**W3186**

**Annual Meeting**

**Corvallis, OR**

**1-2 November 2017**

**Present:** Saad Hafez (ID), Russ Ingham (OR), Vince Klink (MS), Gary Lawrence (MS), Kathy Lawrence (AL), Haddish Melakeberhan (MI), Tom Powers (NE), Phil Roberts (UC Riverside), Brent Sipes (HI), Steve Thomas (NM), Inga Zasada (USDA/ARS, OR)

**Graduate students attending:** Amy Michaud (UC Davis, Edward Caswell Chen’s student), Catie Wram (OSU, Inga Zasada’s student).

**Guest:** Louise-Marie Dandurand, University of Idaho.

**Welcome**

Lynda Ciuffetti, Dept Head, Botany and Plant Pathology, welcomed the group to Oregon State University. Dr. Ciuffetti discussed her former role in multi-state projects and the benefits that can and are obtained by participating in such meetings. She then discussed that the department of Botany and Plant Pathology as a large department at OSU. The department has a large number of both faculty and students. They have been very successful in obtaining grant money and are usually in the top three departments for grantsmanship at OSU. Problems at OSU are like all universities in that there is a lack of replacement for retired faculty.

**Administrative Adviser**

Dr. Joyce Loper, Associate Dean, College of Ag Science introduced herself as the new Administrative Advisor for the W-3186 Multi-state Nematology Project. Dr. Loper discussed her role in the Agricultural Experiment Station and the number of departments and field stations in the College of Agricultural Sciences. Commodities in specific regions of the state were outlined. Dr. Loper stressed the need for our group to have a revised proposal ready to submit by January 15, 2018. Our 2017 annual report is due within 60 days of this meeting and that 2018 will be the final report for the W-3186 project.

**State Reports**

W3186 participants, guests and students introduced themselves to the members.

**Alabama:**

*Meloidogyne incognita* in cotton, soybean, and corn predominate, a little *Meloidogyne* *arenaria* in peanut. Plant health with starter fertilizer and seed treatment with yield increase (in 1 out of 4 trials over two years) although plants larger in early growth; Bacillus (many new species names) for *M. incognita* control for cotton and lots of variability. Certain strains are promising based upon plant growth and yield; turmeric generally very good host to *M. incognita*; birdsfoot trefoil very susceptible to *M. incognita* not so much *Rotylenchulus reniformis* reproduction, *Heterodera glycines* does not reproduce on it either; *Catenaria* control for *H. glycines, R. reniformis, M. incognita* - fungus colonizes dead nematodes but not live nematodes except for living *M. incognita* eggs; *Bacillus* SIR on split roots; Earthworms contain plant-parasitic nematodes in castings also have other nematodes; White flies on cotton vectoring a virus that is not one of the known cotton viruses - first appeared after Hurricane Harvey.

**California Davis** (by Amy Michaud for Ed Caswell-Chin and Howard Ferris)**:**

Snail dispersal of rootknot nematodes - brown garden snail contained *Aphelenchus Ditylenchus Heterodera Mesocriconema Meloidogyne*; fecal pellets contain living nematodes; snails move up to 1 m/hr; eggs in fecal pellets not just on surface and theses eggs hatch and infect host plant; Nemaplex and Nemabase and NIja was updated.

**California Riverside:**

Carrot resistance to *M. incognita* and *M. javanica* exists (cowpea, cotton, dry bean). Genetic and physical mapping of resistance loci is occurring. Stakeholders invited to view resistant lines. QTL mapping of root-knot resistance in cowpea on different linkage groups is available. Stacking resistance genes provides greater protection to cowpea plants. Nematode collections maintained by various labs from *Meloidogyne, Nacabbus, Pratylenchus, Heterodera, Belonomaimus, Cactodera, Mermiths,* and more are found at Riverside. Some nematode populations with virulence on Mi gene also have virulence on resistant cowpea but the same effect is not apparent between Mi gene and carrot resistance - this effect may have implications for management of the nematodes, especially as Mi resistant breaking populations become more common. New products for nematode control include Nimitz, Salibro, Velum One, Movento, Nemastrike (tioxazaphen) by Monsanto/Divergence, Avicta, Aeris (Dupont), Ilevo, Paladin, and Dominus, Majestine, Melocon, Nemix, Actinovate, RhisoVital Taegro, Clavira, Votivo are new chemistry and biologicals as well as seed treatments with less environmental compared to historical products.

**Michigan:**

*M. hapla* resistance in carrot; Soil amendment, tillage, rotation, resistance projects in fruits, vegetables and row crops; Soil health management often encounters variability, so used soil food web model of Structure Index vs Enrichment Index (four quadrants) - can this be integrated with parasitic adaptation? Are microbial populations affecting the outcomes?

**Idaho:**

Mint and *Pratylenchus* and *Verticillum* - mint will not regrow after cutting. Nematicide treatments some cause phytotoxicity. Many nematicides do ok when fungus not present. Pin nematode getting very high 200,000 per 500 cc and spreading to more and more fields. Root cuttings came from Oregon originally. Pin causes substantial damage to mint - what are the percentage of anhydrobiotic juveniles. Velum and Movento give some trend to higher foliar yields. Experiments with greenhouse cultures of nematodes and no verticillium result in treatments giving better results with positive mint yield response. Sym-Agro Employ gives some response. Green-manure brassica crops last for a couple of months before response is lost. These oil seed-radish cropping systems are now being grown in the US (project accomplishment). Tomato - how long does Velum last against *Mi* - results good after 8 weeks but lost by 16 weeks. In another test, effect need to be targeted close to infection and need to prevent infection by applying Velum before. Potato and lesion nematode and *Mc*, the new chemistry is not able to stand alone but needs combination with Vydate. For sugar beet now emphasize tolerance in cultivars, also green manure with radish Defender does well. Cucumber and *Mi* with new products looks to do well. *Globodera pallida* status - contained in less than 1% of potato area, 3000 ac. Idaho population very similar to European pathotype PA2-3. Trade markets restored. Long-term management = resistance which is not readily available for *Gp* - so far everything is susceptible except NY121 with partial resistance only and “Innovation” from Europe and “Maria Huanca” from Peru. Looking at *Solanum sisymbriifolium* as a non-host rotation. The effect of the litchi tomato also occurs with other nematodes. Litchi tomato has hypersensitive response to nematode infection.

**Hawaii:**

The origin of *Rotylenchulus reniformis* on Oahu and its spread across the state is unknown. Microsatellite markers (SSR) and pedigree analysis provide an understanding of the dispersal of organisms. Ten polymorphic SSR markers previously evaluated on populations of *R. reniformis* from the southeastern United States, Colombia and Japan were tested on 348 individuals from the Oahu population. The Oahu population displayed variation within loci. The RR2-5 marker produced 8% double bands and 72% single bands. Similar double bands were observed in RR2-6 (8% double bands, 56% single band, and 36% no band). RR3-3 produced 100% single bands whereas RR3-8 and RR4-1 had 40% single bands and 60% no bands. RR4-4 gave 54% single bands and 46% no bands. RR1-5, RR2, RR 4-5 and RR5 did not amplify any DNA in the Oahu population. Theses SSR markers have detected differences within the Oahu population and differences among the Oahu population and other populations. The variation detected may indicate that the Oahu population is distinct compared to isolates tested by Leach et al.

**Mississippi:**

Genomic approach to understanding defense to PPN. Over expression to induce resistance as well as RNA interference to induce susceptibility identified similarities in *Arabadopsis* - the regulon system - this is the framework to approach PPN resistance. NDR1 affects *Hg, Mi*, and *Rr.* SA signaling, vesicle transport, secondary metabolism. Harpin protein seems to induce the genes in soybean. *Mi, Hg*, and *Rr* big problems. *Rr* in 51 counties on cotton, soybean and sweet potato. *Mi* in 39 counties on corn soybean, cotton, sweet potato. *Ma* on peanut on soybean. Two species of *Hoplolaimus* but not *H. columbus. Hg* in 76 counties. BioST working against *Mi, Rr* and *Hg*, Velum working on *Rr*, Salibro work well against *M*i in squash, Senator working well.

**Nebraska:**

Barcoding of nematode - “alfalfa cyst nematode” coming from Arkansas River, appearing in NE and ID. This is a sister group to *Hg* (*H. metacoginsis*) also found in Kansas and Montana. Only reproduces on alfalfa just like the alfalfa cyst nematode as described in Russia. Causes damage in Russia. ITS sequence not similar to *Hg* but to just one other entry. EPN *Steinernema* and *Heterorhabditis* seems to have native populations in Midwest corn fields. Also getting some *Diplogasteroids.* Subtropical forage grass seed contaminated with *Aphlenchoides fujianensis* but there is one *Af* that falls near to *A. bessyii* so may need to test forages or clean up genebank. First report of *Ditylenchus* on alfalfa in NE. CO1 for root-knot found on trees very good. *Mesocriconema* bar code tree has 1500+ species. *Nacobbus* on sugar beet in western Nebraska has come back in a breeding test plot.

**New Mexico:**

*Ditylenchus* - share contacts for Augustus on rice in Asia. Onions have surpassed Chile as No. 1 annual crop. *Diytlenchus* on garlic on an organic backyard farm, seed purchased online. *Ditylenchus* in 37% of onion fields. Sequencing does not match *D. dipsaci* or *D. destructor*, these may be fungal feeder. Avid and Nimitz for nematode control in turf. Ring nematode is a problem and can be control with these products. In pinto beans, Nimitz reduces *Mi* population but may not give better yield. In vineyards, *Mi* causes plant loss in replanted area with resistant rootstock and pos plant applications of Nimitz and Movento keep *Mi* population low and increased yield. Nimitz in chile being tested.

**Oregon:**

Microbial and biological amendments for Mc on potato. Low tolerance for damage, infection and presence makes Mc control challenging. Microbial assemblages (MeloCon, BioBlend, Hyper Galaxy, BioFit N) applied with a green manure might be more effective than applied to cash crop. When the green manure radish crop and assemblages applied at green manure planting, the green manure reduced Mc populations to non-detectable levels but the assemblages did not have an effect on Mc. Applying assemblage at the time of green manure incorporation did not have an effect on Mc reduction. Without the green manure, the assemblages did ok but combinations of different assemblage’s causes interactions that are neither additive nor synergistic.

**USDA/ARS Oregon:**

*Globodera ellingtonae* more similar to *G. rostochiensis* than to *G. pallida*. Hatch, temperature requirements, similar between Ge and *Gr*. Ro1 genes effective against *Ge* also. *Ge* found in Argentina and now in Chile where several populations have been tentatively identified. Looking at new compounds to determine nematicidal/nematastatic status - hatch, movement, and infectivity. Also looking at gene expression – RNAseq.

**Business Meeting**

Chair Brent Sipes called the meeting to order at 9:00am on 11/2/2017.

**Approval of 2016 minutes:**

The minutes for the 2016 meeting were consulted and then approved

**Officers for 2018:**

Brent Sipes – Chair, Cindy Gleason – Vice Chair; Inga Zasada – Secretary

**2018 Meeting Location:**

Chair – Brent Sipes agreed to host the 2018 meeting in Hawaii. He will determine the actual location but members indicate that Honolulu and a meeting on the University of Hawaii campus may be the most desirable. Members also suggested a possible Thursday/Friday meeting date during the second week of November. Tentative dates are November 8-9 or 15-16, 2018.

**State Project Reports 2017:**

All project reports for 2017 should be sent to Brent Sipes, Chair. These need to be sent to our AA within 60 days of the meeting.

**Project Renewal:** Phil Roberts – Rewrite lead.

Timeline – must be uploaded to NIMSS by 15 January 2018. This will be loaded with the assistance of Gretchen who currently works with Joyce Loper, our administrative advisor.

Justification Statement of Issues - This should be uploaded prior to the proposal submission. This should results in a Temp project being created. W-Temp 4186. It is important to articulate the success and impacts of the project in the revision. The project should be formulated as key impact areas and demonstrate multi state impact.

Related and Current and Previous Work - This provides context, this section will be edited by the members. Look at our appropriate sections**.** This has been organized under objective and use annual reports.

Objectives of new proposal -

1. Characterize genetic and biological variation in nematodes relevant to crop production and trade
2. Determine nematode adaptation processes to hosts, agro-ecosystems and environments
3. Develop and assess nematode management strategies in agricultural production systems

Methods -Will need new tools for each method.

Measurement of Progress and Results - Outputs, Outcomes/impacts, and Milestones. Modify what we currently have as needed. Deliverables, increase data base entries, submit

Projected Participation - Appendix E. We do this before submission. Shows strength and importance of the new project by the number of participants.

Literature Cited – Should be updated to the latest and more recent citations. Literature should be current and limited to 50,000 characters.

Outreach Plan - limited to 2000 characters, maybe like the Nemabase and publications, *Globodera* outreach

Organization and Governance – W-3186 is simple with chair, vice-chair and secretary. Continue with this and mention connectivity.

**Suggested Reviewers:**

Patty Timper, USDA

Rick Davis, NCSU

Tom Forge, Canada

Larry Duncan, UF

Deb Neher, UV

Terry Kirkpatrick, UA

Anne McGuidwin, UW

**Alternates:**

Joe Noling, UF

Greg Tylka, UI

Ernie Bernard, UT

Jon Eisenback, VT

Other Proposal Considerations:

Dr. Loper (AA), suggested that we may want to tie scientific emphasis or researchemphasis to objectives.

Members were asked to send their response to Phil concerning the justification for the new project within the next 10 days.

Additionally, Appendix E should be submitted by 1 December.

Additional scientist will be asked to join the project.

Dr. Louise-Marie Dandurand, guest participant from the University of Idaho, was asked to join as a member of the multi-state project.

**Adjourn:**

Brent Sipes, Chair, expressed his most sincere thanks to Russ Ingham and Inga Zasada for hosting the 2017 W-3186 annual meeting at Oregon State University. He stated that he looked forward to serving as our host in 2018 and safe travels as we returned to our specific states.

Respectfully submitted, Gary Lawrence and Brent Sipes, 11/8/2017