Thrips IPM on Dry Bulb Onions in Washington State

PI: Timothy Waters, WSU Area Extension Educator, Benton & Franklin Counties
Co PI: Doug Walsh, WSU IPM Coordinator

Problem Description

Thrips infestations are a perennial, persistent and ubiquitous problem throughout Pacific Northwest dry bulb onion fields. Some very basic research is needed to ascertain which thrips species are creating problems, which are developing what appears to be resistance to current pest management technologies, and which registered and candidate compounds could be more effective in managing the pest. In addition, application efficacy should be evaluated at different water carrier gallonage rates and delivery pressures to determine the best method for applying insecticides for thrips control.

1. Crop farmgate value and estimated per acre value of the crop. 21,000 acres of dry bulb onions were grown in Washington State in 2006 and were valued at about 132 million dollars. The dry bulb onion crop ranked #10 in Washington agricultural commodities in 2006.

2. Per acre/unit impact including potential monetary losses if appropriate. Thrips are a common and persistent pest of dry bulb onions in the Pacific Northwest. When our research team first approached this problem in 2001, we found that most onion fields were receiving several insecticide applications for thrips control. Lambda-cyhalothrin was the predominant insecticide used for thrips suppression. At registered rates it costs approximately $14 per acre per application. We now have data that demonstrates thrips are surviving for several months in storage and are continuing to infest over 15% of the onions even after the onions received a substantial insecticide load in the production field. This reduces the shelf life and appearance of onions for consumers. It costs about $3,500 to establish and maintain an acre of onions, and 15% of this is pest control, predominately for thrips. If 15% of the crop is infested, that's an average $864/acre loss of product at 2005 prices. We have also documented that in pairwise comparisons (treated for thrips vs. no treatment) among 39 onion cultivars that application of no insecticide treatment of thrips results in between a 15 and 35% (depending on cultivar) decrease in bulb size at harvest. Bulbs are graded by size and value diminishes as bulb size decreases. Onion thrips have also been identified as the primary vector for Iris yellow spot virus. Infections of this virus can devastate entire fields and lead to complete crop loss. Fortunately to date Washington onion growers have not experienced the serious disease outbreaks that Texas and Colorado have.

3. Acres impacted. Approximately 21,000 acres of storage onions were harvested in Washington State in 2007. Production is centered in Adams, Benton, Franklin, Grant, Walla Walla, and Yakima counties. Nearly every acre of onions in production in Washington State receives several applications of pyrethroid, carbamate, naturalyte, and/or organophosphate insecticide, directed at the control of insect pests especially thrips. If conditions are right for disease development the incidence of Iris Yellow Spot Virus (IYSV) could have a devastating impact on onion production. Thrips control is the only recommended treatment for IYSV suppression.

4. Aggregate impact to the industry, including aggregate value of the site or crop in the state. Washington ranks 3rd in U.S. onion production, with 17.3 % of the 2004 market. Onions (storage and non-storage varieties together) were the 10th-ranked crop in Washington in 2006.

With a total production value of $132 million in 2007, Washington is a major player in the nation's overall onion industry and onions are an important, high-value crop for our state.

5. *Effect of the problem on the industry.* Thrips continue to be a problem in storage onion production, and the problem is increasing in magnitude. The introduction and establishment of IYSV only multiplies the importance of effective thrips control. Repeated use of pyrethroid, carbamate, naturalyte and/or organophosphates is a bad idea in terms of environmental concerns and resistance management. As the crop is high-value, producers can afford to use a lot of product and apply it by the calendar. But not only is this disruptive to the ecosystem, it's not working. The industry is overdue for a real solution.

6. *Effect of the problem on consumers, society, environment, non-target species, and human health.* In 2006 illegal applications of carbofuran were applied to onions originating from Oregon and Idaho. Fortunately for PNW onion producers, media attention was focused on food poisoning from California spinach. A media blowout could have devastated the economic returns of Washington growers. Thrips are such a serious problem that growers had an economic incentive to cheat. Using products legally and effectively results in a reduced potential for off target impact and fewer residues on the harvested crop.

7. *Description of alternative control measures and why they are not effective or additional information on the specific need.* Research conducted in Texas suggests an economic threshold for onions of less the 5 thrips per leaf. In over 7 years of study all of the fields we have surveyed in Washington have had population densities far greater then 5 thrips per leaf. Five thrips per plant would now be considered effective control by most onion growers. Several new insecticides are being developed that may have some potential for suppressing thrips populations. These include dinotefuron and several proprietary numbered compounds. These and other candidate compounds should be evaluated in field trials.

Funding Categories

This project meets WSCPR evaluation **Criterion II** in that it lays the foundation for creating/advancing an IPM program in storage onions. This project will also support a Section 18 and also likely advance one or more candidate products toward registration **(Criterion I).**

Categories B and C, Protection of the Environment and Significance to Local and Regional Economy. Category B, Item I includes protection of non-target species, which our research on broad-spectrum alternatives should do. Category C, Item II concerns resistance management, which we are pursuing regarding thrips' resistance to current strategies; Item III concerns development of an integrated pest management tactic, which we will as we study efficacies and habits of the target pest; and Item IV involves registration of additional tactics, which should be an eventual result of our efficacy tests.

Project Description

In the following experiments, field plots of onion (var. Tamara) will be established at the WSU Othello Research Farm and will be grown using rill irrigation and standard grower practices for agronomic and pest management inputs excluding thrips treatments. Plots will be established in a random complete block design with four replications. In each instance, plots are 7.5 feet wide and 30 feet long. Efficacy is evaluated by counting the number immature and adult thrips per plant on 10 individual plants per plot in the field. All data for each sample date will be analyzed

by ANOVA and treatments will be compared to non-treated controls in pairwise *t*-tests. At the end of the growing season onion yield and size will be evaluated for comparison of treatments.

Objective 1. Conduct field efficacy trials for thrips control with candidate insecticide compounds and evaluate season long control programs. New chemistries will be evaluated for efficacy against thrips. The products will be applied via C02 propelled back pack sprayer and evaluated at 3, 7, and 14 days post application to determine efficacy and residual activity for thrips control. Candidate compounds will include several neonicotinoids, several proprietary numbered compounds, several biological oils, and new naturalytes. Registered treatments for thrips will be evaluated in different treatment regimes as part of a season long program. Different programs will be established in order to mimic possible rotations that growers have used or may be recommended as use patterns. Plots will be sampled 3 and 7 days after every spray event and applications will occur on a 7-14 day rotation based on efficacy of the preceding product. A treatment threshold of 5 thrips per plant will be used in this case. Previous studies have indicated that thrips are difficult to control with any chemistry after thrips numbers build past 5 per plant. Producers would like to know how various products could potentially be integrated to provide season-long suppression of thrips.

Objective 2. Determine the species consistency of thrips populations infesting onions in Washington State. Twenty onion plants will be collected weekly from untreated check plots at the WSU Othello research station. The plants will be taken back to the laboratory and dissected in order to collect the thrips on each plant. Samples will be stored in alcohol and the ratio of onion thrips adults to western flower thrips adults present will be ascertained. This portion of last years project is still being conducted, but two years of data will provide better information on whether or not a trend exists in the data. Species information is important as some chemistries are effective against onion thrips, but not western flower thrips.

Objective 3. Evaluate different water carrier gallonage rates and delivery pressures to determine the best method for applying insecticides for thrips control. Carzol, Radiant, and Lannate will be used in rotation with one another to test gallonage and delivery pressure rates. Gallonages including 10, 20, 30, and 40 gallons per acre will be evaluated for efficacy at 40 psi. Pressures including 10, 25, 40, and 60 will be evaluated for efficacy using 40 gallons of water per acre. It has been assumed that the higher the pressure and gallonage, the better thrips control will be. This trend was not realized in last year's data, and therefore requires further experimentation to determine if the trend we saw is valid. We did not see a difference in thrips control at different application water rates and pressures.

ANTICIPATED BENEFITS:

Growers are desperate to improve thrips control in onions. This project will support short-term emergency insecticide registrations and potentially develop some longer-term strategies for thrips suppression in onion fields. Additionally, this will help growers make decisions on which chemistries to use and appropriate application methods and timing resulting in better thrips control and a higher yielding higher quality onion crop.

Project Budget

Expenditure	WSCPR (Washington State Commission on Pesticide Registration) **Funded**	Matching (CASH or IN-KIND)			TOTAL COST
		Source: Dow Agrosciences, Syngenta, Gowan Co, Bayer.	**Source: L&L Ag Production, Nunhems Seeds, Two Rivers Terminal LLC**	**Source: Pacific Northwest Vegetable Association**	
		Amount (CASH)	**Amount (IN-KIND)**	**Amount (CASH)**	
Salaries					
Employee Benefits	$652				$652
Temporary or hourly workers[1]	$6,864				$6,864
Travel[2]	$2,640				$2,640
Ground Rental and Preparation	$500				$500
Equipment					
Plant, cultivate, and fertilize			$1,000		$1,000
Fertilizer			$1500		$1500
Vegetable Seeds			$500		$500
Goods and services	$800	$8,000		**$4,000**	$12,800
Total	$11,456	$8,000	$3,000	**$4,000**	$26,456

1/ Time-slip wages 2 students @ $11/hr, 26 hours/week for 12 weeks
2/ 4,800 miles @ $0.55 per mile

Has this budget been reviewed for accuracy? Yes By Whom? Jennifer Jansen

Projected Expenditures (by quarter)

Time Period	Jan-Mar 2010	Apr-Jun 2010	Jul-Sept 2010	Oct-Dec 2010	Jan-Mar 2009	Apr-Jun 2009
WSCPR Funds	804	4,652	5,000	1,000	0	0
Total Funds	4,304	11,152	8,000	3,000		