2012 Utah IPM/SA Mini-Grant

Project Title: 'Alfalfa Stem Nematode Resistance as a Tool to Ameliorate Crop Losses'
Evaluate the comparative stem nematode resistance levels of eight locally available alfalfa varieties marketed as being highly resistant.

Project Leader: James Barnhill, Banner #: A00014865
Collaborators: Dr. Claudia Nischwitz, USU Extension Plant Pathologist
Dr. Earl Creech, USU Extension Agronomist
Dr. Ricardo Ramirez, Utah State University
Dr. Michael McClure, University of Arizona
Grower: Jay Christensen, Farmer in the Plain City area of Weber County

Dates: March 1, 2012 – December 31, 2013

Situation:

Alfalfa stem nematode, *Ditylenchus dipsaci,* is frequently the most serious disease problem in Utah alfalfa fields. Stem nematode can reduce the yield of non-resistant alfalfa varieties significantly. This is frequently only visible in the spring, while cool weather is slowing the growth of the plants, but continues to effect production throughout the season. The race of stem nematode that infects alfalfa has several other hosts where it can survive, but it can only reproduce on alfalfa or sainfoin. Stem nematode is wide spread through Utah and continues to be spread in waste water, on equipment, on seed and in the manure of animals fed forages infested with the nematode. Insecticides are available to control the nematodes in the soil, but they are expensive, and they only reduce the nematode population temporarily. There are no insecticides labeled for control of stem nematode inside the alfalfa plant where it lives and reproduces. Alfalfa varieties have been developed where more than half of their plants show resistance. For years the Extension Service has encouraged growers to select varieties that are marketed as being resistant (31-50% resistant plants) or highly resistant (>50% resistant plants). However, the seed companies are not regulated in the level of resistance that they can claim. Periodically a variety that is listed as having a high level of resistance does not show high resistance in the field. It would be beneficial to growers to have an unbiased assessment of the stem nematode resistance exhibited by the varieties marketed as being highly resistant.

Objectives:

1) Determine the comparative level of stem nematode resistance of eight alfalfa varieties that are marketed as being highly resistant to stem nematode.
2) Evaluate the economic advantage of growing an alfalfa variety that exhibits high resistance to alfalfa stem nematode when growing in a field that has stem nematode.

3) In future years-Determine how the level of stem nematodes effects stand longevity

Procedures:

It is hoped that data will be collected from this trial over multiple years. The trial will consist of plots that are 5 feet wide and 20 feet long, with 1 foot borders. Plots will be arranged in a randomized block design with 6 replications. Ten alfalfa varieties will be planted in the trial. One of these will be a known susceptible variety, such as Ranger, which only has 5% resistant plants (Peaden et.al. 1995). Eight of the varieties will be selected from those that have done well in yield trials in the intermountain area and are marketed as being highly resistant. The final variety will be one that has well known resistance such as Washoe, which contains 54% resistant plants (Wilson et.al. 1978). The alfalfa will be seeded at the rate of 20 pounds per acre. The trial plots will be planted in a field that has been out of alfalfa for a year, but has a history of severe alfalfa stem nematode infestation. Jay Christensen, who farms in the Plain City area of Weber County, has such a field and has consented to let us use it for the trial. Dr. Earl Creech will provide his plot planter for the seeding. The seeder is two and a half feet wide, so planting the plots will require two passes in each plot.

March-April 2012

- Collect a soil sample of the plot area and have a nutrient analysis completed.
  *Fertilize the plot area according to USU Analytical Lab. recommendations – *James*
- Plant the trial plots – *James and Earl*
- Collect 2 soil samples (each sample will be the composite of 10 random soil cores, 6 inches deep) from each of the replication blocks (12). These will be sent to Dr. Michael McClure at the University of Arizona who has agreed to analyze them for stem nematode. – *Claudia, Ricardo and James*

May-October 2012 Evaluate and Harvest the Plots at each Cutting

- Collect fresh weight yield data from each of the trial plots using either a Carter flail harvester, a walk behind sickle mower or 3 replicates of a square meter hand harvest method. – *James, Earl, Claudia, and Intern*
- Collect a forage sample for dry matter (DM) determination from the same variety in each of the replication blocks (6). Record a wet weight of the sample, have it dried at USU to obtain a dry weight and use the average of these evaluations to calculate the 88% dry matter yield of each plot. – *Earl*
- Collect 5 alfalfa stems from each plot and put them in a labeled plastic bag. These will be placed in a cooler and transported to USU where they will be evaluated for number of stem nematodes. – *Claudia, Ricardo and Intern*

Other evaluations

- At the first cutting, determine the plants per square foot in each plot by averaging the number of plants in 3 randomly placed square foot quadrants. – *James, Claudia, Ricardo and Intern*
- At the second cutting, collect 2 soil samples from each of replication blocks for stem nematode analysis. – *Claudia, Ricardo and James*

October-December 2012

Data Analyses and Evaluation

Yield data will be used to determine the effect of stem nematode resistance on the production and profitability of the 8 trial varieties marketed as highly resistant. Their production will be compared to that of a known resistant variety and a known susceptible variety. This information will aid growers in selecting varieties that have the best stem nematode resistance.

The soil stem nematode levels will be used to evaluate the stem nematode population in each replication block and how that population pressure might correlate to yield.

The stem evaluations for stem nematode will help determine the actual stem nematode population in the plant and how that population level might correlate to yield. It might also help determine if the resistance is due to reduced numbers of nematodes gaining entrance into the alfalfa stem or if the plant is just able to handle the nematode damage better.

Educational Products

- A fact sheet highlighting the findings of the trial will be published on the USU Extension Web site. - *James and Claudia*
- If the trial continues for multiple years an attempt will be made to publish the information in a refereed journal. - *James, Claudia, Earl and Ricardo*
- A power point presentation of the trial results will be developed. - *James, Claudia and Earl*

Jan-Oct 2013

Educational Outreach

Trial results will be shared through presentations at:

- County crop management seminars - *Claudia*
- Utah Association of County Agricultural Agents Conference - *James*
- Western Region County Agriculture Agent Professional Improvement Conference - *James*

- Utah Hay and Forage Symposium - *Earl and Claudia*

A fact sheet and the power point summarizing the trial will be sent to each county Extension office in Utah

Budget:

Alfalfa Stem Nematode Resistance as a Method to Ameliorate Crop Losses **BUDGET SUMMARY** **2011**	
Expenses	
Initial soil analysis ($12)	$12.00
Supplies (i.e. flags, scale, paint, bags, cooler, square foot quadrants, clippers)	$250.00
Fertilizers (to meet USU Lab recommendations)	$25.00
Seed (1 lb/10 varieties @ $4/lb)	$40.00
Mailing Soil Samples (24 samples @ $4/sample)	$96.00
Student Intern (16 hours harvesting and 110 hours evaluating stem samples = 126 hrs 116hrs X $10=$1,160	$1,260
Travel expense – Logan, UT (6 trips @110 miles = 660 miles @ .485/mile)	$320.00
Poster printing	$100
Total Budget	**$2,103**

References:

Peaden, R. N., Griffin, G.D. and Kulger, J. L. Alfalfa Stem Nematode Resistance. (1995).

Wilson, T. R., Kromann, R. P., and Evans, D. W. (1978). Nutrient Digestibility, Digestible Energy and Metabolizable Energy and Agronomic Data for Five Varieties of Alfalfa Hay. J Animal Sci 1978. 46:1351-1355.