GROWING STRAWBERRY FROM THE EQUATOR TO THE ARCTIC

Controlling strawberry powdery mildew with reduced number of fungicide sprays

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Introduction

The strawberry is a successful crop in Britain, where it is largely grown in polythene tunnels. However, with the use of these tunnels the environmental conditions (temperature and relative humidity) have resulted in strawberry powdery mildew (*Podospheara aphanis*) becoming the most feared disease of strawberries; where an infection can cause yield losses of 20-70%.

A rule-based prediction system was devised for recording the accumulated number of hours (144) of conditions necessary for the fungus to germinate, grow and produce spores, i.e. disease conducive hours. For germination: RH >60%, temperature 15.5-30ºC; and for growth 18-30ºC. These parameters combined identify the high-risk periods when sporulation may occur, thus allowing growers to spray fungicide at the optimal time to reduce the initial inoculum[1]. For the prediction system to be more widely adopted it needs to be validated. The system should effectively record the number of disease conducive hours to guide growers to control the disease, be trusted by growers and easy to use as a decision support tool.

Aim: To validate the prediction system (funded by Ceres) to determine whether its use can reduce fungicide applications and so reduce costs as compared to the farm routine (weekly) spray programme, whilst maintaining commercially satisfactory control of strawberry powdery mildew.

Table 1 Summary of farms in the validation of the prediction system in 2019.

Site	Cultivar	Growing method	Temperature and RH sensor used	Period of recording data in prediction system	Existing routine spray programme	Used prediction system as decision support tool
1	Sweet Eve (everbearer)	Coir on tabletops	SMS	12 Jun. - 15 Nov. 2019	Every 7-8 days	Yes
2	Murano (everbearer)	Coir on tabletops	SMS	21 Jun. - 02 Oct. 2019	Every 10 days	Yes
3	Murano (everbearer)	Coir on tabletops	Davis	21 May - Oct. 2019	Every 5-7 days	No

Table 2 Summary of the validation results between using the prediction system and routine programme from three participating farms in 2019.

Site	Number of fungicide applications			Cost-benefit analysis (cost of fungicides and labour, £/hectare)			Disease report	
	Prediction	Routine	Saving	Prediction	Routine	Saving	Prediction	Routine
1	4	8	4	454.88	947.87	492.99	No mildew observed	
2	6	9	3	547.86	804.07	256.21	No mildew observed	
3	-	22	-	-	1516.12	-	Disease present with visible symptoms	

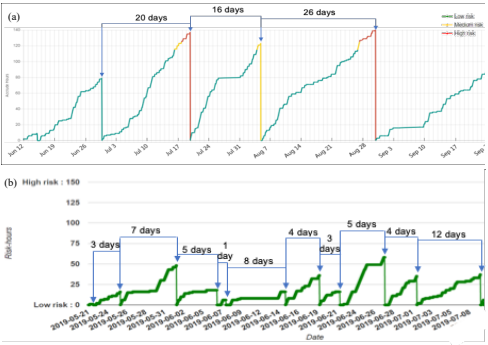

Fig. 2 Prediction graphs as seen on the online platform (a) Site 1: the prediction system has been followed well, most fungicide applications were made between 115 and 144 hours (medium – high risk). The intervals between fungicide applications were extended to over 15 days (routine spray was every 8-12 days); (b) Site 3: non-prediction farm. The routine spray programme was to spray every five days. Ten applications were made when the system was below 50 accumulated hours (low risk).

Materials & Methods

- Three of the six participating farms are presented here, one in Scotland (site 2) and two in England (sites 1 & 3) in 2019 (Table 1);
- Validation criteria: range of geographical locations (England and Scotland), cultivars (Everbearer), growing method (Coir on tabletops), and weather sensors (SMS & Davis);
- Parameters analysed: disease assessment; number of fungicide applications and modes of action used; cost-benefit analysis and usability of system.

Results

- Use of the prediction system provided commercially satisfactory disease control and financial savings in 2019 (Table 2);
- Farm site 1 completed all sprays over 75 accumulated hours and with long intervals of over 14 days between two sprays (Fig. 2a);
- Site 3 (no prediction system) frequently applied fungicides at less than seven-day intervals, at low risk (below 50 accumulated hours) conditions (Fig. 2b);
- The prediction system has been proved to be a user-friendly and time saving decision support tool.

Discussion

The success of the prediction system is dependent on how well it is followed by the grower. The grower needs to have enough confidence to allow the hours to accumulate above 100 hours before applying a fungicide.

A 'clean up' spray must be applied at the start of the season, due to the fungus being present on crops from propagators or present on over-wintered crops.

Benefits of using the prediction system:

- Financial savings (£100-£400 per hectare), due to the reduced number of fungicide applications and saved labour costs;
- Reduced potential for fungicide residues on the fruit;
- Fewer modes of action used, reduced selection pressure on the fungus and decreased risk of fungicide resistance.

The growers found the system to be reliable and user friendly; the system is now licencsed and has been widely adopted by commercial farms for the 2020-2021 growing season.

Reference

[1] Dodgson J, Hall A.M. & Parker S. (2007) System to predict high risk periods for *Podosphaera aphanis* infection of strawberries grown in polythene tunnels. Aspects of Applied Biology. No. 83.

Acknowledgements

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