**S1083 Multi-state project**

**S1083: Ecological and genetic diversity of soilborne pathogens and indigenous microflora**

**2019 Meeting (remote)**

**December 13, 2019 – 9 AM – 12PM**

**AGENDA**

Attendes: Nathan Slathon, Shankar Ganapathi Shanmugam, Carla Garzon (chair), Fulya Baysal-Gurel, Alejandro Rojas, Sydney Everhart, Soledad Benitez (secretary)

**9:00 Greetings and introductions**

Greetings: start with Dr. Garzon, who has been part of the group since 2008 –

Carla Garzon, member of this group since 2008 and current chair of this multistate group welcomed everyone in the call. Dr. Garzon announced that in 2020 she will be moving to a new position, therefor she won’t be able to continue as a chair. Therefore, after this meeting, the current secretary (Soledad Benitez) will take the chair’s position. The chair, with help of the secretary will be in charge of preparing the 2019 report and submission, as well as coordinating the 2020 meeting.

Introduction of other members in the call:

Dr. Ganapathi Shanmugam – Mississippi State University – soil microbiome and soil health – new to pathogen world, with reseach interests on suppressive soils. He joined this multistate project this year.

Dr. Benitez – Ohio State University (since 2017) – plant microbiomes and crop diversification, currently focused on corn and soybean production, as well as some bacterial endophyte work in tomato

Dr. Baysal-Gurel – joined Tennessee State University in 2015 – involved with this group since then and have seen lot of changes since 2015. Current projects focus on nursery research. Her research station is surrounded by more than 600 nursery growers. Work on diagnostics and identification of needs, with a focus on soilborne diseases. Has evaluated different chemical strategies, biofumigant cover crop species and has adoption of the biofumigant cover crops in the area. Current focus on flooding – both from soilborne diseases but attraction of insects to the plant. Collaboration to look at the microbiome.

Dr. Rojas – University of Arkansas. Experience in oomycete pathogens, as well as in ectomycorrhizal diversity. Current research focus on soilborne diseases and cover crops/soil health. Also working on seed quality, specifically impact of seed quality on soybean production. Major focus on field crops, however starting to diversify to other crops, like strawberries.

Dr. Everhart – University of Nebraska. Background in population biology/epidemiology and collaboration with extension faculty for translation of research. Focus on Sclerotinia in soybean and dry bean, as well as Rhizoctonia and Cercospora. Another focus is fungicide resistance as well as research on cover crop effects on microbiome.

**9:10 Brief overview of the S1083 Multi-state project History and Objectives (by Dr. Garzon)**

Project under different versions since the 70’s. The number of members, and members have changed, however the title and focus has been similar. Eventually the project incorporated the component of molecular aspects of microbial populations. In the third version, the project simplify the objectives to two in order to focus on the diversity of microbes from different perspectives, as well as focus on management. This simplified the objectives.

**9:20 Dr. Nathan Slaton, Project Administrative Advisor – General information**

New to the group. His predecessor was also from Arkansas. Dr. Slaton had participated as a faculty member in multistate groups before. Research focus on soil testing and agronomic crop responses to fertilization.

Goals for today: Identify how and when the group will have an official meeting. It seems that it has previously been done in conjunction with APS meetings. Just make sure to plan it accordingly so it is on everyone’s schedule. Also, encourage everyone to go to the site and make sure we are active participants in the program (NAMMS S1083). Also, need to work on the 2019 report to submit in the groups behalf. The report will be submitted within 60-90 days of the official meeting. Since we met in December, try to prepare one and submit 2019 report within the next two months, and then get back on track with the annual meeting starting the 2020 summer.

* Dr. Garzon mentions that given the delay in 2018 approval – the 2019 APS Cleveland meeting was informal – this zoom meeting will count as our 2019 official meeting.

Dr. Slaton encourages in person meetings, as well as seeking funding opportunities. There are a lot of commonalities between the people already in the call. Dr. Slaton has to leave, but will try to join by phone and listen as much as possible.

* Dr. Garzon encouraged that this groups is more a collaborative project. If we have collaboration make sure to list the projects that resulted from this.
* For the 2019 report send materials to Soledad who, with help of the secretary gather everything. (Soledad’s email: benitezponce.1@osu.edu)

**PROJECT REPORTS**

**9:30 Dr. Alejandro Rojas – ARKANSAS – University of Arkansas**

* Soil borne pathology and ecology lab.
* Tap root decline – important pathogen in the south
* Misdiagnosed – sypmtoms very similar to SDS
* Plants break at the soil line. Xylaria (fungal causal agent) – is a good saprophyte. Is there a relationship between cover crop sand the increase of this pathogen (alternate hosts)?
* Not a lot of information on this pathogen – other researchers working on protocols for this pathogen. How to adapt the system to greenhouse and growth chamber?
* Working on the best type of substrate to work with this pathogen
* Studying more what are some of the factors that are driving the incidence of these pathogens in the field – potentially microbiome based and biological control
* Have shown reduced biomass in cover crop species
* Soybean seed issues. Seed symptoms: purple, brown – chalky.
* Some differences observed in between the maturity groups and the infection by the different pathogens.
* Correlation of seed infection with presence of different fungi. Phomopsis has some interesting results.
* Diversity of seedborne fungi. Based on plate assay. Interested in questions of endophyte vs. pathogen / lifestyle change.
* Specialty crop grant in strawberry.
* Strawberry – common to use the same variety – start to look at what are some of the problems in Arkansas – try to provide solutions and communicate to the growers.
* Working on biological control bacteria.
* Screening of collection of potential BCA against different soil borne pathogens. Selection of media and then different pools of pathogens for the BCA.
* Assays to look at impact/mode of action – observed some lysis occurring by some of the bacteria
* Working on preliminary assays on seed germination and see the role of these bacteria
* Look at some antibiotic production genes and plan on working on BCA genome analysis.

**9:50 Dr. Shankar Ganapathi Shanmugam - MISSISSIPPI – Mississippi State University**

* Still not have much data – since just beginning position
* Main focus and interests: Microbial ecology/microbiome/ecology of pathogens
* Working on methodologies to study soybean tap root. How to best rate the disease?
* Plan to develop a survey with farmers to compare management practices
* Worked on some sampling of soils for characterization of microbiome
* Working on quantitative PCR approaches as applied to tap root – how to best target the pathogen, as there could be different spp causing disease.
* Proposing to do a lot these coming year.
* Conversation with Dr. Rojas regarding qPCR approaches not only ID pathogen in the soil, but also in the plant . In a way this pathosystem is similar to SDS because it colonizes early in the season, but shows up later. It also involves a toxin.

**10:10 Dr. Soledad Benitez - OHIO – Ohio State University**

Summary of research presentation – As I was the secretary, I wrote a summary of my presentation after the fact.

Lines of research:

a) Diversification in corn and soybean production and microbiome dynamics:

 - Diversified rotations (2, 3 and 4 yr)

 - Cover crops (Rotations x Cover crops)

b) Crop-livestock systems and plant endophyte diversity

c) Beneficial plant-microbe associations (Trichoderma, AM, screening for SCN associated fungi)

d) Microbe-microbe interactions in the plant-soil interface

Presentation focused on first two topics.

* Worked in rotation experiments in both OH and SD. Looking at both the impact of length of the rotation, as well as the crop sequences within the rotation. Analyzing microbial communities associated to corn and soybean within the studied rotation sequences. Overall summary, rotation length, rotation sequence and crop studied matter, as well as time of sampling and site. Planning on incorporating cover crop as a factor in rotation experiment in OH.
* For endophyte diversity study, using tomato as a crop planted after a pasture rotation with chicken grazing. Analyzing bacterial endophytes from a culturing and DNA-based approach. Looking at different compartments within the tomato plant to understand impact of chicken gracing on subsequent crops, as well as endophyte dynamics during a growing season.

**10:30 Break**

**10:40 Dr. Carla Garzon - OKLAHOMA – Oklahoma State University**

Research focus: Diversity of oomycetes and of Pythium in particular. Focus on horticulture and controlled environments. Have performed research in other soilborne pathogens including fungi.

Epidemiology and population biology in Pythium irregulare and the irregulare complex. Very diverse genetically. Traditional barcoding loci do not provide statistical support to separate phylogeny of irregulare complex and other species. Currently including phylogenomics work. Phylogenomics of Pythium – in collaboration with Agrifood Canada and USDA – GBS

Also working on other species of Pythium in ornamental works.

In addition, research on development of bioinformatic based diagnostic approaches. One being development of E-probes for detection pathogens in nucleic acid samples.

Collaboration with Dr. Andres Espindola. Dr. Espindola developed – MiFi (Microbe Finder), an online tool to design the e-probes based on available sequence information. Researcher curates a database for the group of interest, and then upload the data to MiFi. The MiDetect tool allows to compare metagenome of your sample against a database of the eprobes.

Currently working on developing of eprobes for regulated oomycete species. Work in collaboration with Dr. Gloria Abad- to use Minion data.

Work in hormesis, and relationship to fungicide resistance in Fusarium and Botrytis. Working with transformed strains (Fusarium) – onion and ornamental onions, as well as grapes. Including studies of gene expression changes.

**11:00 Dr. Fulya Baysal-Gurel - TENNESSEE – Tennessee State University**

Presentation focus: Nursery flooding, Phytophthora root rot and Ambrosia beetles

Flooding in relation to hurricanes. What can be done ahead of time – preventite treatment before the flooding event

Three different types of nursery production – “field “– “container” – “pot to pot”

Observation of ambrosia beetle attack after flooding – plant release ethanol under stress Ethanol triggers ambrosia beetle and damage of root.

Beetle makes gallery/entry into the tree (symptoms on the bottom of the tree). Ambrosia beetle carry symbiotic fungi that can also affect the plants.

Focus of study on fungicides/biofungicides that could reduce attractiveness to beetles. Also look at the relationships between fungicides, P. cinnamomi, ambrosia beetles and flooding

Results: Some fungicide do provide some preventative effect – Trichoderma did not perform (only biocontrol tested) – colony recovery of Trichoderma seems to have an effect from flooding. Recently published in crop protection.

Other issues in TN: Decline in gynkos, maple, and other ornamental trees (flowering cherry). Samples that tested positive to Phytophthora. Gynko was supposed to be resistant to Phytophthora. – Result: Phytopythium vexans. It has been confirmed in woody crops overseas (Europe/Brasil). Completed trials with oomycete fungicide and have a few recommendations. Also using cover crops and screening for Phytopythium comfirmed areas. Found them in water sources also (from previous screenings).

Current funding for using drones to determine the locations of drought and flooding.

**Dr. Sydney Everhart - NEBRASKA– University of Nebraska.**

Dr. Everhart had to leave the meeting early and was not able to present more details on her current research.

**11:20 Business meeting – (2020 meeting, new officials)**

As the secretary for 2019, Dr. Soledad Benitez will be the chair for 2020.

We need to select new secretary for 2020. The role of the secretary is to take notes during the annual meeting, as well as prepare the minutes. In addition, the secretary works with the chair for the preparation of the annual report for 2020. The secretary is automatically the chair for the next year (2021), and will be in charge or annual meeting and report organization for 2021.

The annual meeting will be held during the APS Plant Health meeting. For each state there should be funds available to travel for the multistate meetings.

For 2020, APS meeting will be held in Denver Colorado – August 8-12th. The proposal is to meet the Friday before APS (the 7th). Need to find a venue for the meeting.

For next steps:

We need to select the secretary for 2020. Follow-up with an email regarding nominations for secretary, and then do an online vote.

Recommendations for the annual meeting provided by Dr. Slaton:

* The chair generally finds a place to meet. Then we have to get authorization to hold the meeting. Typically, authorizations come out several months prior to the meeting, so planning should be done ahead of time.

First we need an estimate of who will participate and when. After authorization we should be able to apply for funding through experiment stations.

The annual meeting authorization needs to be done through Dr. Slaton. In the past authorizations have been arranged directly through the project advisor.

Keep Dr. Slaton updated with plans for this meeting. There is not many details yet about APS 2020 in the website.

From previous years experience, expect at most ten participants. Generally meetings are one full day, and potentially followed by a visit to a research lab associated to the project (depending on the location of the meeting).

Send 2019 annual reports to Dr. Garzon and Dr. Benitez as soon as possible.

**12:00 Meeting adjourn**