2007 IPM Mini Grant Report - David Drake - November 1, 2007

Use of Oilseeds as Biofumigants to Control Alfalfa Stem Nematode

Project Personnel:

Craig Poulson, Principle Investigator, David Drake, Co-Principle Investigator
Ken Skeem, Cooperator, and Kent Evans, Technical Advisor

Introduction

Alfalfa Stem Nematode (ASN), *Ditylenchus dipsaci*, is increasingly a concern to forage producers in the state of Utah occurring in all regions of alfalfa production; however, noticeable losses have recently occurred in Millard, Cache, and Box Elder counties (2006, Evans et al.). Symptoms include stunted plants, slower spring "green up", poor stand density and the resulting weed infestation, and losses in forage yield and quality. Damage is most often seen in flood-irrigated fields and the pest can be easily spread by using waste water from infested fields or "brown bag" infested alfalfa seed.

Current control methods include prevention by sanitation, crop rotations for two or more years with a non-host crop, and pesticide treatments. Pesticide treatment has not been shown to be very effective, is costly, and is not environmentally preferred. Other control methods are needed to control this pest of Utah's most important forage crop.

The use of a fumigation mustard crop rotation has been shown to provide nematode control in wheat and potatoes in the Pacific Northwest. There is also a considerable interest in growing oilseed mustard crops, canola and camelina, as sources of renewable biofuels. This project was initiated to determine the possible ASN control benefits from a biofumigant mustard, spring canola, and camelina crop rotation.

Materials and Methods

A cooperating farmer in Oasis, Millard County volunteered a heavily ASN infest four year old stand of alfalfa to conduct the study. The stand was removed by use of an herbicide and tillage. Three replications of four crop rotation treatments in a randomized complete block design were planted in 0.2 acre dikes of approximately 25 feet in width and 320 feet in length. Treatments included oats, as a control, spring canola, camelina, and a biofumigation mustard. Triflurilin was applied to mustard treatments at a rate of 2 pts/ac as a pre-emergent weed control. All twelve plots were again cultivated prior to planting to incorporate the herbicide or to maintain the control treatment integrity. Soil samples from all plots were taken, after tillage but prior to planting, and sent off to a nematode lab for nematode identification and quantification.

The experiment was irrigated by level basin irrigation twice during the 2007 growing season. Dikes kept irrigation water from contaminating adjacent treatments. The oat or control treatment was swathed and baled for oat hay at the milk stage as customarily done in the area. The fumigation mustard was mown and tilled into the soil when the plants were green and the oldest flowers were in the pod stage. Canola and camelina crops were randomly split into two half treatments with the whole plant being tilled into the soil and

the other half being harvest for seed and the crop stover being tilled into the soil. The field was then replanted to a single variety of alfalfa, with dikes left maintained, then irrigated. See Figures 1-3. for a visual reference of the experiment.

Camelina Plowed Down	Camelina for Seed
Canola Plowed Down	Canola for Seed
Oats	
Commercial fumigation mustard	

Figure 1. Diagram of a complete block of crop rotation treatments for alfalfa stem nematode separated by dikes, Oasis, Millard County, UT 2007. Irrigation water runs left to right.

Figure 2. Crop rotation treatments for alfalfa stem nematode separated by dikes, Oasis, Millard County, UT 2007. Oats (upper left, blue in color), fumigation mustard, fumigation mustard, and canola (upper right). Note: camera lens was dirty

Figure 3. Crop rotation treatments for alfalfa stem nematode separated by dikes, Oasis, Millard County, UT 2007. Canola (left, blue in color), oats, camelina, and fumigation mustard. Note: camera lens was dirty

Project Status

As of November 1, 2007, the nematode test results have not been returned. Seed and biomass yield for treatment crops have been recorded. The follow up alfalfa crop has germinated and is growing. To finish the project the ASM nematode levels in the soil and new alfalfa crop, soil and tissues analysis, will need to be determined in the spring of 2008. Information should be of suitable quality for presentations and publications.

Budget (costs have been covered by Kent Evans, David Drake, and Ken Skeem)

Fumigation Mustard Seed	$162
Canola, camelina, and oat seed	$ 45
Labor from a summer extension intern 10 hours @ $10/hr	$100
Herbicide	$ 65
Nematode lab analysis, University of Nebraska, 12 @ $50	$600
Equipment use and labor (tillage, spraying, planting, & combining)	$330
Travel (4) trips by D. Drake 160 miles round trip @ 0.485/mile	$310
Soil fertility test and fertilizer	$224
Total	$1,836

Budget needed to complete project

Nematode lab analysis alfalfa tissue 18 @ $50	$900
Nematode lab analysis soil samples 18 @ $50	$900
Travel 1 trip by D.Drake 160 miles roundtrip @ 0.485/mile	$ 78
Total	$1,878

References

Evans, K., Isrealson, C., Pace, M., and Poulsen, C., (2006) Alfalfa stem nematode. Utah Pest Fact Sheet, PLP-001-06. Utah State University Extension, Logan, UT.