

Evaluation of Reduced Risk Pesticides for Control of Onion Thrips on Onions

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INTRODUCTION

Onion thrips (OT) are a cosmopolitan species that are found in onion growing regions around the world. They have been recorded as economic pests on onion, garlic, leeks, tomatoes, cucumbers and beans.

Adults and nymphs feed by piercing and sucking leaf tissues, removing cell contents (Fig. 1). Light feeding results in silvery streaks while heavy feeding may result in plant die-back. Research has shown that onion losses can exceed 40% when high OT populations cannot be controlled.



Fig.1. Onion thrips a) adult, b) nymph, and c) on-plant population.

Historically in Ontario, OT control has been secondary to onion maggot control. However, reliable soil insecticides coupled with more effective monitoring programs have reduced the number of foliar sprays for maggot control resulting in the proliferation of OT populations, especially during dry, hot growing seasons.

Currently four insecticides are recommended for OT control; three pyrethroids and one organophosphorus insecticide. In 2003, 16 commercial populations were tested for insecticide resistance using a diagnostic dose bioassay. Fifteen of 16 populations had 20% or higher survival to pyrethroids tested (deltamethrin and lambda-cyhalothrin) and were considered resistant. In addition, six of the 16 populations were classified as resistant to diazinon. Resistance continues to be a valid concern for Ontario onion growers emphasizing the need for effective products, with different modes of action, that are IPM and environmentally friendly. The goal of this research was to evaluate efficacy of reduced risk pesticides for the control of OT.

MATERIALS AND METHODS

Research trials were conducted in commercial fields and research plots in 2001–2003 (Fig. 2). A total of 21 pesticide formulations were evaluated, including that are considered 'reduced-risk' pesticides (Table 1).



Fig.2. Experimental plots.

Table 1. Reduced risk Insecticides tested, 2001-2003.

Foliar Treatments	Formulation	Rate (product/ha)
<i>Beauveria bassiana</i>	BotaniCard ES	2.0 L
kaolin	Surround	11 kg
novaluron	Rimon 0.83 EC	750 and 1500 mL
pymetrozine	Fulfill 50WG	200 mL
pyriproxifen	Knack 0.86 EC	600 and 750 mL
spinosad	Success 480SC	200, 300, 350 and 400 mL
Seed Treatments	Formulation	Rate (product/250,000 seeds)
clothianidin	Poncho 600F	60 mL
imidacloprid	Gaucho 480 FL	55, 75, 80 and 100 mL
fipronil	Icon 6.2FS	45 and 60 mL
thiamethoxam	Adage 5FS	80 mL

Treatments:

All foliar treatments were applied using a CO₂ pressurized R&D sprayer fitted with a 1.1 m boom and equipped with flat fan nozzles. In 2001, all products were applied in 400 L water/ha; in 2002 and 2003, products were applied in 600 L water/ha. Seed treatments were prepared by tumbling onion seed, product and 1% methyl cellulose (2000-2002) or HP-9 Acrylic Emulsion Polymer (2003; 1 mL/1 kg seed) in a jar for two minutes until seed was evenly coated.

Evaluations:

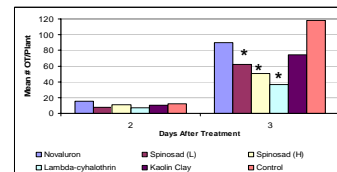
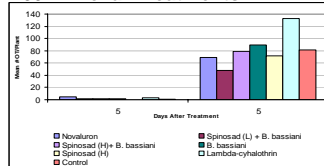
To count OT (adults and nymphs), plants were randomly selected and destructively sampled.

Data Analysis:

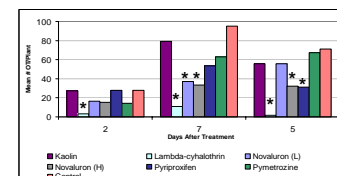
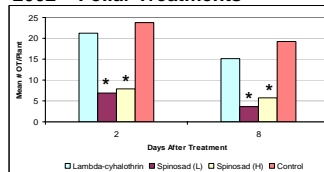
OT counts were transformed using square root ($Y + 0.5$) and analysed using ANOVA and Dunnett's Test (Statistix 2.2, Tallahassee, FL). Actual rather than transformed data are presented.

RESULTS

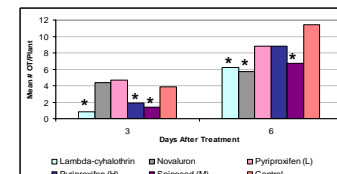
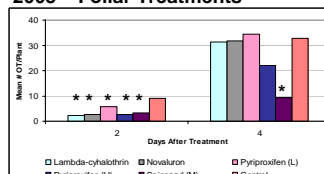
2001 – Foliar Treatments



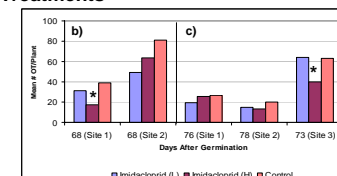
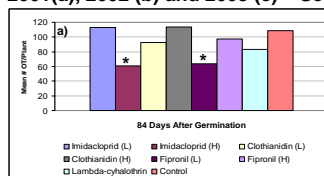
2002 – Foliar Treatments



2003 – Foliar Treatments



2001(a), 2002 (b) and 2003 (c) – Seed Treatments



* - Indicates treatments significantly different from the control on a given assessment date ($P < 0.05$)

DISCUSSION

In all years, plots treated with spinosad and the industry standard, lambda-cyhalothrin, had fewer OT than untreated control plots. The exception was in 2002; at this site resistance to pyrethroids was recorded. In 2002 and 2003, the higher rate of novaluron significantly reduced OT populations as the season progressed. During these trials, pyriproxifen also demonstrated efficacy later in the season, following several applications.

No seed treatment had any significant impact on emergence of onion seedlings during any year of study (data not shown). In 2001, the high rate of imidacloprid and the low rate of fipronil provided protection with significantly fewer OT detected 84 days after germination (approx. 14 weeks). At one site in 2002, both rates of imidacloprid had fewer OT than the untreated control 9 weeks after germination. At the second site, treated seed were not significantly different from untreated control plots 10 weeks after germination. In 2003, numerically fewer OT were recorded 10 weeks after germination in imidacloprid treated plots; at one site, plots treated with the higher rate of imidacloprid had significantly fewer OT than the untreated control.

CONCLUSIONS

In research field studies, foliar application of spinosad (SUCCESS® 480F), novaluron (RIMON® 0.83EC) or pyriproxifen (KNACK® 0.86EC) significantly reduced OT populations. In addition to foliar sprays, application of imidacloprid as a seed treatment (GAUCHO® 480FL) delayed development of OT populations. Although OT tend to cause economic damage later in the season, early exposure to imidacloprid reduced initial numbers, ultimately delaying and reducing the overall population pressure observed later in the season.

While any one of these control products would benefit growers by providing effective OT control and slowing the development of insecticide resistance, none are currently available to Ontario onion growers.

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