

Comparative Efficacy and Compatibility of NeemAQ™ with Standard Products for Greenhouse Whitefly Control in Tomato Crop

Simon Lennard¹

1. Background

The purpose of this study was to assess the efficacy and crop safety of NeemAQ, alone and in combination with commonly used insecticide and fungicide products, for compatibility and comparative efficacy, and investigate any synergistic effects which may exist. The target pest was the nymph stage of greenhouse whitefly (*Trialeurodes vaporariorum*) in a commercial tomato crop in west Auckland.

NeemAQ is a horticultural insecticide formulated as a soluble concentrate (SL) containing active ingredients from the Indian Neem tree.

2. Protocols

2.1. Efficacy

Each of the spray products was made up to the following concentrations in 1 litre containers.

- 1) NeemAQ 10 ml.l⁻¹
- 2) Eco Oil 5 ml.l⁻¹
- 3) Admiral 0.5 ml.l⁻¹
- 4) Untreated – No product
- 5) NeemAQ 10ml.l⁻¹ with Eco Oil 5 ml.l⁻¹
- 6) NeemAQ 10ml.l⁻¹ with Admiral 0.5 ml.l⁻¹
- 7) NeemAQ 10ml.l⁻¹ with Agri 50NF 2 ml.l⁻¹
- 8) NeemAQ 10ml.l⁻¹ with Ippon 0.75 ml.l⁻¹

Twenty leaflets of tomato leaves older than 21 days with more than 10 live whitefly nymphs per leaf were dipped into each of the spray product treatments.

After 8 days, numbers of live whitefly nymphs on the undersides of the leaves were counted for each of the treated leaves and a selection of untreated leaves across the whole trial area. Each leaf was first washed with plain water to remove any honeydew, dead or empty nymph cases.

2.2. Plant Safety – Tomato Fruit

Up to five immature fruit trusses were dipped in each of the above spray mixtures. After 8 days, fruit were assessed for marking or “spray damage”, and the size, shape and colour of any marking as well as whether it was permanent or removable was recorded.

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¹ Suntec NZ Ltd, P O Box 41 Tokomaru 4864 New Zealand

3. Results and Conclusions

3.1 Efficacy

The following statistically significant results occurred according to the Scheffe multiple comparison test post analysis of variance, in order of significance:

| Comparison | Means (nymph count) | Scheffe C statistic |
|---------------------------------|---------------------|---------------------|
| NeemAQ vs Untreated | 7 vs 38 | 5.774 |
| NeemAQ + Ippon vs Untreated | 8 vs 38 | 4.272 |
| NeemAQ vs Eco Oil | 7 vs 31 | 4.169 |
| NeemAQ vs Admiral | 7 vs 31 | 4.145 |
| NeemAQ + Agri 50NF vs Untreated | 10 vs 38 | 3.880 |

$$C_{\text{Critical}} = 3.834$$

NeemAQ alone, was the most effective in reducing live whitefly nymph numbers, along with the combination of NeemAQ with Ippon.

NeemAQ alone was more effective than Admiral or Eco Oil alone, during the time period of this trial

Eco Oil alone and Admiral alone did not reduce live whitefly nymph numbers compared to the untreated leaflets, during the time period of this trial.

Combinations of NeemAQ with either Eco Oil or Admiral reduced the effectiveness of NeemAQ. Combination of NeemAQ with Agri 50NF may reduce the effectiveness of NeemAQ.

3.2 Crop Safety

- 1) The combination NeemAQ with Eco Oil, resulted in black patches or brown circular markings occurring at the distal end of some treated fruit in all of the 5 treated trusses. These marks were permanent, ie they could not be rubbed off easily.
- 2) Admiral alone resulted in faint black specks forming a ring at the distal end of some fruit in 3 out of 5 trusses. These marks were not removable.
- 3) The combination NeemAQ with Admiral, resulted in black rings occurring on some fruit of two out of three treated trusses. These marks were permanent.
- 4) NeemAQ alone resulted in a faint brown speck occurring on one fruit of one of three treated trusses, however the marking was easily removed.
- 5) NeemAQ in combination with Ippon resulted in a faint black ring of specks occurring on one fruit of one of five treated trusses, however the marking was easily removed.
- 6) Eco Oil alone resulted in a faint brown ring occurring on one fruit of one of two treated trusses, however this marking was easily removed.
- 7) No fruit marking occurred as a result of NeemAQ + Agri50 NF treatment.

Acknowledgements

All spray products used in this trial were supplied by Horticulture Ltd.

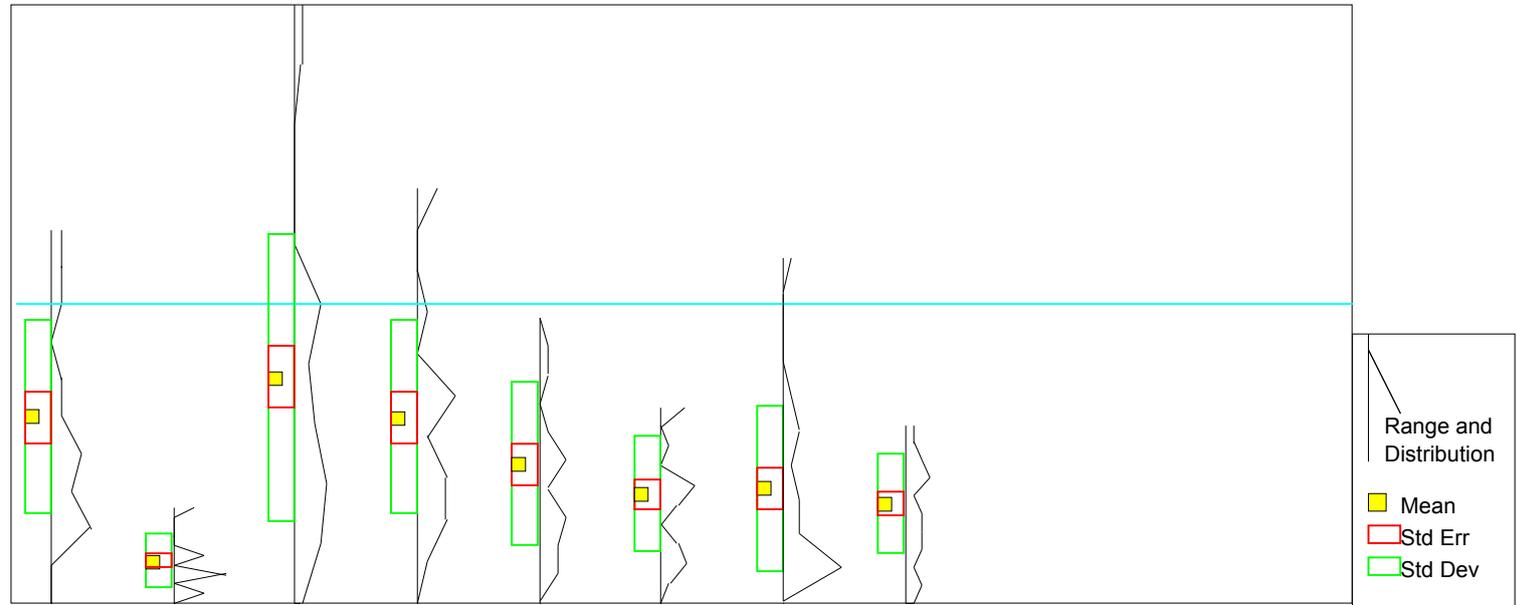
Appendix 1 – Data Analysis Report

Appendix 2 – Efficacy Graph

Data Analysis Report

Study Title NeemAQ Comparative Efficacy and Compatibility - Modified Date 6/10/13 Analyst S.Lennard

Data Summary Plot and Histogram



Summary Statistics

| Data | Count | Sum | Mean | Standard Deviation | Variance | Standard Error | 95% Confidence Interval | Minimum | Maximum | Skewness |
|------------------|-------|-----|------|--------------------|----------|----------------|-------------------------|---------|---------|----------|
| Eco Oil | 14 | 439 | 31.4 | 16.4 | 268.6 | 4.4 | 8.6 | 13. | 63. | .668 |
| NeemAQ | 13 | 91 | 7. | 4.5 | 20.7 | 1.3 | 2.5 | 2. | 16. | 1.001 |
| Untreated | 21 | 796 | 37.9 | 24.2 | 587.5 | 5.3 | 10.4 | 9. | 101. | 1.177 |
| Admiral | 14 | 437 | 31.2 | 16.4 | 267.7 | 4.4 | 8.6 | 8. | 70. | .78 |
| NeemAQ+Admiral | 15 | 350 | 23.3 | 13.8 | 191.4 | 3.6 | 7. | 6. | 48. | .582 |
| NeemAQ+Agri 50NF | 16 | 294 | 18.4 | 9.8 | 95.6 | 2.4 | 4.8 | 4. | 33. | .161 |
| NeemAQ+ Eco Oil | 16 | 310 | 19.4 | 14. | 195.9 | 3.5 | 6.9 | 6. | 58. | 1.314 |
| NeemAQ + Ippon | 17 | 285 | 16.8 | 8.4 | 70.4 | 2. | 4. | 3. | 30. | -.028 |

ANOVA Table $\omega^2 = .246$

| Source of Variance | SS | df | MS | F | F Critical |
|--------------------|-------|-----|------|-------|------------|
| Between Groups | 11045 | 7 | 1578 | 6.858 | 2.1 |
| Within Groups | 27147 | 118 | 230 | | |
| Total | 38192 | 125 | | | |

Comments
 Data has been modified to remove extreme outliers (x2) in upper range and remove lowest two data points to increase normality.

Comparative Efficacy and Compatibility

