the pear psylla is under investigation.
- The collection of CPp infected cultivar/interstock/rootstock combinations will be used to develop fertilization strategies to prevent further CPp colonization and disease symptom development.

Figure 1. *(The pear psylla (Cacopsylla pyricola, left) is involved in the transmission of Candidatus Phytoplasma pyri. The leafhopper Macrosteles sexnotatus (right) is involved in the transmission of Aster Yellows phytoplasma to hyacinth.*

Example 2 - Cicadellidae Monitoring

In 2009 Aster yellows (16Sr-I) phytoplasma infections were detected in hyacinth, gladiolus, hortensia, primula and Scilla. For hyacinth, field sites with increased risks could be identified. Several proven, or putative 16Sr-I phytoplasma vector species were trapped on sticky plates in these fields between mid April and the end of August 2009. Morphological determination activities are currently extended by Cytochrome Oxidase I (COI) sequence analyses. Activities for 2010 will concentrate on:

- Cicadellidae monitoring and further optimization of molecular identification tools.
- Screening of the phytoplasma infection status of trapped Cicadellidae by PCR-analysis.
- 16Sr-I phytoplasma diagnostics of woody plants and weed to investigate the presence of a putative *in planta* reservoir of 16Sr-I phytoplasma close to high risk fields.

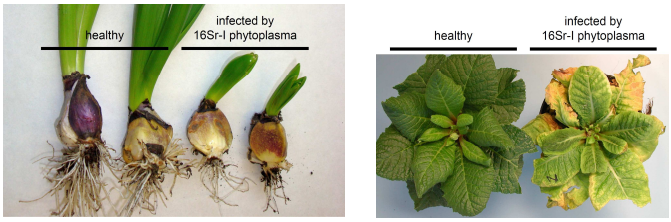

Figure 2. *16Sr-I phytoplasma infection in hyacinth (left) is characterized by poor root formation or sometimes a lack of root development. Flowers are abnormally small or can be aborted. Especially in the potting industry where multiple bulbs on a pot suffer from phytoplasma infections in hyacinth. 16SR-I phytoplasma infection in Primula (right) is characterized by severe chlorosis and yellowing of leaves and poor root formation (not shown).*

Example 3 – Molecular Diagnostics

To become acquainted with phytoplasma infections in The Netherlands, symptom description of diseased plants is supported by the formation of an image database.
Visual diagnostics is additionally supported by molecular diagnostics using manual and (semi automated) magnetic nucleic acid extraction protocols, several sets of detection primers and (Q)-PCR protocols. There is a special emphasis on sampling types and timing of sampling. Information and experiences are exchanged between Dutch research institutes, Dutch testing organizations and the governmental reference laboratory.

Summary

Our research institute runs several epidemiological studies on phytoplasma-vector-crop interactions and vector monitoring (examples 1, 2 and 3). The main objectives of these applied agronomical studies are firstly to introduce tools in The Netherlands for phytoplasma risk assessment and secondly to provide measures to protect crops of high economic value. Our research will benefit from participation in the EU-COST initiative. Likewise, results of these studies will be shared within the EU-COST initiative and will contribute to a description of phytoplasma epidemiology, vector ecology and phytoplasma control in Northern European crop systems.

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