Practical experience of using a prediction system to control strawberry powdery mildew

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Introduction

- Powdery mildew, *Podosphaera aphanis*, is a major fungal disease affecting strawberry production. The pathogen infects strawberries in nearly all organs and appears to be specific to this crop (Fig. 1) (Dodgson et al. 2008).

Figure 1 Mycelium infected strawberry plant. B. Liu (2013).

- The **prediction system** (Fig. 2) monitors temperature and humidity, and records the accumulated number of hours (144) of disease conducive conditions needed for the fungus to develop from conidiospore development through colony formation to conidiospore production thus to alert the grower when fungicide spraying is necessary.
- The hypothesis tested here was the use of the prediction system would enable disease control with fewer fungicide sprays which potentially lowers the Green House Gas (GHG) emissions which results in a more sustainable production system.

Aim

Assess the efficacy of the prediction system in the tunnel on a commercial farm scale, comparing the use of the prediction system with an untreated control and calculating the GHG emissions of the fungicides applied during the trial.

Figure 3 Ladybird field tunnel. B. Liu (2013).

Materials and methods

- Five beds of cultivar Sonata in their third year harvesting were growing in Ladybird trial tunnel (Fig. 3). The first 10m of each bed receives no fungicide spray (Untreated control), the remaining beds receive sprays in accordance with the prediction system.
- The assessment for untreated control and treated was each based on five replicates of 10 leaves each week. The disease level was expressed as % cover of colonies (amount of mycelium) per leaflet.
- The GHG emissions associated with fungicides application were calculated as

GHG emissions (kg CO2/ha) = fungicide application rate (kg a.i./ha) × emission factor (kg CO2/kg a.i.)

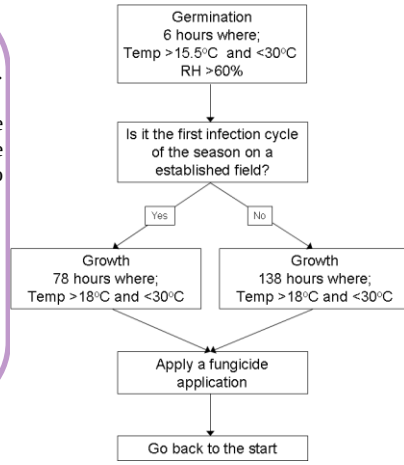

Figure 2 Rule based prediction system

Results

- Disease levels as shown by the AUDPC (Area Under the Disease Progress Curve) were lower in the treated plots throughout the trial (Fig. 4).
- Disease level showed considerable differences between beds in the tunnel: beds located at the side of the tunnel had higher disease level than beds in the middle.
- Environmental conditions e.g. temperature and relative humidity (monitored by Tiny Tags) varied at different locations within the same tunnel.
- Fungicides Fenomenal and Trianosan DG produce higher level of GHG emissions (Fig. 5)

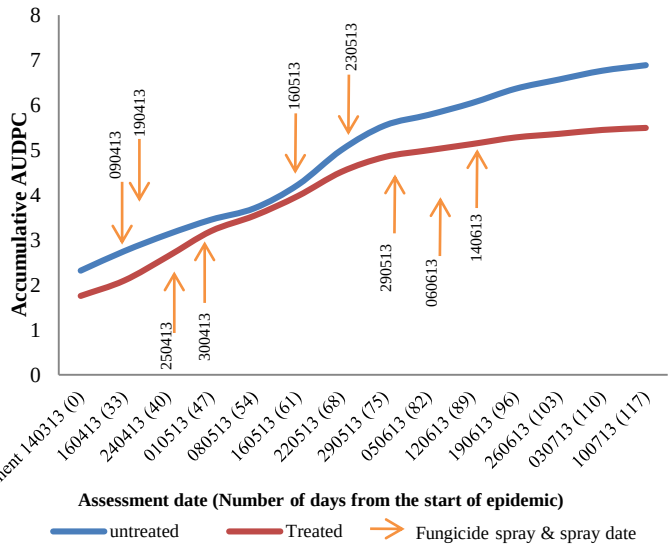

Figure 4 AUDPC against date for treated (sprayed with fungicides) and untreated beds. The graph is based on the mean results of all five beds. The horizontal axis shows the date of each sampling and numbers in the brackets indicate numbers of days since the start of epidemic. The vertical arrows represent dates of fungicide sprays.

Discussion

Though the disease was reduced by fungicide applications, there were considerable differences between beds in the tunnel. This could be attributed by factors such as the trial was carried out in a third year crop and there was a variable amount of overwintering disease in different beds. In addition, by spraying according to the prediction system, less fungicides, particularly Fenomenal and Trianosan would be used hence the overall GHG emissions would be significantly reduced.

Future work

To compare the use of the prediction system between farms; to compare fungicide use of farms which use the prediction system and those which use 'insurance spraying'; to assess the role of silicon wetter and wild pollinators in sustainable strawberry production.

Acknowledgement

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References

Dodgson, J., Hall, A and Parker,S. (2008). Control of strawberry powdery mildew under protection. Project SF 62 & SF 62a.

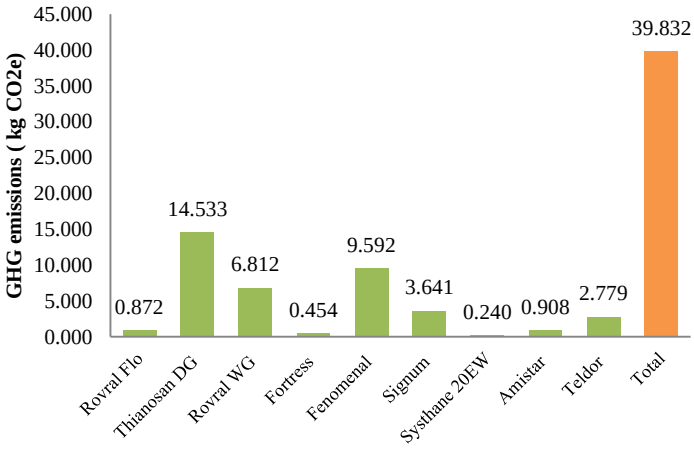

Figure 5 GHG emissions of individual fungicide of individual application applied in Ladybird field during the trial period. Each bar represents an individual fungicide product and the value above represents the GHG emissions (kg CO_2t) of this fungicide on a single application in Ladybird field. The orange bar on the far right indicates the total GHG emissions of all nine fungicides on a single application in Ladybird field.

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