Assessing the impacts of seed treatments and rotation on SCN populations and soybean yield over time

Final Report

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Introduction

Soybean cyst nematode (SCN) is the most damaging pathogen of soybeans. This pathogen persists in fields as recalcitrant cysts and eggs. Root exudates signal eggs to hatch, and the wormlike, SCN juveniles use these same exudates to locate soybean roots. Damage caused by SCN is driven by colonization of roots by females, which set up permanent feeding sites on roots and continuously draw nutrients from the plant. Females eventually turn into cysts, and a single cyst can contain over 600 eggs. Females also produce eggs outside of the cyst, which may hatch and infect roots during the growing season. SCN may go through several generations within a growing season and therefore impose significant yield penalties to soybeans. Losses exceeding 40% are common in fields heavily infested with SCN.

Management of SCN in many areas involves rotation from soybean to non-host crops for multiple years (ex. corn, small grains, lima beans, etc.) and the selection of resistant soybean cultivars. These management practices result in fewer viable eggs in soil over time, which ultimately can reduce SCN population numbers to levels where they are not causing economic losses. Unfortunately, at the present time most soybeans produced in Delaware only contain the PI88788 source of resistance. Persistent, long term exposure to the PI88788 resistance genes results in SCN populations that can reproduce well on plants containing this source of resistance. Even though SCN reproduction may be less than if a susceptible variety was planted in the same field, it may not be sufficient to adequately reduce damage and SCN populations within fields over time. Consequently, **Delaware growers are in need of additional management tools for SCN in soybeans.**

Recently, industry has developed several seed treatments touted as SCN management tools. These products include insecticide treatments, fungicides, and biologicals. Popular press claims these products are potential solutions to SCN issues. Seed treatments have limited single year, within season value due to limitations in the rate of product that can be applied and its effective coverage zone. As a result, protection is often restricted to the initial stages of seedling growth. Value of seed treatments, in terms of yield increase, is unlikely to be realized except in fields with low initial levels of SCN.

Most studies of chemicals and their impacts on SCN involve single year studies. However, some growers may plant continuous beans with nematastatic/nematacidal seed treatments or rotate to corn or another non-host. **It is not known if continuous use of nematacide / biological seed treatments have an additive effect on suppressing SCN populations, if SCN seed treatment effects persist past a single season, or if the impacts of SCN seed treatments, particularly those of biological origin, continue into subsequent years.** Assessing the long term impacts of seed treatments on SCN populations will allow growers to make informed, profitable management decisions as it relates to SCN.

The **objective** of this study is to assess four new or commonly used seed treatments in continuous soybean or a soybean corn rotation for their within season, cumulative, and residual effects on SCN egg numbers and soybean yield. To accomplish this, we will establish two field trials in SCN fields located at the Carvel Research and Education Center over at least a two year period.

Progress

The studies were planted as proposed at the Carvel Research and Education Center. Soybeans were planted on 6/6 16 on 30 inch rows at approximately 160,000 seeds / A. Corn was planted at 32, 000

seeds per A on 6/10. Plots were 10 ft wide x 23 feet long, with 5-6 reps per treatment arranged in a randomized complete block design. Plots were fertilized and maintained for weeds following University of Delaware Recommendations. At planting a sand mixture containing approximately 20,000 SCN eggs per 100 grams was spread in furrow at planting through the insecticide box. A gallon of soil was sampled the day after planting from all plots and again a day before harvest.

Unfortunately the environment in 2016 resulted in multiple issues that resulted in complete failure of this project. First, heavy rains after planting resulted in inordinate stand loss across half of one project and throughout the center of the corn / soybean rotation project. In addition, stand loss in soybeans will impact SCN populations over time, resulting in unreliable data. Stand loss also caused flushes of morning glory later in the growing season, which further confounded results. Despite these issues, we carried out the experiments as proposed to determine if any useful information could be generated from the project. Data analysis confirmed our suspicions that stand loss and other issues imposed significant impacts on the study, and therefore no statistical differences were obtained. Consequently, we cannot continue with the second year of the study and will not ask for the second season of funding due to the issues with the first season of the project. This is unfortunate as not only was the project potentially useful to producers, but a great deal of time and effort was put into the work.

If we propose a similar project in the future we will reduce the amount of treatments and replicate the entire experiment during the field season to minimize a reoccurrence. I apologize that we were not able to provide the data as planned and will work to prevent future issues such as this from occurring.