Oomycete diseases in fruit crops with special reference to crown rot of Strawberry

Robert Saville

East Malling Research
Talk Overview

- Oomycete diseases in fruit crops
- Crown rot in strawberry
- Evaluation of chemical control products
- Towards an integrated control strategy for crown rot
Oomycete diseases in fruit crops

Top fruit

Soilborne Phytophthora spp. which cause diseases of the root and crown (sometimes called collar rot)

Apple and cherry are affected whilst pear and plum trees appear to be relatively resistant.

Diseased trees are commonly found in poorly drained areas of the orchard.

Symptoms above ground; reduced tree vigour and growth, yellowing or chlorosis of leaves, and eventual collapse or death of the tree.

A diagnostic reddish-brown lesion forms on the inner bark and wood. A sharp line demarcates the reddish-brown (diseased) and white (healthy) portion of the crown.

Photo acknowledgement: Kearneysville pathology extension
Strawberry red core/stele caused by *Phytophthora fragariae*. 

- Stunted plants, leaves exhibiting a blue/green appearance leading to plant collapse and death resulting from root death. Roots exhibit characteristic red colour in cortex of root.

Strawberry crown rot caused by *Phytophthora cactorum*.
Strawberry crown rot - Importance

- Crown rot caused by the fungus *Phytophthora cactorum*

- Crown rot can result in significant losses in fruit production

- Losses greatest in protected crops and with very susceptible varieties complete crop loss can occur

- Significant losses can also occur in plant propagation particularly in module plants

- Presence of crown rot in propagation can lead to rejection of the whole stock

- Since 1989 crown rot increased in incidence in UK due to
  - Increased cultivation of susceptible cvs. eg Elsanta
  - Infected planting material
Strawberry crown rot - Symptoms

- Youngest leaves turn blue-green and wilt
- All or part of plant wilts and dies, depending on number of crowns affected
- Affected plants that survive may be stunted
Strawberry crown rot - Symptoms

- Slice crown lengthways
- Extensive red / brown rot in crown
- Plant may break at crown when pulled
- Root rot in later stages of disease
Strawberry crown rot - Symptoms

Main problem with crown rot is symptomless infection
Strawberry crown rot – Factors affecting disease

- Minimum temperature 2°C, optimum temperature 25°C, maximum temperature 30°C
- Warm period with prolonged wet essential for infection
- High temperatures enhance disease development
- Water stress essential
- Disease spread by water splash > spread on plastic mulch
Strawberry crown rot – Factors affecting disease

Cold stored plants

- Cold stored plants increased susceptibility to crown rot
- Cold store damaged plants more susceptible to crown rot
- Transplant stress increases crown rot risk
- Crown rot-infected plants that die in cold store produce large numbers spores that could spread to healthy plants during thaw
Strawberry crown rot – Cultural control

- Sanitation and hygiene very important– Clean up glasshouse / polytunnel before planting
- Disease-free planting material
- Good drainage of peat bags etc
- Clean reliable water supply
- Avoid contamination of unit with field soil on boots, equipment which could introduce the disease
- Good ventilation and air circulation to avoid heat build up or prolonged leaf wetness
Strawberry crown rot – Chemical control

- Fungicides act as protectants. No eradication of disease
- Use of fungicides will depend on risk – High risk routine fungicide application

Products in the UK for outdoor & protected strawberries

Paraat (dimethomorph) – Drip irrigation or drench, Max. no applications = 1
Harvest interval = 35 days

Products in UK for outdoor strawberries

Fenomenal (fenamidone + fosetyl-Al) – Dip, drench, spray Max. no applications = 2
Harvest interval = 35 days
Evaluation of products for control of crown rot in strawberry

HDC funded project - SF121
HDC Trials 2009 & 2010 – Conclusions
Objectives 2011 trial

- Revus, Ranman, Fenomenal, Farmfos (10 l/ha) and Prestop all looked promising as well as the standards Aliette and Paraat

- It is understood that Revus will not be used in the UK so this product was dropped from further trials

- The objectives of trials in 2011 were

  - Confirm efficacy of products identified in 2010 trial when applied as a single treatment

  - To evaluate products in combination with Farmfos (potassium phosphite)

  - To look at effect of spray volume on efficacy (1000 v 400 L/ha)
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<th>Active ingredient</th>
<th>Rate/litre</th>
<th>First treatment</th>
<th>Second treatment</th>
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<td>-</td>
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<td>Spray 1000 L/ha</td>
<td>Repeat spray</td>
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HDC trials – Trial setup 2011

- Trial set up in polytunnel using peat bags raised on crates
- Planted with cv Malling Pearl or Sonata, 20 plants per plot May / June
- Drip irrigation to bags + Overhead irrigation 3X per day
- Prestop applied as 2 x drench for first treatment
- A plant inoculated with *P. cactorum* introduced into each peat bag 29/6
- Trial assessed in August and October 2011 and April 2012
- Assessed by recording numbers of plant collapsed or dead
Inoculated plants of Sonata and Pearl introduced into bags on 29 June

Pearl inoculated plants started to wilt by 5 July

Plot plants of Pearl first signs of collapse in untreated plots by 18 July

Crown rot well advanced in control plots of Pearl by mid July early August

Almost none of the inoculated Sonata plants were showing any symptoms

Sonata inoculated plants re inoculated in mid August
HDC Trials
Treatments evaluated in 2011 – Results Pearl

% infected plants per plot

- Untreated
- Ranman
- Fenomenal
- SL567A
- Paraat
- Prestop
- Farmfos 1000
- Farmfos 400
- Ranman/FF
- Fenomenal/FF
- SL567A/FF
- Paraat/FF
- Prestop/FF
- Farmfos/FF
- HDC F12 0.5
- HDC F12 1.0

Legend:
- August
- October
- Apr-12
HDC Trials - Conclusions

- In untreated **Pearl** plots disease was slow to develop but by October assessment around 50% of plants were infected.

- All treatments appeared to have reduced infection except for Farmfos at lower spray volume of 400 L/ha and Experimental product at higher rate.

- The additional Farmfos spray 4 weeks later appears to have improved control.

- With **Sonata** there was no visible infection in the plots.

- By October some disease had developed but only 6% infected in untreated plots.

- No obvious differences between treatments.
2012 trials

2012 trials are being conducted as part of SCEPTRE

Includes more products with activity against Phytophthora
Towards an integrated control strategy for crown rot

An integrated control programme needs to include:

- Cultural control
- Protectant fungicides
- Disease-free planting material
- Genetic resistance
Towards an integrated control strategy for crown rot

Increasing our understanding of symptomless infection
- Main route of introduction
- Understand epidemiology
- Develop sensitive diagnostics

Exploiting genetic resistance
- Being exploited in agricultural crops (e.g. potato)
- Using Pan-genomic approach of plant and pathogen interacting components (R-genes and Effectors)
- Breed new varieties which can recognise the pathogen and respond appropriately (pyramid R-genes)