ONION THRIPS MANAGEMENT: CRISIS AVERTED? WHAT'S NEXT?

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Onion thrips (*Thrips tabaci* Lindeman) is a major onion pest that can cause significant bulb yield reductions if not managed. Insecticide use is the principal tool for managing thrips, but more research is needed to evaluate the performance of new insecticides and identify strategies that minimize their use without compromising the level of control and that mitigate insecticide resistance development. This article provides some guidelines on how to improve management of thrips using new reduced-risk insecticides and resistant cultivars.

Based on multiple years of examining efficacy of insecticides to manage onion thrips in onion, the best performing products have been (trade names listed in alphabetical order) Agri-Mek SC (Syngenta), Exirel (DuPont Crop Protection), Movento (Bayer CropScience), and Radiant SC (Dow AgroSciences) (**Fig. 1**). Using these products in a sequence will provide season-long control and should mitigate insecticide resistance development and reduce pesticide and input costs. For example, past studies in New York and other locations throughout the U.S. have shown excellent season-long thrips control with the following sequence of products (in order of first spray to last spray): Movento, Movento, Agri-Mek, Agri-Mek, Radiant and Radiant (**Fig. 2**). The logic behind this sequence is that each thrips generation is limited to being exposed to a single insecticide. While this strategy has not proven to delay insecticide resistance in onion thrips populations, similar strategies have proven to delay resistance in other vegetable insect pests.

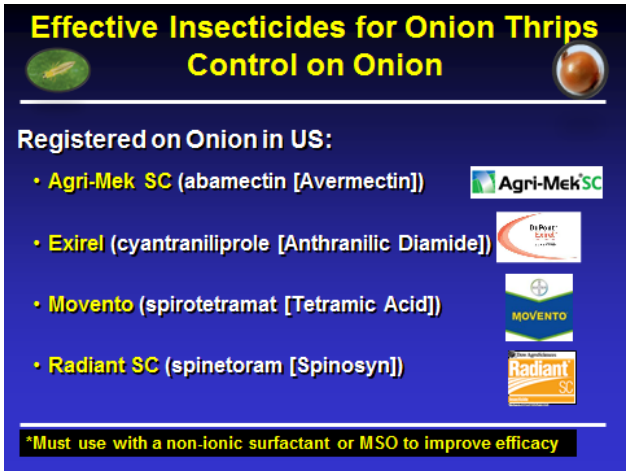


Figure 1. Effective products for onion thrips control in onion. Note: Exirel is not labelled in NY as of Jan. 1, 2015.

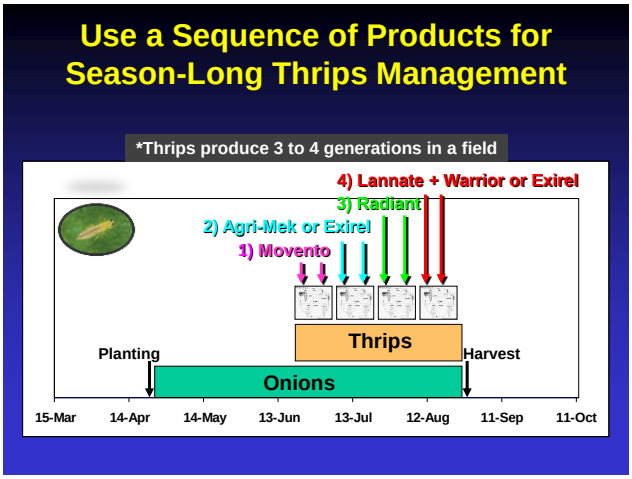


Figure 2. Sequence of products used for season-long control of onion thrips in onion. Note: Exirel is not labelled in NY as of Jan. 1, 2015.

While a weekly sequence of insecticide applications has been effective in managing thrips infestations, there are likely instances when the frequency of applications is not needed on a weekly basis. Incorporating action thresholds to determine whether or not an insecticide application is warranted each week also has been shown to effectively manage onion thrips. For example, using an action threshold of 1 thrips larva per leaf for most insecticides works well and 3 thrips larvae per leaf works well for Radiant. In some cases, thrips can be managed over the entire season with substantially fewer applications compared with a weekly spray program (**Fig. 3**).

Exirel is the newest effective insecticide registered on onion for managing thrips. While it has a national registration, it is not yet labelled for use in New York (as of January 1, 2015). Identifying where Exirel fits best in a sequence of foliar-applied products to manage thrips during the season is important. Past research in New York showed that starting the season-long thrips control program with two applications of Movento controlled onion thrips significantly better than starting with two applications of Exirel (data not shown). Therefore, should Exirel be applied in the middle or end of the season in a season-long sequence?

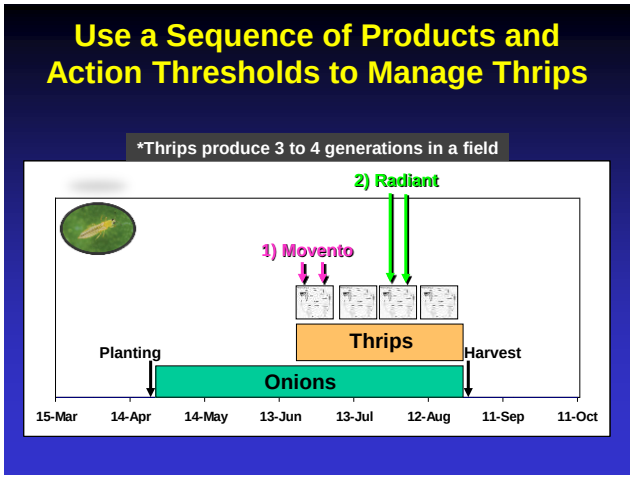


Figure 3. Products applied in a sequence and only when the density of thrips exceeds an action threshold to control onion thrips in onion over the entire season.

To examine this question, a field trial near Elba, NY in 2014 was conducted in which three different sequences of insecticide products were evaluated on a weekly basis for 6 consecutive weeks: (a) Movento, Movento, Agri-Mek, Agri-Mek, Radiant and Radiant (= MMAARR); (b) Movento, Movento, **Exirel, Exirel**, Radiant and Radiant (=MM**EE**RR); and (c) Movento, Movento, Radiant, Radiant, **Exirel, Exirel** (=MMRR**EE**). All insecticide sequence treatments provided equivalent season-long thrips control, indicating that placement of Exirel either in the middle or at the end of the sequence did not make a difference (**Fig. 4**).

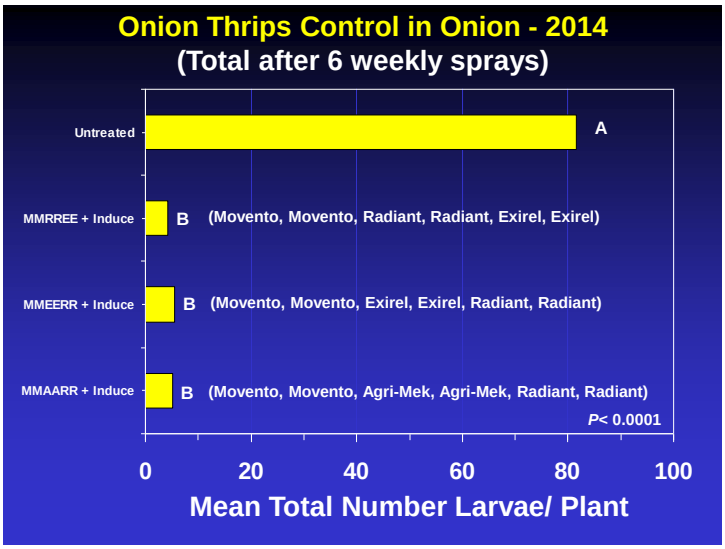


Figure 4. Efficacy of insecticide sequences examined to provide season-long control of onion thrips in an onion field near Elba, NY in 2014. Note: Exirel is not labelled in NY as of Jan. 1, 2015.

According to the labels for the four insecticides listed in **Fig. 1,** all should be co-applied with a non-ionic surfactant or methylated seed oil to improve efficacy against thrips on onion. There are many types of surfactants and identifying those to co-apply with these insecticides that will enhance thrips control is important.

To address this issue, a field trial was conducted in New York in 2014 in which various surfactants were combined with insecticides to determine their efficacy against onion thrips in onion. The surfactants evaluated were Induce (non-ionic), MSO (methlyated seed oil), Silwet L-77 (organosilicone), and both PureSpray Green and JMS Stylet Oil (mineral oil) (**Fig. 5**). The insecticide sequence treatment was evaluated either with or without surfactants. The insecticide sequence for all treatments was Movento, Movento, Agri-Mek, Agri-Mek, Radiant and Radiant [=MMAARR Only]). Results indicated that the insecticide-only treatment (MMAARR Only) provided only mediocre control of the thrips infestation. The insecticide treatment sequence co-applied with MSO did not provide as effective thrips control as those co-applied with Induce, Silwet L-77 or JMS Stylet Oil. Those applied with PureSpray Green provided an intermediate level of control between MSO and the others.

Surfactants should be co-applied with insecticides to improve efficacy for managing onion thrips infestations in onion. Among the surfactants examined, all significantly improved the performance of the insecticide sequence regimen.

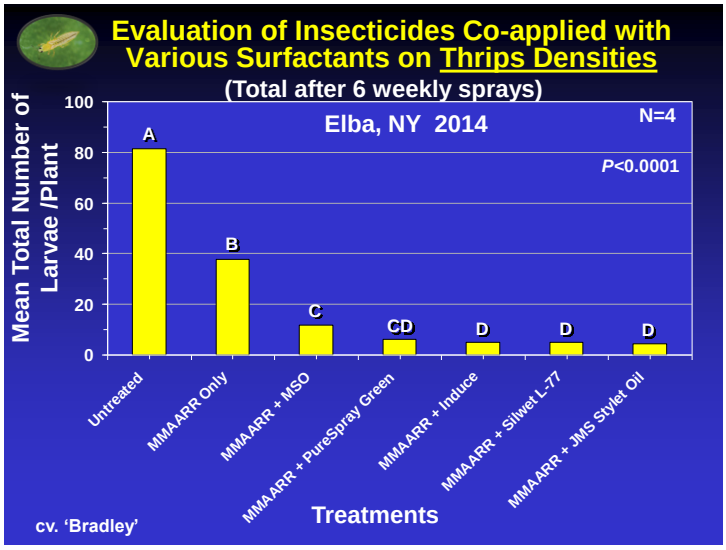
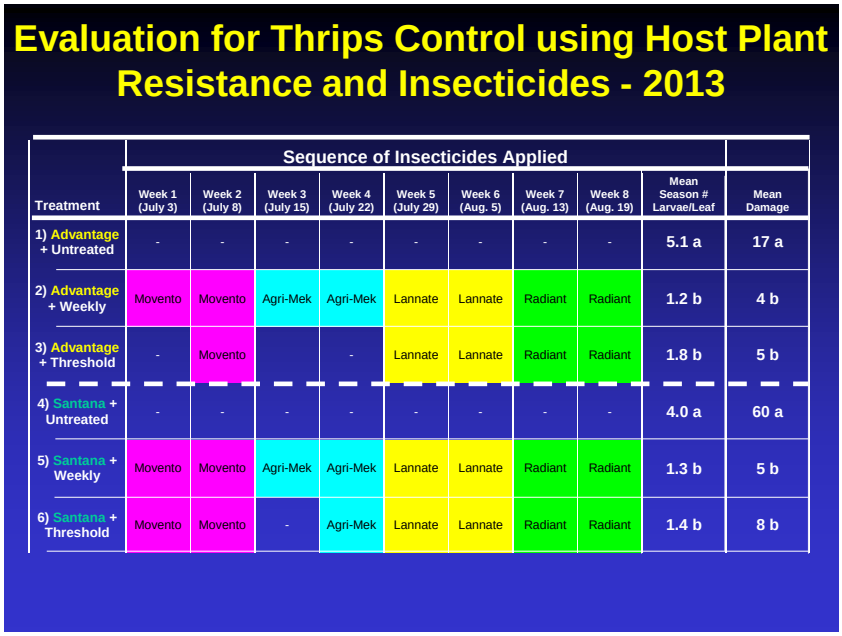


Figure 5. Efficacy of insecticides co-applied with various types of surfactants in which all insecticide sequences were identical, but surfactants differed, to provide season-long control of onion thrips in onion.

Long-term onion thrips management should include tactics that complement insecticide use. One of the most promising and sustainable means to manage insects is to grow cultivars that are resistant to them or the damage they cause. Several commercially available onion cultivars have low levels of resistance to onion thrips and research is needed to evaluate the combination of "thrips-resistant" onions and an action-threshold based insecticide program, which already has been developed.

In 2013 and 2014, a strategy that included a cultivar that had a low level of thrips resistance and an insecticide regimen based on a predetermined sequence of products timed using action thresholds was evaluated for thrips control near Elba, NY. Dry bulb onion seeds, cv. 'Advantage' (=thrips-resistant) and cv. 'Santana' (=thrips-susceptible) were planted in separate experiments because each had a different maturity (i.e., Advantage matured 7 to 10 days later than Santana). For each cultivar, there were three insecticide treatments: a) no insecticides, b) weekly spray program, and c) action-threshold based spray program. An action threshold of 1 larva per leaf was used for all action threshold treatments.

Results indicated that thrips were controlled effectively in both Advantage and Santana plantings following either the weekly spray program or the action threshold program in both years (**Figs. 6, 7**). However, fewer insecticide applications were applied in the action threshold program compared with the weekly spray program (**Figs. 6, 7**). Thrips damage in all insecticide-treated plots was significantly lower than in untreated ones **(Figs. 6, 7)**. Thrips densities in untreated Advantage plots were similar to those in untreated Santana in both years, indicating that the resistant properties in Advantage were insufficient to reduce the thrips infestation



Treatment	Sequence of Insecticides Applied									
	Week 1 (July 3)	Week 2 (July 8)	Week 3 (July 15)	Week 4 (July 22)	Week 5 (July 29)	Week 6 (Aug. 5)	Week 7 (Aug. 13)	Week 8 (Aug. 19)	Mean Season # Larvae/Leaf	Mean Damage
1) Advantage + Untreated	-	-	-	-	-	-	-	-	5.1 a	17 a
2) Advantage + Weekly	Movento	Movento	Agri-Mek	Agri-Mek	Lannate	Lannate	Radiant	Radiant	1.2 b	4 b
3) Advantage + Threshold	-	Movento		-	Lannate	Lannate	Radiant	Radiant	1.8 b	5 b
4) Santana + Untreated	-	-	-	-	-	-	-	-	4.0 a	60 a
5) Santana + Weekly	Movento	Movento	Agri-Mek	Agri-Mek	Lannate	Lannate	Radiant	Radiant	1.3 b	5 b
6) Santana + Threshold	Movento	Movento	-	Agri-Mek	Lannate	Lannate	Radiant	Radiant	1.4 b	8 b

Figure 6. Numbers of applications and efficacy of management strategies that combined host plant resistance and insecticide sequences timed using action thresholds to manage onion thrips in onion in 2013.

(**Fig. 6, 7**). However, thrips damage in Advantage was substantially lower than in Santana and did not reduce bulb yield (data not shown). Thrips in Advantage tended to concentrate in the neck of the plant throughout the study, while those in Santana fed on the entire leaf surface later in the season, perhaps explaining why more damage occurred in Santana. Another explanation is that Advantage canopy was larger than Santana canopy, so the same amount of feeding damage on Advantage would be proportionally lower than that on Santana.

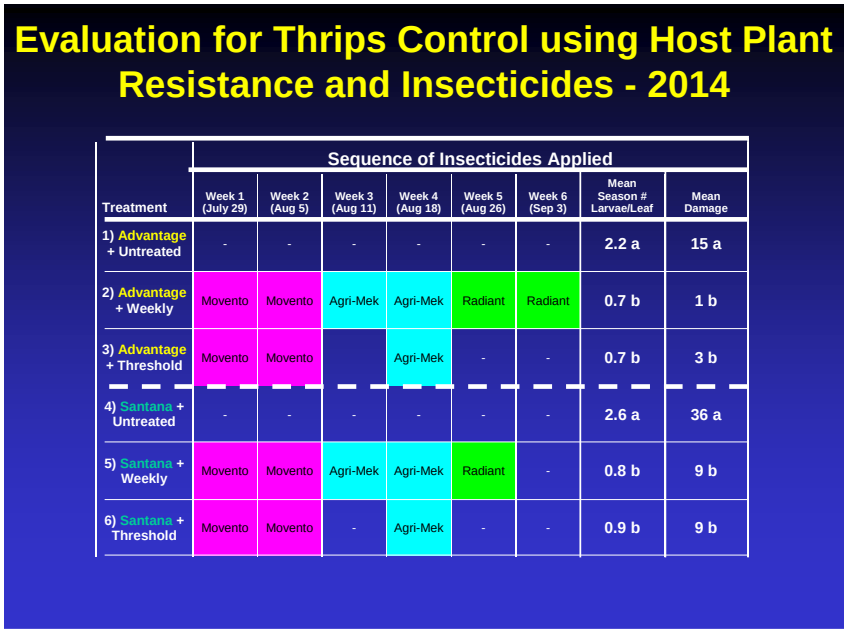


Figure 7. Numbers of applications and efficacy of management strategies that combined host plant resistance and insecticide sequences timed using action thresholds to manage onion thrips in onion in 2014.

Inclusion of a thrips-resistant cultivar and an action-threshold based insecticide regimen may reduce the overall application frequency in some years and will provide excellent thrips control.

Has the thrips crisis been averted? Yes! There is a new set of effective insecticides, each of which should be used sparingly (no more than two consecutive applications). These insecticides should be applied following a predetermined sequence as described previously (e.g., MMAARR). Determining when to apply an insecticide based on an action threshold will likely reduce overall insecticide use. Taken together, this approach for managing onion thrips with insecticides should be highly effective for many years. However, long-term management of thrips also should consider other management tactics to use along with insecticides. Thrips-resistant onion cultivars are a promising tactic and should be considered when available.