# Grower Summary

## PC 302d

Tomato: Phase 4 of the development of a robust IPM programme for *Tuta absoluta*

Final 2013

## Disclaimer



The results and conclusions in this report may be based on an investigation conducted over one year. Therefore, care must be taken with the interpretation of the results.

## Use of pesticides

Only officially approved pesticides may be used in the UK. Approvals are normally granted only in relation to individual products and for specified uses. It is an offence to use non-approved products or to use approved products in a manner that does not comply with the statutory conditions of use, except where the crop or situation is the subject of an off-label extension of use.

Before using all pesticides check the approval status and conditions of use.

Read the label before use: use pesticides safely.

## Further information

If you would like a copy of the full report, please email the HDC office (hdc@hdc.ahdb.org.uk), quoting your HDC number, alternatively contact the HDC at the address below.

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| **Project Number:** | PC 302d |
| **Project Title:** | Tomato: Phase 4 of the development of a robust IPM programme for Tuta absoluta |
| **Project Leader:** | Paul Howlett |
| **Contractor:** | Wight Salads Ltd |
| **Industry Representative:** | Dr Phil Morley, TGA |
| **Report:** | Final 2013 |
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| **Previous report/(s):** | N/A |
| **Start Date:** | 01 January 2013 |
| **End Date:** | 28 February 2014 |
| **Project Cost:** | £23,900 |

## Headline

A new IPM compatible strategy for the control of *Tuta absoluta* in UK tomato crops is given in this report.

## Background

*Tuta absoluta* was first intercepted in the UK on Spanish imports in March 2009 and there soon followed an outbreak in a commercial crop. The pest rapidly became established on several sites across the country where it caused extensive damage by mining in leaves, stems and fruit. UK tomato growers desperately required a reliable method of controlling *T. absoluta* which could be integrated into the existing IPM programme.

The project team has been working towards a robust control programme for *T. absoluta* in conventional and organic crops since the pest's arrival at WSG's production site in Portugal in 2008. Based on experience gained in Mediterranean countries during 2009 and 2010, the team designed a theoretical season-long IPM strategy based on the predatory bug, *Macrolophus* spp. Potential components of this programme were evaluated using a 'modular' approach in which each module was tested independently. The most effective and compatible modules were then brought together for evaluation within this project.

The main components of the programme were:

- *Macrolophus pygmaeus* - a predatory bug
- A product containing spinosad, Product A – an insecticide derived from naturally occurring soil fungi*
- A product containing chlorantraniliprole, Product B - an IPM compatible target specific insecticide*

***These products are only available via a plant health order issued by the FERA Plant Health Inspectors when there is an outbreak of *Tuta absoluta*.**

The intention was to release *Macrolophus* at the start of the growing season in the knowledge that it should begin to provide some control by late spring / early summer. The pest would be allowed to colonise the crop but population growth would be slowed by an application of Product A via the irrigation system before the first generation of caterpillars completed their development. If necessary, Product B would be used as a second line of defence (SLoD) to suppress pest development until the predator gained control. The importance of varying the chemistry used for *T. absoluta* treatments must not be underestimated due to the ever present risk of resistance selection.

## Summary

The overall aim of the project was to create a cost-effective and sustainable IPM programme for *T. absoluta* in UK tomato crops. Specific technical objectives were to:

- To evaluate a prototype IPM programme in four ‘types’ of tomato crops.
- Draft a Factsheet for UK growers describing in detail the new IPM programme.
- Convey results to the tomato industry.

### *The approach*

Four sites were selected for inclusion in the project based on their recent history of *T. absoluta* infestations, their type of growing system and the experience of the nursery staff in participating in large scale experimental trials. The sites included a coir-grown crop, a rockwool-grown crop, a NFT-grown crop and a soil-grown organic crop. *Tuta absoluta* did not become established at the organic site during the first three months of the trial, so the study was switched to a late planted (week 12) soil crop at another site to ensure capture of some data about such crops.

The crops were carefully monitored throughout the 2013 growing season. The nursery staff recorded numbers of adult *T. absoluta* using pheromone traps following a technique developed in HDC Project PC302 and Dr Jacobson visited each site at 2-4 week intervals to record numbers of both *T. absoluta* larvae and *Macrolophus*. Decisions on the timing and type of actions to be taken in each stage of the IPM programme were made in response to the pest monitoring data.

### *Macrolophus establishment*

Where *Macrolophus* was released early in the growing season at the rate of 1/m$^2$ and then provided with Artemia eggs as supplementary food, the populations began to reach useful levels by mid-May and continued to grow throughout the summer months. By the end of September, there were 6-8 predators per plant head. At the NFT site, where *Macrolophus* was released at lower rates and without supplementary food, population growth was slower. The optimum rates of release and the true benefits of providing supplementary food for *Macrolophus* were beyond the scope of this project and must be investigated in more detail. No *Macrolophus* were released in the soil-grown crop due to the late planting date and there was very little natural colonisation from other sources.

### *Active mines on plants and timing of insecticidal treatments.*

At the coir and rockwool sites, numbers of active mines increased markedly 8-9 weeks post-planting and the first treatment of Product A was deemed necessary after a further 3-4 weeks

(*i.e.* late-March / early-April). This provided protection for a further 6-8 weeks when a SLoD treatment was required. In both cases, the speed of the pest development necessitated application via the irrigation system. Thereafter, numbers were suppressed by *M. pygmaeus* and remained at a very low level until the end of the season. No end of season ‘clean-up’ treatments were required against *T. absoluta*.

The situation developed differently in the earlier planted NFT crop. Active mines were found soon after planting and the first Product A treatment was applied 4 weeks later (mid-January). This provided protection for 16 weeks (*i.e.* until mid-May) when a SLoD with Product B was applied. In the absence of adequate protection from *Macrolophus*, another SLoD was required after a further 10 weeks (mid-July). The speed of the pest development at that time necessitated application via the irrigation system. Thereafter, the growing *Macrolophus* population suppressed the pest and no further treatment was required at the end of season.

The soil-grown crop was planted later and grown at a lower temperature regime. As a consequence, the first Product A treatment was not required against *T.absoluta* until mid-summer. In the absence of *Macrolophus*, two further SLoD treatments were required at intervals of 4-5 weeks. The first was Product A via the irrigation system in late July. The second was a high volume spray of Product B which doubled as the end of season ‘clean-up’.

It was clear that the protection afforded by Product A when applied via the irrigation to soil-grown crops was 2-3 weeks less than when applied by the same method to coir-, rockwool- or NFT-grown crops.

### *Compatibility of spinosad and Macrolophus*

Spinosad has been shown to have some detrimental effect on *Macrolophus* populations when tested in laboratory bioassays. Guido Sterk (IPM Impact, Belgium) has demonstrated ‘moderate toxicity’ following topical application by spraying, which equates to 50-75% mortality in the bioassays. When applied via the irrigation, he reported the impact to be reduced to ‘slight toxicity’, which equates to 25-50% mortality. In practice, there are now many documented cases of *Macrolophus* populations continuing to increase in size on commercial tomato crops following both high volume sprays and systemic applications of products containing spinosad. The assessments in the present trials reaffirm those observations.

### *In summary*

The IPM programme was highly successful at both the coir and rockwool sites. At the NFT site, *Macrolophus* population growth was slower and as a consequence an additional SLoD treatment was required. However, no plants were lost due to foliar / stem mining and no fruit were graded out due to caterpillar activity.

Results in the soil-grown crop were less conclusive due to the late planting and lack of *Macrolophus.* However, the various components of the programme have been shown to be independently effective in soil-grown crops. Product A applied via the irrigation reduced the *T. absoluta* numbers although the residual effect on subsequent population growth was 2-3 weeks less than in the other three types of growing system. Product B, as a high volume spray, proved to be an effective SLoD. *Macrolophus* is known to establish on soil-grown organic crops and should colonise the plants as rapidly as on coir and rockwool if introduced at the same rate and provided with supplementary food.

Some further work is required to determine the optimum rates of release of *Macrolophus* and the true value of providing supplementary food for independently.

## Financial Benefits

In 2012, *T. absoluta* was considered to be the most important pest of tomato crops in the UK. At one nursery during June-July 2012, 30% of fruit were damaged by the pest and graded out. This represented a loss of approximately £50k per hectare to that grower for that period alone. The project would have provided a x2 payback from that single example.

## Action Points

- It is important that growers have accurate topical information upon which to base their decisions throughout the season:
  - Count active *T. absoluta* mines on the plants to provide reliable information about the size of the pest population. The procedure must be tailored to each individual site taking into account the type of crop, size of glasshouse and any other monitoring systems that are already in place.
  - Count *Macrolophus* following the guidelines provided in HDC Factsheet 14/10.
- Release *Macrolophus pygmaeus* at the rate of 1 per $m^2$ as soon as possible after the plants are brought into the production glasshouse. The provision of supplementary food as *Artemia* feeding stations may aid establishment but this requires further investigation.
- Allow *T. absoluta* to colonise the crop and then apply Product A via the irrigation system before the first caterpillars complete their development. This must be done in conjunction

with a Plant Health Order for the control of *T. absoluta and* follow the instructions detailed in the EAMU provided by the FERA Plant Health Inspector. This treatment can be supplemented by physical control methods including deleafing, sticky floor treatments and mass trapping with pheromone and / or light traps. However, it is difficult to quantify the real contribution made by such actions.

- Despite the measures taken to delay *T. absoluta* population growth up to this point, it seems inevitable that at least one SLoD treatment will be required before the predatory bugs start to have a significant impact. It is proposed that Product B be the first choice. This product is completely compatible with *Macrolophus* and introduces different chemistry thus reducing resistance selection pressure. Product B high volume sprays must be done in conjunction with a Plant Health Order for the control of *T. absoluta* and follow the instructions detailed in the EAMU provided by the FERA Plant Health Inspector. In some circumstances, treatment with Product A may have to be repeated.
- Other options for SLoD treatments include entomopathogentic nematodes and *Bacillus thuringiensis*, depending on the type of damage and type of crop. However, this must first be discussed and agreed with Plant Health section of FERA.
- By late-spring, *Macrolophus* should be more numerous and start to suppress the *T. absoluta* population growth by feeding on eggs and larvae. However, careful monitoring is required to determine whether it becomes necessary to apply additional SLoD treatments.
- If monitoring indicates that an end of season 'clean-up' treatment is required, then it is suggested that Steward® (indoxacarb) be used as it brings different chemistry to the programme and thus contributes to resistance management.