SRSFC Project 2021-E10 Project Progress Report: Development of fact sheets and comparative critical disease information for *Vitis vinifera*, traditional hybrids, and Pierce's disease tolerant grapevine hybrids.

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Abstract: Wine grape production in the Southeast is unique, in that southeastern vineyards often contain an extensive variety of grape species (e.g. *Vitis vinifera*, *V*. *rotundifolia*, and *V*. *aestivalis*) and hybrids (e.g. Vidal blanc) – often side by side or within close proximity. Adding to that mix, Pierce's disease (PD) tolerant hybrid wine grape cultivars (e.g. Blanc du bois, Lamonto, Crimson Cabernet and Walker [Univ. California] breeding program varieties) are becoming an important alternative to *Vitis vinifera* cultivars in the southeastern United States. Detailed fact sheets are not currently available. In addition, accurate identification of pathogens, especially new pathogens is critical. This grant has provided for a multi-year project, and will involve extensive microscopy, lab confirmation through PCR and other methods, and extensive photography/video of pathogens in the field and lab. Work is ongoing, and first fact sheets should be available in 2022.

Objective: Establish informative and extensive fact sheets about pathogens and diseases of *Vitis vinifera*, traditional hybrids, and Pierce's disease tolerant grapevine hybrids.

Justification and Description: Wine grape production in the Southeast is unique, in that southeastern vineyards often contain an extensive variety of grape species (e.g. *Vitis vinifera*, *V*. *rotundifolia*, and *V*. *aestivalis*) and hybrids (e.g. Vidal blanc) – often side by side or within close proximity. Adding to that mix, Pierce's disease (PD) tolerant hybrid wine grape cultivars (e.g. Blanc du bois, Lamonto, Crimson Cabernet and Walker [Univ. California] breeding program varieties) are becoming an important alternative to *Vitis vinifera* cultivars in the southeastern United States. While these hybrid cultivars lessen the concern from PD, unease among producers has been noted about the available information on the susceptibility and sensitivity to other grape diseases; little is known about the specific pathogens that will attack these grapes. For example, a PD-tolerant variety, Camminare noir, was devastated by presumptive *Macrophoma* spp. (Figure 1), but symptoms were typical of black rot and would have been misidentified without microscopy. As another example, extensive spotting was observed in Lamonto; this could have been caused by various environmental issues or pathogens (Figure 2). Likewise, losses in Blanc du bois to a necrosis of clusters during bloom were extensive for the last three years, but only yeasts and *Cladosporium* spp. were identified as potential pathogenic causes; however, nutrition, environment, or other issues may have been involved. The bottom line is that limited information is available on the web or elsewhere to help producers, county agents, specialists, etc. to understand these new varieties and the pathogens or other issues associated with them. At the same time, good diagnostic resources are limited for even the traditional *V*. *vinifera* and hybrid grapes.

Fact sheets that would help county agents, vineyard managers, research/extension personnel and extension diagnosticians identify pathogens, diseases, and/or physiological/nutritional issues across grape species and varieties is not readily available. In addition, disease symptoms are highly variable across species and cultivars; current fact sheets are generally *V*. *vinifera*-centric and provide limited help in identifying diseases on other species and hybrids now grown in the Southeast. In addition, speciation of pathogens may show that new pathogenic species are involved in the diseases observed. Visual and microscopic assessment is no longer sufficient when determining which pathogens are attacking plants; rather PCR, pathogen grow out (agar media in petri plates), and spore comparison is now becoming the gold standard for identification – resulting in a vastly expanded knowledge of the pathogen complexes associated with identical symptomology. For example, when using PCR and media grow outs, >20 species have now been identified as causal in bitter rot of apple. Such findings have critical impact on our understanding of fungicide efficacy, resistance development and resistance management.

This is a multi-year project, and will involve extensive microscopy, lab confirmation through PCR and other methods, and extensive photography/video in the field and lab. This effort will provide growers and extension personnel with readily available information that will increase their ability to identify and scout for disease problems – reducing costly failures moving forward.

Specific diseases and pathogens, such as downy mildew, will be initially targeted for fact sheet development. For example, downy mildew, an oomycete, occurs on *V*. v*inifera*, *V*. *aestivalis*, and

Figure 1. Macrophoma rot on Camminare noir Pierce's disease resistant grape from the Walker breeding program (Univ. California) as observed in Georgia. Extensive rot that resembled black rot symptoms was observed (A), but microscopy identified *Macrophoma* spp. (B) as the primary pathogen throughout the vineyard. Good fact sheets with photos of fruit symptoms, fruiting structures and spores are not readily available for this pathogen of grapes. County agents and specialists now routinely utilize microscopy to identify pathogens, so fact sheets that include sufficient information for accurate identification are needed.

numerous hybrids. However, symptomology can vary based on species and variety and stage of infection. Numerous photographs will be taken of the downy mildew symptoms and different grape species/varieties and at varying stages of development (leaves, fruit, etc.); these can be utilized to develop comparisons in a fact sheet. High definition microscopic investigations will include photographs from dissecting and compound microscopes. In the case of fungal pathogens, grow-out on media and photographs of the top and bottoms of petri dishes will be utilized; fruiting structures and spores will also be clearly photographed. Grow outs and PCR will be utilized to further confirm pathogens associated with specific diseases when warranted, such as bunch rots. Videos of field symptoms and diagnostics with a hand lens will be linked to fact sheets. Fact sheets will be variable in content, as it may make sense to develop some fact sheets by specific variety, whereas for most fact sheets, these will be developed for each specific disease. Again, it is anticipated that this will be a multi-year project. The first year will be a proof-of-concept year, and if the grant panel approves of the resulting fact sheets, we will continue the project to fully develop additional fact sheets over time.

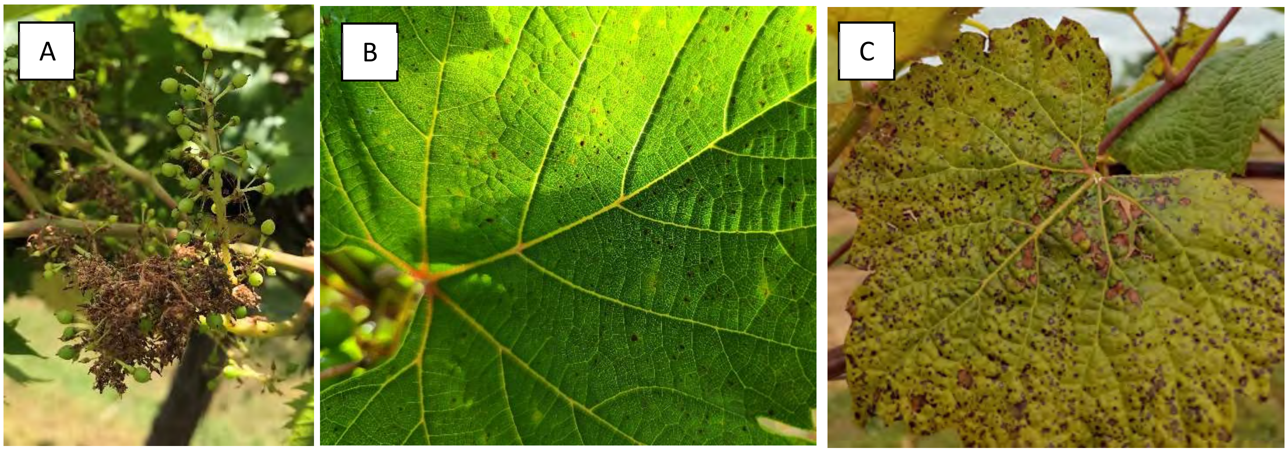

Figure 2. Diseases or possibly environmental/physiological issues of unknown etiology. Bunch necrosis of Blanc du bois (A) has been a major issue for the last three years, and there is limited to no information of value relative this issue on this variety. This unique Pierce's disease resistant variety is now being planted throughout the Southeast, but no good fact sheets address the potential negatives associated with the variety. Limited references indicate that this could be associated with excess nutrients, but potential pathogens can be found in association with symptomatic blooms. Without regard, fact sheets should be developed for issues that are often or generally observed with particular varieties. Likewise, Lomanto shows symptoms, speckling (B) and necrotic spots (C), of concern as well; this may be related to ozone or some other cause, but producers do not have good references to such, and this has not been investigated well.

Results: The work for this grant will be continued in 2022 and beyond. For 2021, field photographs were collected and categorized for several diseases and multiple cultivars. Microscopy photographs were started as well, but more need to be collected. One of the key parameters will be the use of several microscopes located in the University of Georgia Electron Microscopy facility, and unfortunately, they moved to a new facility over the summer and fall, precluding any use of these scopes. However, we have visited the new facility and are set to conduct this aspect of the project in 2022. Work will continue in 2022, and it is anticipated that fact sheets will start to flow from this effort in the coming year. This is as long-term project, and additional funds may be requested in future years, but not this year.