IPM Mini Grant Proposal 2007

Title: The use of oilseeds as biofumigants to control Alfalfa Stem Nematodes

Project Personnel:
      Craig Poulson, Principle Investigator
      David Drake, Co-Principle Investigator
      Ken Skeem, Cooperator

Situation Statement:
      Alfalfa Stem Nematode (ASN) is one of the most important alfalfa pests in Millard and other counties in Utah. ASN is difficult to control, there are no cost effective chemical controls for ASN so the best controls are through management practices. This requires a field to be planted to a non-host crop for 2-3 years to decrease ASN numbers low enough to reestablish a new stand of alfalfa without significant losses. In Millard County and many other counties in Utah, alfalfa is the most economical crop for growers. Many growers have tried different measures to reduce the rotation interval. Very few leave a field out of alfalfa for three years. Many settle for two years while others push the rotation with only one year out of alfalfa or even planting a filed straight back to alfalfa with no rotational crop. Invariably these producers that push the rotation loose significant yield from their new stands of alfalfa, even sometimes having to take a new stand out after only one or two years. If we could provide a biofumigant as a viable rotation crop then we could possibly reduce the numbers of nematodes to low enough numbers in a one year rotation to allow the replanting of alfalfa without the detrimental effects of yield reduction or reduced stand life. We would like to look at using a cruciferous oilseed crop as a biofumigant to reduce the numbers of ASN while still providing some economical benefit to the grower. This trial will require 2 years, due to crop rotational needs, to fully complete.

Objectives:
    1) Determine if Canola and Camelina will function as biofumigants for the control of ASN. Historically this is done by plowing the crop down while it is still green and growing.
    2) Determine if Canola and Camelina need to be plowed under green (before seed can be harvested) to act as biofumigants, or if the seed can be harvested prior to plowing it down, thus being able to harvest a crop and still achieve ASN control.
    3) Determine if a one year rotation to a biofumigant crop will achieve good enough control to reestablish alfalfa without economic loss due to decreased stand life and/or yield reduction.

Procedures:
      Our Cooperator is willing to let us use a 10 acre field that has had ASN for the past few years. The field is currently in alfalfa but needs to be taken out, it has been in 5+ years. The cooperator is also willing to use his equipment (tractor, baler, swather, combine, and planter) to help run the trial.
      First thing in the spring the field will be prepared for planting, depending on the weather this can be anywhere form Feb-Mar, at that time the Investigators will sample the field to get a base line number for ASN infestations.
      The 10 acre field will be divided into plots running the length of the field. The field is a level basin that is flood irrigated so the plots will run from the head ditch to the bottom of the field. We will have 4 treatments each replicated dependant on equipment and irrigation

limitations with the intent of at least 4 replications per treatment. The treatments will be a commercial fumigation mustard, barley, canola, and camelina.

When the canola and camelina reach maturity but are still green, we will plow half of those plots down. The other half will be taken to seed and the seed will be harvested. The residue will then be plowed down. The barley will be harvested normally either green chopping it or taking it to grain and then baling the straw. The fumigation mustard will be entirely plowed down at the same time that we plow down half of the canola and camelina.

At the conclusion of the season we will again test for ASN, this time taking samples from each of the different treatments (fumigation mustard, barley, canola for seed, canola plowed down, camelina for seed, and camelina plowed down)

On the second year of the trial we will plant 2 different varieties of alfalfa across the plots. We will select a highly resistant variety and a susceptible variety to ASN. We will plant these varieties so that they cross each of the different plots. We will then monitor the growth of each variety noting ASN infested plants. Yield data from each of the treatment areas will also be collected.

Head ditch is to the left, irrigation water will flood from left to right. Diagram shows one sample replication.

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

2nd year

Alfalfa Variety 1	Alfalfa Variety 2	Alfalfa Variety 1	Alfalfa Variety 2

Data Analysis and Presentation of Results:

For the first year of the project we will analyze nematode infestation levels before and after each treatment. Collections will be made in the spring prior to planting and in the fall after harvest of all treatments. These numbers will be compared statistically to determine if at that point there is any benefit from the biofumigant crops.

Results will be presented at grower meetings and published in fact sheet form.

After the second year of the project we will be able to better understand the role of biofumigant crops for the control of ASN. After the second year we will publish the results in fact sheet form as well as presenting the results for publication in scholarly journals. Once again the results will also be presented at grower meetings as well as professional meetings.

Evaluation:

Knowledge of public will be evaluated through the use of surveys at meetings where the results are presented. Follow up surveys will also be used to asses the impact of the study as to the number of people implementing the procedure.

Budget for first year only:

Seed:	$150.00
Chemical to control volunteer alfalfa:	$100.00
Planting/cultivation/harvesting costs:	$500.00
Sampling materials/cost: 6 treatments x 4 reps x 2 sampling times	
(early vs late season) = 48 samples x $50.00 a sample =	$2,400.00

Total Budget: $3,150.00