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2013 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 the damaged bulbs 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.

From 2011 to 2013, 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 all study sites was alfalfa which was rototilled shortly before planting the onion crop. 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.***

Trial Information for 2013

Location:	Tulelake, CA
Soil Type:	Tulebasin mucky silty clay loam 4.2% organic matter
Planting Date:	April 20, 2013
Harvest Date:	October 11, 2013
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
Seeding Rate:	1200 seeds per plot (348,500 seeds per acre)

Insecticide Application Methods
Insecticides were applied as a seed treatment or in-furrow at planting. In-furrow treatments were applied using Teejet 8001 EVS nozzles @ 30 psi. The nozzles were mounted on the onion planter to apply a 3-4 inch band directly over the seed after seed placement but before furrow closure. All seed treatments were applied as an encrustment by Alan George Taylor at Cornell University. FarMore FI500 was commercially applied as a pelleted coating.

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 May 21st, June 6th and June 19th. A visual evaluation of onion stand and vigor was estimated in each plot on July 2nd (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.

Results
Onion stand density and onion yield for 2013 treatments is presented in Table 1. Onion stand and yield averaged across 2011, 2012, and 2013 for insecticide treatments tested all three years is presented in Table 2. Insecticide seed treatments containing spinosad and clothianidin had the highest onion stand density and onion yield all three years (Table 2). Combining thiamethoxam with spinosad as a seed treatment did not increase onion stand density and onion yield compared spinosad seed treatment all three years (Table 2).

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 (roto-till tested in 2012). In fact, in-furrow applications of spinosad had similar onion stand density and yield compared to the untreated control (Tables 1 and 2). Oxamyl applied in-furrow had lower or similar onion stand density and yield compared to the control in 2012 and 2013. Imidacloprid applied in-furrow had lower stand density and yield compared to the control all three years. The reason for reduced onion stand and yield associated with imidacloprid is unknown. This insecticide 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, but chlorpyrifos onion stand and yield were lower compared to spinosad and clothianidin seed treatments all three years (Tables 1 and 2).

In 2013, we tested the compatibility of using spinosad seed treatment in combination with common insecticides and fungicides applied in-furrow at planting. Results showed applying chlorpyrifos, oxamyl, and/or tebuconazole in-furrow in combination with spinosad seed treatment did not negatively influence the efficacy or crop safety of spinosad. Spinosad seed treatment (Regard insecticide or OI-500) is currently registered in CA for use in onions. FarMore FI-500 is another seed treatment currently registered in CA. The FarMore FI-500 seed treatment is a combination of fungicides and insecticides including spinosad.

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Table 1. The Influence of Maggot Insecticide Treatments on Onion Stand and Yield in 2013.

Insecticide Treatment[1]	Insecticide Rate/Acre	Onion Stand Density 1 leaf	3-leaf	5-leaf plants per plot[2]	Onion Yield ton/acre
Regard (spinosad) seed trt + Vydate in-furrow at planting	0.2 mg ai/seed + 32 fl. oz	662	591	677	25.00
Regard (spinosad) seed trt + Folicur & Lorsban 4E in-furrow at planting	0.2 mg ai + 20.5 fl. oz + 32 fl. oz	641	565	643	25.46
thiamethoxam + spinosad seed trt (similar ai to FarMore)	0.1 mg + 0.2 mg ai/seed	625	552	597	24.31
Regard (spinosad) seed trt + Folicur (in-furrow at planting	0.2 mg ai/seed + 20.5 fl. oz	583	535	586	25.58
Regard (spinosad) seed trt	0.2 mg ai / seed	581	502	572	24.32
Sepresto (clothianidin+imidacloprid) seed trt	0.24 mg ai / seed	561	493	568	24.61
Regard (spinosad) seed trt + Admire Pro in-furrow at planting	0.2 mg ai/seed + 14 fl. oz	542	508	531	24.01
Lorsban 4E (chlorpyrifos) in-furrow at planting	32 fl. oz/A	374	337	361	19.22
Cruiser (thiamethoxam) seed trt	0.2 mg ai / seed	269	229	256	14.70
Lorsban 15-G (chlorpyrifos) in-furrow at planting	6.6 lbs/acre	206	205	208	14.07
Vydate (oxamyl) in-furrow at planting	32 fl. oz/A	102	90	99	6.94
Entrust (spinosad) in-furrow at planting	6 oz/A	84	72	77	5.45
Untreated Control (raw seed)	none	85	68	73	5.81
Untreated Control with Thiram	none	67	60	65	4.33
Admire Pro (imidacloprid) in-furrow at planting	14 fl. oz/A	70	58	62	4.62
95% Confidence Interval		*34*	*41*	*36*	*2.51*

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

[2] 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 - 2013 For Insecticide Treatments Tested all Three Years at IREC.

Insecticide Treatment[1]	Insecticide Rate/Acre	Onion Stand Density 1.5 leaf	3-leaf plants per plot[2]	Onion Yield tons/acre
Regard (spinosad) seed trt	0.2 mg ai / seed	669	638	21.45
Sepresto (clothianidin+imidacloprid) seed trt	0.24 mg ai / seed	662	637	21.61
FarMoreFI500 (thiamethoxam + spinosad) pelleted seed trt	mfg rec. rate/seed	612	611	21.02
Lorsban 4E (chlorpyrifos) in-furrow at planting	32 fl. oz/A	508	490	18.80
Lorsban 15-G (chlorpyrifos) in-furrow at planting	6.6 lbs/acre	412	392	16.33
Cruiser (thiamethoxam) seed trt	0.2 mg ai / seed	366	356	15.96
Untreated Control with Thiram	none	259	222	10.91
Untreated seed-raw seed	none	265	209	10.97
Entrust (spinosad) in-furrow at planting	6 oz/A	244	196	10.65
Admire Pro (imidacloprid) in-furrow at planting	14 fl. oz/A	176	150	8.84
95% Confidence Interval		*40*	*39*	*1.10*

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

[2] Seeding rate was based on achieving a desired seed spacing of 2 inches or 1200 plants per plot.