SCEPTREPLUS

Year 2 Trial Report

Trial code:	SP 34
Title:	**Integrated Control of Tomato Russet Mite- Semi-field Efficacy Trial**
Crop	Tomato
Target	Tomato Russet Mite (TRM), *Aculops lycopersici* (Eriophyidae)
Lead researcher:	Dr Bethan Shaw
Organisation:	NIAB EMR (East Malling Research)
Period:	1st May 2020- 31st March 2022
Report date:	November 2021
Report author:	Dr Bethan Shaw
ORETO Number: (certificate should be attached)	Certificate No. 411

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.

Date **Authors signature**

12/11/2021

Trial Summary

Introduction

The Tomato Russet Mite *Aculops lycopersici* (Eriophyidae) (TRM) is a common and significant pest of tomato crops around the world and has become an increasing problem in UK tomato production. Unlike other Eriophyid mites, the TRM is oligophagous, reported to survive on a range of solanaceous plants (e.g. nightshades) and plants in other families, e.g. wild blackcurrant, wild gooseberry and blackberry. The visible symptoms of TRM infestation are discolouration of the stems to a brown/golden colour, shrivelling and browning of leaves, flower drop, and fruits exhibiting russeting. Severe infestations can lead to death of the plant. Even minor infestations can cause flower-drop, reduced fruit size, and unsaleable fruits due to visible TRM damage (russeting). All lead to financial losses for growers.

Current control options are limited, and growers mainly rely on sulphur-based products or conventional acaricides, which can upset the biocontrol options for other pests. The aim of this trial was to test conventional and novel products which could be compatible with an IPM programme and used in the UK to manage this pest. Products were chosen after consultation with growers, agronomists, agro-chemical companies, other industry stakeholders and SCEPTREPlus consortium members. In Year 1 of this trial, products highlighted by the review were tested in leaf dipping bioassays. The most promising products were taken forward into a large scale replicated trial in Year 2.

Methods

Cultures of TRM were established from infested material collected by tomato growers and agronomists. Healthy tomato plants were housed in a quarantine facility at 26°C and infested as required. Infested plants were rotated within the facility to ensure distribution of the mites between plants. Once the TRM populations built to a sufficient size, plants were relocated to an insect proof polytunnel for the trial. Foliar applications of the products were made; applications of some products were repeated as recommended by the manufacturer. Leaf samples were collected 6 and 13 days post 1st application and assessment of mite mortality was performed.

Results

Of the 5 treatments applied, only Dynamec resulted in a significantly higher proportion of deaths compared to the untreated control. AHDB9970 reduced the total number of mites by 9x compared to the water-only control, although the proportion of live to dead mites was similar between the two treatments. Initial results using Naturalis appeared positive, but this effect was not statistically significant and had declined by the 2nd assessment.

Conclusions

None of the novel products tested were able to eradicate TRM populations. Dynamec applications caused the highest proportion of deaths. AHDB9970 reduced the total numbers of live mites.

Take home message:

- AHDB9970 caused a reduction in the total numbers of mites and is approved for use in tomato.
- Dynamec is currently approved on tomato and resulted in a higher proportion of deaths than all other treatments.
- New methods of control are required to manage this pest.

Objectives

The aim of this study was to evaluate the efficacy of promising products to control tomato russet mite (TRM). The products were identified in an earlier review (SP 34 Control of Tomato Russet mite – review of control measures) by Charles Whitfield, NIAB EMR. In 2020 a screening trial was performed to highlight promising products to be taken forward into a replicated field trial in 2021.

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**
PP1/152(4)	Design and analysis of efficacy evaluation trials	None
PP1/181(4)	Conduct and reporting of efficacy evaluation trials including good experimental practice	None
PP1/239(2)	Dose expression for plant protection products (PPPs)	None
PP1/223(2)	Introduction to the efficacy evaluation of plant protection products	None
PP1/213(4)	Resistance risk analysis	None
PP1/315(1)	*Aculops lycopersici* on tomato	None

Mite culturing

Tomato seedlings (v. Alicante) were purchased from 'Spadework', Ofham, West Malling on 23rd April 2021. The plants (108 plants in total) were maintained in an insect-free room within the quarantine facility at NIAB EMR at 26°C under a 16:8 light dark cycle to promote growth. Plants were transferred to 4L pots after 4 weeks. Any flowers were removed to encourage foliage growth and side shoots were not removed to encourage side growth. Plants were fed with 'Miracle-Gro' weekly to promote growth.

Tomato foliage infested with TRM was collected by growers and agronomists from commercial crops and sent to NIAB EMR to infest the trial plants. The infested material was checked under a microscope and any predators and pests other than TRM were removed. Mite-infested material was collected by growers from the beginning of June 2021 for three weeks. Several infestations of mites were required to establish a stable population.

Once a week, plants within the quarantine facility were moved around to promote the spread of TRM to all plants. Leaf samples were taken weekly from the beginning of July 2021 to assess pest establishment. At the first assessment, mite populations were found on all plants sampled (30 plants sampled out of 108). All plants were transferred to an insect-proof, protected, polytunnel for the application of treatments and the remaining duration of the trial.

Test site

Item	Details
Location address	Mite culturing: Quarantine facility, NIAB EMR, New Road, East Malling, Kent, ME19 6BJ Trial execution: Ditton Rough trial tunnels NIAB EMR, New Road, East Malling, Kent, ME19 6BJ
Crop	Tomato
Cultivar	Alicante
Soil or substrate type	M52 compost in 4L pots
Agronomic practice	Miracle-Gro fertiliser. No pest or disease treatments.

Trial design

Plots consisted of 3 plants which had physical contact with each other to aid mite movement within the plot. Plants from different plots did not touch one another. There was a minimum of 0.5m between the plots to limit mite movement between treatments. There were 5 replicate blocks divided into 6 plots; each plot (3 plants) was randomly assigned to one of the 6 treatments (18 plants per block; 90 total; excluding spare plants). Each plot contained one of the plants from the pre-assessment, ensuring that all plots contained mite-infested plants. The two other plants within each plot were not checked for mites, however as all 30 of the plants checked within the pre-assessment did host mites and were treated the same as one another it was presumed these also hosted mite populations. Figure 1 displays the plot and block design. Spare plants, which had not been assigned a treatment but were infested with mites, were held in reserve in case that plants needed to be replaced. Ultimately, they were not required during the trial and so were not used or assessed.

Item	Details
Trial design:	Randomised block design
Number of replicates:	5 replicates depending on experiment

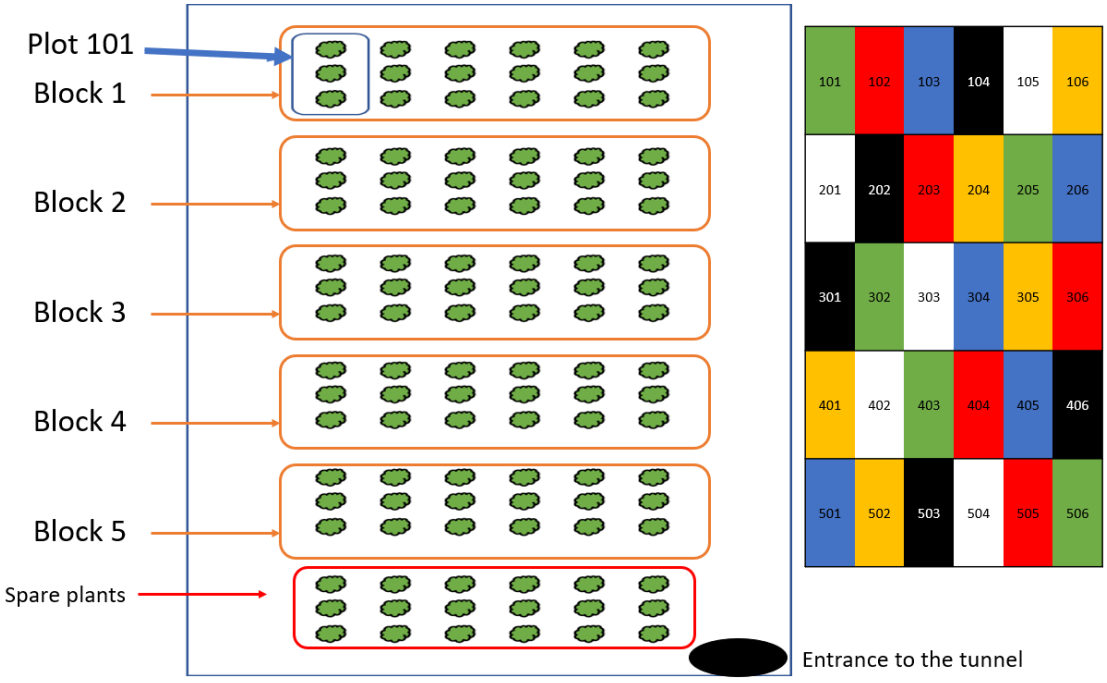

Figure 1. Left - Schematic birds-eye view of the trial set up in the protected polytunnel. Each orange box indicates an individual block. Plots consisted of three plants in a row, indicated by the blue box. Note that plants within each plot were in contact with each other. There was no contact between plants from different plots or blocks. Plants within the red box were spare and untreated and were not assessed.
Right - Diagram displays the treatments randomly assignment to the plots. Colour of the plots does not relate to the treatment and is for representation purposes only.

Treatment details

AHDB Code	Active substance	Product name/ manufacturers code	Formulation batch number	Content of active substance in product	Formulation type	Adjuvant
Water-only control	NA (deionised water)	NA	NA	NA	NA	NA
Not provided	NA	NA	NA	NA	NA	NA
AHDB9970	NA	NA	NA	NA	NA	NA
AHDB9944	NA	NA	NA	NA	NA	NA
AHDB9813	NA	NA	NA	NA	NA	NA
Not provided	Beauveria bassiana	Naturalis (strain ATCC 74040)	Not legible	71 g/L (2.3 x 10^7 CFU*/ml)	Oil dispersion	NA

*CFU- colony forming units.

Application schedule

Treatment number	Treatment Colour	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	Peach	Water-only control (deionised water)	NA	NA	A, B
2	Yellow	Dynamec	4.5 g/ha	0.25 L/ha	A, B
3	Green	AHDB9970	766 g/ha	16 L/ha	A, B
4	Turquoise	AHDB9944	147.6 g/ha	0.9 L/ha	A
5	Blue	AHDB9813	160 g/ha	200 g/ha	A
6	Pink	Naturalis	214.8 g/ha	3 L/ha	A, B

Application details

Treatment solutions were made 30 minutes prior of the first treatment application. On advice from industry, products were applied at 500 L/ha. Leaf area was calculated to reflect commercial densities (40000 tomato plants/ha) resulting in 3.75ml of treatment solution being applied per plot to plants in the trial. Treatments were applied with a 'Cooper Peglar CP 3 Series 2000 Knapsack Sprayer'. A 1.2 m high spray guard was used to surround plants while treatments were applied to prevent drift between plots. The spray assistant ensured that the spray guard did not come into contact with any plants to prevent the contamination between plots. All treatments were applied once on 9th July 2021 and 4 treatments were re-applied on 16th July 2021 where applicable.

	Application A	Application B

Application date	09/07/2021	16/07/2021
Time of day	14:00 start	13:30 start
Crop growth stage (Max, min average BBCH)	Primary foliage growth - all flowers removed	Primary foliage growth - all flowers removed
Crop height (cm)	1m	1m
Application Method	Knapsack sprayer	Knapsack sprayer
Application equipment	Cooper Peglar CP 3 Serie 2000 Knapsack Sprayer'	Cooper Peglar CP 3 Serie 2000 Knapsack Sprayer'
Nozzle pressure	3 bar	3 bar
Nozzle type	Albuz (Purple/lilac)	Albuz (Purple/lilac)
Application water volume/ha	500 L/ha	500 L/ha
Temperature of air - shade (°C)	27°C	30°C
Wind speed range (km/h)	1.4	NA
Dew presence (Y/N)	No	No
Cloud cover (%)	5%	0%

Assessment methodology

A pre-treatment assessment was performed 24 hours prior to the first treatment application to confirm all plots had mites present. For each assessment, 3 leaves were destructively harvested randomly from each plot (one leaf per plant) and inspected under a microscope at x25 magnification within the laboratory. A scale was used to indicate mite presence 0 = no mites, 1 = 1-5 mites, 2 = 6-15 mites and 3 = 16+mites (Appendix c). Plants were rearranged in situations where mite numbers were low. These plots had a plant interchanged with another from a different plot, where high mite numbers were found.

For the treatment efficacy assessment, mite mortality was assessed 6 and 13 days post the 1st treatment application. Only adult mites were assessed (orange in colour). Mortality was assessed by checking for movement in response to physical contact. This was done by using the single bristle of a fine paintbrush to gently touch each mite. If no movement occurred, it was assumed that the mite was dead. Assessment of mites were made from 5 leaves per plot, which were picked from random locations in the plot. Mites were only assessed on the underside of the leaves, as in the Year 1 trial it had shown that the underside of the leaf typically hosted higher mite numbers than the upper surface.

Assessment details

	Evaluation Timing		
Evaluation date	**After 1st conventional insecticides**	**After 1st Bio-insecticides**	**Assessment**
08/07/21	-1 day	-1 day	Pre-assessment of mite numbers
15/07/21	6 days	6 days	Mortality on underside of leaf
22/07/21	13 days	13 days	Mortality on underside of leaf

Statistical analysis

Statistical analysis was performed using R in R-Studio. The proportion of dead to live mites at each time-point was assessed (probability of death). The data was analysed using mixed effect logistic regression, 'plot' was included as a random effect. Post-hoc means and contrasts were estimated using the emmeans package, with p-values adjusted for false discovery rate using the Tukey method.

Results

Assessment 1 results - mean number of live and dead mites per treatment plus standard deviation and standard error of the mean 6 days post 1st spray application.

Treat	Mean live	SE	Mean dead	SE	Total	Proportion dead
1	18.4	7.7	3.8	0.9	22.2	0.17
2	54.6	18.7	21.6	5.0	76.2	0.28
3	34.2	25.1	22.8	18.0	57	0.40
4	16.2	9.4	4.0	1.5	20.2	0.20
5	61.2	27.4	13.6	6.8	74.8	0.18
6	19.6	10.6	9.0	6.2	28.6	0.31

Assessment 2 results – mean number of live and dead mites per treatment plus standard deviation and standard error of the mean 13 days post 1st spray application.

Treat	Mean live	SE	Mean dead	SE	Total	Proportion dead
1	215.2	76.5	69.8	30.9	285	0.24
2	54.8	15.6	57.2	14.6	112	0.51
3	24.0	14.3	7.2	5.0	31.2	0.23
4	112.0	62.8	36.0	21.0	148	0.24
5	179.6	40.2	44.4	8.2	224	0.20
6	64.4	37.5	25.4	15.1	89.8	0.28

Raw data can be seen in Appendix 3. In the replicated field trial, there was no statistically significant difference between any of the treatments and the water-only control, 6 days post 1st application (Figure 2 left). There was a statistically significant difference between Dynamec and the water-only control, 13 days post 1st application with a significantly higher probability of death in the Dynamec treatment ($p < 0.001$) (Figure 2 right).

There was also a statistically significant difference in mite mortality between Dynamec and AHDB9813 ($p < 0.01$) (Treatment 5), and between AHDB9944 (Treatment 4) and AHDB9813 ($p = 0.02$) (Treatment 5) which had the lowest probability of death in the first assessment. In the second assessment, Dynamec had a significantly higher probability of death than all other treatments.

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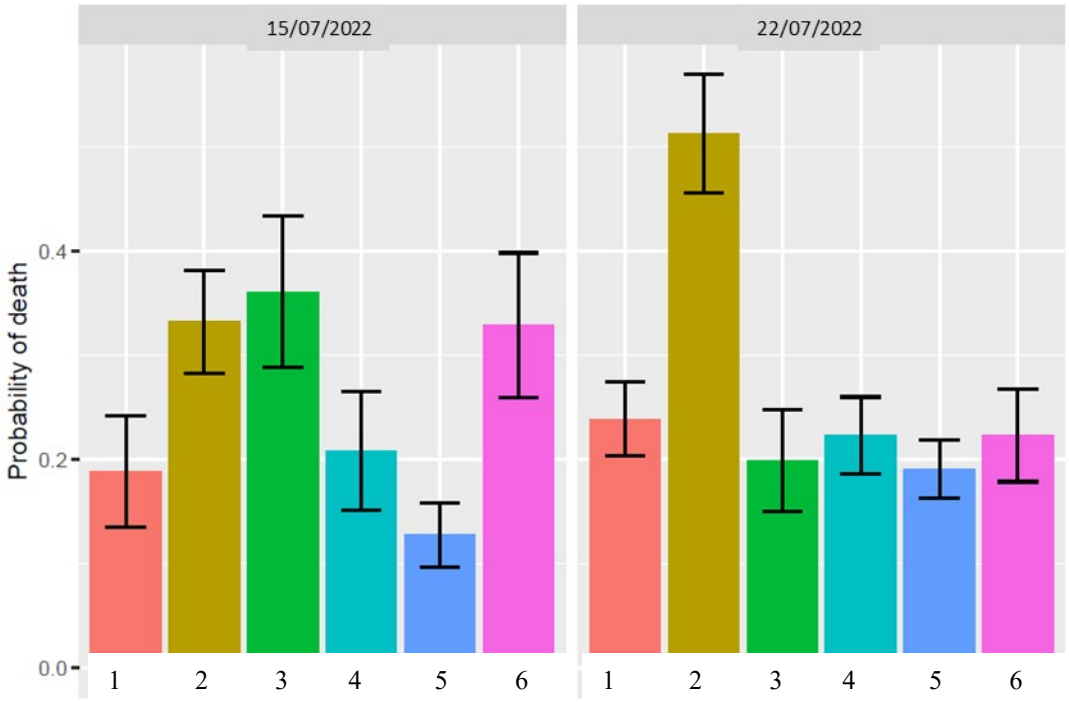

Figure 2. Probability of death (plus standard error of the means) of TRM on 15/07/2021 6 days post 1st spray (left), and on 22/07/2022 13 days post 1st spray (right). * indicates a statistically significant difference from the water-only control. Treatment 1, peach bars: water-only control. Treatment 2, yellow bars: Dynamec. Treatment 3, green bars: AHDB9970. Treatment 4, turquoise: AHDB9944. Treatment 5, blue bars: AHDB9813. Treatment 6, pink bars: Naturalis.

Figure 3 displays the number of live mites in both assessments. Three of the treatments and the water-only control had higher numbers of live mites during the second assessment compared to the first. Two of the treatments, Dynamec and AHDB9970, showed no increase in numbers of live mites between the two assessments.

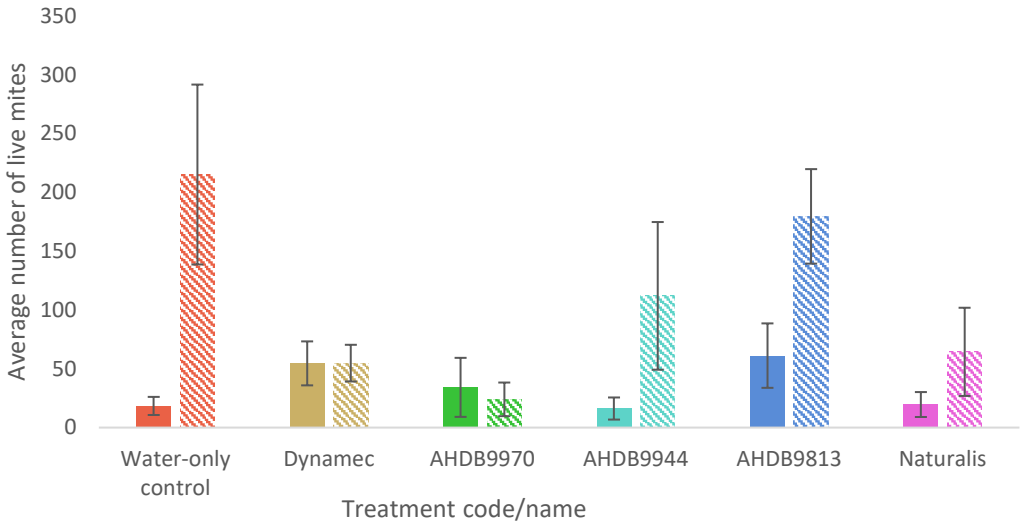

Figure 3. Average number of live mites (plus standard error of the means) in first (solid bars) and second (hashed bars) assessments for each treatment.

Discussion

Unfortunately, no effective novel products to control TRM were identified within this trial. While initial results with two products (AHDB9970 and Naturalis) appeared promising in the first assessment 6 days post application, this effect was not found in the second assessment. In both cases, these products were applied twice, 6 days prior to both assessments, and so lack of efficacy is not thought to be as the result of product degradation. AHDB9813 (Treatment 5) is thought to be providing adequate control of TRM in commercial crops, however, within this trial it was not found to have reduced mite survival significantly and had given a significantly lower probability of death than Dynamec in the second assessment.

Prior to the application of the treatments in the trial, the plants were inspected for mites and then the plants were redistributed between plots to even out mite numbers. Due to the assessments requiring destructive leaf sampling (i.e. the leaves were removed from the plant for the assessment and then destroyed), it was not possible to mitigate uneven distributions between plots prior to treatment application. During the assessments, we found that the mite populations varied considerably between plots and therefore also treatments, but the analysis that was performed accounted for the uneven distribution of mites.

When looking at the differences between treatments in the numbers of live mites, Dynamec and AHDB9970 were the only two treatments that did not show an increase in numbers from the first to second assessment. It may be that these treatments are able to slow population growth and if a third assessment had been included, it may have shown a gradual reduction in mite numbers over time. The efficacy shown by AHDB9970 in the second assessment may not have been detected in the probability

of death analysis, as the proportion of live to dead mites was similar to the water-only control (0.23 and 0.24 respectively). However, there were 9x less mites at the time of the second assessment of plants treated with AHDB9970 (31.2 mites) compared to the water-only control (285 mites). This contrasts with the first assessment, in which the water-only control had 2.5x less mites (22.2 mites) than AHDB9970 (57 mites), indicating that over time, AHDB9970 reduced the overall number of live mites. Plants treated with AHDB9970 were infested with the lowest number of mites of all the treatments at the time of the second assessment. This included Dynamec which had 4x more mites than AHDB9970.

Conclusions

It is unfortunate that no new products have been identified to demonstrate adequate control of TRM within this trial. Dynamec and AHDB9970 prevented an increase in the number of live mites between assessments and so these may play a role in reducing pest pressure in tomato. Both of these products are currently approved for use on tomato. AHDB9813 was unexpectedly ineffective in this trial; it is used currently to reduce TRM infestations in some glasshouse crops. Although there are still some approved products with which to target TRM, alternative approaches are required in the longer term.

Acknowledgements

We would like to thank:

- Phil Morley, who provided vital advice and guidance on the proposed treatments and facilitated the collection of TRM to establish the cultures.
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Finally, thank you to the SCEPTREPlus team for their guidance and support with this project during another challenging year.

Appendix

a. Trial diary

Date and name	Record of work done, observations made or reference to lab or field book entry (give book and page numbers)
21/04/21	Irrigation set-up.
23/04/21	Collect 220 x Alicante tomatoes from Spadework and transfer into CT1 and outer room of insect quarantine.
21/05/21	Began repotting tomatoes into 4litre pots of compost (tomato specific soil produced by glasshouse team). Redistributed the layout of tomatoes. Turned off top growth lights due to burning the leaves.
25/05/21	Bought Miracle-Gro all-purpose due to nutrition deficiencies.
27/05/21	Re-potted more tomatoes into 4 litre pots.
03/06/21	Requested more compost (from glasshouse) to finish repotting.
04/06/21	Finished repotting tomatoes. Removed shelving units to move tomatoes down to floor (and use growth lights). Redistributed tomatoes again into a 3 by 3 formation per tray; there are 10 trays in
10/06/21	Organised and picked up TRM samples from grower. Distributed samples over tomatoes
22/06/21	Organised and picked up TRM samples from grower. Distributed samples over tomatoes
30/06/21	Performed a TRM check on infected tomatoes; 12 out of 24 randomly sampled leaves had a presence of TRM. Spider mite was also seen.
05/07/21	Tomatoes moved from CT1 into DR big poly tunnel. Plant's foliage was drastically cut back. Waste foliage was left in the tunnel so mites could re-locate back onto the plants. This will be removed prior to spray applications
07/07/21	Plots labelled and dead plants swapped for spares. Irrigation checked.
08/07/21	**PRE-ASSESSMENT** Leaves collected for the pre-assessment. A sprig per plant was collected (3 in total). For the assessment 1 leaf from each sprig was checked under the microscope for the presence/absence of TRM. Using a scale 0-3 (0=no mites, 1=1-5 mites, 2= 6-15 mites, 3=16+ mites). Based on the pre-assessment, plants were moved around to ensure no plots had 0 scores on each plant; 203-303, 404-402, 405-503 had one plant swapped with one another to increase TRM infestation. Dead plant was swapped out. All plots have one sprig labelled with plot number and a photo taken; this is to follow how the treatments etc. affect the plant. Dead plant matter was discarded. Data logger introduced.
09/07/21	1st Spraying of all treatments.
12/07/21	Plants checked. Irrigation turned on for 10 mins to boost plants. They seemed a little drooped due to the warm weather at the weekend.
15/07/21	Leaves collected for 1st TRM mortality assessment. 5 leaves per plot were taken and live/dead numbers counted (by use of a bristle from a brush).
16/07/21	2nd (final) Spraying of treatments – applied treatments 1, 2, 5 & 6 (not 3 and 4).
22/07/2021	Leaves collected for 2nd (last) TRM mortality assessment. 5 leaves per plot were taken and live/dead numbers counted (by use of a bristle from a brush). Plot 302 (Control) 1 leaf was missing, so only 4 leaves were assessed.
30/07/2021	Took photos of each plot's sprig.

b. Photos from trial

Healthy tomato plants (Alicante) being grown in 27°C 16:8 light dark cycle. Plants were held in these conditions until the trial began. Plants were infested with mites in these conditions.

TRM damage on developing fruitlet in control plants prior to crop destruction.

Tomato leaves displaying visible signs of TRM with the ‘russeting’ at the base of the leaflets on both images.

c. Raw data from assessments.

- Pre-assessment 8/07/21- data collected using a scale to indicate mite population density on leaves rather than counting total individuals.

		leaf number			
Plot	**Treat no.**	**1**	**2**	**3**	
101	1	1	2	1	
102	6	0	1	1	
103	3	2	1	1	
104	2	1	1	1	
105	5	1	2	1	
106	4	1	1	1	
201	5	1	0	1	
202	2	1	0	0	
203	6	3	1	3	
204	4	1	0	1	
205	1	1	1	1	
206	3	1	1	0	
301	2	1	1	0	
302	1	1	1	1	
303	5	0	0	0	
304	3	1	1	0	
305	4	1	0	0	
306	6	1	0	0	
401	4	1	1	1	
402	5	1	1	2	
403	1	2	0	0	
404	6	1	1	1	Plant swapped with 402
405	3	0	0	0	Plant swapped with 503
406	2	1	0	2	
501	3	1	1	0	
502	4	1	0	1	
503	2	3	2	1	
504	5	1	1	1	
505	6	1	1	1	
506	1	1	2	1	

Infestation scale	
1	**1-5 mites**
2	**6-15 mites**
3	**16+ mites**

- 1st Assessment – Raw data collected 15/07/21. A = number of live mites, D = number of dead mites. Treatment number reflects treatment table in methodology.

		leaf number									
		1		2		3		4		5	
Plot	Treat	A	D	A	D	A	D	A	D	A	D
101	1	5	4	0	0	0	0	1	0	0	0
102	6	0	1	7	16	0	1	14	12	0	3
103	3	0	0	4	0	0	0	1	0	1	2
104	2	1	0	22	5	12	1	3	2	3	0
105	5	3	0	3	0	6	0	0	0	14	3
106	4	1	0	0	0	0	0	0	0	0	0
201	5	0	1	5	1	12	2	0	0	4	0
202	2	2	0	112	22	8	3	0	0	1	2
203	6	30	5	29	2	0	0	0	1	0	0
204	4	21	6	1	0	9	0	10	1	11	2
205	1	0	0	1	1	1	0	0	0	45	5
206	3	7	2	0	0	0	0	20	13	0	0
301	2	37	4	6	1	2	0	0	3	7	6
302	1	1	1	0	0	1	0	11	2	4	0
303	5	2	1	1	0	0	0	0	0	1	0
304	3	0	0	0	0	1	1	1	0	0	0
305	4	1	1	1	3	3	1	0	0	0	0
306	6	1	0	1	0	0	0	0	0	1	0
401	4	2	1	0	1	0	0	3	0	0	0
402	5	94	30	0	0	1	0	16	2	9	1
403	1	0	0	2	0	1	0	0	1	1	0
404	6	0	0	0	0	0	0	0	0	0	1
405	3	0	2	0	0	2	0	1	0	0	0
406	2	1	1	0	1	3	7	0	0	5	13
501	3	0	0	1	0	48	42	84	52	0	0
502	4	0	0	0	0	1	0	14	3	3	1
503	2	18	19	5	7	0	0	1	0	24	11
504	5	0	0	93	23	23	3	16	1	3	0
505	6	3	2	7	1	1	0	0	0	4	0
506	1	0	0	8	2	3	0	6	3	1	0

- 2nd Assessment – Raw data collected 22/07/21. A = number of live mites, D = number of dead mites. Treatment number reflects treatment table in methodology.

		leaf number									
		1		2		3		4		5	
Plot	Treat	A	D	A	D	A	D	A	D	A	D
101	1	37	23	3	1	33	19	10	6	30	16
102	6	0	0	4	2	1	1	0	0	17	1
103	3	5	0	5	1	5	1	0	0	6	1
104	2	42	68	3	6	6	0	0	1	14	4
105	5	45	5	7	3	99	18	28	8	32	6
106	4	0	1	40	10	4	2	0	0	2	2
201	5	3	0	86	49	13	2	0	0	28	11
202	2	60	44	2	0	0	1	2	0	0	0
203	6	6	4	46	30	0	0	0	0	1	0
204	4	1	0	48	28	22	3	75	27	210	60
205	1	6	0	232	80	6	7	7	1	184	96
206	3	1	0	0	0	3	0	0	0	3	0
301	2	0	0	0	2	3	14	23	35	10	6
302	1	243	36	7	1	66	26	16	2		
303	5	151	1	19	9	11	3	96	30	12	2
304	3	0	0	3	2	2	1	0	0	0	0
305	4	6	0	1	0	2	0	5	1	1	2
306	6	1	0	6	1	6	1	0	0	5	1
401	4	6	3	1	1	15	8	1	0	15	0
402	5	7	8	19	0	3	0	1	0	24	8
403	1	0	0	0	1	1	0	3	0	1	0
404	6	46	8	7	1	4	2	153	68	2	2
405	3	4	1	1	2	0	0	1	0	1	0
406	2	7	9	1	0	0	1	0	0	0	0
501	3	20	10	6	2	14	2	40	13	0	0
502	4	13	1	52	23	9	3	12	2	19	3
503	2	0	0	1	1	96	88	4	6	0	0
504	5	11	5	38	14	50	19	88	16	27	5
505	6	13	4	1	1	0	0	1	0	2	0
506	1	3	1	94	6	16	1	48	16	30	10

d. ORETO certificate

Certificate of

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

This certifies that

NIAB EMR

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: 12 July 2018
Effective date: 1 January 2018
Expiry date: 31 December 2022

Signature _____
Authorised signatory

Certification Number
ORETO 411

HSE
Chemicals Regulation Division

Department of Agriculture and Rural Development