TUTA ABSOLUTA: THE BATTLE GOES ON

Rob Jacobson, independent IPM and pollination consultant, describes how the UK's IPM programme against *Tuta absoluta* has come under threat and summarises his results with a novel new mating disruption technique in 2017 (AHDB project PE 032)

Recent history of *Tuta absoluta* in the UK

Tuta absoluta arrived in the UK in 2009 and rapidly became the most important pest of our commercially-grown tomatoes.

For example, as a result of *T. absoluta* damage, 30% of mined fruit were graded out during June and July at one UK nursery in 2012. That caused losses of £50k per hectare for that grower for that period alone.

By 2013, Dr Jacobson, working on behalf of the British Tomato Growers' Association and with HDC funding, had developed a completely new IPM strategy for use against the pest. The programme was based on the predator, *Macrolophus pygmaeus*, integrated with some physical control measures and the chemical insecticides, spinosad (Conserve), chlorantraniliprole (Coragen) and indoxacarb (Steward). *Macrolophus* was released at the start of the growing season so that it would start to provide some control of the pest by late spring or early summer. When the pest arrived, it was allowed to colonise the crop but population growth was slowed by applying spinosad through the irrigation system before the first generation of caterpillars completed their development. If necessary, a high volume spray of chlorantraniliprole was applied as a second line of defence during the summer to keep the pest and predator populations in balance. If crop monitoring indicated that a clean-up spray was required at the end of the season, then the third insecticide, indoxacarb, was used to reduce the number of *T. absoluta* surviving in the glasshouse to infest the next crop. The three insecticides used in the IPM programme were from different Insecticide Resistance Action Committee (IRAC) Mode of Action Classification Groups and, together with the biological control agent, should have formed a robust resistance management strategy. Nonetheless, strict warnings were given to growers about maintaining an effective insecticide resistance management strategy.

The IPM programme was very successful and British tomato growers admit that they became complacent about the pest. However, during the 2015 and 2016 growing seasons several growers began to experience difficulties with various components of the programme.

Resistance to spinosad was confirmed (via AHDB project, PE 028, and independent testing) at three UK nurseries. In addition, a spinosad resistant population of *T. absoluta* was

confirmed on a Danish nursery even though the insecticide had never been used on that site. That population had recently arrived in Denmark on organic produce from Spain and must have already been resistant to spinosad. Chlorantraniliprole treatment failures at two UK sites in 2016 may also have been due to resistance. If so, this would be consistent with the development of resistance in Italy and Greece. These control failures made it clear that the British tomato industry had to take measures to remain one step ahead of this potentially devastating pest.

Mating disruption as part of the IPM programme

The concept of mating disruption as a component of the *T. absoluta* IPM programme was first introduced to the UK tomato industry by Dr Jacobson at the 2011 'Tomato Conference'. It involves artificially saturating the atmosphere in the glasshouse with a synthetic version of the sex pheromone that is naturally produced by female moths to attract males prior to copulation. As a consequence, the males become confused and are unable to find the females - so they do not mate. The mating disruption product, Isonet-T, which was produced by ShinEtsu and is distributed by CBC (Europe) and Fargro Ltd, was approved for use in the UK at the start of the 2017 growing season.

The mating disruption technique had the potential to slow down *T. absoluta* population growth in the early part of the season while *Macrolophus* were becoming established; thereby providing an alternative to Conserve via the irrigation in the IPM programme. Unpublished reports from mainland Europe, where it had been used in 2016, were very promising. However, a peer reviewed study from the University of Liege (Belgium) indicated that some female *T. absoluta* exhibited parthenogenesis (*i.e.* production of eggs without mating) which would clearly compromise the efficacy of this system. Crop-scale trials were urgently required to determine the true potential of this product for UK growers.

AHDB funded project, PE 032, began at the start of the 2017 growing season with a mating disruption trial hosted by Jan Bezemer & Sons, North Yorkshire. The pest had been present in these crops at the end of the 2016 growing season and male moths continued to be caught in pheromone-based monitoring traps in the empty glasshouses during December.

Isonet-T dispensers containing the sex pheromone were placed in crops in early January - either one week before or two weeks after the arrival of the tomato plants. The image opposite shows a single Isonet-T pheromone dispenser attached to the support wire in a tomato crops – one of 1,000 deployed per hectare.

Where placement of dispensers was delayed by two weeks, a few active *T. absoluta* mines were seen during the first 4 weeks of the crop but none thereafter. Otherwise, no active mines were found during the following 22 weeks in any of the treatments. By that time, *Macrolophus* were well established and capable of controlling any subsequent *T. absoluta* infestation. The full trial results, which were nothing short of spectacular, are provided in the project report which is available from the AHDB.

Several TGA members, who already had significant *T. absoluta* infestations in their crops in February 2017, were watching our mating disruption trial with interest. They all opted to place Isonet-T dispensers in their crops despite our belief that they had already passed the optimum time for treatment. However, their results were, without exception, beyond all our expectations. The pest population growth stopped immediately and the crops gradually 'cleaned up' as the old damage was removed by routine deleafing. Only one of the growers saw any resurgence of *T. absoluta* that growing season and that was only in one of his many glasshouses.

Despite these truly spectacular results, it is important that we do not dismiss the reports of parthenogenesis published by the University of Liege. It is quite possible that our use of the mating disruption technique could select for a small proportion of female moths that exhibit parthenogenesis - just as the use of certain insecticides can select for resistance to that particular chemistry. Colleagues at Exeter University are beginning to study parthenogenesis with particular reference to the selection process in *T. absoluta*. Meanwhile, it is important that UK growers only use Isonet-T as part of an IPM programme with equal consideration given to other biological, physical and insecticidal products.

Dr R J Jacobson
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