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2016 Tulelake Maggot Research Summary- Commercial and Experimental Insecticide Options for Protecting Spring-Seeded Processing Onions from Seedcorn Maggot and Onion Maggot

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Introduction

Maggots (the larval stage of flies) including onion maggot, *Delia antiqua*, and seed corn maggot, *Delia platura*, are widespread onion pests in Tulelake. Larvae of both species feed on young onion plants often resulting in seedling mortality that can decrease onion plant populations by more than 50% of the desired population. Maggot damage was particularly bad in 2015 and 2016, and many growers reported greater than 15% stand loss regardless of insecticide choice or field location.

Current management recommendations focus on a combination of cultural controls and insecticide application at planting. In spring 2016 a COGRAB research study was started at the request of growers to address multiple research objectives including: 1.) Test the efficacy of commercially available treatments and several experimental insecticides; and 2.) Evaluate different seed treatment methods used alone and in combination with chlorpyrifos to determine their efficacy for maggot control and their compatibility with different onion planter setups. ***Some pesticides listed in this report may not be labeled for use in onions. Please consult pesticide labels for use instructions.***

2016 Site Information

- **Soil type-** mucky silty clay loam-4.2% OM
- **Growing season-** early May to late September
- **Irrigation –** solid-set sprinklers
- **Onions-** 36 inch beds with 4 seed-lines spaced 6 inches apart; 2-inch seed spacing; Olam processing variety
- **Design-** RCB with 6 blocks (reps)

2016 Insecticide Application Methods

- **Seed treatments**: encrustment, mini-pellet, and full-size (bb-sized) pellets.
- **In-furrow treatments**: 3-inch band of insecticide applied directly over the seed after seed placement but before furrow closure using Teejet even fan 8001 nozzles at 30 psi mounted on the onion planter

Onion Measurements

Onion stand density was measured in each plot by counting the number of green onions in the entire plot at the 1-leaf stage, 3-leaf stage, and immediately before harvest. Onion yield was measured weighing all topped onion bulbs in each plot.

Study Results

- Complete result table shown on page 3 and graphs for different treatment groups shown on pages 4-6.
- Spinosad (OI100 & FI500) applied as a encrustment seed coating and clothianidin (Sepresto) seed coatings were numerically the most effective labeled insecticide option for minimizing a reduction in onion plant population. These insecticide seed treatments numerically had higher onion stands compared to chlorpyrifos (Lorsban) applied at the maximum rate in-furrow.
- The type of seed coating may influence the efficacy of spinosad on Tulelake soil but the trend was not statistically different and more research is needed.
- Applying chlorpyrifos (Lorsban) in-furrow in combination with spinosad (OI100 & FI500) and clothianidin (Sepresto) seed treatment did not improve onion plant population compared to seed treatment alone.
- Bifenthrin (Capture LFR) applied in-furrow appears to be a very promising experimental option for protecting onions from maggot.

Special Thanks: The research team would like to thank the California Garlic and Onion Research Advisory Board for financial support of this research, Alan George Taylor at Cornell University for seed treatment and technical advice, Skagitt Seed Services for seed treatment, and Olam International for donating onion seed.

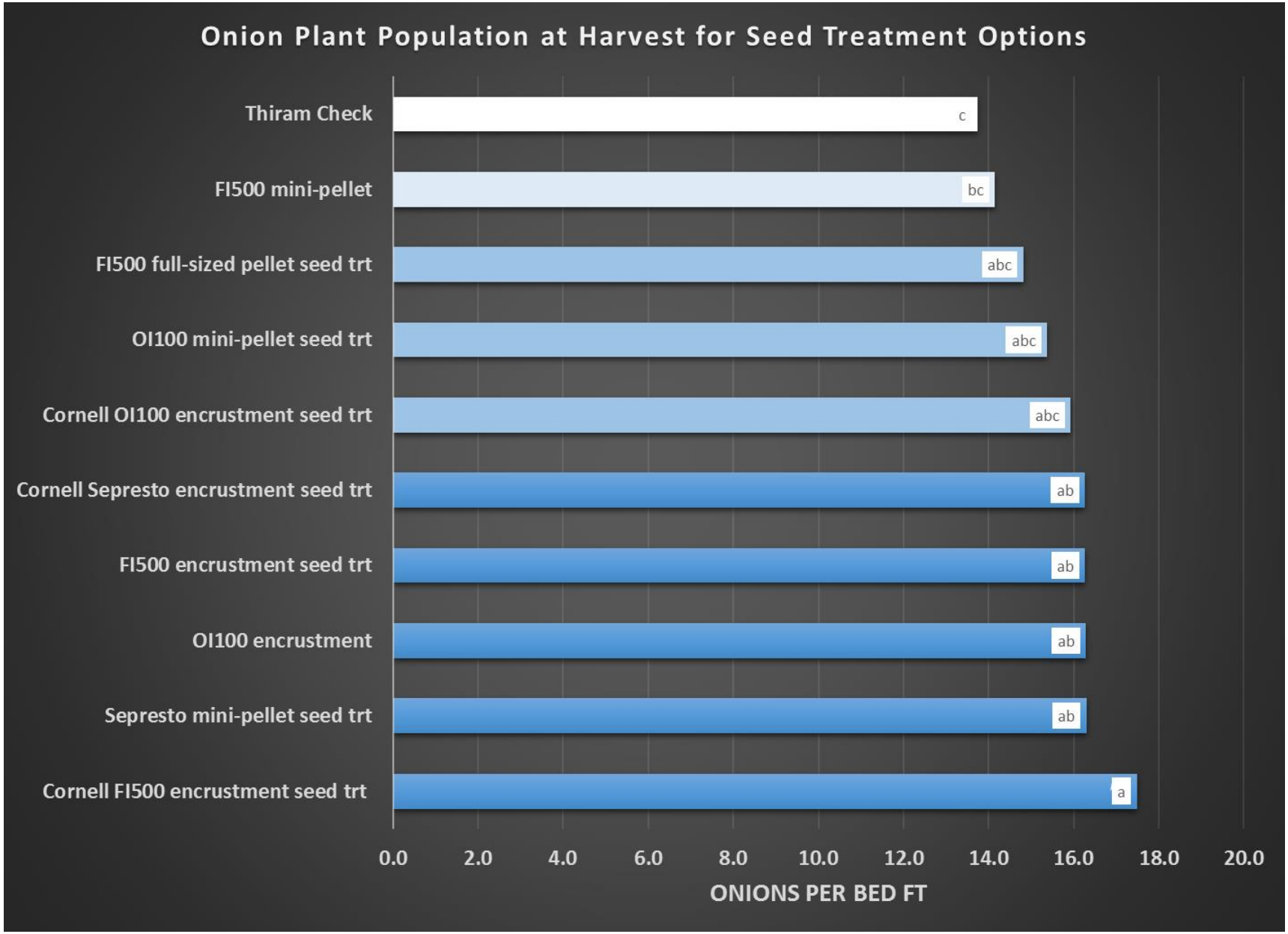
Onion Stand at Different Onion Growth Stages and Onion Yield for Insecticides Applied to Prevent Onion Mortality from Seedcorn Maggot and Onion Maggot Feeding at IREC in 2016.

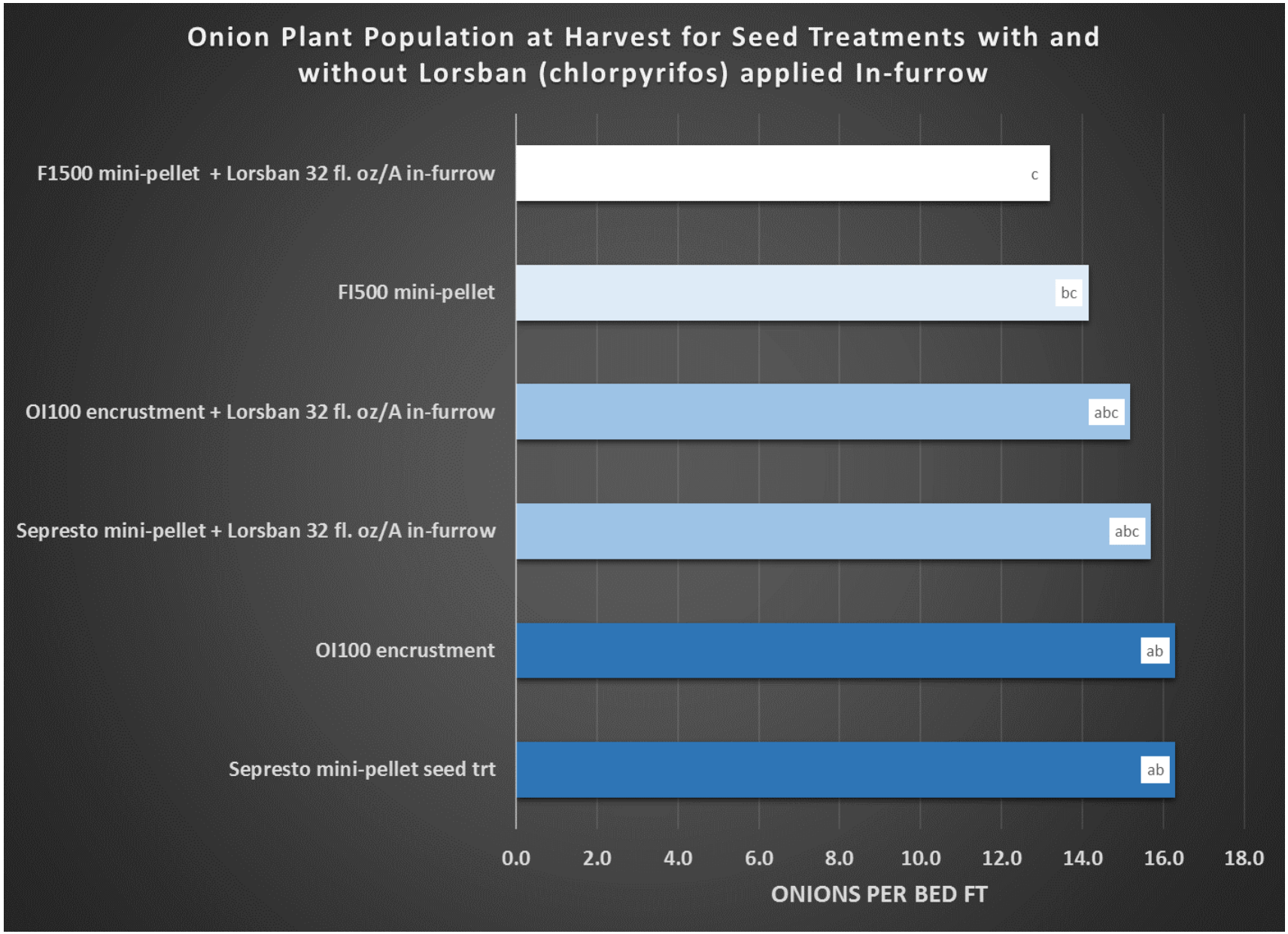
		1-leaf stage	3-leaf stage	Harvest	
		Onion Stand	Onion Stand	Onion Stand	Onion yield
Insecticide and in-furrow application rate	Insecticide Application Method	plants/bed ft	plants/bed ft	plants/bed ft	tons/acre
Cornell FI500 w/o fungicide package* (spinosad + thiamethoxam)	Seed trt (encrustment)	16.7 a	18.1 a**	17.5 a	21.76 a
Capture LFR (bifenthrin)	In-furrow	16.4 ab	16.5 abc	16.4 ab	21.27 ab
Commercial* Sepresto (imidacloprid + clothinidin)	Seed trt (mini-pellet)	15.8 ab	16.9 abc	16.3 ab	20.92 ab
Commercial OI100 (spinosad)	Seed trt (encrustment)	17.1 a	16.9 abc	16.3 ab	20.80 ab
Commercial FI500 (spinosad, thiamethoxam, fungicides)	Seed trt (encrustment)	15.7 ab	16.9 abc	16.3 ab	21.50 ab
Cornell Sepresto (imidacloprid + clothinidin)	Seed trt (encrustment)	16.7 a	17.1 ab	16.3 ab	20.56 ab
Cornell OI100 (spinosad)	Seed trt (encrustment)	15.8 ab	16.1 abc	15.9 abc	20.95 ab
Commercial Sepresto + Lorsban 32 fl. oz/A	Seed trt (mini-pellet) & Lorsban in-furrow	16.7 a	16.7 abc	15.7 abc	20.03 ab
Commercial OI100 (spinosad)	Seed trt (mini-pellet)	14.8 ab	15.3 abc	15.4 abc	20.25 ab
Lorsban liquid 32 fl. oz/A	Lorsban post-plant soil drench	15.5 ab	16.1 abc	15.3 abc	20.01 ab
Commercial OI100 + Lorsban 32 fl. oz/A	Seed trt (encrustment) & Lorsban in-furrow	15.9 ab	15.9 abc	15.2 abc	19.97 ab
Commercial FI500 (spinosad, thiamethoxam, fungicides)	Seed trt (full-pellet)	14.7 ab	15.2 abc	14.8 abc	19.93 ab
Lorsban liquid (chlorpyrifos) 32 fl. oz/A	In-furrow	16.2 ab	15.4 abc	14.5 abc	19.04 ab
Agri-Mek (abamectin) 3.5 fl. oz/A	In-furrow	15.2 ab	15.0 abc	14.5 bc	20.14 ab
Verimark (cyantraniliprole) 13.5 fl. oz/A & Exirel (cyazypyr) 20 oz/A	Verimark in-furrow & Exirel soil drench	14.1 ab	14.6 bc	14.2 bc	19.98 ab
Commercial FI500 (Spinosad, thiamethoxam, fungicides)	Seed trt (mini-pellet)	14.4 ab	14.3 bc	14.1 bc	19.55 ab
Radiant (spinetoram) 10 fl. oz/A	In-furrow	13.9 ab	13.9 bc	14.1 bc	19.69 ab
Radiant (spinetoram) 20 fl. oz/A	In-furrow	13.9 ab	14.5 bc	14.0 bc	20.06 ab
No Insecticide-Thiram Check	none	14.1 ab	14.0 bc	13.7 c	19.93 ab
Verimark (cyantraniliprole) 13.5 fl. oz/A	In-furrow	13.1 b	13.7 c	13.3 c	18.81 ab
Commercial F1500 + Lorsban 32 fl. oz/A	Seed trt (minipellet) & Lorsban in-furrow	14.0 ab	13.7 c	13.2 c	18.67 b

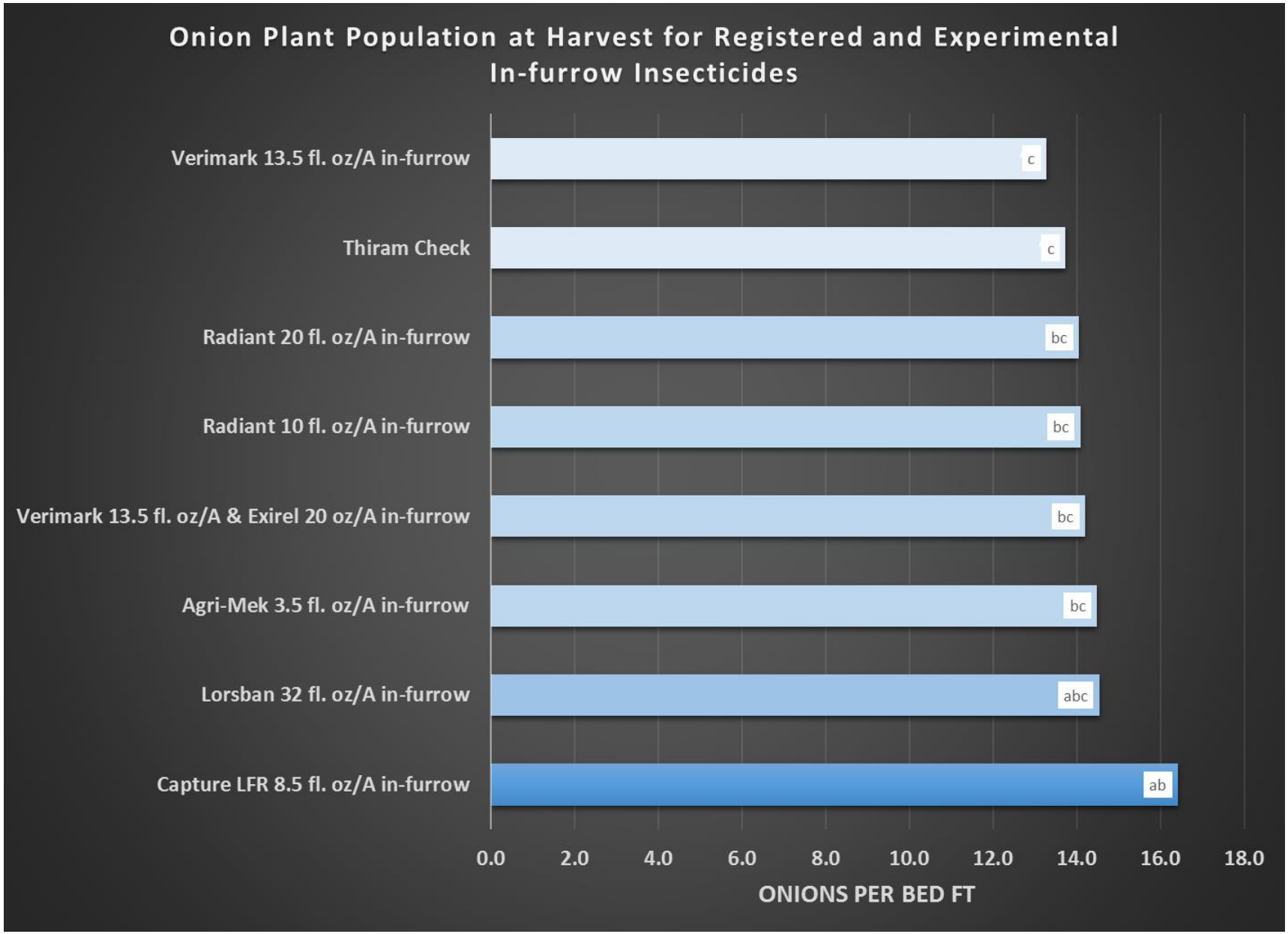
* All seed was treated with thiram fungicide except the commercial FI500. Commercial seed treatments were tested for % germination at the time of planting and all were greater than 90%.

** Data was analyzed using ANOVA and Tukey-Kramer mean comparison. Treatments with the same letter are not statistically different.

*** Yellow sticky traps were placed on the field edge and changed weekly from planting until maggot fly counts reached minimal numbers. Seed corn maggot flies were captured in high numbers during onion establishment. Onion maggot flies were captured in lower numbers during establishment.


Onion Plant Population at Harvest for Seed Treatment Options
Thiram Check
FI500 mini-pellet
FI500 full-sized pellet seed trt
OI100 mini-pellet seed trt
Cornell OI100 encrustment seed trt
Cornell Sepresto encrustment seed trt
FI500 encrustment seed trt
OI100 encrustment
Sepresto mini-pellet seed trt
Cornell FI500 encrustment seed trt
c
bc
abc
abc
abc
ab
ab
ab
ab
a
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
20.0
ONIONS PER BED FT


Onion Plant Population at Harvest for Seed Treatments with and without Lorsban (chlorpyrifos) applied In-furrow
F1500 mini-pellet + Lorsban 32 fl. oz/A in-furrow
FI500 mini-pellet
OI100 encrustment + Lorsban 32 fl. oz/A in-furrow
Sepresto mini-pellet + Lorsban 32 fl. oz/A in-furrow
OI100 encrustment
Sepresto mini-pellet seed trt
c
bc
abc
abc
ab
ab
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
ONIONS PER BED FT


Onion Plant Population at Harvest for Registered and Experimental In-furrow Insecticides
Verimark 13.5 fl. oz/A in-furrow
Thiram Check
Radiant 20 fl. oz/A in-furrow
Radiant 10 fl. oz/A in-furrow
Verimark 13.5 fl. oz/A & Exirel 20 oz/A in-furrow
Agri-Mek 3.5 fl. oz/A in-furrow
Lorsban 32 fl. oz/A in-furrow
Capture LFR 8.5 fl. oz/A in-furrow
c
c
bc
bc
bc
bc
abc
ab
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
ONIONS PER BED FT