SCEPTREPLUS

Final Trial Report

Trial code:	SP11
Title:	Egg laying deterrents for the spotted wing drosophila (SWD)
Crop	Work done on Blueberry and Blackberry; Results relevant to soft and stone fruit and grapes
Target	To determine whether products can act as egg laying deterrents for SWD or reduce emergence of SWD
Lead researcher:	Jerry Cross
Organisation:	NIAB EMR
Period:	January – March 2018
Report date:	31 May 2018 (Finalised report issued 13 June 2018, reissued 28 February 2019)
Report author:	Madeleine Cannon, Jerry Cross
ORETO Number: (certificate should be attached)	ORETO 321 is NIAB EMR's 2017 certificate of Official Recognition of Efficacy Testing Facilities or Organisations in the United Kingdom. Notification of renewal for 2018 has been received, but the new certificate number has not yet been issued. The certificate and renewal notification letter are given in Appendix 3.

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

13 June 2018 

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Date Authors signature

Trial Summary

Introduction

Seven different chemical treatments (calcium hydroxide, AHDB9919, calcium hydroxide plus AHDB9919, sodium hydrogen carbonate, AHDB9967, Urtica and AHDB9931) were tested in the laboratory to determine if they reduced egg laying and adult emergence through an insecticidal, repellent or oviposition deterrent effect on SWD.

Methods

Blueberry and blackberry fruits were dipped in an aqueous solution of each chemical at the standard recommended rate, 48 hours before versus 48 hours after the fruit had been artificially infested (= 'inoculated') with SWD adults. Note that AHDB9931 was included on blackberry only as the product was obtained too late for the test on blueberry which was done first. As a result there is no cross-validation of the results between fruits for this chemical. Fruits were dipped 48 hours before being inoculated to determine if they had insecticidal, repellent or oviposition deterrent effects. Fruits were dipped 48 hours after being inoculated with SWD to determine whether they had curative insecticidal effects.

The number of eggs was then recorded immediately after the 48 hours. The number of adult SWD emerging after two weeks was also recorded.

Results

The results on blackberry and blueberry were different for both pre-inoculation and post inoculation treatments. Urtica gave statistically significant reductions (~50%) in numbers of emerging SWD adults on blueberry showing insecticidal effects probably of short persistence and is a promising treatment worthy of further investigation.

AHDB9931 gave the greatest reductions in numbers of SWD emerged in both the before and after inoculation tests on blackberry where it was included, with calcium and AHDB9919 close followers on, though the reductions except in one case were not statistically significant. These treatments also need further investigation.

Conclusions

This work needs repeating, possibly more than once depending on results, to validate findings before firm conclusions are drawn. Modifications to the experimental methodology (e.g. an increase in the numbers of fruits and the numbers of SWD adults used for inoculation), or possibly greater replication, may be of benefit in reducing experimental variability and improving the power of the experiments to discriminate treatment effects.

Further laboratory tests investigating effects on a wider range or fruits (e.g. including strawberry and cherry), and at a wider range of intervals pre- and post-treatment, is needed. Choice versus no-choice testing protocols should be explored. If activity of one or more treatments is confirmed in such further tests, field testing will then be needed.

If an effective treatment is found, it would be an important development as it could be useful in extending the interval between sprays of conventional insecticides in spray programmes for SWD.

Take home message:

Out of all the products tested AHDB9931 and Urtica showed the greatest potential as products for reducing SWD emergence. Further testing is required, including on different fruits (strawberry, cherry) to validate these results and explore choice versus no choice testing protocols.

Objectives

1. To determine whether products can act as egg laying deterrents for SWD
2. To determine whether products can reduce emergence of SWD

Introduction

Spotted wing drosophila (SWD) was first identified in the UK in 2012 and since then has become a significant pest of soft and stone fruit crops. Currently SWD control is reliant on a small number of chemical insecticides. Other non-chemical/food grade products are therefore required to provide another source of control of SWD. These products in turn, can then be integrated into a growers spray programme and hopefully achieve better and sustainable control of SWD. The aim of this work was to test seven different potential products (calcium hydroxide, AHDB9919, calcium hydroxide plus AHDB9919, sodium hydrogen carbonate, AHDB9967, Urtica and AHDB9931) for their insecticidal, repellent and oviposition deterrent effect on SWD. To achieve this objective blueberry and blackberry fruits were dipped in each treatment before and after the fruit had been inoculated with female SWD.

Methods

The experiment was carried out on two separate occasions for blueberries (30 Jan – 15 Feb) and blackberries (21 Feb – 9 Mar).

Treatments

Six products were tested against a negative distilled water control using blueberries. The product AHDB9931 was included later for the blackberries and therefore seven products were tested against a negative distilled water control using blackberries. The fruit was dipped in each treatment pre-inoculation and post- inoculation of SWD. Treatments were made up to 500 millilitres (ml) with distilled water in 1 litre (l) beakers and the pH was tested before the fruit was dipped using an Orionstar A211 pH meter (Table 1, Figure 1 A&B).

Experimental design

Randomised complete block experimental designs with 6 replicates were used throughout.

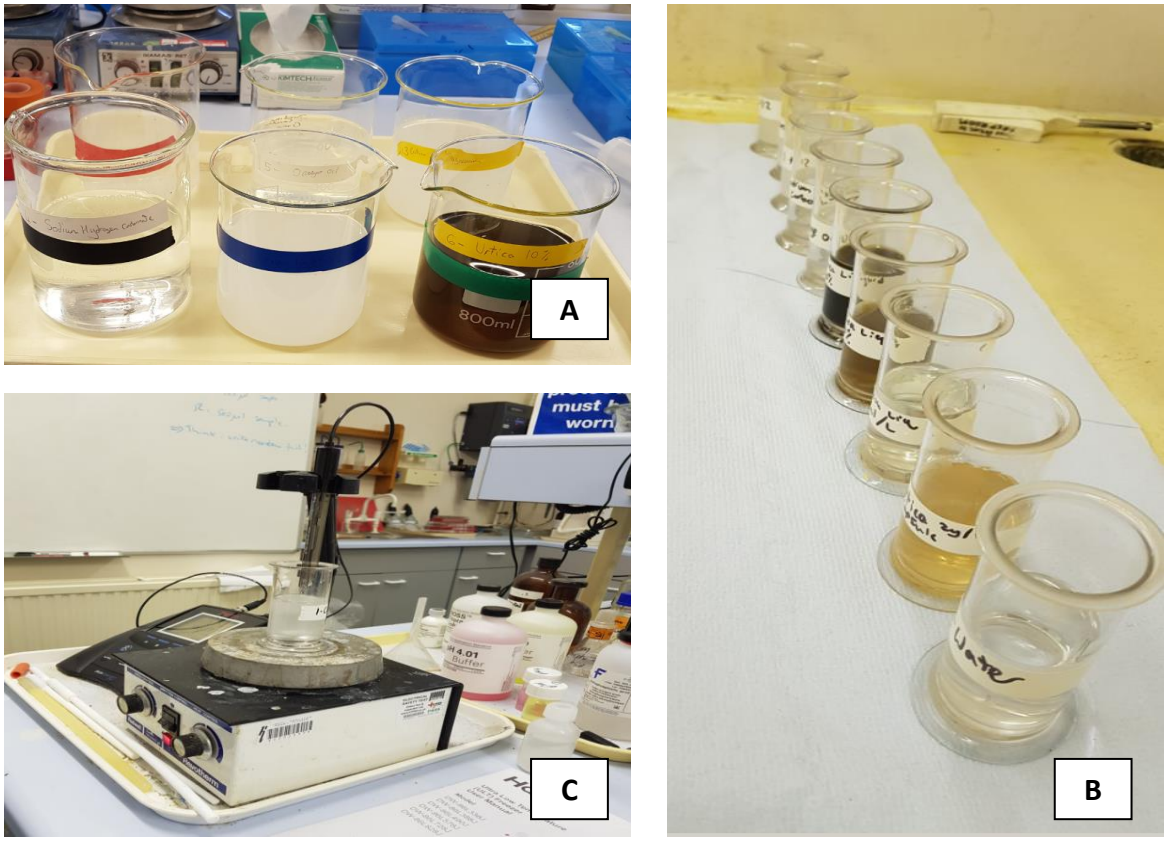

Figure 1. A. Litre beakers containing treatment dilutions. **B.** Samples of dilutions. **C.** pH of dilution being measured

Table 1. Treatments

Treatment	Company	Basic substance	Fruit	Dipping time	pH	Recommended rate (g or ml/ l)	Conc. (g or ml/ 500 ml)
Calcium hydroxide Ca(OH)2	Mineral S-Water	Basic substance on fruit – but as Fungicide after leaf drop	Blueberries Blackberries	Pre- inoculation/ Post inoculation Pre- inoculation/ Post inoculation	11.83/ 11.93 12.15/12.12	2 g	1 g
AHDB9919	Confidential	No	Blueberries Blackberries	Pre- inoculation/ Post inoculation Pre- inoculation/ Post inoculation	10.14/10.03 10.25/10.14	2 g	1 g
Calcium hydroxide + AHDB9919	As above	Yes + No	Blueberries Blackberries	Pre- inoculation/ Post inoculation Pre- inoculation/ Post inoculation	11.69/11.74 11.99/11.9	2 g	1 g
Sodium hydrogen carbonate	Backpulver	Basic substance on fruit as fungicide	Blueberries Blackberries	Pre- inoculation/ Post inoculation Pre- inoculation/ Post inoculation	8.03/8.04 8.15/8.22	2 g	1 g
AHDB9967	Confidential	Yes	Blueberries Blackberries	Pre- inoculation/ Post inoculation Pre- inoculation/ Post inoculation	6.96/6.88 6.89/6.99	2 ml	1 ml
Urtica	Salus	Basic substance on plum, cherry, redcurrant – PHI 7 days.	Blueberries Blackberries	Pre- inoculation/ Post inoculation Pre- inoculation/ Post inoculation	5.85/5.84 5.77/5.82	100 ml	50 ml
Distilled water control	-	-	Blueberries Blackberries	Pre- inoculation/ Post inoculation Pre- inoculation/ Post inoculation	7.1/5.74 6.85/7.19	-	-
AHDB9931	Confidential	No	Blueberries Blackberries	Pre- inoculation/ Post inoculation Pre- inoculation/ Post inoculation	- 6.05/6.02	16 ml	8 ml

Treatment application

Before the trial SWD were applied to a sub-sample of blueberries and blackberries to ensure there was no mortality from exposure to residues on the fruit. No fly mortality was observed on the fruit after 24 hours of exposure on all fruit used in the trial. Fruit was stored at 4 ^{o}C, before the start of each experiment the fruit was washed to remove any residues and left to dry at room temperature for 30 minutes.

All blueberries and blackberries were inoculated with SWD on the 30 Jan and 21 Feb, respectively. Half of the fruit was dipped in each treatment 48 hours before inoculation or 48 hours after inoculation.

Inoculation

The fruit, 3 blackberries and 5 blueberries, was placed in deli cup (Diameter = 9 cm, depth = 6.8 cm) with a mesh lid, containing blue paper towel. Five female SWD (3 – 4 days old) were applied to each cup for 48 hours at 22^{o}C, 16 hours light: 8 hours dark and ~40 % relative humidity (Figure 2A&B).

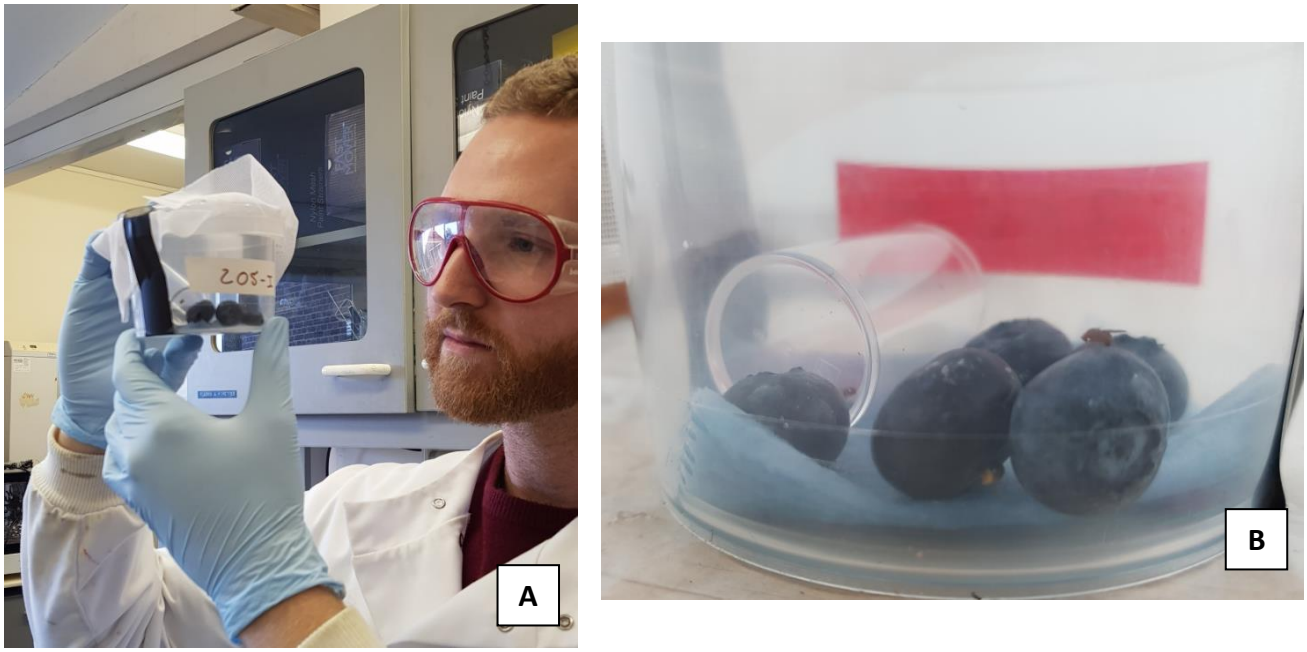

Figure 2. A. Meshed deli cup with tube of SWD, blueberries and blue roll. **B.** Deli cup with blueberries and SWD.

Fruit dipping

The fruit was distributed into nylon mesh bags (10 cm x 15 cm) in units containing 3 blackberry fruit or 5 blueberry fruit. The bags were labelled with their corresponding treatment colour.

Treatments were made up in 500 ml of distilled water in 1 litre beakers at the rate outlined above (Table 1). Treatments were stirred frequently to prevent the solutions separating. Suitable PPE was worn and the mesh bags containing the fruit were dipped into each treatment for five seconds to ensure full coverage of the fruit. The dipping solutions for all treatments were all prepared first. Then all the replicate bags of fruits for each treatment were dipped at once, working through the treatments successively. The preparation of the 7

dipping solutions and the dipping process took 2 hours to complete. Immediately after dipping, the bags of fruits were then all hung in a fume cupboard with the fan on until dry. Drying took approximately 3 hours (Figure 3A&B).

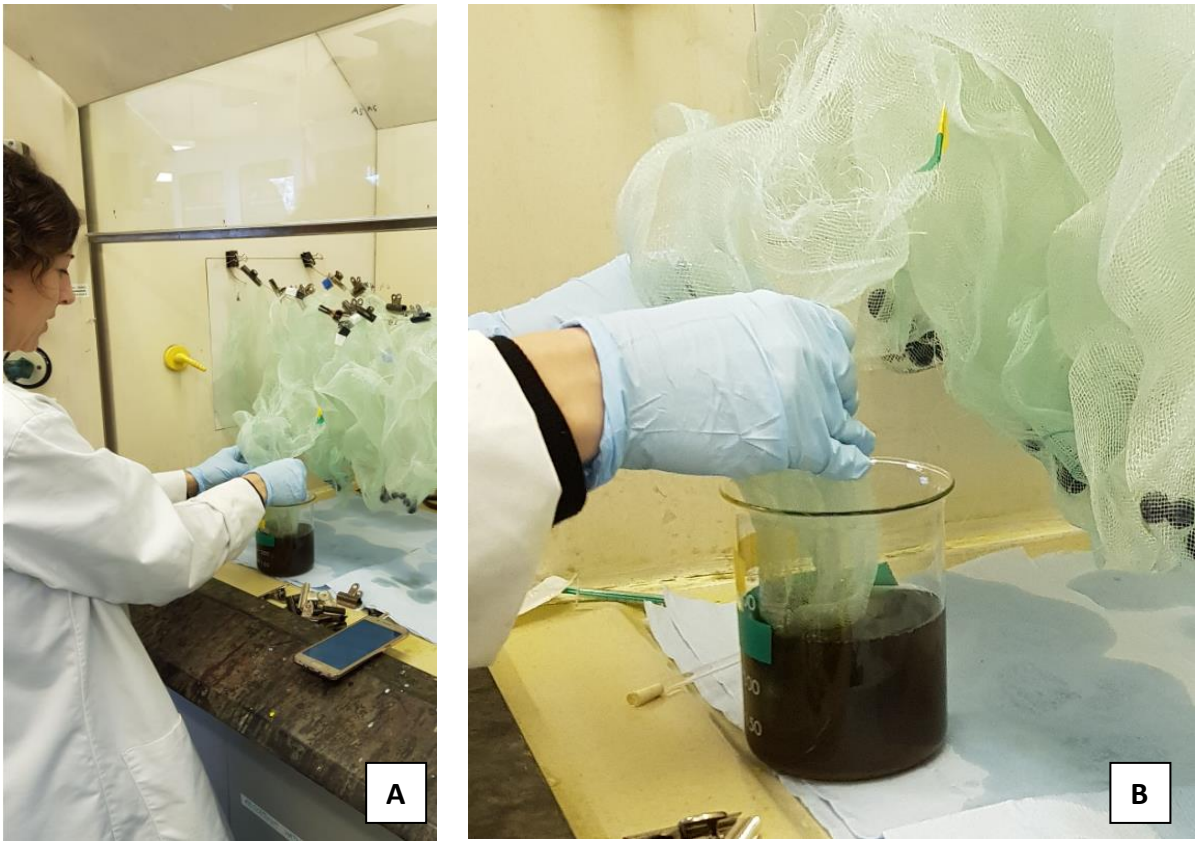

Figure 3. A. Mesh bags hung in fume cupboard to dry and being dipped in Urtica dilution**. B.** Mesh bag with blueberries being dipped in Urtica dilution.

Assessments

Egg counts

The number of eggs laid in the blueberries was immediately counted after the fruit was inoculated.
Eggs with two breathing tubes on the surface of the fruit were often found within an indentation in the fruit (Figure 4). The number of eggs laid in the blackberries was not counted as the blackberries do not maintain their structure therefore making egg counting difficult.

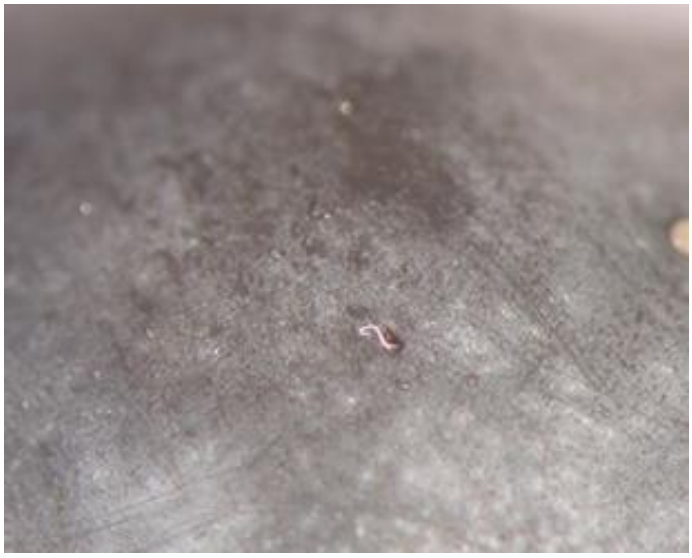

Figure 5. Egg breathing tubes on surface of a blueberry

Adult emergence

After treatment application the fruit was then incubated at 22 ^{o}C, 16 hours light: 8 hours dark and ~40 % relative humidity for 2 weeks and the number of male and female SWD emerging was recorded (Figure 6).

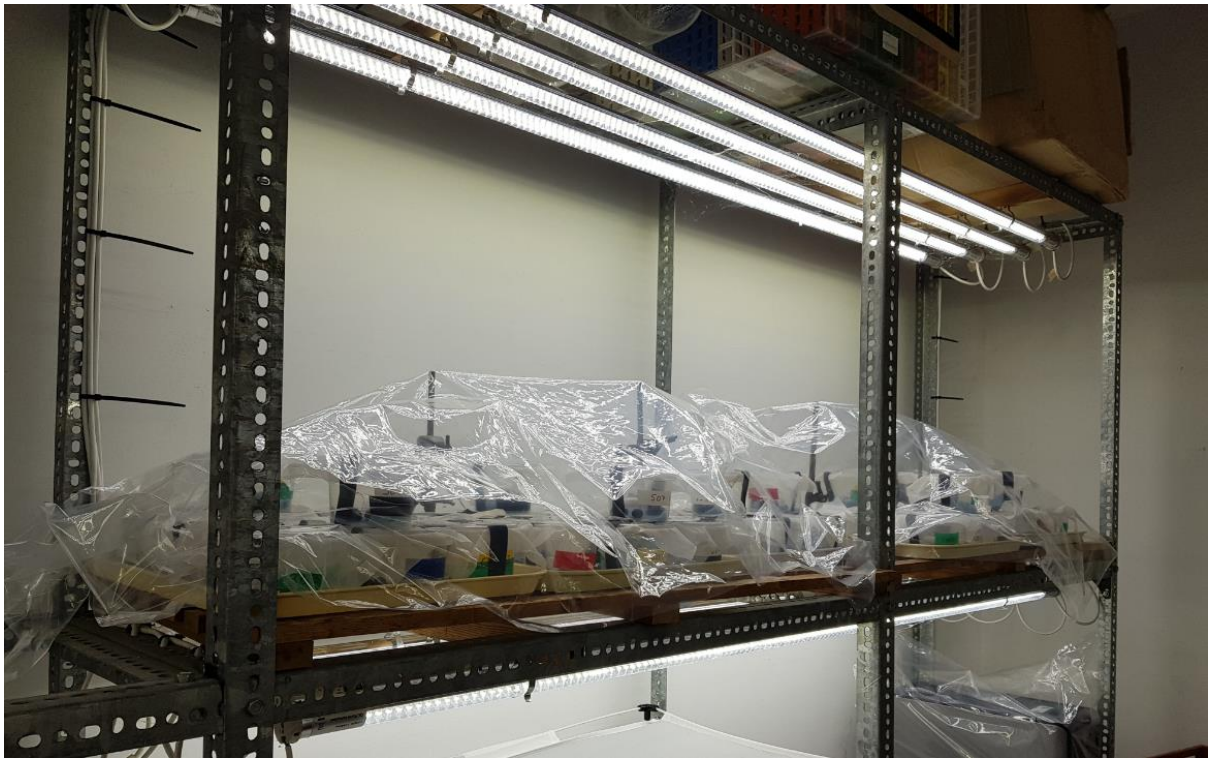

Figure 6. Fruit being incubated in a temperature controlled room at NIAB EMR.

Statistical analysis

All variates were subject to ANOVA using appropriate variance-stabilising transformations where appropriate. All comparisons vs Control used Dunnett's t-test, which adjusts for multiple comparisons and tends to be more conservative than the standard LSD test.

Results

Fruit inoculated with SWD adults 48 hours after dipping in treatment solution

None of the Fprob values in ANOVAs of the data were statistically significant, or even nearly so (Tables 1-3, Figure 1)). Numbers of males, females or total adults that emerged from either blackberry or blueberry, or the numbers of eggs laid on blueberry or the numbers of adults that emerged from those eggs, showed no significant reductions compared to the untreated control.

None of the treatments were effective. Where fruits were inoculated with SWD adults after treatment, treatments could either have repellent effects, oviposition deterrent effects or insecticidal effects. None of these effects were apparent. Note that egg counts were not done on blackberry due to the convoluted nature of the fruit surface which makes this too difficult to do.

Fruit inoculated with SWD adults 48 hours before dipping in treatment solution

Fprob values in ANOVAs of the data on blackberry (Table 4) were not statistically significant though those for the data for adults on blueberry were significant ($P \leq 0.032$) (Tables 4-6, Figure 2).

On blackberry (Table 4), the 52% reduction in males compared to the water only (negative) control caused by AHDB9931 was statistically significant at the $p \leq 0.05$ level. However, the reductions in females and total adults were not significant, suggesting this may be a chance result. Note that in LSD testing, the Calcium hydroxide and AHDB9919 treatments also reduced the numbers of males compared to the water only (negative) control significantly (by 37.8% and 44.5%, respectively) but again reductions in females and total adults were not significant for this treatment.

On blueberry (Table 5), the Urtica treatment showed statistically significant ($p \leq 0.05$) reductions in males, females and total adults, by 45.0, 61.2 and 53.6%, respectively. There were no statistically significant treatment effects on the numbers of eggs laid or the numbers of adults emerging per egg laid (Table 6).

Where fruits were inoculated with SWD adults before treatment, the mode of action of treatments is insecticidal. The Urtica treatment showed insecticidal effects, but these may be of short persistence as the 48 hours after dipping treatment was ineffective (see above).

Conclusions

- As the results of the treatments on blackberry and blueberry were different both for pre-inoculation and post-inoculation treatment, all these results should be treated with caution. Note that AHDB9931 was obtained late and was included in the tests on blackberry only (which were conducted after the tests on blueberry) so there is no cross-check of the results between fruits for this treatment.
- Urtica gave statistically significant reductions (~50%) in numbers of emerging SWD adults on blueberry showing insecticidal effects probably of short persistence and is a promising treatment worthy of further investigation.
- AHDB9931 gave the greatest reductions in numbers of SWD emerged in both the before and after inoculation tests on blackberry where it was included, with Calcium and AHDB9919 close followers on, though the reductions except in one case were not statistically significant. These treatments also need further investigation.

- This work needs repeating, possibly more than once depending on results, to validate findings before firm conclusions are drawn. Modifications to the experimental methodology (e.g. an increase in the numbers of fruits and the numbers of SWD adults used for inoculation), or possibly greater replication, may be of benefit in reducing experimental variability and improving the power of the experiments to discriminate treatment effects.
- Further laboratory tests investigating effects on a wider range or fruits (e.g. including strawberry and cherry), and at a wider range of intervals pre- and post-treatment, is needed. Choice versus no-choice testing protocols should be explored. If activity of one or more treatments is confirmed in such further tests, field testing will then be needed.
- If an effective treatment is found, it would be an important development as it could be useful in extending the interval between sprays of conventional insecticides in spray programmes for SWD.

Table 1. Numbers of male, female and total adult SWD emerging from <u>BLACKBERRY</u> inoculated with SWD 48 hrs <u>AFTER</u> dipping			
Blackberry	males	females	adults
Water (negative control)	41.50	52.83	94.33
Calcium hydroxide + AHDB9919	36.83	44.00	80.83
Calcium hydroxide	25.50	37.50	63.00
AHDB9931	21.67	29.67	51.33
AHDB9919	26.67	30.83	57.50
AHDB9967	35.83	39.17	75.00
Sodium hydrogen carbonate	22.17	30.00	52.17
Urtica	32.33	33.50	65.83
Fprob	0.337	0.267	0.19
SED	9.57	9.92	17.15
DF	35	35	35
LSD (5%)	19.43	20.15	34.82

Table 2. Numbers of male, female and total adult SWD emerging from <u>BLUEBERRY</u> inoculated with SWD 48 hrs <u>AFTER</u> dipping			
Blueberry	males	females	adults
Water (negative control)	17.50	17.67	35.17
Calcium hydroxide + AHDB9919	21.83	22.00	43.83
Calcium hydroxide	21.50	19.5	41.00
AHDB9919	18.00	19.00	37.00
AHDB9967	19.17	18.17	37.33
Sodium hydrogen carbonate	15.83	16.50	32.33
Urtica	20.00	20.67	40.67
Fprob	0.612	0.904	0.764
SED	3.551	4.44	7.43
DF	30	30	30
LSD (5%)	7.252	9.06	15.17

Table 3. Numbers of SWD eggs and adult SWD per egg emerging from <u>BLUEBERRY</u> inoculated with SWD 48 hrs <u>AFTER</u> dipping			
Blueberry	eggs	Log_e(adults/egg)	adults/egg‡
Water (negative control)	17.17	0.9646	2.624
Calcium hydroxide + AHDB9919	18.67	0.9504	2.587
Calcium hydroxide	11.83	1.5468	4.697
AHDB9919	21.50	0.6485	1.913
AHDB9967	17.33	0.9701	2.638
Sodium hydrogen carbonate	19.00	0.6456	1.907
Urtica	17.17	0.9821	2.670
Fprob	0.774	0.696	
SED	5.67	0.530	
DF	30	30	
LSD (5%)	11.57	1.083	
‡ mean back-transformed values			

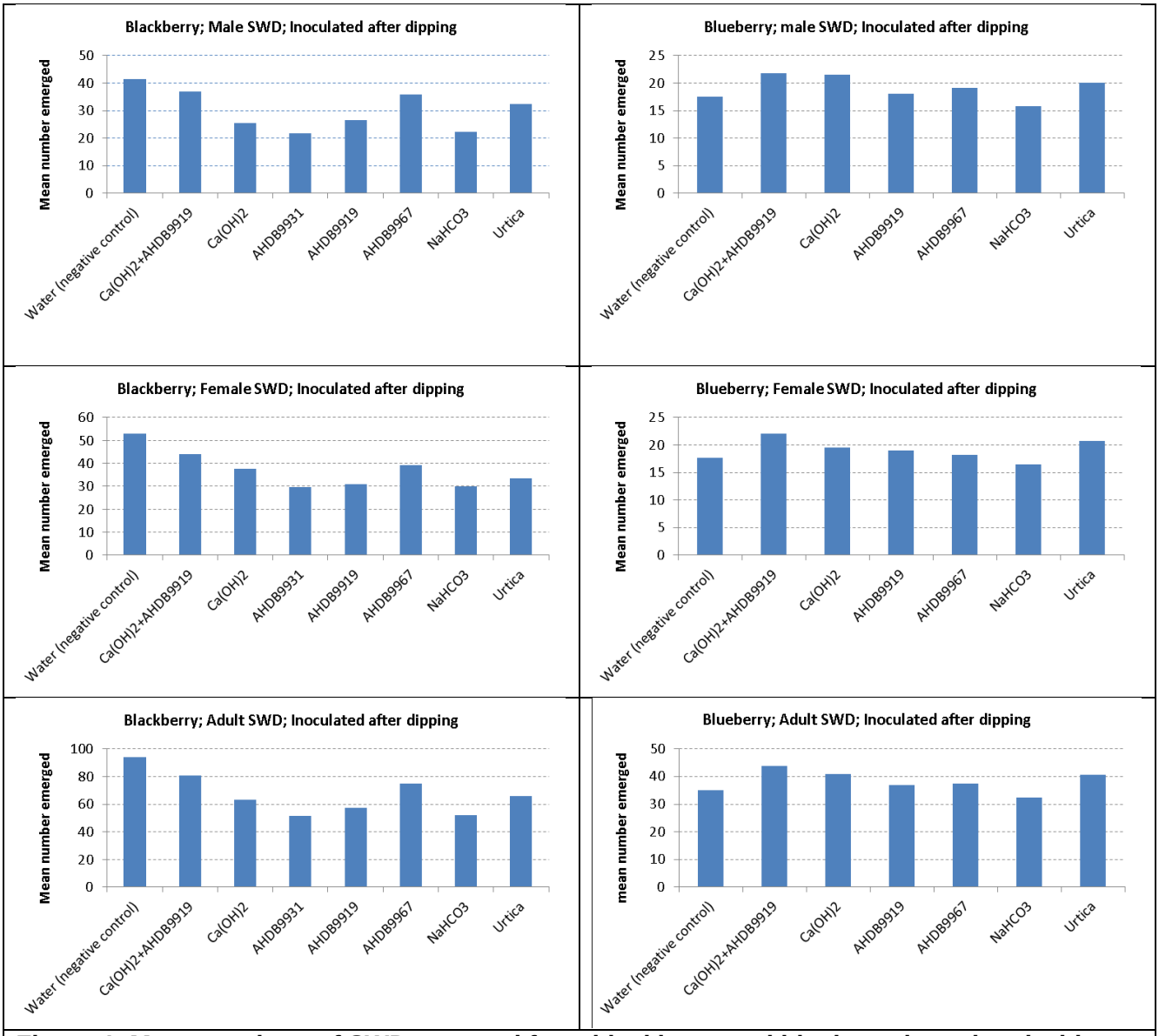

Figure 1. Mean numbers of SWD emerged from blackberry and blueberry inoculated with SWD 48 hrs after dipping

Table 4. Numbers of male, female and total adult SWD emerging from <u>BLACKBERRY</u> inoculated with SWD 48 hrs <u>BEFORE</u> dipping				
Blackberry	males	% reduction†	females	adults
Water (negative control)	37.50		40.83	78.33
Calcium hydroxide + AHDB9919	27.00	28.0	35.50	62.50
Calcium hydroxide	23.33	37.8	24.00	47.33
AHDB9931	18.00	52.0	19.67	37.67
AHDB9919	20.83	44.5	22.67	43.50
AHDB9967	32.33	13.8	41.50	73.83
Sodium hydrogen carbonate	31.33	16.5	35.83	67.17
Urtica	29.50	21.3	32.83	62.33
Fprob	0.109		0.127	0.096
SED	6.75		8.98	15.03
DF	35		35	35
LSD (5%)	13.70		18.24	30.50
† % reduction compared to water only negative control. Green highlight: significant reduction compared to water only (negative) control P ≤ 0.05.				

Table 5. Numbers of male, female and total adult SWD emerging from <u>BLUEBERRY</u> inoculated with SWD 48 hrs <u>BEFORE</u> dipping						
Blueberry	males	% reduction†	females	% reduction†	adults	% reduction†
Water (negative control)	16.67		18.50		35.17	
Calcium hydroxide + AHDB9919	18.83	-13.0	16.83	9.0	35.67	-1.4
Calcium hydroxide	12.17	27.0	10.67	42.3	22.83	35.1
AHDB9919	20.67	-24.0	16.50	10.8	37.17	-5.7
AHDB9967	13.33	20.0	15.50	16.2	28.83	18.0
Sodium hydrogen carbonate	17.50	-5.0	17.83	3.6	35.33	-0.5
Urtica	9.17	45.0	7.17	61.2	16.33	53.6
Fprob	0.032		0.032		0.017	
SED	3.488		3.614		6.34	
DF	30		30		30	
LSD (5%)	7.123		7.382		12.94	
† % reduction compared to water only negative control. Green highlight: significant reduction compared to water only (negative) control $P \leq 0.05$.						

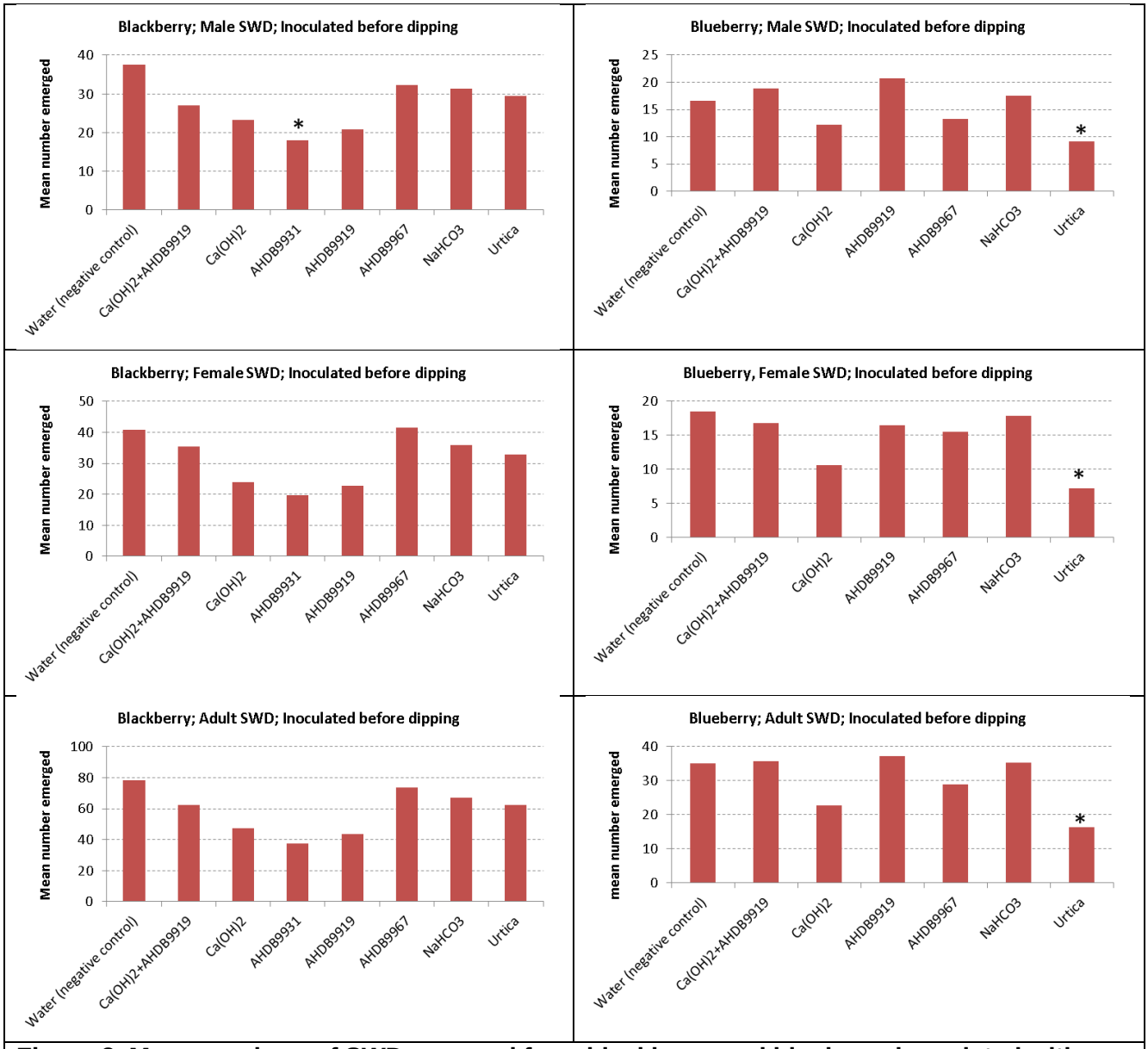

Figure 2. Mean numbers of SWD emerged from blackberry and blueberry inoculated with SWD 48 hrs before dipping. *Statistically significant reductions compared to the water only (negative) control at $p \leq 0.05$ are marked with an asterisk.

Table 6. Numbers of SWD eggs and adult SWD per egg emerging from <u>BLUEBERRY</u> inoculated with SWD 48 hrs <u>BEFORE</u> dipping			
Blueberry	eggs	Log_e(adults/egg)	adults/egg‡
Water (negative control)	74.67	-0.768	0.464
Calcium hydroxide + AHDB9919	74.50	-0.738	0.478
Calcium hydroxide	78.50	-1.448	0.235
AHDB9919	82.67	-0.776	0.460
AHDB9967	80.50	-1.208	0.299
Sodium hydrogen carbonate	67.33	-0.629	0.533
Urtica	82.17	-1.698	0.183
Fprob	0.866	0.061	
SED	12.03	0.387	
DF	30	30	
LSD (5%)	24.57	0.79	
† % reduction compared to water only negative control * t probabilities of pairwise differences from water only negative control ‡ mean back-transformed values			

Acknowledgements

AHDB is acknowledged for funding this work, and also the crop protection companies for their financial contributions as well as providing samples for the trials.

Appendix 1: Experiment diary

Date and name	Record of work done, observations made or reference to lab or field book entry (give book and page numbers)
8/01/2018	Went through protocol. Blueberries will be tested first. 5 Females. For pre and post in total we need: 84 deli cups (containers), 84 tubes, 84 petri-dish lids, 84 mesh filters, 1260 female flies, 1260 fruit.
16.01.2018	CS to check deli cups and fruit – all present and fruit purchased FR to check petri dish lids, tubes, cotton balls. – all present MC get netting – blue netting FR to test fruit on SWD. – Fruit purchased from Sainsbury's and flies applied to fruit. No flies died and fruit contained larvae (19/01)
22.01.2018	FR to set up 2/3 cages of flies and to check cultures
25.01.2018	CS/FR - to make holes, cut filters, label deli cups, tape on mesh= treatment colour. MC - Set up data sheets for the experiment – CJ set up data sheet
26.01.2018	MC -Purchase fruit and wash fruit. FR - to test fruit on SWD + check cultures for cultures + remove bait from cages so flies are 3-4 days old at inoculation.
29.01.2018	All - Set up trial – deli cups, bags, water, Weigh subsample of 5 fruit x 3. Measure Ph of treatments. Compare two nettle products (capsules and liquid) to determine which has the greatest variation from neutral ph. Test the capsule at 2g per l and the liquid as it is (100%), 10% nettle liquid 90% water and 2 ml per l of water.
30.01.2018	All- • Make solutions and measure pH • Dip post dipping (inoculated after dip) fruit for 5 seconds (5 FRUITS PER BAG) • Dry fruit in fume cupboard • Prep 84 tubes of 5 female flies per tube • Inoculate all fruit FR- To add water and maintain humidity

1.02.2018	All- • Remove flies • Count eggs of all fruit • Make solutions and measure pH • Dip pre dipping (inoculated before dip) fruit for 5 seconds. (5 FRUITS PER BAG) • Dry fruit in fume cupboard • Put fruit in boxes FR- To add water and maintain humidity
12.02.2018	All- • Record emergence of adults
21.02.2018	• MC - Make solutions and measure pH. Measure Ph of treatments • CS - Weigh subsample of 3 fruit x 3. • CS - Dip post dipping (inoculated after dip) fruit for 5 seconds (3 FRUITS PER BAG). Dry fruit in fume cupboard • FR - Prep 84 tubes of 5 female flies per tube • CS/FR - Inoculate all fruit • FR- To add water and maintain humidity
23.02.2018	MC - Make solutions and measure pH CS - •Remove flies •Dip pre dipping (inoculated before dip) fruit for 5 seconds. (3 FRUITS PER BAG) •Dry fruit in fume cupboard •Put fruit in boxes FR- To add water and maintain humidity
9.03.2018	FR/CS – Fruit assessed for SWD adults

Appendix 2. Raw data from assessments

Blackberry; Inoculated after dipping; Inoculated: 21/02/2018 15:30; Date dipped: 21/02/2018 12:00; Date flies removed: 23/02/2018 15:30								
Treat no.	Block	Pot number	Dipping time	Egg count (pairs of egg breathing tubes counted)	# Male SWD	# Female SWD	# Adult SWD	# Other drosophila
6	1	1	1	N/A	1	4	5	0
5	1	2	1	N/A	18	22	40	0
3	1	3	1	N/A	39	44	83	0
7	1	4	1	N/A	34	37	71	0
1	1	5	1	N/A	20	19	39	0
4	1	6	1	N/A	25	42	67	0
8	1	7	1	N/A	7	4	11	0
2	1	8	1	N/A	14	15	29	0
6	2	9	1	N/A	14	28	42	0
7	2	10	1	N/A	17	21	38	0
1	2	11	1	N/A	24	27	51	0
8	2	12	1	N/A	24	35	59	0
3	2	13	1	N/A	36	47	83	0
2	2	14	1	N/A	2	4	6	0
5	2	15	1	N/A	35	40	75	0
4	2	16	1	N/A	2	2	4	0
5	3	17	1	N/A	21	16	37	0
3	3	18	1	N/A	21	32	53	0
2	3	19	1	N/A	43	31	74	0
7	3	20	1	N/A	91	67	158	0
1	3	21	1	N/A	12	24	36	0
6	3	22	1	N/A	42	42	84	0

8	3	23	1	N/A	21	39	60	0
4	3	24	1	N/A	12	31	43	0
7	4	25	1	N/A	55	53	108	0
4	4	26	1	N/A	36	25	61	0
5	4	27	1	N/A	44	59	103	0
6	4	28	1	N/A	23	40	63	0
1	4	29	1	N/A	21	52	73	0
3	4	30	1	N/A	24	27	51	0
2	4	31	1	N/A	37	45	82	0
8	4	32	1	N/A	19	44	63	0
7	5	33	1	N/A	20	26	46	0
4	5	34	1	N/A	41	51	92	0
2	5	35	1	N/A	39	54	93	0
1	5	36	1	N/A	49	56	105	0
6	5	37	1	N/A	50	38	88	0
5	5	38	1	N/A	69	62	131	0
8	5	39	1	N/A	25	18	43	0
3	5	40	1	N/A	43	49	92	0
6	6	41	1	N/A	64	49	113	0
3	6	42	1	N/A	58	65	123	0
8	6	43	1	N/A	34	38	72	0
5	6	44	1	N/A	28	36	64	0
4	6	45	1	N/A	17	29	46	0
1	6	46	1	N/A	27	47	74	0
7	6	47	1	N/A	32	113	145	0
2	6	48	1	N/A	25	36	61	0

Blueberry; Inoculated after dipping; Inoculated 30/01/2018 14:30; Date dipped: 30/01/2018 11:20; Date flies removed: 01/02/2018 14:30								
Treat no.	Block	Pot number	Dipping time	Egg count (pairs of egg breathing tubes counted)	# Male SWD	# Female SWD	# Adult SWD	# Other drosophila
5	1	1	1	122	18	13	31	0
4	1	2	1	73	22	26	48	0
3	1	3	1	74	14	15	29	0
7	1	4	1	62	17	26	43	0
1	1	5	1	100	20	21	41	0
6	1	6	1	94	12	9	21	0
2	1	7	1	119	14	13	27	0
3	2	8	1	62	27	21	48	0
1	2	9	1	47	25	29	54	0
4	2	10	1	95	13	19	32	0
6	2	11	1	42	12	11	23	0
5	2	12	1	71	21	16	37	0
7	2	13	1	44	20	17	37	0
2	2	14	1	47	23	17	40	0
6	3	15	1	93	14	18	32	0
2	3	16	1	73	23	27	50	0
7	3	17	1	86	11	12	23	0
5	3	18	1	74	23	21	44	0
3	3	19	1	86	19	31	50	0
1	3	20	1	40	16	12	28	0
4	3	21	1	67	9	8	17	0
5	4	22	1	77	25	32	57	0
7	4	23	1	103	22	26	48	0
3	4	24	1	70	29	29	58	0

2	4	25	1	75	19	23	42	0
4	4	26	1	47	11	12	23	0
1	4	27	1	71	21	15	36	0
6	4	28	1	57	20	23	43	0
4	5	29	1	69	24	18	42	0
3	5	30	1	114	13	17	30	0
1	5	31	1	61	27	28	55	0
6	5	32	1	46	33	33	66	0
7	5	33	1	54	16	16	32	0
2	5	34	1	99	9	15	24	0
5	5	35	1	107	14	8	22	0
3	6	36	1	52	29	19	48	0
6	6	37	1	108	29	30	59	0
2	6	38	1	77	20	19	39	0
5	6	39	1	65	14	19	33	0
7	6	40	1	88	19	9	28	0
1	6	41	1	126	20	12	32	0
4	6	42	1	108	16	16	32	0

Blackberry; Inoculated before dipping; Date inoculated: 21/02/2018 12:10; Date dipped: 23/02/2018 15:30: Date flies removed: 23/02/2018 13:30								
Treatment	Block	Pot number	Dipping time	Egg count (pairs of egg breathing tubes counted)	Male SWD	Female SWD	Adult SWD	Other drosophila
5	7	49	2	N/A	39	38	77	0
7	7	50	2	N/A	65	74	139	0
6	7	51	2	N/A	43	59	102	0
4	7	52	2	N/A	28	25	53	0
3	7	53	2	N/A	44	41	85	0
8	7	54	2	N/A	13	11	24	0
2	7	55	2	N/A	19	15	34	0
1	7	56	2	N/A	28	19	47	0
3	8	57	2	N/A	25	25	50	0
2	8	58	2	N/A	22	22	44	0
5	8	59	2	N/A	19	34	53	0
1	8	60	2	N/A	39	51	90	0
6	8	61	2	N/A	9	9	18	0
4	8	62	2	N/A	29	42	71	0
7	8	63	2	N/A	25	22	47	0
8	8	64	2	N/A	17	13	30	0
8	9	65	2	N/A	22	24	46	0
6	9	66	2	N/A	29	19	48	0
1	9	67	2	N/A	11	25	36	0
5	9	68	2	N/A	45	52	97	0
3	9	69	2	N/A	23	32	55	0
7	9	70	2	N/A	38	43	81	0
4	9	71	2	N/A	16	22	38	0

2	9	72	2	N/A	10	9	19	0
5	10	73	2	N/A	33	53	86	0
3	10	74	2	N/A	5	16	21	0
7	10	75	2	N/A	35	38	73	0
6	10	76	2	N/A	9	10	19	0
4	10	77	2	N/A	45	59	104	0
2	10	78	2	N/A	28	41	69	0
1	10	79	2	N/A	10	1	11	0
8	10	80	2	N/A	22	31	53	0
1	11	81	2	N/A	18	18	36	0
8	11	82	2	N/A	7	17	24	0
3	11	83	2	N/A	27	47	74	0
2	11	84	2	N/A	27	33	60	0
5	11	85	2	N/A	28	26	54	0
6	11	86	2	N/A	52	50	102	0
4	11	87	2	N/A	30	30	60	0
7	11	88	2	N/A	20	38	58	0
4	12	89	2	N/A	40	37	77	0
2	12	90	2	N/A	19	16	35	0
5	12	91	2	N/A	30	46	76	0
8	12	92	2	N/A	27	22	49	0
6	12	93	2	N/A	35	50	85	0
7	12	94	2	N/A	42	30	72	0
1	12	95	2	N/A	34	30	64	0
3	12	96	2	N/A	38	52	90	0

Blueberry; Inoculated before dipping; Date inoculated: 30/01/2018 14:30: Date dipped: 01/02/2018 11:30: Date flies removed 01/02/2018 11:00								
Treatment	Block	Pot number	Dipping time	Egg count (pairs of egg breathing tubes counted)	Male SWD	Female SWD	Adult SWD	Other drosophila
7	7	43	2	47	6	13	19	0
4	7	44	2	41	14	11	25	0
1	7	45	2	54	17	11	28	0
3	7	46	2	82	23	21	44	0
2	7	47	2	53	14	18	32	0
6	7	48	2	80	8	9	17	0
5	7	49	2	111	14	21	35	0
1	8	50	2	84	2	1	3	0
6	8	51	2	49	18	13	31	0
4	8	52	2	70	22	21	43	0
2	8	53	2	78	23	14	37	0
7	8	54	2	73	15	20	35	0
5	8	55	2	32	23	24	47	0
3	8	56	2	92	16	17	33	0
7	9	57	2	67	22	15	37	0
2	9	58	2	122	19	14	33	0
1	9	59	2	83	15	19	34	0
3	9	60	2	56	21	16	37	0
4	9	61	2	87	22	12	34	0
5	9	62	2	81	6	7	13	0
6	9	63	2	92	6	6	12	0
4	10	64	2	62	20	21	41	0
5	10	65	2	94	24	29	53	0
7	10	66	2	94	21	28	49	0

1	10	67	2	94	11	8	19	0
3	10	68	2	62	12	13	25	0
2	10	69	2	77	32	13	45	0
6	10	70	2	77	11	8	19	0
5	11	71	2	74	9	10	19	0
1	11	72	2	63	13	6	19	0
7	11	73	2	102	13	14	27	0
6	11	74	2	121	8	5	13	0
3	11	75	2	68	17	15	32	0
2	11	76	2	93	16	18	34	0
4	11	77	2	59	15	19	34	0
4	12	78	2	85	12	23	35	0
6	12	79	2	74	4	2	6	0
3	12	80	2	87	24	19	43	0
7	12	81	2	65	23	21	44	0
5	12	82	2	91	4	2	6	0
2	12	83	2	73	20	22	42	0
1	12	84	2	93	15	19	34	0

Appendix 3. NIAB EMR's 2017 certificate of Official Recognition of Efficacy Testing Facilities or Organisations in the United Kingdom and notification of renewal for 2018

Certificate of

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

This certifies that

East Malling Research
(and East Malling Services 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
Biologicals and Semiochemicals
Stored Crops

Date of issue: 7 January 2013
Effective date: 1 January 2013
Expiry date: 31 December 2017

Signature *Authorised signatory*

Certification Number
ORETO 321

HSE
Chemicals Regulation Directorate

Department of Agriculture and Rural Development

HSE

Health and Safety Executive

Chemicals Regulation Directorate

Tony Fisher

Mallard House
Kings Pool
3 Peasholme Green
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Tel: 020 3028 1166
tony.fisher@hse.gov.uk

http://www.hse.gov.uk/

Mr A Harris
NIAB EMR
New Road
EAST MALLING
Kent
ME19 6BJ

Date 7 March 2018

Reference TOR 144

Dear Mr Harris,

Re: 'Official Recognition of Efficacy Testing Facilities or Organisations' - Inspection Report

Please find attached a copy of the report prepared following the inspection of your organisation's Official Recognition facilities on 14 February 2018.

As stated at the de-brief, East Malling Research satisfied the requirements of Regulation EC No 1107/2009 and Commission Regulation (EU) No 284/2013), and therefore passed the inspection.

Your facility/organisation will therefore continue to appear in the list of 'Officially Recognised Efficacy Testing Facilities or Organisations in the UK', which is published on CRD's website.

I would like to draw you attention to points detailed in the De-brief section of the report, most of which were raised during the inspection. Points1 to 22 identify deficiencies in the current procedures which should be addressed as soon as possible. Many of these will need to be reflected in the relevant SOPs. Points 23 to 24 are of a more advisory nature and identify possible improvements to procedures or areas where procedures may need changing under certain circumstances.

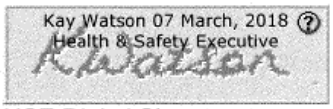
CRD does not normally require a formal response on these issues at this time, however it is noted that you have submitted an application for the renewal of your ORETO status. Part of the documentation in support of that application requires an explanation of the steps taken to address any issues raised in the last inspection report. In this particular instance, considering the timing of the inspection in relation to the expiry of your certificate, we request from you an explanation of the steps you intend to take to address the issues raised in this inspection report. This must be submitted as soon as possible, but by the end of March at the latest, so it can be considered with your renewal application.

We will be happy to provide further advice if required.

If you find anything factually incorrect in the enclosed report or if you have any questions, please contact me at the above address, by telephone, or e-mail to tony.fisher@hse.gov.uk

Please confirm receipt of this letter and report.

Yours sincerely



HSE Digital Signature

Tony Fisher
Official Recognition Inspection Team

For more information on Plant Protection Products visit: www.hse.gov.uk/pesticides

Official recognition information can be accessed via: http://www.hse.gov.uk/pesticides/topics/pesticide-approvals/pesticides-registration/efficacy-guides/official-recognition-introd.htm