# Evaluation of Insecticide Sequence Programmes for the Control of Onion Thrips (*Thrips tabaci*) in Pukekohe During the 2025/2026 Season

April 2026, B. Cheyne & A. Payne

## Introduction

Onion thrips (Thrips tabaci) are a persistent pest of onion crops in the Pukekohe region. Feeding damage by adults and juveniles reduces photosynthetically active leaf area and may increase crop susceptibility to secondary foliar diseases such as Stemphylium leaf blight. Under Pukekohe conditions, thrips management relies on well-timed insecticide programmes that provide sustained suppression while rotating modes of action to minimise resistance development.

This trial evaluated a range of insecticide sequence programmes, rather than single products, to quantify their effectiveness against adult and juvenile onion thrips populations and to assess impacts on gross bulb yield.

## Objective

The objective of this study was to:

- Compare the effectiveness of multiple insecticide sequence programmes for the control of onion thrips
- Quantify adult and juvenile thrips populations at each assessment timing during the spray programme
- Evaluate treatment effects on gross bulb yield at harvest

## Materials and Methods

### Trial Site and Crop

The trial was conducted during the 2025/2026 growing season within a commercial onion crop located in Pukekohe, New Zealand. The crop consisted of the red onion cultivar 903 and was managed according to standard commercial production practices. All agronomic operations, including irrigation, fertiliser applications, and disease management, were undertaken by the grower. Insecticide applications within the trial area were restricted to the designated treatment programmes.

### Experimental Design

The trial was established as a randomised complete block design (RCBD) comprising of seven treatments with four replicates per treatment. Individual plots consisted of a single bed measuring 1.7 m in width and 10 m in length. Treatments were randomly allocated within each block to minimise the effects of field variability and improve the precision of treatment comparisons.

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**Insecticide Treatments and Application Timing**

Seven insecticide sequence programmes were evaluated, including an untreated control and six rotational programmes using Uphold, Solvigo, and Benevia.

**Table 1.** Insecticide sequence programmes

| Application No. | Trt.1 (UTC) | Trt.2 | Trt.3 | Trt.4 | Trt.5 (Industry) | Trt.6 | Trt.7 |
|---|---|---|---|---|---|---|---|
| 1–3 | – | Uphold | Uphold | Solvigo | Solvigo | Benevia | Benevia |
| 4–6 | – | Solvigo | Benevia | Uphold | Benevia | Uphold | Solvigo |
| 7 | – | Benevia | Solvigo | Benevia | Uphold | Solvigo | Uphold |

Each product within a sequence was originally intended to be applied three times. However, due to delayed trial commencement and seasonal constraints, only seven spray applications were made in total. As a result:

- The first two products in each sequence received three applications each.
- The final product in each sequence received only one application
- Consequently, the final product in each programme had limited opportunity to influence thrips populations prior to assessment.

Spray application dates were:

- 1 December 2025
- 9 December 2025
- 15 December 2025
- 22 December 2025
- 30 December 2025
- 5 January 2026
- 13 January 2026

**Thrips Assessments**

Thrips populations were assessed on six occasions:

- 1 December 2025
- 9 December 2025
- 15 December 2025
- 22 December 2025
- 29 December 2025
- 5 January 2026

Importantly, all thrips assessments were completed prior to the final (7th) spray application; therefore, the results reflect the effect of only the first two sequences, comprising six applications in total. Consequently, the contribution of the final product applied in each programme was not fully captured in the thrips population data.

At each assessment:

- Adult thrips were recorded first
- Juvenile thrips were recorded second

Counts were based on 25 plants per plot, sampled from the centre rows of each bed.

### Yield Assessment

Gross bulb yield was assessed once at commercial maturity (100% top-fall) on the 16th of January 2026 and expressed as tonnes per hectare (t/ha).

### Statistical Analysis

Data was analysed using ARM 2026.0. Adult and juvenile thrips counts were analysed separately for each assessment date. Data was transformed where required to meet model assumptions, and treatment means were separated using Tukey's HSD ($\alpha = 0.05$). Yield was analysed as a single endpoint variable.

## Results

### Adult Thrips

Adult thrips populations increased in the untreated control throughout December, confirming sustained pest pressure over the season. Treatment separation became evident from the second assessment onwards.
From 15 December, all insecticide sequence programmes significantly reduced adult thrips densities relative to the untreated control. Adult suppression was not determined by the initial product alone but by the overall programme structure, including sequence design and rotation of modes of action.

Sequences incorporating Solvigo and Uphold, or Benevia and Uphold, in either order, consistently maintained lower adult thrips populations across assessments. While several high-performing programmes initiated with Solvigo or Benevia, comparable suppression was also observed when these products followed Uphold, highlighting its key role within effective control strategies.

At the final assessment on the 5th of January, all programmes continued to suppress adult thrips relative to the untreated control, despite the final product in each sequence having received only a single application.

**Table 2.** Effect of insecticide sequence treatments on adult thrips numbers

| Treatment | Dec 1 | Dec 9 | Dec 15 | Dec 22 | Dec 29 | Jan 5 |
|---|---|---|---|---|---|---|
| Untreated control | 1.98 | 3.98 bc | 7.75 a | 14.66 a | 7.86 a | 4.15 a |
| Uphold → Solvigo → Benevia | 1.62 | 4.56 abc | 1.68 c | 1.30 c | 1.83 c | 1.81 bc |
| Uphold → Benevia → Solvigo | 1.36 | 4.76 ab | 7.44 a | 5.24 b | 2.62 c | 2.43 abc |
| Solvigo → Uphold → Benevia | 1.60 | 1.52 d | 2.96 b | 2.33 c | 2.01 c | 2.06 bc |
| Solvigo → Benevia → Uphold | 1.73 | 3.48 c | 1.76 c | 0.99 c | 4.21 b | 3.61 ab |
| Benevia → Uphold → Solvigo | 1.70 | 5.36 a | 3.16 b | 2.01 c | 2.03 c | 1.23 c |
| Benevia → Solvigo → Uphold | 1.58 | 1.88 d | 3.83 b | 1.19 c | 4.36 b | 2.66 abc |

**Juvenile Thrips**

Juvenile thrips populations exhibited clearer and more consistent treatment separation than adult counts. The untreated control recorded the highest juvenile densities at every assessment, with a population peak in late December.

All insecticide sequence programmes significantly reduced juvenile thrips populations from the 15th of December onwards. Sequences that alternated products with differing modes of action were particularly effective at limiting juvenile recruitment.

Importantly, suppression of juvenile thrips was observed across multiple sequences. This indicates that the cumulative effect of the sequence, rather than the initial product alone, was responsible for reducing population development.

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**Table 3.** Effect of insecticide sequence programmes on juvenile thrips numbers

| Treatment | Dec 1 | Dec 9 | Dec 15 | Dec 22 | Dec 29 | Jan 5 |
|---|---|---|---|---|---|---|
| Untreated control | 3.78 | 5.97 ab | 13.09 a | 20.35 a | 22.82 a | 9.06 a |
| Uphold → Solvigo → Benevia | 3.17 | 8.36 a | 6.80 b | 3.94 b | 3.89 b | 4.97 bc |
| Uphold → Benevia → Solvigo | 2.93 | 8.28 a | 6.56 b | 5.39 b | 4.36 b | 7.23 ab |
| Solvigo → Uphold → Benevia | 3.40 | 0.84 c | 5.92 b | 4.72 b | 3.52 b | 2.70 c |
| Solvigo → Benevia → Uphold | 3.29 | 2.47 bc | 3.04 d | 6.57 b | 6.69 b | 6.86 ab |
| Benevia → Uphold → Solvigo | 3.67 | 6.68 a | 4.56 c | 6.86 b | 3.93 b | 3.31 c |
| Benevia → Solvigo → Uphold | 3.03 | 2.44 bc | 4.08 cd | 5.00 b | 5.20 b | 5.87 abc |

**Yield**

Gross bulb yield ranged from 44.20 t/ha to 50.39 t/ha. While some insecticide programmes produced numerically higher yields than the untreated control, differences were not statistically significant (P = 0.296).
Yield results reflect whole season crop performance, including the final application that was not captured in thrips assessments.

**Table 4.** Effect of insecticide sequence programmes on total yield

| Treatment | Yield |
|---|---|
| Untreated control | 48.02 |
| Uphold → Solvigo → Benevia | 47.95 |
| Uphold → Benevia → Solvigo | 47.38 |
| Solvigo → Uphold → Benevia | 50.39 |
| Solvigo → Benevia → Uphold | 49.64 |
| Benevia → Uphold → Solvigo | 46.80 |
| Benevia → Solvigo → Uphold | 44.20 |

## Discussion

This trial demonstrated that onion thrips control was determined by sequence performance over time, rather than the presence or absence of any single product. Programmes incorporating Solvigo or Benevia early followed by Uphold often performed well.

The results highlight the importance of:

- Rotating modes of action
- Avoiding reliance on a single product
- Designing programmes that suppress juvenile populations to limit adult pressure later in the season

The inability to fully express the final product in thrips assessments should be considered when interpreting results. Nevertheless, consistent suppression across sequences indicates that effective population management can be achieved through strategic sequencing, not just product choice.

## Conclusion

All insecticide sequence programmes reduced onion thrips populations relative to the untreated control when assessed using combined adult and juvenile thrips counts. The results indicate that programme efficacy was determined by the interaction and sequencing of insecticides throughout the season, rather than by the performance of any single product or the product applied first.

Although the final insecticide within each programme had limited time to demonstrate its full effect prior to assessment, several sequences provided sustained suppression of onion thrips populations. Programmes incorporating multiple modes of action performed particularly well, supporting the value of rotational strategies for effective pest management and resistance mitigation.

Overall, the findings support the use of strategically designed insecticide sequences as an important component of integrated onion thrips management programmes in Pukekohe onion production systems.

**Appendix**

**Appendix i –** Weather Data

| | December | | | January | | |
|---|---|---|---|---|---|---|
| **Date** | **Max (°C)** | **Min (°C)** | **Rainfall (mm)** | **Max (°C)** | **Min (°C)** | **Rainfall (mm)** |
| 1 | 24.1 | 13.5 | 0 | 24.2 | 15.4 | 0.1 |
| 2 | 23.1 | 19 | 9.1 | 25.2 | 13.2 | 20.8 |
| 3 | 25.5 | 13.5 | 29.4 | 23.8 | 12.2 | 17.9 |
| 4 | 21.7 | 14.7 | 0 | 26.5 | 12.6 | 0 |
| 5 | 22.6 | 14.6 | 0 | 26.5 | 13.2 | 0 |
| 6 | 25 | 12.3 | 0 | 26.1 | 15.4 | 0 |
| 7 | 28.4 | 12 | 0 | 27 | 15.7 | 0 |
| 8 | 29.5 | 14.8 | 0 | 24.3 | 15.3 | 0 |
| 9 | 29.6 | 14 | 0 | 25 | 17.2 | 0 |
| 10 | 30.5 | 15.3 | 0 | 26.7 | 14.7 | 0 |
| 11 | 27.1 | 14.8 | 0 | 28.5 | 16.9 | 0 |
| 12 | 23.1 | 11.8 | 0 | 24.6 | 11.5 | 0 |
| 13 | 26.3 | 12.2 | 0 | 27.6 | 17.4 | 0 |
| 14 | 25.4 | 11.7 | 0 | 28 | 19.6 | 3.7 |
| 15 | 24.1 | 16.7 | 0.3 | 26.3 | 18 | 28.6 |
| 16 | 26.2 | 12.1 | 16.1 | 25.4 | 13.4 | 0 |
| 17 | 20.3 | 9.2 | 1.2 | - | - | - |
| 18 | 22.7 | 13.3 | 0.7 | - | - | - |
| 19 | 21.7 | 16.1 | 4.8 | - | - | - |
| 20 | 22.1 | 13.9 | 0.4 | - | - | - |
| 21 | 22.1 | 9.4 | 0 | - | - | - |
| 22 | 23.5 | 18.6 | 4 | - | - | - |
| 23 | 23.1 | 19.3 | 2.2 | - | - | - |
| 24 | 25.1 | 11.6 | 0.1 | - | - | - |
| 25 | 26 | 12.4 | 0 | - | - | - |
| 26 | 26.9 | 14.2 | 9.9 | - | - | - |
| 27 | 19.6 | 11.2 | 2 | - | - | - |
| 28 | 23 | 14.7 | 0 | - | - | - |
| 29 | 22.3 | 16.4 | 6.4 | - | - | - |
| 30 | 25.1 | 18 | 3.9 | - | - | - |
| 31 | 24.8 | 16.3 | 7.2 | - | - | - |