Research results from strawberry disease control project

AHDB is funding Project SF 157 to investigate some key diseases of strawberry and develop novel approaches to controlling these where appropriate. The project has been running for four years and enters its final year in the 2019 season. Here we summarise some of the key findings for growers to date, some of which growers can adopt in the 2019 season These findings are heavily abbreviated summaries with no scientific background or detail included in this document. The higher level of detail can be found in the latest reports of SF 157 on the AHDB Horticulture website.

Novel approaches to powdery mildew control

An initial set of experiments was done with the aim of reducing reliance upon conventional fungicides.
The work demonstrated that AQ10 (*Ampelomyces quisqualis*) and a coded biocontrol product from Bayer applied in admixture with Silwet were as effective as a 7-day routine fungicide spray programme.

A separate series of trials were done on products both currently approved for use on strawberry and a biological (coded) product. The effective protectant, curative and anti-sporulant properties of each were assessed. The findings are summarised in the table below.

Table 1. Protectant, curative and anti-sporulant properties of products effective for the control of powdery mildew on strawberry

Product - active[FRAC code] (approval status on strawberry)	**Protectant** (number of days applied before infection occurred)	**Curative** (number of days applied after infection where disease was controlled)	**Anti-sporulant** (number of days during which sporulation was effectively suppressed)
Talius –proquinazid[13] (protected)	7-8	2-3	2-3
Takumi – cyflufenamid[U06] (outdoor & protected)	4-5	2-3	2-3
Luna Sensation – fluopyram[7]/trifloxystrobin[11] (protected)	4-5	2-3	4

Charm – difenoconazole[3]/fluxapyroxad[7] (outdoor & protected)	Yet to be tested	Not tested	4
Silwet – wetting agent (outdoor & protected)	Not tested	Not tested (not expected to have an effect)	2-3
Silwet & **AQ 10** – *Ampelomcyes quisqualis* (protected)	2 (without Silwet)	Not tested (not expected to have an effect)	4
Silwet & **Coded product** – coded (not approved)	2-3 (without Silwet)	Not tested (not expected to have an effect)	2-3

Later in the project, a standard 7-day fungicide programme was compared to a managed programme which was based upon visual inspection for incidence of strawberry powdery mildew, the environmental risk of mildew infection (which employed the NIAB EMR strawberry powdery mildew model based on temperature and humidity records) and the strawberry growth stage. The managed programme employed both conventional fungicides and a bacterial based biocontrol agent either with or without routine applications of Cultigrow (a biostumulant not approved for use as a plant protection product) or silicon. The standard programme included the wetting agent Silwet and the conventional fungicides Luna Sensation (protectant and curative action), Takumi (protectant and curative action) and Talius (protectant action) – all have good anti-sporulant activity. The managed programme used approximately 50% less spray applications, which reduced the cost by half compared to the standard 7-day fungicide programme and it was equally effective at maintaining control of powdery mildew. In contrast to the standard 7-day fungicide programme (where all permitted numbers of applications of the products had been made by the end of the season), in the managed programme, far fewer applications had been made and a number were still available should late infection require additional control. The use of such a managed powdery mildew control programme will be demonstrated at the NIAB EMR WET Centre in 2019.

Key results so far:

- Biofungicides have been identified that are effective for the control of strawberry powdery mildew when used in an appropriate spray programme.
- Approved products have been tested for their relative activity and mode of action against strawberry powdery mildew.
- Managed programmes using a combination of biofungicides, conventional fungicides and silicon have reduced the number of spray applications made compared to 7-day standard fungicide programme, at only half the cost.

Investigating fruit rots in strawberry

Initial work investigating the use of the cool chain on the development of Mucor and Rhizopus rots in strawberry, found that low temperatures had little impact on preventing the development of these rots after harvest.

The pathogen *Pestalotiopsis* has been found in the crowns of wilting strawberry plants in recent times and research was done to understand its importance in strawberry. *P. clavispora* is the species commonly found in the UK, which can colonise strawberry tissue and cause a post-harvest

rot. However, the work couldn't prove that it causes a primary disease in the plant crown even under ideal conditions. It has been concluded that *P. clavispora* is a weak secondary pathogen of strawberry which infects plants under stress. Molecular primers are being developed to detect the pathogen in plants in propagation.

Key results so far:

- *Pestalotiopsis clavispora* has been investigated as a pathogen of strawberry, but it was concluded that it is a secondary pathogen which infects plants under stress.

Phytophthora research

A survey of runner material in propagation looked for the presence of latent infection by *Phytophthora fragariae* and *Phytophthora cactorum*, the causes of red core and crown rot. 5% of samples were found to have latent infection of *P. fragariae* and 30% of *P. cactorum*. The levels showed no correlation with different varieties. Latent infection does not necessarily translate into yield reducing disease, but the disease can develop and cause symptoms in plants under stress.

Research in container-grown strawberry where the substrate was amended with arbuscular mycorrhizal fungi (AMF) and plant growth promoting rhizobacteria (PGPR) showed that both could reduce the severity of red core disease but not crown rot.

A dipping and drenching trial was undertaken to assess the effect of fungicides and biological control products on the control of Phytophthora diseases at planting time. Fenomenal, Prestop, T 34 and a biological coded product significantly reduced the development of *P. cactorum*. It was found that dipping alone was sufficient to achieve this rather than both dipping and drenching.

Key results so far:

- Substrates amended with either AMF or PGPR can reduce the severity of red core infection.
- Dipping plants with Fenomenal, Prestop and T 34 can significantly reduce the development of crown rot.