Regional IPM Competitive Grants Program—Northeast Region
Progress Report, 2007

A. Grant Data

- Category: *Northeast Regional IPM Competitive Grants Program (RIPM)*
- Title: *A Grower Decision Tool for Optimized Disease Management in Snap and Dry Beans: Development and Implementation*
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- State(s) involved: *New York, Pennsylvania*
- Grant #: *2006-34103-16934*
- Year the grant was awarded: *2006*
- Length of grant: 2 years, *6/15/06 – 6/14/08*
- Funding amount: *$46,196*

B. Nontechnical Summary.

White and gray molds are the primary fungal diseases on snap and dry beans in NY and PA that trigger the use of fungicides. Both fungi are aggressive and have a very wide host range that makes rotation from non-hosts difficult. Producers are in need of a decision tool that provides guidance on the strategic and prudent use of materials for pod mold control. The proposed research develops a user-friendly decision tool for action based on weather conditions and pathogen behavior. The decision tool will effectively remove the guesswork from disease management practices.

C. Introduction.

White mold caused by *Sclerotinia sclerotiorum* and gray mold caused by *Botrytis cinerea*, are the primary diseases that trigger the use of foliar fungicides on snap and dry beans in New York, Pennsylvania, and several other states where bean production is concentrated. Both fungi thrive during the warm humid summer months when bean production is at its peak. The diseases are most problematic when plants are vigorous and yields and profit potential are greatest. These two pathogens are quite cosmopolitan and aggressive. *S. sclerotiorum* is known to attack over 408 species of plants, which makes rotation from non-hosts difficult. Cultural practices alone are unable to arrest disease development.

Until recently, pod mold control in snap beans was achieved through the use of the fungicide vinclozolin (Ronilan, EPA Reg. No. 7969-85). The outstanding efficacy of vinclozolin allowed snap bean producers to control disease with one low rate, well timed application. No other materials on the market could be used as prudently and still result in excellent disease control. Vinclozolin was pulled from the market due its carcinogenic and endocrine disruption properties. The loss of vinclozolin has resulted in snap bean producers using less efficacious materials and generously applying fungicides to reduce perceived and real risks of disease epidemics. Producers are attempting to control disease with multiple fungicide applications (as opposed to one vinclozolin application), using unproven timing strategies, and when affordable, applying the highest labeled rate. With these strategies, neither snap nor dry bean producers are effectively controlling pod molds. For many farmers, fungicides are being applied as an insurance measure against potential devastating crop loss due to disease.

Snap beans and dry beans produced for fresh market and processing are economically valuable crops produced in New York and Pennsylvania. Based on the most recent statistics (2006) from the United States Department of Agriculture National Agricultural Statistics Service, 19,000 acres of dry beans and 32,900 acres of snap beans (fresh and processing) are grown in New York State. Together the value of these beans crops is worth $33,946,000 (dry beans $5,975,000 and snap beans $69,173,000). The snap bean processing acreage for Pennsylvania (2004) was 14,000 acres for a value of $10,158,000.

This proposal addresses a producer articulated critical need for research-based control strategies for white and gray molds on snap and dry beans in New York and Pennsylvania. Producers are in need of a decision tool that uses an informed database to evaluate the on-site situation, determine the need for intervention, and suggest the most efficacious application rates and timing for pod mold control. The need is for a user-friendly decision tool that can eliminate subjective "insurance applications" of fungicides.

D. Objectives.

To optimize white and gray mold management strategies in snap and dry beans grown in New York and Pennsylvania. *Progress is being made towards helping growers make the critical decision to intervene or not. Work continues on optimization of intervention strategies. Significant progress has been made towards characterizing efficacy of registered materials, and optimizing rates and timing.*

To develop a decision tool for growers that will provide guidance on the strategic and prudent use of registered fungicides and biopesticides for control of pod molds on snap and dry beans, while achieving acceptable and economic disease control. *Data was collected in 2006 that has been incorporated into the decision tree database. A model decision tool has been constructed and is being modified and evaluated in 2007.*

E. Approach.

Two approaches have been deployed. Field trials have been designed to evaluate efficacy of registered materials and assist in identifying new materials with reduced environmental impacts. Research based efficacy information will be presented to growers.

The second approach has been to collate existing knowledge and data on mold development into a decision tree structure for predicting the combination of factors which, when met, would place fields at risk of severe mold development. In the process of doing so, it became apparent that the research community is aware of which factors are important for mold development on an individual basis, but there are no data on the relative importance of each factor or how they link together. For example, by how much does rotation reduce the risk of mold relative to row orientation, or does it? Hence, we were prompted in 2006 and 2007 to conduct extensive field surveys to ascertain what conditions promote mold development in commercial fields across the Western New York and Pennsylvania landscape.

F. Progress.

Clear progress has been made in determining efficacy of materials registered for white and gray mold control. Research based information on efficacy and timing is available for use by growers. The decision tool continues to be developed, and extensive field surveys will provide the additional data needed for further refinement of the tool. Progress has been hampered by the unfortunate dry weather patterns in 2006 and 2007, which have limited disease development in commercial fields. However, in spite of the generally dry (NY is in a summer drought in 2007) conditions, we are still observing fields with mold, albeit at low levels.

G. Results.

Mold levels have been generally low in fields in 2006 and 2007 due to unusually dry weather (although we do wonder if this will become the norm due to climate change). This has resulted in a slightly reduced data base for challenging the nascent decision tool. Our data further indicate that in commercial fields soil moisture is infrequently near 100% capacity 7-14 days pre-bloom, which is the current thinking for spore release requirements at bloom. As the decision tool is developed, we need to take into account that sclerotia produce stipes over time, and can start and stop or suspend further development of apothecia and ascospores until weather conditions are favorable. Latent infections that develop once moisture becomes available must also be integrated into the model decision tool. We have observed that blossoms on plants for an extended period beyond peak bloom provide additional unaccounted-for infection sites for *S. sclerotiorum* and *B. cinerea*. We are also observing a major effect of canopy closure on pod mold development. Our current data are leading to several new hypotheses which may lead to revisions of our current thinking of white and gray mold development and of control strategies.

H. Impacts.

Although this work is in progress, the expected impact is that snap and dry bean producers will have an informed database on which to base mold control decisions. Growers will have a research based means of identifying periods when mold risk is zero, low or high. This will reduce routine applications of fungicides, and the associated environmental impact. Growers should realize increased profitability without a reduction in product quality.