2014 Pennsylvania Vegetable Marketing and Research Program
Pennsylvania Vegetable Growers Association Report
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Title: Survey of soilborne snap bean pathogens in Pennsylvania and establishment of a research plot dedicated to snap bean root pathogen research.

Principal Investigator:

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INTRODUCTION:

Snap beans are susceptible to a number of common soilborne root pathogens including *Rhizoctonia solani*, *Pythium* spp., and *Fusarium* spp. Often these pathogens occur in association with one another to create complexes. Root rots are generally most severe and cause the greatest damage to beans when cool and wet soil conditions occur from seeding to three weeks after planting and then are followed by hot dry weather. The poorly established root systems are unable to up-take the nutrients and water necessary to sustain the plant and it collapses. Damages and losses are often expressed as poor emergence due to seed decay and pre-emergence damping-off, post-emergence damping-off, as well as root rots later in the season that lead to the development of stunted, unthrifty and less productive plants. The wide host ranges of these soilborne pathogens and their ability to produce resistant survival structures make the use of crop rotation as a management strategy difficult once they are established in a field.

On-farm grower trials are an important tool for evaluating potential management strategies however, the variability in soilborne pathogen pressure and the difficulty in creating a favorable environment for disease development can make it difficult to obtain reliable results especially when a management tool is in the early stages of evaluation. Establishment of a research block dedicated to research on soilborne snap bean pathogens will facilitate conducting much needed research and enable us to infest the soil with various soilborne fungal pathogens and create disease favorable conditions through adjustments in fertility and irrigation. Research being conducted at other peer institutions has used this same strategy for the evaluation of seed treatments, in-furrow drenches, cultivar evaluations, etc. There for in 2014, we proposed to establish a snap bean “disease field” at the Russell E. Larson Research and Education Center with populations of soilborne fungal pathogens to facilitate the evaluation of management strategies in replicated field trials. In addition, in collaboration with Steve Kistler and John Esslinger, root health assessments were made an on-farm product efficacy trial was conducted to evaluate several select seed and soil treatments for managing soilborne pathogens.

METHOD AND RESULTS:

In summer 2014, a two acre plot at Rock Springs was selected and double cropped to snap bean crop. The crop residue from the first crop was plowed down and a second crop established to build-up pathogen pressure within the site. Frequent rains made it unnecessary to apply supplemental irrigation during the growing season. Due to time constraints this past fall, soil samples will be collected early in spring 2015 and a greenhouse snap bean bioassay conducted to assess for soilborne pathogens. Over time at this site, the snap bean soilborne pathogen population will continue to build and will be more uniformly distributed across the field which will facilitate the evaluation of potential management practices.

On 9 Jun, a semi-replicated snap bean root rot product efficacy trial was established at the home farm of Steve Kistler in collaboration with John Esslinger. Soil applied treatments included an untreated check, Ridomil Gold, Headline, streptomycin, a fish-based fertilizer, Ridomil Gold plus Headline and then the

seed treatments HiStick N/T and GraphEX-SA which are Rhizobium inoculants with and without *Bacillus subtilis*, respectively. These treatments were evaluated on the three cultivars Envey, Wyatt and Cassidy. In mid-July at late flowering/pin-stage, five plants were carefully dug from each row of two double row plots for a total of20 plants per treatment. The roots were carefully washed and observed for symptoms of the several common soilborne pathogens.

From the hypocotyl and roots of select plants that differed based on symptoms, isolations were made by cutting a small piece of tissue from the margin between healthy and symptomatic issue, surface sterilizing it and then placing it on potato dextrose agar plates. As fungal cultures grew from the tissue they were transferred to a new plate and DNA from the fungal culture was isolated using PCR and the fungus identified based on DNA sequence homology with other known isolates in the GenBank database. The fungi isolated from the symptomatic tissue included *Rhizoctonia solani, Fusarium solani* f. sp. *phaseoli* and *F. oxysporum*. In addition, *Diaporthe sojae* which is recognized as being one of the causal agents of Phomopsis seed decay as well as pod and stem blight in soybean was frequently isolated from the plant tissue. The host range includes snap bean as well as other legume and non-legume hosts.

Although quantitative data was not collected, visual observations from this trial indicate that cv. Envey is less susceptible to the soilborne pathogens present in this field trial compared to cvs. Wyatt and Cassidy. Also the root systems of plants treated with Ridomil Gold, Headline or a combination of both tended to be more robust than the other treatments. Additional trials under more controlled conditions are necessary in order to better understand the role of seed and soil treatments in managing soilborne pathogens of snap bean.

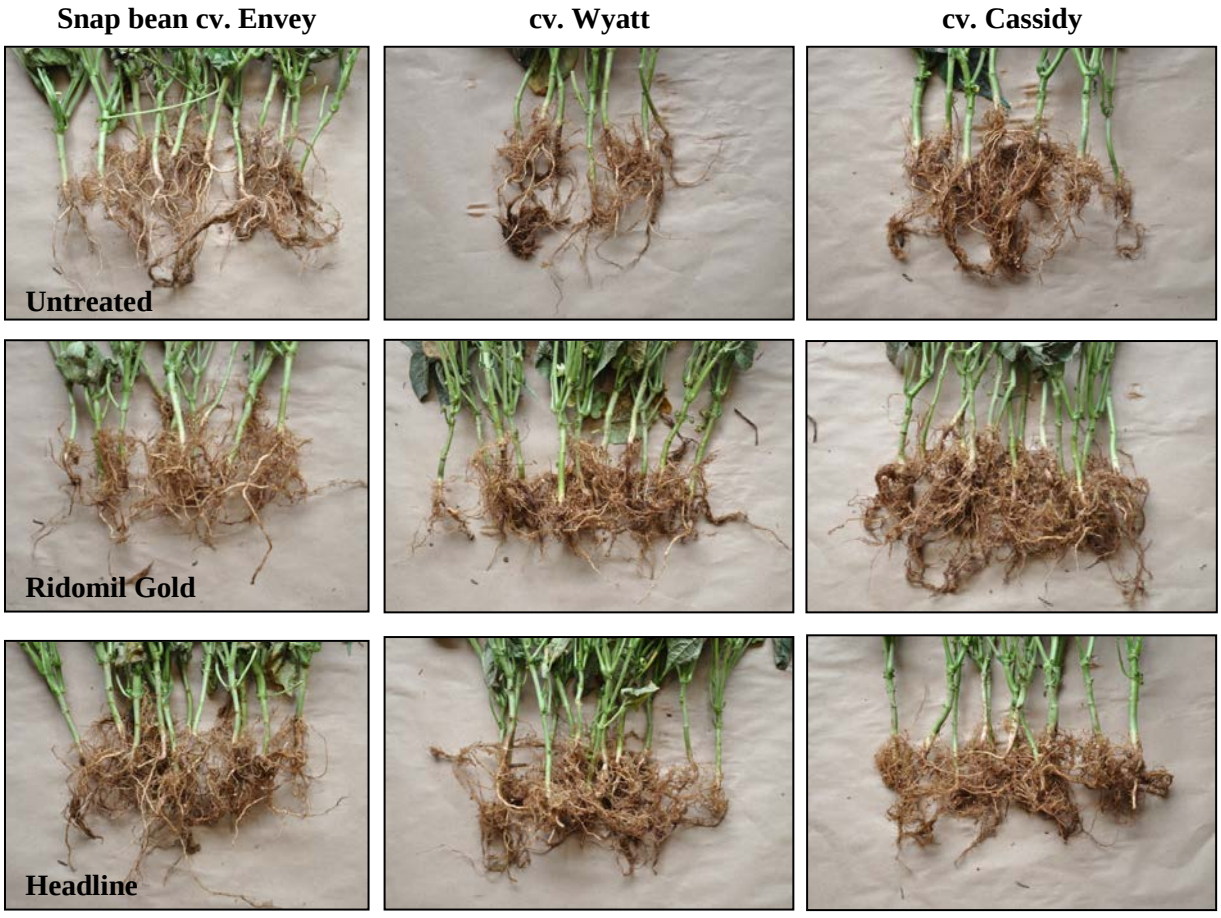

Figure 1A. Effect of select seed and soil treatments on the root health of the three snap bean cultivars Envey, Wyatt and Cassidy (columns). The treatments are labeled across the rows.

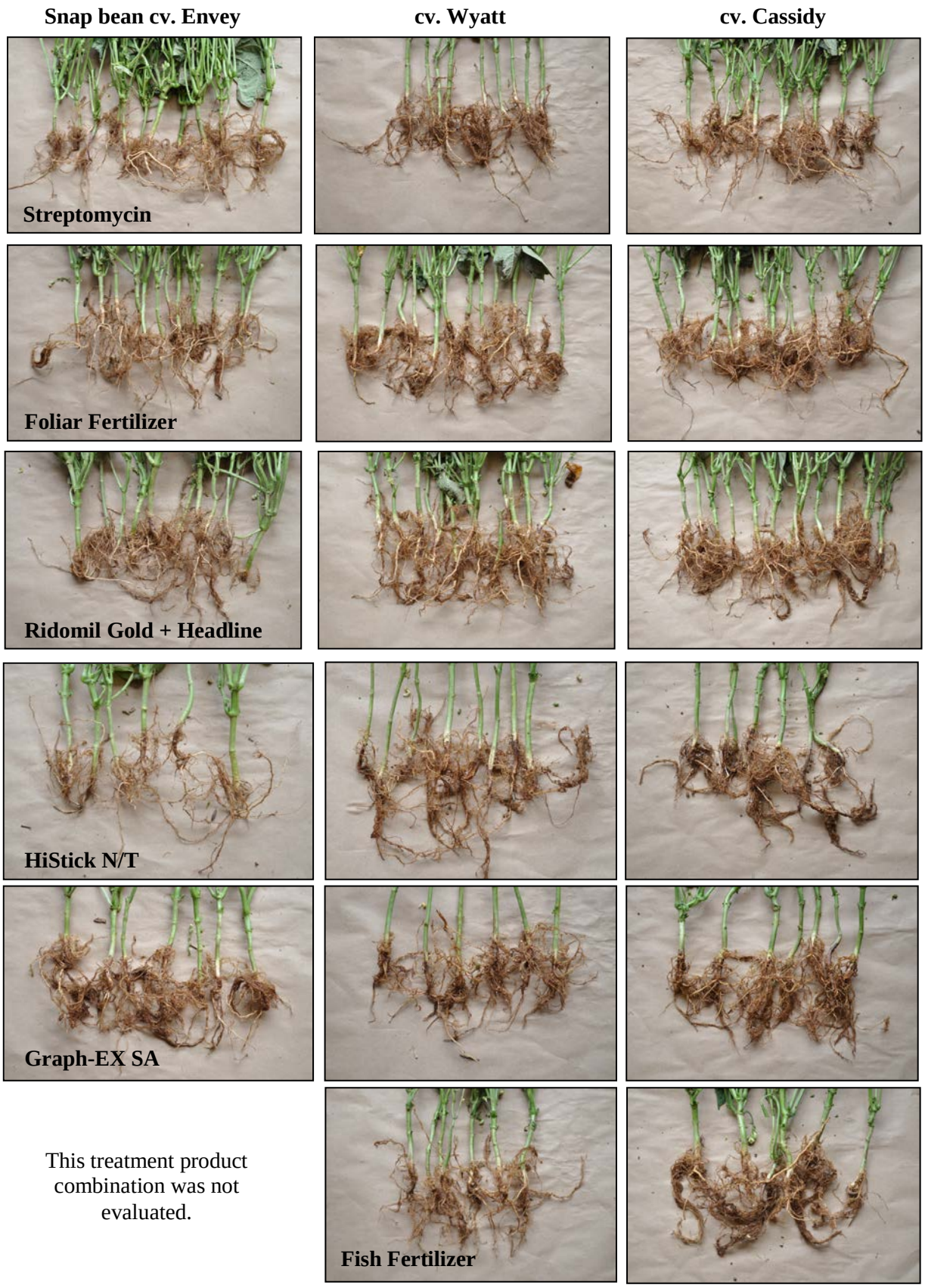

Figure 1B. Effect of select seed and soil treatments on the root health of the three snap bean cultivars Envey, Wyatt and Cassidy (columns). The treatments are labeled across the rows.