

## 2012 Maggot Control in Processing Onions

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**Introduction:** Maggots (the larval stage of flies) including the onion maggot, *Delia antiqua*, and the seed corn maggot, *Delia platura*, are problem pests of onion. Larvae attack seedlings and young onion plants feeding on the developing epicotyls and roots. A single maggot can kill up to 10 seedlings. Control of the first generation is often sufficient, as long as the onion crop is not otherwise stressed. Diseased or physically injured onions are susceptible to damage by second- and third-generation maggots because bulbs from damaged plants attract flies and are more penetrable by the maggots. Maggots are typically most problematic in soils with high organic matter or in fields with a large amount of decaying crop residue.

In 2011 and 2012, a maggot control study was established at the Intermountain Research and Extension Center with funding support from the California Garlic and Onion Research Board. Study objectives were to compare insecticides and insecticide application methods to the current in-furrow standard (chlorpyrifos). The preceding crop at the study sites was alfalfa which was rototilled shortly before planting the onions. The abundant decaying organic matter after alfalfa stand removal created optimal conditions to attract maggot flies. During May and June, sticky traps placed throughout the trial area captured high numbers of both seed corn maggot and onion maggot flies. ***Some pesticides listed in this report may not be labeled for use in onions. Please consult pesticide labels for use instructions.***

### General Trial Information for 2012

**Location:** Tulelake, CA  
**Soil Type:** Tulebasin mucky silty clay loam 4.2% organic matter  
**Planting Date:** April 28, 2012  
**Harvest Date:** September 27, 2012  
**Irrigation:** Solid-set sprinklers  
**Plot Size:** 6 ft (2 beds) by 25 ft  
**Bed (row) Spacing:** 36 inches; 4 seed-lines per bed spaced 6 inches apart  
**Trt Replication:** 6 replications; RCB design  
**Onion Seed Source:** Sensient Variety (86% germination)  
**Seeding Rate:** 1200 seeds per plot (348,500 seeds per acre)

### Insecticide Application Methods:

- Insecticides were applied as a seed treatment, in-furrow at planting, rototill incorporated into the onion bed before planting, and water incorporated shortly after planting. In-furrow treatments were applied using Teejet AI80015VS nozzles @ 30 psi. The nozzles were mounted on the onion planter to apply a 4 inch band directly over the seed after seed placement but before furrow closure. All seed treatments, except FarMore FI500, were applied as an encrustment by Alan George Taylor at Cornell University. FarMore FI500 was commercially applied as a pelleted coating. Rototill incorporated insecticides were broadcast applied over the top of each onion bed and then immediately incorporated in the top 4 inches of soil using a two-row bed shaper/ tiller. Treatments were rototill-incorporated 2 days before planting. The Vydate water incorporated treatment was irrigated with 1 inch of water (6 hour set) immediately after broadcasting Vydate at 60 gpa with a CO<sub>2</sub> backpack sprayer four days after planting.

### Onion Stand, Vigor, and Yield:

- Onion stand density was measured in each plot by counting the number of green onions in the entire plot on June 1<sup>st</sup> and June 19<sup>th</sup>. A visual evaluation of onion stand and vigor was estimated in each plot on July 9<sup>th</sup> (7-leaf) using a 0 to 10 scale. 0 = 100% stand loss and 10 = highest vigor in the trial. Onion yield was measured by hand-harvesting all onions in each plot.

### 2012 Insecticide Treatment List

Insecticide Treatment <sup>1</sup>	Insecticide Rate/Acre	Rototill 2 days before planting	In-furrow at planting	Seed treatment	Chemigated 4 days after planting
Untreated seed-raw seed	none				
Untreated Control with Thiram	none			x	
Sepresto (clothianidin+imidacloprid)	0.24 mg ai / seed			x	
Entrust (spinosad) seed trt	0.2 mg ai / seed			x	
Cruiser (thiamethoxam) seed trt	0.2 mg ai / seed			x	
FarMoreFI500 (thiamethoxam + spinosad) pelleted seed trt	mfg rec. rate/seed			x	
thiamethoxam + spinosad seed trt	0.1 mg ai + 0.2 mg ai / seed			x	
Lorsban 15-G (chlorpyrifos) in-furrow at planting	6.6 lbs/acre		x		
Lorsban 4E (chlorpyrifos) in-furrow at planting	32 fl. oz/A		x		
Entrust (spinosad) rototill before planting	6 oz/A	x			
Entrust (spinosad) in-furrow at planting	6 oz/A		x		
Entrust (spinosad) split applied rototill and in-furrow	3 oz/A + 3 oz/A	x	x		
Admire Pro (imidacloprid) rototill before planting	14 fl. oz/A	x			
Admire Pro (imidacloprid) in-furrow at planting	14 fl. oz/A		x		
Amire Pro (imidacloprid) split applied rototill and in-furrow	7 fl. oz/A + 7 fl. oz/A	x	x		
Admire Pro (imidacloprid) in-furrow at planting	7 fl. oz/A		x		
Vydate (oxamyl) in-furrow at planting	32 fl. oz/A		x		
Vydate water incorporated 1st irrigation after planting	64 fl. oz/A				x

<sup>1</sup> Thiram 42S at 188 mg ai/100 g of seed applied as a seed treatment was included in all treatments except the untreated control. All seed treatments were applied as encrustment by Alan Taylor at Cornell University except the FarMore FI500 trt which was applied by the manufacturer.

## **Results**

Onion vigor ratings, onion stand density, and onion yield for 2012 treatments are presented in Table 1. Onion stand and yield averaged across 2011 and 2012 for insecticide treatments tested both years at IREC are presented in Table 2. Insecticide seed treatments containing spinosad and clothianidin had the highest onion stand density and onion yield in 2011 and 2012. Combining thiamethoxam with spinosad as a seed treatment did not increase onion stand density and onion yield compared spinosad seed treatment both years.

Applying neonicotinoid and spinosyn insecticides as a seed treatment was far more effective than applying them in-furrow at planting or rototill-incorporated before planting. In fact, in-furrow and rototill-incorporated applications of spinosad and imidacloprid had similar or lower onion stand density and yield compared to the untreated control. Imidacloprid applied in-furrow at all rates had lower stand density and yield compared to the control averaged across years. Oxamyl applied in-furrow or water-incorporated shortly after planting also had lower onion stand density and yield compared to the untreated control in 2012. The reason for reduced onion stand and yield associated with oxamyl and imidacloprid is unknown. These insecticides may negatively influence beneficial organisms that associate with onions or predatory organisms that feed on maggots.

Chlorpyrifos applied in-furrow had higher onion stand density and yield compared to the untreated control averaged across years, but chlorpyrifos onion stand and yield were lower compared to spinosad and clothianidin seed treatments averaged across years.

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**Table 1. Influence on Insecticide Treatments on Onion Stand, Vigor, and Yield at IREC in 2012.**

Insecticide Treatment <sup>1</sup>	Insecticide Rate/Acre	Onion	Onion Stand Density		Onion Yield 9/27/2012 tons/acre
		Vigor Ratings <sup>2</sup> 7-leaf 0 to 10 rating scale	1.5 leaf plants per plot <sup>3</sup>	3-leaf	
Sepresto (clothianidin+imidacloprid) seed trt	0.24 mg ai / seed	7.7	708	793	26.49
Entrust (spinosad) seed trt	0.2 mg ai / seed	7.8	614	735	25.68
FarMoreFI500 (thiamethoxam + spinosad) pelleted seed trt	mfg rec. rate/seed	7.9	638	732	25.54
thiamethoxam + spinosad seed trt	0.1 mg ai + 0.2 mg ai / seed	7.8	617	671	25.27
Lorsban 4E (chlorpyrifos) in-furrow at planting	32 fl. oz/A	7.5	505	573	23.59
Lorsban 15-G (chlorpyrifos) in-furrow at planting	6.6 lbs/acre	7.4	439	505	22.91
Cruiser (thiamethoxam) seed trt	0.2 mg ai / seed	7.2	398	454	21.51
Untreated Control with Thiram	none	6.9	403	417	20.21
Untreated seed-raw seed	none	7.3	361	383	20.03
Entrust (spinosad) rototill before planting	6 oz/A	6.8	340	347	18.37
Entrust (spinosad) split applied rototill and in-furrow	3 oz/A + 3 oz/A	6.8	315	338	18.56
Entrust (spinosad) in-furrow at planting	6 oz/A	6.6	293	306	18.08
Admire Pro (imidacloprid) in-furrow at planting	14 fl. oz/A	6.7	272	288	17.02
Vydate (oxamyl) in-furrow at planting	32 fl. oz/A	6.8	278	283	17.24
Vydate water-incorporated 1st irrigation after planting	64 fl. oz/A	6.8	272	279	16.77
Admire Pro (imidacloprid) rototill before planting	14 fl. oz/A	6.7	252	261	16.76
Admire Pro (imidacloprid) in-furrow at planting	7 fl. oz/A	6.6	259	258	16.45
Amire Pro (imidacloprid) split applied rototill and in-furrow	7 fl. oz/A + 7 fl. oz/A	6.8	241	253	16.55
<i>95% Confidence Interval</i>		<i>0.4</i>	<i>60</i>	<i>67</i>	<i>1.63</i>

<sup>1</sup> Thiram 42S at 188 mg ai/100 g of seed applied as a seed treatment was included in all treatments except the untreated control

<sup>2</sup> Visual evaluation of onion vigor in each plot. 0 -10 scale; 0 = 100% stand loss no vigor and 10 = extremely high vigor

<sup>3</sup> Seeding rate was based on achieving a desired seed spacing of 2 inches or 1200 plants per plot.

**Table 2. Onion Stand and Yield Averaged Across 2011 and 2012 for Insecticide Treatments Tested Both Years at IREC.**

Insecticide Treatment <sup>1</sup>	Insecticide Rate/Acre	Onion Stand Density		Onion Yield tons/acre
		1.5 leaf plants per plot <sup>2</sup>	3-leaf	
Sepresto (clothianidin+imidacloprid) seed trt	0.24 mg ai / seed	713	709	20.10
Entrust (spinosad) seed trt	0.2 mg ai / seed	713	706	20.01
FarMoreFI500 (thiamethoxam + spinosad) pelleted seed trt	mfg rec. rate/seed	605	641	19.38
Lorsban 4E (chlorpyrifos) in-furrow at planting	32 fl. oz/A	576	567	18.58
Lorsban 15-G (chlorpyrifos) in-furrow at planting	6.6 lbs/acre	515	485	18.04
Cruiser (thiamethoxam) seed trt	0.2 mg ai / seed	414	419	16.59
Untreated Control with Thiram	none	356	304	14.20
Untreated seed-raw seed	none	355	280	13.55
Entrust (spinosad) in-furrow at planting	6 oz/A	324	258	13.25
Admire Pro (imidacloprid) in-furrow at planting	7 fl. oz/A	245	196	11.28
Admire Pro (imidacloprid) in-furrow at planting	14 fl. oz/A	229	196	10.95
<i>95% Confidence Interval</i>		<i>58</i>	<i>56</i>	<i>1.34</i>

<sup>1</sup> Thiram 42S at 188 mg ai/100 g seed applied as a seed treatment was included in all treatments except the untreated control

<sup>2</sup> Seeding rate was based on achieving a desired seed spacing of 2 inches or 1200 plants per plot.