



# Grower Summary

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## **TF 216**

Evaluation of products for  
control of *Neonectria ditissima*  
on apples

Final 2016

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The results and conclusions in this report may be based on an investigation conducted over one year. Therefore, care must be taken with the interpretation of the results.

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Before using all pesticides check the approval status and conditions of use.

Read the label before use: use pesticides safely.

## **Further information**

If you would like a copy of the full report, please email the AHDB Horticulture office (hort.info.@ahdb.org.uk), quoting your AHDB Horticulture number, alternatively contact AHDB Horticulture at the address below.

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AHDB Horticulture is a Division of the Agriculture and Horticulture Development Board.

**Project title:** Evaluation of products for control of *Neonectria ditissima* on apples

**Project number:** TF 216

**Project leader:** Dr Angela Berrie, East Malling Research

**Report:** Final report, 2016

**Previous reports:** Annual report, 2015

**Key staff:** Dr Angela Berrie  
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**Location of project:** East Malling Research (NIAB-EMR from 9 February 2016), New Road, East Malling, Kent, ME19 6BJ

**Industry Representative:** Mark Holden, Adrian Scripps Ltd, Whetsted Road, Five Oak Green, Tonbridge, Kent, TN12 6RR

**Date project commenced:** 1 April 2014

**Date project completed** 30 June 2016  
**(or expected completion date):** (Extension agreed to 31 August 2016)

## **GROWER SUMMARY**

### **Headline**

- Three fungicides including Syllit 400SC (dodine) and two experimental products, F119 (now registered on apples as Delan Pro) and F115, were effective in reducing *Neonectria* fruit rot when applied as sprays at petal fall and pre-harvest.

### **Background and expected deliverables**

Canker, caused by the fungus *Neonectria ditissima* (formerly named *Nectria galligena*), is one of the most important diseases of apple and pear. Most of the established apple cultivars are very susceptible to the disease and the more recently introduced cultivars such as Jazz, Braeburn, Rubens, Cameo, Kanzi and Zari are also particularly susceptible. The fungus attacks trees in the orchard, causing cankers and die back of young shoots, resulting in loss of fruiting wood and increasing pruning costs. Apple canker can be particularly damaging in young orchards where, in some years, up to 10% of trees can be lost annually, in the first few years of orchard establishment, as a result of trunk cankers, particularly following exceptionally wet or cold winters. *N. ditissima* also causes a fruit rot that can result in significant losses as high as 10% or more in stored fruit. *Neonectria* rot, which is often at the fruit stalk end, is also difficult to spot on the grading line, but becomes obvious during marketing leading to rejection of fruit consignments.

In 2013 the incidence of canker in apple orchards was exceptionally high as a result of wet weather during leaf fall in 2011 and 2012 and above average rainfall in spring and summer 2012. Of particular significance was the high incidence of trees with systemic canker in young orchards which is most likely to have arisen from the tree nursery. This is especially important given that many growers are investing in new orchards with cultivars that are particularly susceptible and / or sensitive to canker so the problem will only get worse.

Much is known about the epidemiology of apple canker but there are still significant gaps in knowledge which will require long term research and are now being addressed in the new AHDB project TF 223 (*Integrated pest management of tree fruit pests and diseases*) which started in April 2015. However, in the short term, control of the cankers and fruit rot is still very dependent on fungicide sprays and, even when new approaches are developed and implemented, it is likely that fungicides will still play an important role in the integrated approach.

Control currently relies upon a combination of cultural methods to remove canker lesions and the use of protectant fungicides. Effective fungicides are currently limited. Generally copper fungicides are used at autumn leaf fall and before bud burst to protect leaf scars and bud-scale scars. Previously, products based on carbendazim were applied during the spring and summer to prevent tree and fruit infection in this period. These products are no longer approved for use. In AHDB project TF 144 (*Apple: Evaluation of fungicides for the control of apple canker*), potential alternative fungicides were evaluated for canker control and tebuconazole (Folicur) was identified as a possible alternative product and now has an EAMU (0115/2015) for use post-harvest during leaf fall. However, products effective against *N. ditissima* that can be used in the growing season are limited. There is now a range of fungicides from new chemical groups (SDHI group), foliar nutrients and fortifying products and biocontrol agents that could potentially be active against *N. ditissima* which are worth evaluating.

## **Summary of the project and main conclusions**

### *Year 1*

In the first year, experimental fungicides, alternative chemicals and a biocontrol agent were evaluated for their efficacy in controlling *Neonectria* canker and fruit rot. Two separate trials were conducted on cv. Gala at East Malling Research in 2014. In the fruit rot trial, six experimental fungicides, along with Syllit 400SC (dodine), two alternative chemicals and the biocontrol agent Serenade ASO (*Bacillus subtilis*), were all compared to Bellis (pyraclostrobin + boscalid) and an untreated control for control of *Neonectria* fruit rot. Fungicides were applied twice at petal fall and twice pre-harvest while the other products were applied every two weeks from petal fall. Fruit was harvested in September and cold-stored in controlled atmosphere until March when fruit rot incidence was assessed.

Weather conditions at petal fall and pre-harvest were favourable for infection of fruit by *N. ditissima* with around 10% fruit rot in untreated plots. Two experimental products, HDC F119 (now available as Delan Pro) and HDC F115, along with one existing registered product Syllit 400SC, significantly reduced *Neonectria* fruit rot by up to 50%. Treatments HDC F120, CuPC33 and 42Phi Cu showed reductions in rot incidence but were not statistically significant. Treatments HDC F115, Syllit 400SC and HDC F120 also significantly reduced the incidence of brown rot. The incidence of fruit scab was significantly less on fruit treated with HDC F115, HDC F118, HDC F119, Syllit 400SC, HDC F120, HDC F121 and CuPC33 compared to the untreated control. Syllit 400SC was significantly better than all other treatments.

In the canker control trial, similar products were evaluated with Folicur (tebuconazole) included as the standard. Products were applied four times at 10%, 50%, 90% and 100% leaf fall. Rainfall during the leaf fall period was average to high and should have given conditions conducive to the development and spread of canker. However, actual numbers of cankers associated with leaf scars on extension growth was relatively low and on average about 1 per shoot. One of the lowest numbers was recorded on shoots from untreated plots. There were no significant effects of treatments on numbers of cankers.

In a separate study, sodium hypochlorite (14% chlorine) was compared to Folicur (tebuconazole) and an untreated control for its ability to suppress *N. ditissima* cankers on apple trees when applied as a drenching spray. The efficacy of the treatments was assessed by collecting canker washings and checking them under the microscope for *N. ditissima* spores. The trial was set up in January 2015. Unfortunately, none of the cankers targeted produced any spores, even the untreated ones. It appeared that many of the cankers had become inactive following prolonged dry weather at this time. The trial will be repeated in December 2015.

## Year 2

### *Neonectria fruit rot*

In the second year experimental fungicides and alternative chemicals identified as effective in 2014 were combined in programmes and evaluated for their efficacy in controlling *Neonectria* fruit rot compared to an untreated control. Programmes evaluated were F115 alone and in combination with 42Phi Cu or CBL, Delan Pro (F119) alone and in combination with 42Phi Cu or CBL and Syllit 400SC in combination with 42Phi Cu and F115. F220, 42Phi and CBL were also applied alone. The fungicides were applied as two sprays at petal fall and two pre-harvest. CBL was applied at monthly intervals and 42Phi Cu applied at 14 day intervals. Fruit was harvested in September and cold-stored in air at 2°C until January when the fruit was removed from store and assessed for rots after two weeks in an unheated barn to allow rot development.

Weather conditions at petal fall and pre-harvest were less favourable for infection of fruit by *N. ditissima* so consequently fruit infection was lower than in 2014 and more variable. None of the programmes or treatments applied significantly reduced *Neonectria* rot but the lowest incidence was recorded in programmes based on F115 and F119 (Delan Pro) and Syllit 400SC, identified as effective in 2014, and in plots treated with F220. Programmes based on F115, F220 and Syllit 400SC also significantly reduced the incidence of brown rot. Programmes including 42Phi and Delan Pro significantly reduced *Phytophthora* rot. The

overall incidence of *Colletotrichum* rot had considerably increased compared to 2014 where incidence was less than 0.5% in most plots. None of the treatments had any significant effect on *Colletotrichum* rot.

#### *Neonectria canker*

In the canker control trial, Bellis, F115, 42Phi Cu, F118, F119 (Delan Pro), Syllit400SC, F220, Serenade + SP057 (wetter) and Captan were evaluated for control of canker. Folicur (tebuconazole) was included as the standard and an untreated control. Products were applied at 10%, 50%, 75% leaf fall as protectants against *N. ditissima* infection of leaf scars. A 4<sup>th</sup> spray was delayed to coincide with artificial wounds inoculated with *N. ditissima*. The incidence of natural new cankers on extension growth in the autumn leaf fall trial was low and variable with no significant effects of treatments on incidence. However, the highest number of cankers was recorded on untreated plots and the lowest numbers on plots treated with Folicur (standard), Bellis, Syllit, F220, Captan and Serenade + SP057 (wetter). In the inoculated canker trial the treatments Folicur (standard), F115 and Captan all significantly reduced cankers.

In a separate study sodium hypochlorite (14% chlorine) was compared to Folicur (tebuconazole) and a water control for its ability to suppress *N. ditissima* cankers on apple trees when applied as a drenching spray. The efficacy of the treatments was assessed by collecting canker washings and checking them under the microscope for *N. ditissima* spores. None of the treatments had any clear significant effect on production of spores by the cankers.

### **Financial benefits**

Apple canker is one of the most challenging disease problems facing the apple industry, mainly because of the difficulties in achieving successful control. Most of the established apple cultivars are very susceptible to the disease and the more recently introduced cultivars such as Jazz, Braeburn, Rubens, Cameo, Kanzi and Zari are also particularly susceptible. Apple canker can be particularly damaging in young orchards where, in some years, up to 10% of trees can be lost annually, in the first few years of orchard establishment, as a result of trunk cankers. Many new orchards are planted as intensive fruit wall systems (c. 3,000 trees/ha) to maximise yield and quality and simplify management and harvesting. Establishment costs are expensive at £7/tree or £21,000/ha. Therefore tree losses in the early years of the orchard can be particularly damaging financially.

*N. ditissima* also causes a fruit rot that can result in significant losses as high as 10% or more in stored fruit. Rots often occur in the stalk end of the fruit and are difficult to detect during fruit grading and subsequently develop during marketing leading to the rejection of fruit

consignments. Orchards receive routine sprays of fungicides pre and post-harvest to protect trees and fruit from *Neonectria* fungal infection at an average annual cost of around £700/ha. Effective products to control the 'canker problem' available for use in the growing season are limited. This project is not going to solve the problem completely but will identify new products that could be used in the growing season to protect fruit and the tree from *Neonectria* infection. This should result in better control of the disease and reduction in losses in the orchard and in store and contribute to the wider research on canker undertaken as part of the new AHDB Tree fruit project (TF 223).

The information generated from the project will be delivered to the industry through the AHDB Grower journal and joint EMRA / AHDB grower days.

### **Action points for growers**

- This project has identified potential fungicide products that could be used to control *Neonectria* fruit rot. F119 is now registered for use on apples as Delan Pro. F115 will be registered for use on apples in Europe and may be available in the UK in the future. Syllit 400SC is registered for use on apples and pears but for dessert apples only pre-blossom and for culinary apples up to July. Its future is uncertain but the product owner is hoping to retain it for use in apple.
- Evaluation of new products for canker control should continue as they become available