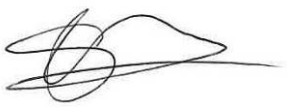
SCEPTREPLUS

Final Trial Report

Trial code:	SP66
Title:	AHDB SCEPTREplus blackcurrant leaf spot fungicide screen
Crop	Blackcurrant (*Ribes nigrum*)
Target	Blackcurrant leaf spot (*Drepanopeziza ribis*) [EPPO: DREPR]
Lead researcher:	Dr Sonia Newman
Organisation:	RSK ADAS Ltd
Period:	March 2020 to October 2020
Report date:	December 2020
Report author:	Dr Sonia Newman
ORETO Number: (certificate should be attached)	409

I the undersigned, hereby declare that the work was performed according to the procedures herein described and that this report is an accurate and faithful record of the results obtained



……20/12/2020…… ……
Date Authors signature

Trial Summary

Introduction

Blackcurrant leaf spot (*Drepanopeziza ribis)* represents a major disease risk to blackcurrant production in the UK with an estimated annual cost to the industry of £1.1 million. This disease infects bushes early in the season, causing small brown spots to develop leaves. Over time these can coalesce and ultimately turn the leaf yellow or brown leading to premature leaf drop. Damage done to bushes during harvest can lead to entry wounds for *D. ribis* and severe infections can cause total defoliation leading to up to 75 % crop losses. A field-based trial located in Gloucestershire identified alternative chemical and biological treatments to effectively manage this disease.

Methods

A field in Gloucestershire, a region prone to high levels of blackcurrant leaf spot was selected for this trial. A product efficacy trial consisting of a four block, randomised design was established in a mature blackcurrant crop of the susceptible variety Ben Hope, with infection reliant on natural levels of spore inoculum. Other than the application of the test fungicide treatments by ADAS staff, the crop was treated as in commercial practice.

A total of seven treatments were tested in the trial including an untreated control (water) and a standard fungicide programme (Signum, Switch and Systhane). The five trial products included two conventional, three biological plant protection products. Treatment plots were treated four times with different crop protection products using a knapsack sprayer at roughly 10 day intervals for the first three applications and the final treatment postharvest. The field was harvested on 16th July after the commercial crop and the treated crop was destroyed.

Plants were assessed for disease at each treatment date and 14 days following the final treatment application. At each assessment, blackcurrant leafspot disease incidence and severity on the foliage, as well as crop safety were recorded. Incidence was recorded as the presence or absence of the target diseases on the central 20 bushes per plot (1 or 0). The total average severity score across the same 20 bushes was recorded (total % plant area affected) where possible. During the main cropping season infections were limited to a few leaves per bush so accurate severity assessments were not possible. Crop safety effects were noted and symptoms recorded on a whole plot scale. These were scored on a scale from 0 to 10, with 10 being ‘dead’, and 0 being ‘no effect’. Plots which scored below 2 were deemed to have a commercially acceptable level of damage.

Results

Incidence:

Disease development in the trial was slow, with the first incidence of leaf spot recorded 21 days after the first fungicide application on 07 May 2020. Significant differences were seen in the incidence of blackcurrant leafspot in the postharvest (field harvested on 16th July) assessments on 21 July and 14 August (Table 1).

Table 1. Mean foliar *D. ribis* incidence (percentage of 20 bushes infected - %) per treatment for each of the six assessment dates. Incidence was zero across entire trial at the preliminary assessment on 16 April 2020. Field was harvested on 16th July.

Date / Treatment	27-Apr	07-May	21-May	24-Jun	21-Jul	14-Aug
Untreated	0.00	0.00	1.25	12.5	25.00	95.00
Standard	0.00	0.00	1.25	3.75	10.00	40.00
AHDB 9892	0.00	0.00	1.25	3.75	12.50	41.25
AHDB 9862	0.00	1.25	3.75	7.50	10.00	42.50
AHDB 9852	0.00	0.00	2.50	5.00	11.25	31.25

AHDB 9871	0.00	0.00	1.25	2.50	11.25	37.50
AHDB 9967	0.00	1.25	3.75	3.75	13.75	56.25
P value	-	0.590	0.531	0.420	0.106	0.001
d.f.	-	6	6	6	6	6
s.e.d.	-	0.971	1.796	4.74	5.18	12.18
l.s.d.	-	2.040	3.772	9.95	10.87	25.59
	Not significantly different from untreated control (p>0.05)					
	Significantly less than untreated control (p<0.05)					
	Significantly more than untreated control (p<0.05)					

In the final postharvest assessments (14 Aug) all of the treatments significantly reduced the incidence of *D. ribis* compared with the untreated control (95 %). The coded products did not provide any additional protection to the blackcurrant bushes than the standard leaf spot control program.

Severity:

Overall leaf spot severity was quite low in the trial, however, at both assessments the untreated control (water) had significantly greater leaf spot severity than the other treatments. At the final assessment (14 Aug) 26 days after the postharvest treatment there was a significant reduction ($p < 0.05$) in the leaf spot severity in all of the treatments compared with the untreated control (16.25 %). All of the treatments were comparable to the standard fungicide programme, and although foliar leaf spot symptoms were lowest in AHDB 9871 the differences between the treatments were not statistically significant

Table 2. Mean foliar *D. ribis* severity (percentage of leaf area affected - %) per treatment for each of the five assessment dates.

Date Treatment	21-Jul	14-Aug
Untreated	3.25	16.25
Standard	1.25	6.50
AHDB 9892	1.50	8.25
AHDB 9862	1.25	8.75
AHDB 9852	1.25	8.25
AHDB 9871	1.50	5.75
AHDB 9967	1.50	9.50
P value	0.052	0.001
d.f.	6	6
s.e.d.	0.627	12.18
l.s.d.	1.317	25.59
	Not significantly different from untreated control (p>0.05)	
	Significantly less than untreated control (p<0.05)	
	Significantly more than untreated control (p<0.05)	

Phytotoxicity:
Slight scorching or bleaching was seen in a few of the treatments, including the grower standard programme at the second treatment application. The symptoms in all of the treatments (standard, AHDB 9892, AHDB 9862 and AHDB 9852) were transient and not of commercial concern.

Conclusions

- All five coded products tested reduced blackcurrant leaf spot (*D. ribis*) incidence and severity in a blackcurrant field trial during postharvest assessments.
- The biological product AHDB 9871 reduced blackcurrant leaf spot severity and incidence at the end of the trial. It could be a useful component of an IPM programme.

- The biological product AHDB 9852 resulted in the lowest incidence of leaf spot than any other treatment at the final disease assessment, but did not provide a significant improvement over the industry standard.
- The conventional chemistry products AHDB 9892 and AHDB 9862 gave comparable reductions in disease incidence to the grower standard programme and significantly reduced the disease severity compare to the control.
- Minor phytotoxic effects were seen in plots treated with some treatments including the grower standard. This damage was slight and not of commercial concern.
- Further work is required to establish the best integrated programmes and to assess product efficacy under higher disease pressure conditions.

Take home message:

All of the tested products reduced blackcurrant leafspot incidence and severity and all treatments were comparable to the control. AHDB 9871 and AHDB 9852 gave the best control for severity and incidence, respectively, but were not significantly better than the other products.

Objectives

To assess a range of conventional fungicides, biofungicides and biological products for their safety and efficacy against blackcurrant leaf spot (*Drepanopeziza ribis*) in an established blackcurrant crop.

Trial conduct

UK regulatory guidelines were followed but EPPO guidelines took precedence. The following EPPO guidelines were followed:

Relevant EPPO guideline(s)		Variation from EPPO
PP 1/135(4)	Phytotoxicity assessment	None
PP 1/152(4)	Guideline on design and analysis of efficacy evaluation trials	None
PP 1/225(2)	Minimum effective dose	None
PP 1/181(4)	Conduct and reporting of efficacy evaluation trials including good experimental practice	None
PP 1/214(3)	Principles of acceptable efficacy	None
PP 1/224(2)	Principles of efficacy evaluation for minor uses	None

There were no deviations from EPPO guidance:

Test site

Item	Details
Location address	Moat Farm, Newent, GL18 1JG
Crop	Blackcurrant
Cultivar	Ben Hope – susceptible to *D. ribis*
Soil or substrate type	Clay loam
Agronomic practice	Modified commercial practice – no fungicide inputs by the host grower; crop was harvested by machine to the floor
Prior history of site	Blackcurrants

Trial design

Item	Details
Trial design:	Randomised block
Number of replicates:	4
Row spacing:	3 m
Plot size: (w x l)	7 m x 2 m
Plot size: (m^2)	14
Number of plants per plot:	28
Leaf Wall Area calculations	N/A

Treatment details

AHDB Code	Active substance	Product name/ manufacturers code	Formulation batch number	Content of active substance in product	Formulation type
Untreated	N/A - water	-	-	-	-
Standard	boscalid + pyraclostrobin.	Signum	12-M00622	26.7% w/w + 6.7% w/w	Water dispersible granule
Standard	fludioxonil + cyprodinil	Switch	SSP9B60417	37.5% w/w + 25% w/w	Water dispersible granule
Standard	myclobutanil	Systhane	F470K3C050	200 g/l	Emulsion, oil in water
AHDB 9892	N/D	N/D	N/D	N/D	N/D
AHDB 9862	N/D	N/D	N/D	N/D	N/D
AHDB 9852	N/D	N/D	N/D	N/D	N/D
AHDB 9871	N/D	N/D	N/D	N/D	N/D
AHDB 9967	N/D	N/D	N/D	N/D	N/D

No adjuvants were included at any treatment application.

Application schedule

Treatment number	Treatment: product name or AHDB code	Rate of active substance (ml or g a.s./ha)	Rate of product (l or kg/ha)	Application code
1	Untreated - water	-	-	A-D
2	Standard - Signum	400 g + 100 g	1.5 kg/ha	A, C
	Standard - Switch	375 g + 250 g	1.0 kg/ha	B
	Standard - Systhane	90 ml	0.45 L/ha	D
3	AHDB 9892	50 g + 75 g	1.0 L/ha	A-D
4	AHDB 9862	Unknown	1.5 kg/ha	A-D
5	AHDB 9852	640 ml	3.2 L/ha	A-D
6	AHDB 9871	10.17 kg	10 L/ha	A-D
7	AHDB 9967	Unknown	1.6 L/ha	A-D

Application details

	Application A	Application B	Application C	Application D
Application date	16/04/2020	27/04/2020	07/05/2020	21/07/2020
Time of day	13:00 – 14:00	11:45 – 12:30	12:45 – 13:40	11:00 – 11:40
Crop growth stage (Max, min average BBCH)	BBCH 55	BBCH 60	BBCH 71	BBCH 99
Crop height (cm)	150	150	150	150
Crop coverage (%)	50	50	75	75
Application Method	Spray	Spray	Spray	Spray
Application Placement	Foliar	Foliar	Foliar	Foliar
Application equipment	Oxford Precision Sprayer (Knapsack)	Oxford Precision Sprayer (Knapsack)	Oxford Precision Sprayer (Knapsack)	Oxford Precision Sprayer (Knapsack)
Nozzle pressure	2	2	2	2
Nozzle type	Flat Fan	Flat Fan	Flat Fan	Flat Fan
Nozzle size	02F110	02F110	02F110	02F110
Application water volume/ha	400	400	400	400
Temperature of air - shade (°C)	19.5	15.1	19.5	17.8
Relative humidity (%)	52.3	53.2	56.9	66.8
Wind speed range (m/s)	1.7-2.0	1.2-1.9	1.1-1.9	2.1-1.3
Dew presence (Y/N)	N	N	N	N
Temperature of soil - 2-5 cm (°C)	Not recorded	Not recorded	Not recorded	Not recorded
Wetness of soil - 2-5 cm	Not recorded	Not recorded	Not recorded	Not recorded
Cloud cover (%)	95	70	10	5

*Soil wetness and soil temperature do not impact the establishment and progression of *D. ribis* and were not recorded.

Untreated levels of pests/pathogens at application and through the assessment period

Common name	Scientific Name	EPPO Code	Infection level pre-application	Infection level at start of assessment period	Infection level at end of assessment period
Blackcurrant leaf spot	*Drepanopeziza ribis*	DREPRI	0 % incidence	0 % incidence	95 % incidence

Assessment details

At each assessment date, all plots were assessed for blackcurrant leaf spot (*D. ribis*) incidence and severity. Incidence was recorded as the presence or absence of the target disease on the central 20 bushes in the plot (1 or 0). The total average severity score across the same 20 bushes was recorded (total % plant area affected) where possible. During the main cropping season infections were limited to a few leaves per bush so accurate severity assessments were not possible. Crop safety effects (phytotoxicity) were noted and symptoms recorded on a whole plot scale. These were scored on a scale from 0 to 10, with 10 being ‘dead’, and 0 being ‘no effect’ (Table 1). Plots which scored below 2 were deemed to have a commercially acceptable level of damage.

Other diseases such as Septoria leaf spot (*Mycosphaerella ribis*) and Botrytis were monitored during the trial, though no significant infections of either were noted.

Table 3. Scale used for the assessment of the extent of phytotoxic damage in treated plots

Crop tolerance score	Equivalent to crop damage (% phytotoxicity)
0	no damage
1	5-10%
2*	10-15%
3	15-25%
4	25-40%
5	40-50%
6	50-60%
7	60-70%
8	70-80%
9	80-95% damage
10	complete crop kill 100%

* 2 = acceptable damage, i.e. damage unlikely to reduce yield, and acceptable to the grower.

Table 4. Blackcurrant leafspot and crop safety assessment schedule.

Evaluation date	Evaluation Timing (DA)*	Crop Growth Stage (BBCH)	Evaluation type (efficacy, phytotoxicity)	Assessment
16/04/2020	0	55	Preliminary	- *D. ribis* incidence and severity
27/04/2020	11	60	Efficacy Phytotoxicity	- *D. ribis* incidence - Crop safety
07/05/2020	21	71	Efficacy Phytotoxicity	- *D. ribis* incidence - Crop safety
21/05/2020	35	75	Efficacy Phytotoxicity	- *D. ribis* incidence - Crop safety
24/06/2020	69	85	Efficacy Phytotoxicity	- *D. ribis* incidence - Crop safety
21/07/2020	96	99	Efficacy Phytotoxicity	- *D. ribis* incidence and severity - Crop safety
16/08/2020	122	99	Efficacy Phytotoxicity	- *D. ribis* incidence and severity - Crop safety

* DA –days after first spray application.

Statistical analysis

The trial was analysed as a randomised block design with four replicates of 7 treatments using ANOVA (Genstat 18th edition). No data transformation was required.

Results

Phytotoxicity

Four of the test treatments, including the grower standard, showed some phytotoxic effects after the second fungicide spray (Table 3). The most severe of these was some leaf scorch and bleaching in AHDB 9862. These effects were transient and below the threshold of commercial concern, with no treatment scoring above 2.

Table 5. Phytotoxicity scores for six assessment dates after treatment with test products.

Date / Treatment	27-Apr	07-May	21-May	24-Jun	21-Jul	16-Aug
Untreated	0.00	0.00	0.00	0.00	0.00	0.00
Standard	0.00	0.50	0.50	0.00	0.00	0.00
AHDB 9892	0.00	0.25	0.25	0.00	0.00	0.00
AHDB 9862	0.00	0.75	0.75	0.00	0.00	0.00
AHDB 9852	0.00	0.25	0.25	0.00	0.00	0.00
AHDB 9871	0.00	0.00	0.00	0.00	0.00	0.00
AHDB 9967	0.00	0.00	0.00	0.00	0.00	0.00

Efficacy

Incidence:
Disease development was slow in the trial, with the first incidence of leaf spot recorded 21 days after the first fungicide application (DA) on 07 May 2020. The trial field was harvested 16 July. Significant differences were seen in the incidence of *Drepanopeziza ribis* in the postharvest assessments on 21 July and 14 August (Table 4).

Table 6. Mean foliar *D. ribis* incidence (percentage of 20 bushes infected - %) per treatment for each of the six assessment dates. Incidence was zero across entire trial at the preliminary assessment on 16 April 2020. Field was harvested 16th July.

Date / Treatment	27-Apr	07-May	21-May	24-Jun	21-Jul	14-Aug
Untreated	0.00	0.00	1.25	12.5	25.00	95.00
Standard	0.00	0.00	1.25	3.75	10.00	40.00
AHDB 9892	0.00	0.00	1.25	3.75	12.50	41.25
AHDB 9862	0.00	1.25	3.75	7.50	10.00	42.50
AHDB 9852	0.00	0.00	2.50	5.00	11.25	31.25
AHDB 9871	0.00	0.00	1.25	2.50	11.25	37.50
AHDB 9967	0.00	1.25	3.75	3.75	13.75	56.25
P value	-	0.590	0.531	0.420	0.106	0.001
d.f.	-	6	6	6	6	6
s.e.d.	-	0.971	1.796	4.74	5.18	12.18
l.s.d.	-	2.040	3.772	9.95	10.87	25.59
	Not significantly different from untreated control (p>0.05)					
	Significantly less than untreated control (p<0.05)					
	Significantly more than untreated control (p<0.05)					

In the final postharvest assessment (14 Aug) all of the treatments significantly reduced the incidence of *D. ribis* compared with the untreated water control (95 %). The coded products did not provide any additional protection to the blackcurrant bushes than the standard leaf spot control program.

Severity:

Disease severity was difficult to assess accurately until the disease incidence increased at the postharvest assessments, due to low initial disease incidence and only a few leaves per bush being infected. Severity of *D. ribis* in the plots at the postharvest assessments can be found in Table 5.

Table 7. Mean foliar *D. ribis* severity (percentage of leaf area affected - %) per treatment for each of the postharvest assessment dates. Field was harvested 16th July.

Date / Treatment	21-Jul	14-Aug
Untreated	3.25	16.25
Standard	1.25	6.50
AHDB 9892	1.50	8.25
AHDB 9862	1.25	8.75
AHDB 9852	1.25	8.25
AHDB 9871	1.50	5.75
AHDB 9967	1.50	9.50
P value	0.052	0.001
d.f.	6	6
s.e.d.	0.627	12.18
l.s.d.	1.317	25.59
	Not significantly different from untreated control (p>0.05)	
	Significantly less than untreated control (p<0.05)	
	Significantly more than untreated control (p<0.05)	

Overall the leaf spot severity was low in the trial, however, at both assessments the untreated control had greater leaf spot severity than the other treatments (3.25% and 16.25 % respectively). At the final assessment (14 August) 26 days after the postharvest treatment there was a significant reduction in the leaf spot severity in all treatments compared with the untreated control. All of the treatments were comparable to the standard fungicide programme, and although foliar leaf spot symptoms were lowest in AHDB 9871 the differences between the treatments were not statistically significant (Figure 1).

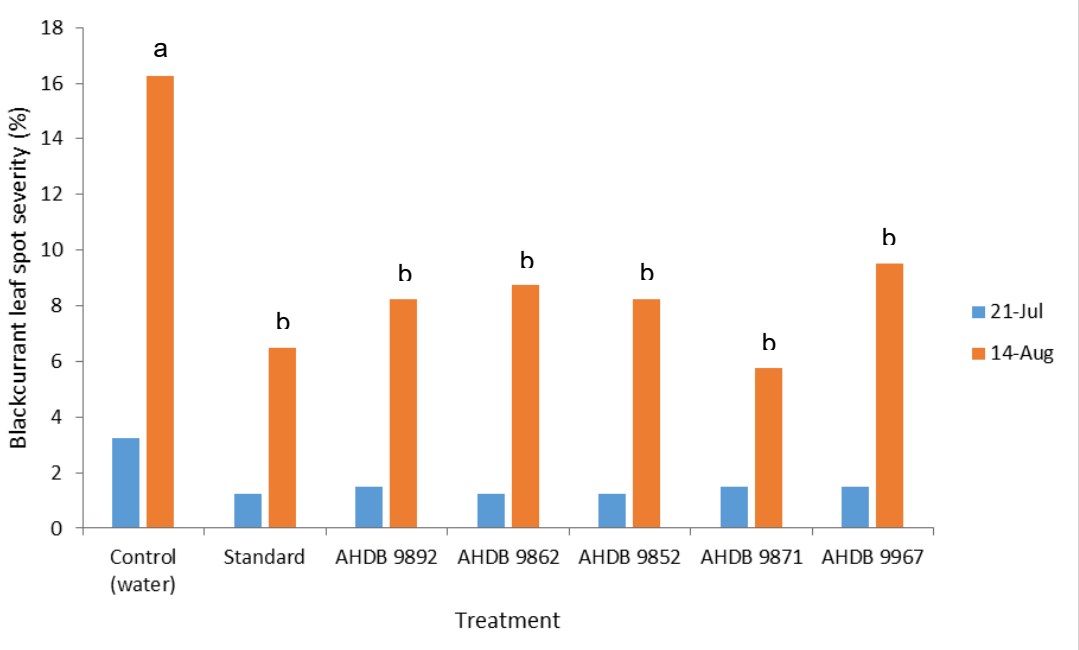


Figure 1. Effect of different test product treatments on mean blackcurrant leafspot severity (percentage foliage affected, %) at the fourth treatment application (21/07/20) and three

weeks later (16/08/20). p = 0.001 on 14/08/20; bars labelled with the same letter represent the same level of leaf spot severity and are not statistically different from each other.

Percentage reduction in leaf spot severity for treatments compared with the untreated control, at each assessment date are given in Table 6 and further highlight product efficacy at each assessment.

Table 8. Percentage reduction in mean *D. ribis* severity for each treatment compared to the untreated control.

Date / Treatment	21-Jul	16-Aug
Untreated	0.00	0.00
Standard	61.54	60.00
AHDB 9892	53.85	49.23
AHDB 9862	61.54	46.15
AHDB 9852	61.54	49.23
AHDB 9871	53.85	64.62
AHDB 9967	53.85	41.54

Discussion

The trial area was successfully naturally infected with spores (ascospores) of *Drepanopeziza ribis* from surrounding bushes and leaf litter. *D. ribis* ascospores discharge usually occurs around bud burst or early flower when they are moistened by rain. Initially, the disease was slow to develop in the trial due to unusually dry conditions during this critical infection period. From the beginning of July onwards there was sufficient rain and leaf wetness for the disease to develop and spread within the plots.

Machine harvesting of the crop causes wounding to leaves assisting infections to occur and an increase in disease severity developed in this trial postharvest. The incidence of *D. ribis* increased in the untreated plots to 95 % by the end of the trial. The severity of the leaf symptoms was too low to score initially with only a few leaves per bush infected, however, this increased towards the end of the trial and the untreated plots recorded an average of 16.25 % of the leaf area in the plot affected. Premature defoliation was noted in the untreated plots, which was not seen to the same extent in the other treatments. This will reduce vigour and growth and result in crop losses in the next season.

All of the treatments in the trial gave significantly better control of *D. ribis* than in the untreated plots and none of them were significantly better than the standard programme. Of the coded products the lowest incidence at the end of the trial was in the plots treated with the biological product AHDB 9852 (FRAC BM01), with just over 31 % of the bushes infected compared to 40 % in the standard grower spray programme. This product also reduced the severity of the leaf symptoms, but not to the same degree as some of the other treatments.

The biofungicide product AHDB 9871 had the second lowest incidence of *D. ribis* at the end of the trial and was comparable to the standard fungicide programme. This product had the lowest severity of leaf spot symptoms at the final assessment. This demonstrates that under the correct conditions and with good preventative timing, this treatment, and potentially other biological products can be a useful part of an IPM programme. Under low disease pressure conditions AHDB9871 could be used alone to extend the spray intervals of conventional products, or combined with other products to enhance their activity and improve resistance management. Compatibility testing would be required prior to this approach.

The conventional chemistry products AHDB 9892 (FRAC 7 + 3) and AHDB 9862 (FRAC 3) performed as well as the standard programme in disease incidence and also reduced the severity of symptoms when compared to the untreated control. SDHI fungicides (FRAC code

7) can only be used twice per year and there is a medium risk of resistance in DMI fungicides (FRAC code 3). Mixing AHDB 9862 with an effective non cross-resistant fungicide would be recommended to avoid resistance building up. Both of these products would provide an alternative product and mode of action to growers to aid in good resistance management practice.

AHDB 9967 also significantly reduced the severity of symptoms compared to the control, but was not quite as effective as some of the other treatments as the disease pressure increased.

The test products were applied alone at full rate, and generally more frequently than is permitted during commercial cropping, e.g. four rather than two applications of SDHI fungicides per year. Symptoms of phytotoxicity developed in some treatments, but never to levels of commercial concern and so all products can be considered crop safe on outdoor blackcurrants.

Due to unknown operator exposure risks the trial area could not be harvested. This was necessary, but a deviation from standard commercial practice. Normal production would have workers on the back of the harvester handling the fruit and removing debris. It would be difficult to obtain an accurate yield due to the nature of harvesting by machine and the relatively small plot areas. Products tested in this work were demonstrated to provide good control against *D. ribis*, but it is possible that they may have had other effects on the crop, which could not be established in this work. This could be evaluated, alongside spray programmes incorporating the most efficacious products identified in this project in future work.

Conclusions

- All five coded products tested reduced blackcurrant leaf spot (*D. ribis*) incidence and severity in a blackcurrant field trial.
- The biological product AHDB9871 reduced blackcurrant leaf spot severity and incidence at the end of the trial. It could be a useful component of an IPM programme.
- The biological product AHDB 9852 resulted in the lowest incidence of leaf spot than any other treatment at the final disease assessment.
- The conventional chemistry products AHDB 9892 and AHDB 9862 gave comparable reduction in disease incidence to the grower standard programme and significantly reduced the disease severity compare to the control.
- Minor phytotoxic effects were seen in plots treated with some treatments including the grower standard. This damage was slight and not of commercial concern.
- Further work is required to establish the best integrated programmes and to assess product efficacy under higher disease pressure conditions.

Acknowledgements

AHDB for funding the work, and the crop protection companies for their financial contributions and provision of samples for the trials. Thanks should also be given to the Harriet Prosser from Lucozade Ribena Suntory and grower Edward Keene who provided the site and crops for the trials as well as technical input.

Appendix

a. Crop diary – events related to growing crop

Crop	**Cultivar**	**Planting date**	**Row width** (m)
Blackcurrant	Ben Hope	2002	3 m

Previous cropping

Year	**Crop**
2002-2020	Blackcurrants

Active ingredients(s)/fertiliser(s) applied to trial area

Date	**Product**	**Rate** (kg/ha)
04/04/2020	13-13-29.5	308kg

No herbicides, fungicides or pesticides were applied to the trial rows.

b. Table showing sequence of events by date – this relates to treatments and assessments.

Date	**Event**
16/04/2020	Trial set-up Disease assessment 1 Treatment application 1
27/04/2020	Disease assessment 2 Crop safety assessment 1 Treatment application 2
07/05/2020	Disease assessment 3 Crop safety assessment 2 Treatment application 3
21/05/2020	Disease assessment 4 Crop safety assessment 3
24/06/2020	Disease assessment 5 Crop safety assessment 4
16/07/2020	Trial field was harvested
21/07/2020	Disease assessment 6 Crop safety assessment 5 Treatment application 4
16/08/2020	Disease assessment 7 Crop safety assessment 6

c. Photos

Trial at set up – 16/04/2020

Drepanopeziza ribis symptoms – 16/08/20

Untreated control – postharvest - 16/08/2020

AHDB 9871 – postharvest - 16/08/2020

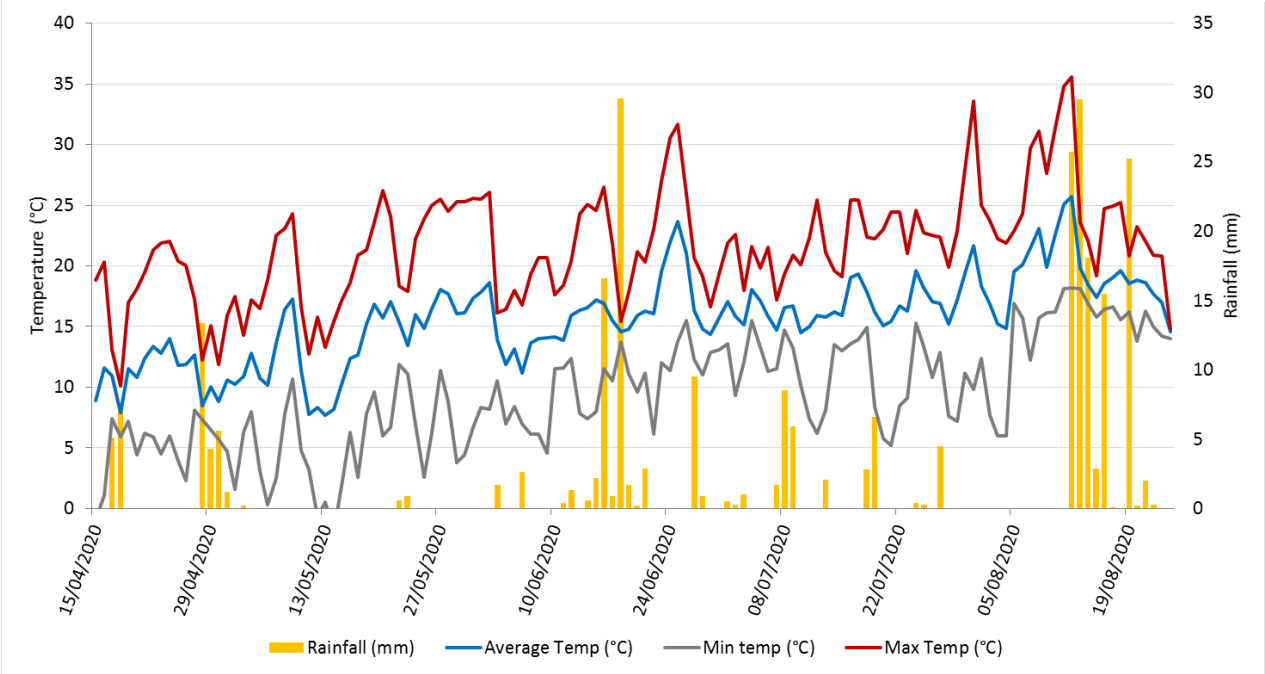
AHDB 9892 – postharvest - 16/08/2020

AHDB 9867 – postharvest - 16/08/2020

AHDB 9852 – postharvest - 16/08/2020

AHDB 9871 – postharvest - 16/08/2020

d. Climatological data during study period



Date	Average Temp (°C)	Min temp (°C)	Max Temp (°C)	Average R Humidity (%)	Min R Humidity (%)	Max R Humidity (%)	Rainfall (mm)
15/04/2020	8.9	-1.0	18.8	71.7	31.6	100.0	0.0
16/04/2020	11.6	1.1	20.3	70.2	38.5	99.2	0.0
17/04/2020	10.9	7.4	13.1	83.8	71.8	93.9	5.1
18/04/2020	7.9	5.9	10.1	94.6	89.5	99.1	7.3
19/04/2020	11.5	7.2	17.0	75.6	50.8	98.6	0.0
20/04/2020	10.8	4.4	18.1	71.0	41.6	95.0	0.0
21/04/2020	12.4	6.2	19.5	68.3	39.0	90.9	0.0
22/04/2020	13.3	5.9	21.3	70.3	42.5	95.4	0.0
23/04/2020	12.8	4.5	21.9	75.7	44.9	98.7	0.0
24/04/2020	14.0	6.0	22.0	71.1	43.8	95.5	0.0
25/04/2020	11.8	3.9	20.4	78.0	51.8	98.2	0.0
26/04/2020	11.9	2.3	20.0	79.0	41.7	100.0	0.0
27/04/2020	12.7	8.1	17.3	74.1	54.8	98.3	0.0
28/04/2020	8.5	7.3	12.2	95.0	72.9	99.4	13.4
29/04/2020	10.1	6.5	15.1	87.8	58.1	100.0	4.3
30/04/2020	8.8	5.7	11.9	87.3	69.1	96.6	5.6
01/05/2020	10.6	4.7	15.9	78.7	50.8	97.9	1.2
02/05/2020	10.2	1.6	17.5	79.2	51.8	99.6	0.0
03/05/2020	10.9	6.3	14.3	88.2	65.5	100.0	0.2
04/05/2020	12.8	8.0	17.2	79.4	58.2	98.5	0.0
05/05/2020	10.7	3.1	16.5	71.7	45.0	96.0	0.0
06/05/2020	10.2	0.3	18.8	74.7	41.0	100.0	0.0
07/05/2020	13.6	2.5	22.5	75.3	48.7	100.0	0.0
08/05/2020	16.4	7.8	23.1	79.9	49.3	100.0	0.0
09/05/2020	17.3	10.7	24.3	77.4	52.3	98.3	0.0

10/05/2020	11.3	4.8	16.6	81.0	57.6	95.5	0.0
11/05/2020	7.8	3.2	12.7	63.0	40.4	82.7	0.0
12/05/2020	8.4	-0.7	15.8	70.4	42.2	97.7	0.0
13/05/2020	7.7	0.5	13.3	70.3	41.3	99.9	0.0
14/05/2020	8.2	-1.9	15.4	65.2	39.7	98.5	0.0
15/05/2020	10.2	1.9	17.1	73.0	51.1	98.3	0.0
16/05/2020	12.3	6.3	18.6	70.7	45.6	94.0	0.0
17/05/2020	12.7	2.6	20.9	75.5	47.0	99.9	0.0
18/05/2020	15.2	7.8	21.3	71.6	49.8	96.1	0.0
19/05/2020	16.8	9.6	23.6	79.2	57.3	99.3	0.0
20/05/2020	15.7	6.0	26.2	76.3	33.9	100.0	0.0
21/05/2020	17.0	6.7	24.1	72.0	42.7	96.9	0.0
22/05/2020	15.3	11.9	18.3	71.4	53.2	95.2	0.6
23/05/2020	13.4	11.1	17.9	72.2	49.0	86.5	0.9
24/05/2020	16.0	6.9	22.2	68.6	43.0	95.1	0.0
25/05/2020	14.9	2.6	23.9	69.4	38.8	100.0	0.0
26/05/2020	16.5	6.3	25.0	74.2	47.4	99.7	0.0
27/05/2020	18.0	11.4	25.5	68.3	37.1	97.3	0.0
28/05/2020	17.7	8.8	24.5	64.5	37.8	98.3	0.0
29/05/2020	16.1	3.8	25.3	63.2	34.3	98.5	0.0
30/05/2020	16.2	4.4	25.3	64.1	35.2	97.2	0.0
31/05/2020	17.3	6.7	25.6	60.3	34.4	93.5	0.0
01/06/2020	17.8	8.3	25.5	61.9	37.1	89.5	0.0
02/06/2020	18.6	8.2	26.1	61.1	34.4	94.5	0.0
03/06/2020	13.9	10.5	16.1	87.1	67.0	98.0	1.7
04/06/2020	11.9	7.0	16.4	83.3	57.5	98.8	0.0
05/06/2020	13.1	8.4	18.0	63.9	41.0	92.1	0.0
06/06/2020	11.1	7.0	16.8	78.3	64.2	94.5	2.6
07/06/2020	13.6	6.1	19.3	78.6	57.0	98.6	0.0
08/06/2020	14.0	6.1	20.7	74.3	48.9	98.9	0.0
09/06/2020	14.1	4.6	20.7	72.4	42.9	100.0	0.0
10/06/2020	14.1	11.5	17.6	78.2	63.0	93.7	0.0
11/06/2020	13.9	11.6	18.4	84.6	68.1	94.1	0.4
12/06/2020	15.9	12.4	20.4	87.1	69.9	98.8	1.3
13/06/2020	16.3	7.8	24.3	78.9	43.6	100.0	0.0
14/06/2020	16.5	7.4	25.1	82.0	53.3	100.0	0.6
15/06/2020	17.2	8.0	24.6	75.3	46.3	100.0	2.2
16/06/2020	16.9	11.5	26.5	87.1	47.1	100.0	16.6
17/06/2020	15.5	10.5	21.8	92.1	72.4	100.0	0.9
18/06/2020	14.6	13.7	15.4	99.3	97.0	100.0	29.6
19/06/2020	14.8	11.1	17.8	89.5	67.0	100.0	1.7
20/06/2020	15.9	9.6	21.2	86.8	61.3	100.0	0.2
21/06/2020	16.2	11.2	20.3	78.5	59.0	99.6	2.9
22/06/2020	16.1	6.1	23.0	78.0	57.4	100.0	0.0
23/06/2020	19.5	12.0	27.0	74.3	53.6	97.3	0.0
24/06/2020	22.0	11.4	30.5	73.0	44.2	100.0	0.0
25/06/2020	23.7	13.8	31.7	69.2	38.8	99.0	0.0
26/06/2020	21.0	15.5	25.9	77.6	57.5	96.9	0.0
27/06/2020	16.3	12.3	20.7	85.1	69.8	98.5	9.5
28/06/2020	14.8	11.0	19.1	78.5	60.0	97.4	0.9
29/06/2020	14.4	12.9	16.6	74.5	66.2	81.8	0.0
30/06/2020	15.7	13.1	19.3	81.4	72.7	90.5	0.0

01/07/2020	17.0	13.6	21.9	79.3	59.4	95.9	0.5
02/07/2020	15.8	9.3	22.6	81.3	59.1	99.6	0.3
03/07/2020	15.2	12.1	18.0	85.6	72.6	96.0	1.0
04/07/2020	18.1	15.5	21.6	86.1	74.1	96.2	0.0
05/07/2020	17.1	13.3	19.8	69.9	53.2	91.2	0.0
06/07/2020	15.8	11.3	21.5	69.3	52.9	86.2	0.0
07/07/2020	14.7	11.5	17.2	83.5	67.9	97.9	1.7
08/07/2020	16.5	14.7	19.3	96.6	85.3	100.0	8.5
09/07/2020	16.7	13.2	20.9	93.6	80.1	100.0	5.9
10/07/2020	14.5	10.2	20.1	77.4	52.8	100.0	0.0
11/07/2020	15.0	7.4	22.3	74.0	44.9	99.6	0.0
12/07/2020	15.9	6.2	25.4	70.8	40.5	100.0	0.0
13/07/2020	15.7	8.1	21.1	87.1	59.0	100.0	2.1
14/07/2020	16.2	13.5	19.6	84.6	65.4	100.0	0.0
15/07/2020	15.9	13.0	19.1	84.7	74.3	96.2	0.0
16/07/2020	19.1	13.6	25.4	79.2	60.3	97.9	0.0
17/07/2020	19.3	13.9	25.4	79.4	54.8	100.0	0.0
18/07/2020	17.8	14.9	22.4	82.6	66.3	98.4	2.8
19/07/2020	16.2	8.4	22.2	76.7	46.3	100.0	6.6
20/07/2020	15.1	5.8	23.0	70.7	41.9	99.8	0.0
21/07/2020	15.4	5.2	24.4	71.5	42.1	100.0	0.0
22/07/2020	16.7	8.5	24.4	71.0	39.7	100.0	0.0
23/07/2020	16.3	9.1	21.0	85.1	64.4	100.0	0.0
24/07/2020	19.6	15.3	24.6	79.6	57.5	98.4	0.4
25/07/2020	18.2	13.4	22.7	87.1	71.2	97.5	0.3
26/07/2020	17.0	10.8	22.5	79.0	54.7	98.9	0.0
27/07/2020	16.9	12.9	22.4	90.5	75.3	98.7	4.5
28/07/2020	15.2	7.6	19.9	72.4	48.2	97.4	0.0
29/07/2020	17.2	7.2	22.9	70.3	51.1	99.1	0.0
30/07/2020	19.4	11.2	28.0	69.0	36.2	99.8	0.0
31/07/2020	21.7	9.8	33.6	70.1	38.2	99.8	0.0
01/08/2020	18.3	12.4	25.0	75.8	52.6	98.4	0.0
02/08/2020	16.8	7.7	23.7	70.7	44.0	99.8	0.0
03/08/2020	15.2	6.0	22.2	71.1	42.4	100.0	0.0
04/08/2020	14.8	6.0	21.9	79.9	57.2	99.7	0.0
05/08/2020	19.5	16.9	22.9	83.9	66.0	96.6	0.0
06/08/2020	20.1	15.7	24.3	89.2	78.6	97.8	0.0
07/08/2020	21.5	12.2	29.7	75.9	43.6	100.0	0.0
08/08/2020	23.1	15.7	31.1	73.1	49.2	98.1	0.0
09/08/2020	19.9	16.1	27.6	80.8	56.9	92.8	0.0
10/08/2020	22.6	16.2	31.4	78.5	52.3	98.5	0.0
11/08/2020	25.1	18.1	34.8	72.8	39.5	96.5	0.0
12/08/2020	25.7	18.2	35.6	73.3	36.1	99.9	25.7
13/08/2020	19.8	18.1	23.6	96.4	85.2	100.0	29.5
14/08/2020	18.5	16.9	22.1	96.6	81.3	100.0	18.1
15/08/2020	17.4	15.8	19.2	94.3	87.9	100.0	2.9
16/08/2020	18.5	16.4	24.7	96.1	77.0	100.0	15.5

e. Raw data from assessments

			Incidence (proportion of 20 bushes), severity (%) and phytotoxicity (0-10) of blackcurrant bushes infected with *Drepanopeziza ribis*													
				27-Apr		07-May		21-May		24-Jun		21-Jul		16-Aug			27-Apr
Block	**Plot**	**Treatment**	Phytotox.	Incidence	Phytotox.	Incidence	Phytotox.	Incidence	Phytotox.	Incidence	Phytotox.	Incidence	Severity	Phytotox.	Incidence	Severity
1	101	3	0	0	0	0	0	0	0	5	0	15	2	0	25	5
1	102	1	0	0	0	0	0	0	0	20	0	30	5	0	100	25
1	103	5	0	0	0	0	0	0	0	0	0	5	1	0	40	15
1	104	7	0	0	0	0	0	5	0	5	0	20	2	0	40	10
1	105	6	0	0	0	0	0	0	0	0	0	5	1	0	40	5
1	106	4	0	0	1	0	1	0	0	20	0	20	2	0	30	5
1	107	2	0	0	1	0	1	0	0	15	0	20	2	0	50	5
2	201	4	0	0	0	5	0	5	0	10	0	10	1	0	55	10
2	202	1	0	0	0	0	0	5	0	5	0	10	1	0	100	15
2	203	7	0	0	0	0	0	5	0	5	0	5	1	0	70	10
2	204	5	0	0	1	0	1	0	0	10	0	10	1	0	30	8
2	205	6	0	0	0	0	0	0	0	10	0	15	2	0	35	5
2	206	3	0	0	1	0	1	5	0	5	0	10	1	0	30	8
2	207	2	0	0	1	0	1	0	0	0	0	0	0	0	30	5
3	301	6	0	0	0	0	0	5	0	0	0	5	1	0	20	5
3	302	4	0	0	1	0	1	5	0	0	0	5	1	0	45	10
3	303	2	0	0	0	0	0	5	0	0	0	15	2	0	35	8
3	304	5	0	0	0	0	0	5	0	5	0	20	2	0	20	5
3	305	3	0	0	0	0	0	0	0	5	0	10	1	0	85	15
3	306	7	0	0	0	0	0	0	0	0	0	20	2	0	80	10
3	307	1	0	0	0	0	0	0	0	25	0	35	5	0	100	10
4	401	3	0	0	0	0	0	0	0	0	0	15	2	0	25	5
4	402	4	0	0	1	0	1	5	0	0	0	5	1	0	40	10
4	403	5	0	0	0	0	0	5	0	5	0	10	1	0	35	5
4	404	2	0	0	0	0	0	0	0	0	0	5	1	0	45	8
4	405	1	0	0	0	0	0	0	0	0	0	25	2	0	80	15
4	406	6	0	0	0	0	0	0	0	0	0	20	2	0	55	8
4	407	7	0	0	0	5	0	5	0	5	0	10	1	0	35	8

f. Trial design

TREATMENT	DISCARD	Standard	Standard	Untreated	AHDB 9967	DISCARD
BLOCK		1	2	3	4	
PLOT		107	207	307	407	
TREATMENT	DISCARD	AHDB 9862	AHDB 9892	AHDB 9967	AHDB 9871	DISCARD
BLOCK		1	2	3	4	
PLOT		106	206	306	406	
TREATMENT	DISCARD	AHDB 9871	AHDB 9871	AHDB 9892	Untreated	DISCARD
BLOCK		1	2	3	4	
PLOT		105	205	305	405	
TREATMENT	DISCARD	AHDB 9967	AHDB 9852	AHDB 9852	Standard	DISCARD
BLOCK		1	2	3	4	
PLOT		104	204	304	404	
TREATMENT	DISCARD	AHDB 9852	AHDB 9967	Standard	AHDB 9852	DISCARD
BLOCK		1	2	3	4	
PLOT		103	203	303	403	
TREATMENT	DISCARD	Untreated	Untreated	AHDB 9862	AHDB 9862	DISCARD
BLOCK		1	2	3	4	
PLOT		102	202	302	402	
TREATMENT	DISCARD	AHDB 9892	AHDB 9862	AHDB 9871	AHDB 9892	DISCARD
BLOCK		1	2	3	4	
PLOT		101	201	301	401	

g. ORETO certificate

Certificate of

Official Recognition of Efficacy Testing Facilities or Organisations in the United Kingdom

This certifies that

RSK ADAS Ltd

complies with the minimum standards laid down in Regulation (EC) 1107/2009 for efficacy testing.

The above Facility/Organisation has been officially recognised as being competent to carry out efficacy trials/tests in the United Kingdom in the following categories:

Agriculture/Horticulture
Stored Crops
Biologicals and Semiochemicals

Date of issue: 1 June 2018
Effective date: 18 March 2018
Expiry date: 17 March 2023

Signature Alison Richardson
Authorised signatory

Certification Number
ORETO 409

HSE
Chemicals Regulation Division

Department of Agriculture and Rural Development