PROGRAM & PROCEEDINGS

of the

67th ANNUAL MEETING

of the **SOUTHWESTERN BRANCH** of the

ENTOMOLOGICAL SOCIETY OF AMERICA

ENTOMOLOGICAL SOCIETY OF AMERICA
SOUTHWESTERN
BRANCH

and the **ANNUAL MEETING** of the

SOCIETY OF SOUTHWESTERN ENTOMOLOGISTS

SOCIETY OF SOUTHWESTERN ENTOMOLOGISTS
1976

April 14–18, 2019

Hyatt Regency Tulsa

Tulsa, Oklahoma

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We thank the following people and organizations for their generous donations in support of the Insect Expo and other functions of the 2019 SWB-ESA meeting.

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STUDENT AWARDS

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SOUTHWESTERN BRANCH

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Meeting Information

REGISTRATION:

All persons attending the meetings or participating in the program must register. On-site registration fees for the meeting are:

Full meeting

Active ESA member	$225
Student ESA member	$90
Honorary/Emeritus	$60
Non-member	$275
Spouse/Guest	$65
One day registration	$125

The full-meeting fee includes admission to all functions, including the banquet.

HOTEL LOCATION:

The Hyatt Regency Tulsa is located at 100 East Second Street Tulsa, OK 74103
(918) 234-1234.

TRAVEL INFORMATION:

The Tulsa International Airport is located at 7777 E Apache St, Tulsa, OK 74115, about 10 miles from the hotel. Complimentary shuttle service is available to and from the airport by calling the hotel.

PROGRAM SCHEDULE AND MODERATORS:

Speakers are limited to the time indicated in the schedule, and moderators have the responsibility and authority to enforce restricting time to that in the schedule. Speakers should have their presentations uploaded in the Presentation Upload room no later than the evening before their presentation. Moderators should visit the Presentation Upload room to sign in before their assigned session and obtain speaker presentation files for the session. Moderators will upload all speaker files onto the A/V equipment in the meeting room.

AUDIOVISUAL & UPLOAD of PRESENTATIONS:

ONLY digital projectors with computers will be provided for oral presentations. Speakers must submit their presentations as Power Point files to the Upload / Presentation Preview Room one day before the session during which they will present. The Presentation Upload & Preview area will be located in the Executive Room and will be open during the following hours:

Monday, April 15	3:00 PM – 5:00 PM
Tuesday, April 16	7:00 AM – 5:00 PM

POSTER PRESENTATION INFORMATION:

Poster Size: Poster must be contained within the 46 × 46 inch (117 × 117 cm) space provided. The poster must NOT exceed the size limit.

Set Up: Your poster must be displayed at your assigned space in the Tulsa Ballroom North the night before (i.e., either Monday or Tuesday, 6:00 – 8:00 PM) your poster is scheduled. **Bring your own Velcro strips to secure your display to the poster board.**

Author Presence: **All Student competitors are to stand next to their posters during designated BREAK time on Tuesday, April 16th.** Regular member presenters should similarly be present at their posters during designated BREAK time on Wednesday, April 17th.

ESA CERTIFICATION BOARD INFORMATION:

Information regarding the ESA Certification Board is available at the Registration Desk.

JOB OPPORTUNITY BOARD:

The Student Affairs Committee will host a Job Opportunities Board during the meeting. Employers are encouraged to post copies of available opportunities for prospective students. Prospective employees/students should bring multiple copies of CV or résumé to the Board for review by potential employers. Volunteers operating the Board will serve as liaisons to arrange interviews if needed. The Job Opportunities Board will be located in the Executive Room, Second Floor along with the presentation upload and silent auction.

LOST AND FOUND:

Articles should be turned in or reported to the Registration Desk or hotel main desk.

MESSAGES:

A message board is at the Registration Desk.

CODE OF CONDUCT

By attending the 2019 Southwestern Branch Annual Meeting, you agree voluntarily to abide by our ethics policy. The full policy may be found online at entsoc.org/conduct. If you need to file a complaint, please contact Rosina Romano at rromano@entsoc.org, 301-731-4535 x3010.

Program Information

Entomological Society Of America Southwestern Branch

2018-2019 Executive Committee

Eric Rebek, President
eric.rebek@okstate.edu

Justin Talley, Past-President
justin.talley@okstate.edu

Molly Keck, Vice President
mekeck@ag.tamu.edu

Wyatt Hoback, Secretary
whoback@okstate.edu

Wizzie Brown, Secretary-elect
ebrown@ag.tamu.edu

Ed Bynum, Treasurer
EBynum@ag.tamu.edu

Jesus Esquivel,
Representative to the ESA Governing Board
Jesus.Esquivel@ARS.USDA.GOV

2018-2019 Committees

AUDIT COMMITTEE
- Scott Armstrong (Chair)
- Mickey Eubanks
- Bruce Noden

AWARDS AND HONORS COMMITTEE
- Sonja Swiger (Chair)
- Jesus Esquivel
- Kristopher Giles
- Alvaro Romero
- Ken McPherson
- Laura Weiser-Erlandson
- Sergio Sanchez-Pena
- Astri Wayadande
- Robert Puckett

CERTIFICATION BOARD
- Wizzie Brown

BRANCH ARCHIVIST
- Gregory Cronholm

FRIENDS OF THE SOUTHWESTERN BRANCH COMMITTEE
- Molly Keck (Chair)
- Eric Rebek
- Scott Ludwig
- Andrine Shufran

IN MEMORIAM COMMITTEE
- Phillip G. Mulder, Jr. (Chair)
- Edmond Bonjour
- Jim Woolley
- David Thompson
- Allen Dean

INSECT DETECTION, EVALUATION, AND PREDICTION COMMITTEE
- Carol Sutherland (Chair)
- Charlie Konemann

INSECT EXPO COMMITTEE
- Andrine Shufran (Chair)
- Wizzie Brown
- Molly Keck
- Phillip G. Mulder, Jr.
- Mo Way

LINNAEAN GAMES COMMITTEE
- Scott Bundy (Chair)
- Eric Rebek (Gamesmaster)
- Cheri Abraham
- Wyatt Hoback
- Adam Mitchell
- Juliana Rangel Posada
- Alvaro Romero
- Bonnie Pendleton

LOCAL ARRANGEMENTS COMMITTEE
- Edmond Bonjour (Co-chair)
- Ali Zarrabi (Co-chair)

2018-2019 Committees ...continued

MEMBERSHIP COMMITTEE
- Justin Talley (Chair)
- Manuel Campos
- Jesus Esquivel
- Bill Ree
- Sergio Sanchez-Pena
- Astri Wayadande

NOMINATING COMMITTEE
- Justin Talley (Chair)
- Eric Rebek
- Carlos Bogran
- Jerry Michels
- Ed Bynum

PROGRAM COMMITTEE
- Wizzie Brown (Co-Chair)
- Sonja Swiger (Co-Chair)

SITE SELECTION COMMITTEE
- Wyatt Hoback (Chair)
- Molly Keck
- Eric Rebek
- Justin Talley

STUDENT RESEARCH PAPER AND POSTER AWARDS COMMITTEE
- Bonnie Pendleton (Chair)
- Ali A. Zarrabi
- Suhas Vyavhare
- Brandon Smythe
- Tom Royer
- Eric Rebek
- Jane Pierce
- Bob Davis
- Scott Bundy
- Joni Blunt
- Justin Talley

YOUTH SCIENCE COMMITTEE
- Mo Way (Chair)
- Wizzie Brown
- Molly Keck
- Bonnie Pendleton
- Jane Pierce
- Andrine Shufran

COMMITTEE ON DIVERSITY AND INCLUSION
- Alvaro Romero (Chair)

EARLY CAREER PROFESSIONALS COMMITTEE
- Tracey Payton Miller (Chair)

EDUCATION AND OUTREACH COMMITTEE
- Wyatt Hoback (Chair)
- Andrine Shufran
- Molly Keck
- Wizzie Brown

SCIENCE POLICY CAPABILITY COMMITTEE
- Kristopher Giles (Chair)

STUDENT AFFAIRS COMMITTEE
- Jocelyn Holt (Chair)
- Jacob Farriester
- Fabian List
- Karen Poh
- Tyler Raznick
- Jeffrey Yung

Past-Presidents and Chairmen of the Southwestern Branch

President	Year	Meeting Location
Justin Talley	2017-18	Albuquerque, NM
Carlos Bográn	2016-17	Austin, TX
Jerry Michels	2015-16	Tyler, TX
Bob Davis	2014-15	Tulsa (Catoosa), OK
Jesus Esquivel	2013-14	San Antonio, TX
Scott Bundy	2012-13	Las Cruces, NM
Allen Knutson	2011-12	Little Rock, AR
Tom Royer	2010-11	Amarillo, TX
Carlos Blanco	2009-10	Cancun, Mexico
Bonnie Pendleton	2008-09	Stillwater, OK
Greg Cronholm	2007-08	Ft. Worth, TX
David Thompson	2006-07	Corpus Christi, TX
Bart Drees	2005-06	Austin, TX
Phil Mulder	2004-05	Albuquerque, NM
John D. Burd	2003-04	Lubbock, TX
Terry Mize	2002-03	Oklahoma City, OK
W. Pat Morrison	2001-02	Guanajuato, Mexico
Jim Reinert	2000-01	San Antonio, TX
James A. Webster	1999-00	Ft. Worth, TX
Carol Sutherland	1998-99	Las Cruces, NM
Ann Weise	1997-98	Corpus Christi, TX
Pete Lingren	1996-97	Oklahoma City, OK
Charles L. Cole	1995-96	Austin, TX
J. Terry Pitts	1994-95	Dallas, TX
Sidney E. Kunz	1993-94	Monterrey, Mexico
John G. Thomas	1992-93	Albuquerque, NM
Don Bull	1991-92	Tulsa, OK
Aithel McMahon	1990-91	College Station, TX
Russel E. Wright	1989-90	San Antonio, TX
Joyce Devaney	1988-89	El Paso, TX
Russ Andress	1987-88	Dallas, TX
Don Rummel	1986-87	Austin, TX
John E. George	1985-86	Monterrey, Mexico
Paul D. Sterling	1984-85	San Antonio, TX
H. Grant Kinzer	1983-84	Oklahoma City, OK
James R. Coppedge	1982-83	Corpus Christi, TX
Bill C. Clymer	1981-82	El Paso, TX
Horace W. VanCleave	1980-81	San Antonio, TX
Robert L. Harris	1979-80	Brownsville, TX
Jimmy K. Olson	1978-79	Houston, TX
J. Pat Boyd	1977-78	Lubbock, TX
Robert A. Hoffman	1976-77	Guadalajara, Mexico
Weldon H. Newton	1975-76	Oklahoma City, OK
Harry L. McMenemy	1974-75	El Paso, TX
Roger O. Drummond	1973-74	Dallas, TX
Dieter S. Enkerlin	1972-73	San Antonio, TX
Stanley Coppock	1971-72	Mexico City, Mexico

Chairman	Year	Meeting Location
C.A. King, Jr.	1970-71	El Paso, TX
Ted McGregor	1969-70	Brownsville, TX
Neal M. Randolph	1968-69	Dallas, TX
Walter McGregor	1967-68	Oklahoma City, OK
Harvey L. Chada	1966-67	San Antonio, TX
R.L. Hanna	1965-66	El Paso, TX
H.E. Meadows	1964-65	Austin, TX
Dial E. Martin	1963-64	Monterrey, Mexico
Manning A. Price	1962-63	Houston, TX
Sherman W. Clark	1961-62	Oklahoma City, OK
O.H. Graham	1960-61	San Antonio, TX
Clyde A. Bower	1959-60	El Paso, TX
Paul Gregg	1958-59	Dallas, TX
C.R. Parencia	1957-58	Houston, TX
J.C. Gaines	1956-57	San Antonio, TX
D.C. Earley	1955-56	Ft. Worth, TX
John M. Landrum	1954-55	Houston, TX
D.E. Howell	1953-54	Dallas, TX
P.J. Reno	1952-53	Galveston, TX
R.C. Bushland	1951-52	San Antonio, TX
H.G. Johnston*	1950-51	Dallas, TX

*** Southwestern Branch, American Association of Economic Entomologists**

AWARDS

Southwestern Branch Student Awards

John Henry Comstock Graduate Student Award

Jocelyn Holt

Texas A & M University

Jocelyn R. Holt's research is increasing our understanding of the interplay between genetics and insect mutualisms in invasive species. She is assessing the role insect microbiomes play in mediating mutualisms among insects. Her research has revealed microbial differences between sugarcane aphids (SCA) that seem to correspond to genetic differences of sorghum or sugarcane populations. She is also investigating whether these genetically distinct SCA populations differ in their attractiveness to ants and is examining the fine-scale genetic structure of the tawny crazy ant to inform future integrated pest management. Jocelyn was born in California, where she completed a B.S. in Biology at Cal Poly Pomona and a M.S. in Biology at CSUN. She received a Graduate Diversity Excellence Fellowship and a Lechner Excellence Fellowship to attend Texas A&M where she is currently a PhD candidate. She is committed to increasing diversity in academia and to facilitating the retention of women in STEM fields; seen by her participation in the ESA Student Affairs Committee, Aggie Women in Entomology, LAUNCH Program and TAMU WISE. She fosters the next generation of scientists through teaching and mentorship of undergraduate researchers. Jocelyn's research and service exemplify her passion for entomology and science advocacy.

Undergraduate Student Achievement in Entomology Award

Victoria Pickens

Oklahoma State University

Victoria Pickens was raised in Sand Springs, Oklahoma and graduated from the Oklahoma School of Science and Mathematics. Aside from school, the majority of her life was spent atop the back of a horse chasing around cattle and competing in local, state, regional, and national competitions. Originally planning to be a pre-vet student, Victoria immediately switched to entomology bioforensic option after hearing, Dr. Phil Mulder, give a presentation at freshman orientation. From there, her newly discovered passion for six-legged creatures only grew. She began as a Freshman Research Scholar, conducting research on flies and forensic decomposition, and gradually continued to study flies throughout her undergraduate career. In her junior year, she was a Niblack Research Scholar and conducted research on the microbiome of flies. She has since moved to other insect vector studies in relation to mosquitoes and ticks. She has won the Undergraduate 10-minute Presentation Competition at the Entomological Society of America regional meeting for the past two years, and recently placed second at the national meeting for entomology in the Undergraduate Poster competition in Vancouver, Canada. After graduation, she plans to study insect microbe interactions in graduate school and continue research in medical and veterinary entomology.

Southwestern Branch Student Awards, cont'd

Percival Scientific Undergraduate Entomology Student Activity Award

Liam Whiteman

Oklahoma State University

Mr. Liam Whiteman is pursuing a B.S. in Entomology from Oklahoma State University (OSU) and anticipates graduation is May, 2020. He is active in research and received the Niblack Scholarship, OSU's highest scholarship for undergraduate research. He studies mosquito oviposition and community assemblages and worked as an intern in 2018 with the Bureau of Reclamation doing endangered species surveys. He is an active member of the Entomological Society of America and has presented, played on the OSU Linnaean Games team and volunteered for the Insect Expo. In his community, he visits assisted living homes where he reads to the residents and tells stories related to entomology. Liam plans to pursue an advanced degree and work with endangered species and habitat conservation after graduation.

Early Care Professional Award

ESA Excellence in Early Career Award

Brandon Smythe

New Mexico State University

Dr. Brandon Smythe is a veterinary entomologist that is a Research Assistant Professor at New Mexico State University. He is currently the program manager for the Veterinary Entomology Research Laboratory within the Center for Animal Health and Food Safety.

He has been successful in his early career not only as an early career professional but also as a PhD student who was promoted to his current position while working towards his degree. During this time, he has garnered more than $1 million in contracted research and has advised undergraduate as well as graduate students. His supervision over students in conjunction with his work has resulted in 7 peer reviewed publications and over 25 technical reports for industry. Dr. Smythe's research has focused on biting fly ecology and pest management within animal production systems. He has established a successful program in veterinarian pharmaceutical parasiticide development. This type of research focuses on proprietary information but Dr. Smythe has been innovative in incorporating original research that answers important questions related to veterinary entomology while conducting these confidential research trials. Dr. Smythe grew up around the Las Cruces, NM area and is married with children.

Southwestern Branch Nominations for ESA Professional Awards

ESA Distinguished Achievement Award in Teaching

Rupesh Kariyat

University of Texas Rio Grande Valley

Dr. Rupesh Kariyat is an Assistant Professor in the Biology Department of the University of Texas Rio Grande Valley (UTRGV). He teaches undergraduate courses in entomology and ecology, and a graduate course on insect-plant-microbial interactions. Dr. Kariyat's research program focuses on chemical ecology of herbivore-pollinator interactions in domesticated and natural ecosystems. Dr. Kariyat is originally from India, and moved to the United States after completing B.S. in agricultural sciences. His graduate work was focused on pollination biology in alfalfa (M.S., University of Wyoming), and plant-herbivore-pollinator interactions in weeds (Ph.D., Pennsylvania State University). Dr. Kariyat then moved to Switzerland (ETH Zurich) as a Postdoctoral Scholar in the laboratory of Consuelo De Moraes and Mark Mescher and continued work on insect-plant interactions, focusing on plant defense and herbivore counter defenses. He has been an ESA member since graduate school, and have given talks at branch and national meetings, organized and participated in symposia, and received awards and program enhancement funds. In addition, he has also been involved with ESA educational and outreach activities, and at UTRGV, he recently received a grant to kick start an insect collection for teaching entomology. More details about his lab can be found at https://phenotype2017.wixsite.com/kariyatlab

ESA Award for Excellence in Integrated Pest Management

Michael Brewer

Texas A & M University

Dr. Brewer holds a field crops entomology position at Texas A&M with expectation to conduct research that leads to the development, demonstration, and implementation of IPM tools in plant production systems. He obtained his Ph.D. from University of California, Riverside campus. He is stationed at a Research and Extension Center in Corpus Christi, and currently is major professor of five Ph.D. students. His areas of interest are in applied insect ecology of plant-herbivore-natural enemy interactions as moderated by environmental and landscape influences, and in development of efficient and sustainable insect pest management. He enjoys the challenge of transitioning research into application, while demonstrating how application-focused research can move our science forward. This approach has most recently been applied to his work on sugarcane aphid on sorghum, in collaboration with USDA ARS, 5 Land-grant Universities, private companies, and grower associations. He has published 89 peer-reviewed journal articles in national and international journals. He is active in the Entomological Society of America and has served as subject editor of the Journal of Economic Entomology since 2002.

Plenary Session Schedule

TUESDAY, APRIL 16, 2019, MORNING

Promenade Salon D, Second Floor (Hyatt Regency Tulsa)

8:00 am **Welcome and Call to Order**
Eric Rebek, President, Southwestern Branch ESA

8:10 am **Welcome from the Society of Southwestern Entomologist**
Manuel Campos, President, Society of Southwestern Entomologists

8:20 am **ESA Presidential Address**
Robert Peterson, ESA President

8:50 am **ESA Society Update**
David Gammel, Executive Director of ESA

9:00 am **Governing Board Update**
Jesus Esquivel, Representative to the ESA Governing Board

9:10 am **Entomological Foundation Update**
Andrine Shufran, Board of Counselors

9:20 am **Board Certified Entomologists Report**
Wizzie Brown, SWB Representative to ESA

9:25 am **In Memoriam Committee Report**
Phil Mulder, Chair

9:45 am **Nominating Committee Report**
Justin Talley, Chair

9:55 am **Local Arrangement Announcement**
Edmond Bonjour & Ali Zarrabi, Local Arrangement Co- Chairs

Program Announcements
Wizzie Brown & Sonja Swiger, Program Co-Chairs

10:05 am **Break**

Program Summary

SUNDAY, APRIL 14, 2019

Program	Time	Location
Southwestern Branch Executive Committee Meeting	3:00 PM - 5:00 PM	Boardroom 304

MONDAY, APRIL 15, 2019

Program	Time	Location
Insect Expo	9:00 AM - 1:00 PM	Promenade Ballroom, Second Floor
Meeting Registration	1:00 PM - 5:00 PM	Foyer, Second Floor
Society of Southwestern Entomologists Executive Committee Meeting	2:00 PM - 3:30 PM	Goodman Room, Second Floor
Presentation Upload & Preview Room	3:00 PM - 5:00 PM	Executive Room, Second Floor
Society of Southwestern Entomologists General Membership Meeting	4:00 PM - 5:00 PM	Promenade Salon A, Second Floor
Welcome Reception	5:00 PM - 7:00 PM	Oklahoma Ballroom, First Floor
Student Competition Poster Set-Up	6:00 PM - 8:00 PM	Tulsa Ballroom North, First Floor
Trece Reception *Invitation Only*	7:00 PM - 10:00 PM	Promenade Salon A, Second Floor
Student Affairs Committee Meeting / Photo Salon Judging	8:00 PM - 10:00 PM	Director's Row 3, Second Floor

TUESDAY, APRIL 16, 2019		
Program	**Time**	**Location**
Meeting Registration	7:00 AM - 3:00 PM	Foyer, Second Floor
Presentation Upload & Preview Room	7:00 AM - 5:00 PM	Executive Room, Second Floor
Silent Auction	7:00 AM - 5:00 PM	Executive Room, Second Floor
Plenary Session	8:00 AM - 10:00 AM	Promenade Salon D, Second Floor
Student Poster Competition: Undergraduate	8:00 AM - 4:00 PM	Tulsa Ballroom North, First Floor
Student Poster Competition: Master's	8:00 AM - 4:00 PM	Tulsa Ballroom North, First Floor
Student Poster Competition: Ph.D	8:00 AM - 4:00 PM	Tulsa Ballroom North, First Floor
Break	10:00 AM - 10:20 AM	Tulsa Ballroom North, First Floor
Student Ten Minute Paper Competition: Undergraduate	10:20 AM - 1:35 PM	Promenade Salon A, Second Floor
Student Ten Minute Paper Competition: Ph.D	10:20 AM - 1:55 PM	Promenade Salon B, Second Floor
Student Ten Minute Paper Competition: Master's	1:35 PM - 2:35 PM	Promenade Salon A, Second Floor
Break	2:30 PM - 2:50 PM	Tulsa Ballroom North, First Floor
Regular Ten Minute Paper Session Tuesday	3:00 PM - 5:00 PM	Promenade Salon B, Second Floor
Student Competition Poster Removal	4:00 PM - 6:00 PM	Tulsa Ballroom North, First Floor
Linnaean Games - Preliminary Round	5:00 PM - 7:00 PM	Promenade Salon C, Second Floor
Regular Posters Set-up	6:00 PM - 8:00 PM	Tulsa Ballroom North, First Floor
TAMU entomology faculty and professional staff exchange and updates	6:00 PM - 7:30 PM	Goodman Room, Second Floor
Student Reception	7:00 PM - 10:00 PM	Tulsa Ballroom Central, First Floor
Student Three-Minute Presentations	7:30 PM - 10:00 PM	Tulsa Ballroom Central, First Floor

WEDNESDAY, APRIL 17, 2019

Program	Time	Location
Meeting Registration	7:00 AM - 3:00 PM	Foyer, Second Floor
Silent Auction	7:00 AM - 2:30 PM	Executive Room, Second Floor
Innovations in Entomology Education	8:00 AM - 9:55 AM	Promenade Salon B, Second Floor
Current Research & Extension Topics in Urban & Landscape Entomology in the Southwestern US	8:00 AM - 11:30 AM	Promenade Salon A, Second Floor
Regular poster session	8:00 AM - 5:00 PM	Tulsa Ballroom North, First Floor
Break	10:00 AM - 10:20 AM	Tulsa Ballroom North, First Floor
Regular Ten Minute Paper Session Wednesday	10:20 AM - 12:00 PM	Promenade Salon B, Second Floor
Blood Feeding Arthropods of Veterinary and Medical Importance: Sharing Discoveries on Surveillance, Biology and Control	1:00 PM - 5:00 PM	Promenade Salon A, Second Floor
Skills for Women Navigating Their Early Careers	1:00 PM - 5:00 PM	Promenade Salon B, Second Floor
Break	2:30 PM - 2:50 PM	Tulsa Ballroom North, First Floor
Linnaean Games - Final Round	5:00 PM - 7:00 PM	Promenade Salon C, Second Floor
Regular Poster Removal	5:00 PM - 7:00 PM	Tulsa Ballroom North, First Floor
Awards Banquet and Final Business Meeting	7:30 PM - 10:00 PM	Tulsa Ballroom South, First Floor

THURSDAY, APRIL 18, 2019

Program	Time	Location
Southwestern Branch Executive Committee Meeting	8:00 AM - 10:00 AM	Boardroom 304

Notes

Oral & Poster Presentation Schedule

TUESDAY, APRIL 16, 2019, POSTERS

Student Poster Competition: Undergraduate / 8:00 AM-4:00 PM

Tulsa Ballroom North, First Floor

P1-1 **Standardizing in-vitro procedures used to determine efficacy of insecticidal feed-through products against filth flies.**
Ramon Zepeda *(rz@nmsu.edu) and Brandon Smythe, New Mexico State Univ., Las Cruces, NM*

P1-2 **Evaluation of the temperature tolerance of the predatory mite Stratiolaelaps scimitus for biological control of the honey bee ectoparasitic mite Varroa destructor.**
Travis Trimm *(travistrimm501@gmail.com), Ellie Chapkin, Betty Hernandez and Juliana Rangel, Texas A&M Univ., College Station, TX*

P1-3 **Mite"y" Kibbles: Grain mite populations increase on test formula of dog food.**
Brandon Henriquez *(brandon.henriquez@okstate.edu), Ankur Limaje and W. Wyatt Hoback, Oklahoma State Univ., Stillwater, OK*

P1-4 **Masonry insect preference in diameter for nesting sites at Tarleton State University, Stephenville.**
John Garcia *(john.garcia01@go.tarleton.edu), John Montoya, Adam Mitchell and David H. Kattes, Tarleton State Univ., Stephenville, TX*

P1-5 **Solids versus Stripes: Predatory Hemipteran (*Platymeris biguttatus*) response to normal and artificially colored aposematic prey (*Tenebrio molitor*).**
Leon Tan *(leontanlo@hotmail.com) and W. Wyatt Hoback, Oklahoma State Univ., Stillwater, OK*

P1-6 **Host plant and native pollinator relationships in an urban ecosystem.**
Haley Vincze *(haley.vincze@gmail.com), Tarleton State Univ., Wylie, TX*

P1-7 **Aphid, parasitoid and hyperparasitoid populations in different cole crops in the field.**
Criselda Aranda-Ramirez *(crissaranda10@gmail.com), Francisco Lopez-Monzon and Sergio Sánchez-Peña, Universidad Autónoma Agraria Antonio Narro, Saltillo, CU, Mexico*

P1-8 **Development of fall armyworm larvae on grass, dry beans, peppers and potato in the laboratory.**
Rosadelia Roblero-Gonzalez *(DELIROBLERO@hotmail.com), Patsy Guerrero-Espinoza and Sergio Sánchez-Peña, Universidad Autónoma Agraria Antonio Narro, Saltillo, CU, Mexico*

P1-9 **A comparison of a degree day model for pecan nut casebearer (*Acrobasis nuxvorella* Neunzig) to historical data in Mesilla Valley, New Mexico.**
Jeanette Castañon *(jevelyn@nmsu.edu), Larry Blackwell and Dave Thompson, New Mexico State Univ., Las Cruces, NM*

P1-10 **Neonicotinoid insecticide resistance in populations of the potato psyllid (*Bactericera cockerelli)* across Texas (and beyond).**
Kristyne Varela *(kristyne.varela@ag.tamu.edu)[1] and Adrianna Szczepaniec[2], [1]Texas A&M AgriLife, Bushland, TX, [2]Texas A&M AgriLife Research, Amarillo, TX*

P1-11 **A pre-assessment of entomological knowledge and student fears.**
Jonathan Harris *(jonathan.harris10@okstate.edu) and W. Wyatt Hoback, Oklahoma State Univ., Stillwater, OK*

P1-12 **Above or below: How culverts affect aquatic macroinvertebrate activity in Oklahoma streams.**
Rayne Key *(rayne.key@okstate.edu), Melissa Reed and W. Wyatt Hoback, Oklahoma State Univ., Stillwater, OK*

Student Poster Competition: Master's / 8:00 AM-4:00 PM

Tulsa Ballroom North, First Floor

P2-1 **A layered approach to IPM of *Spodoptera*: Insecticidal residues do not reduce parasitism of *Telenomus* parasitoids.**
Leonardo Vieira Santos *(leonardo.santos@okstate.edu)[1], W. Wyatt Hoback[1], Regiane Cristina Oliveira de Freitas Bueno[2], Jean Carlo do Prado[2], Lucas Moraes Santos[2] and Daniel de Lima Alvarez[2], [1]Oklahoma State Univ., Stillwater, OK, [2]Universidade Estadual Paulista, Botucatu, Brazil*

P2-2 **Comparative Gene Expression and Upregulation of Possible Antimicrobial Peptide-Producing Genes of *Nicrophorus orbicollis* and *Nicrophorus pustulatus*.**
Jacob Farriester *(jacobfarriester@gmail.com), W. Wyatt Hoback, Brian Couger, John Gustafson and Darren Hagen, Oklahoma State Univ., Stillwater, OK*

P2-3 **Acaricidal effect of plant extracts on *Tetranychus urticae* Koch. (Acari:Tetranychidae).**
José Ontiveros *(uaaan12@gmail.com), Universidad Autónoma Agraria Antonio Narro, Saltillo, CU, Mexico*

P2-4 **Selection of an internal reference gene for functional genomics or gene expression analysis in *Dalbulus maidis* (Hemiptera: Cicadellidae).**
Christian Ayala-Ortiz *(christian.ayala_ortiz10@okstate.edu)[1], Trenna Blagden[1], Stephen M. Marek[1], Dmitry A. Dmitriev[2], Christopher H. Dietrich[3] and Astri Wayadande[1], [1]Oklahoma State Univ., Stillwater, OK, [2]Illinois Natural History Survey, Champaign, IL, [3]Univ. of Illinois, Champaign, IL*

P2-5 **Intestinal proteolytic activity of *Anticarsia gemmatalis* (Hübner) (Lepidoptera: Noctuidae).**
Julieta Hernandez-Mejia[1], Rogelio Pérez-Ramírez[1], ***Reyna Torres-Acosta*** *(ivonnetorresacosta@yahoo.com.mx)[2], Jorge Torres-Castillo[3], Miguel García-Delgado[3] and Ludivina Barrientos-Lozano[1], [1]Tecnológico Nacional de México, Victoria, TM, Mexico, [2]Universidad Autónoma de Tamaulipas, Mante, TM, Mexico, [3]Universidad Autónoma de Tamaulipas, Victoria, TM, Mexico*

P2-6 **Entomochemicals and antioxidants from the central American locust (*Schistocerca piceifrons piceifrons*, Walker).**
Rogelio Perez-Ramirez *(rogelio.1991@yahoo.com)[1], Ludivina Barrientos-Lozano[1] and Jorge Torres-Castillo[2], [1]Tecnológico Nacional de México, Victoria, TM, Mexico, [2]Universidad Autónoma de Tamaulipas, Victoria, TM, Mexico*

P2-7 **Season long, base-wide monitoring needed to characterize adult mosquitoes at an Army National Guard Training Facility.**
Thomas Hess *(tmhess@okstate.edu), Bruce Noden and W. Wyatt Hoback, Oklahoma State Univ., Stillwater, OK*

P2-8 **The impact of sorghum phenology and variety on population growth and longevity of sugarcane aphid (*Melanaphis sacchari*, Zehntner (Hemiptera: Aphididae)).**
Subin Neupane *(neupanesubeen@tamu.edu)[1], David Kerns[1] and Adrianna Szczepaniec[2], [1]Texas A&M Univ., College Station, TX, [2]Texas A&M AgriLife Research, Amarillo, TX*

P2-9 **Evaluation of resistance to bird cherry-oat aphid (*Rhopalosiphum padi*) in wheat germplasm.**
Grace Jones *(gracej67@gmail.com), Ali Zarrabi, Kristopher Giles, Tom Royer, Mark Payton and Brett Carver, Oklahoma State Univ., Stillwater, OK*

P2-10 **Crapemyrtle bark scale *Acanthococcus lagerstroemiae* (Hemiptera: Eriococcidae) ecology.**
Kyle Gilder *(kyle.gilder@tamu.edu)[1], Victoria Hicks[1], Mengmeng Gu[1], Michael Merchant[2] and Kevin Heinz[1], [1]Texas A&M Univ., College Station, TX, [2]Texas A&M AgriLife Extension Service, Dallas, TX*

P2-11 **Analyzing the significance of photoperiod on fitness of sugarcane aphid,*Melanaphis sacchari*, on sorghum.**
Ethan Triplett *(ethan.l.triplett@gmail.com) and Bonnie Pendleton, West Texas A&M Univ., Canyon, TX*

P2-12 **From invasive pest to ecological supporter: Benefits of the sugarcane aphid (*Melanaphis sacchari*) to native Hymenoptera.**
Michael Caballero *(michaelcaballero9@gmail.com)[1], J. Scott Armstrong[2] and W. Wyatt Hoback[1], [1]Oklahoma State Univ., Stillwater, OK, [2]USDA - ARS, Stillwater, OK*

P2-13 **Strategy to eliminate *Candidatus* Liberibacter solanacearum from *Bactericera cockerelli* (Sulc.) by applying antibiotic.**
Pablo Hernandez Lara *(p.ulises.h@gmail.com), Universidad Autónoma Agraria Antonio Narro, Saltillo, CU, Mexico*

P2-14 **On-plant bioassays of *Metarhizium rileyi* and *Heterorhabditis* nematodes against fall armyworm, *Spodoptera frugiperda*.**
Fernando Sanchez-Pedraza *(fer_5516g1@hotmail.com), Diego Treviño-Cueto and Sergio Sánchez-Peña, Universidad Autónoma Agraria Antonio Narro, Saltillo, CU, Mexico*

P2-15 **The effects of below-ground chemical cues from entomopathogenic nematodes on host plant selection of diabroticite beetle larvae.**
John Grunseich *(johngrunseich@gmail.com), Texas A&M Univ., College Station, TX*

P2-16 **The Lost Cricket Project: engaging citizen scientists in acoustic biomonitoring to establish occurrence of a cryptic Orthopteran species.**
Andres Buitrago *(ab1298@wildcats.unh.edu), Univ. of New Hampshire, Portsmouth, NH*

Student Poster Competition: Ph.D / 8:00 AM-4:00 PM

Tulsa Ballroom North, First Floor

P3-1 **The role of habitat heterogeneity and plant quality in structuring grassland arthropod communities.**
Rebecca Prather *(rebeccaprather@ou.edu) and Michael Kaspari, Univ. of Oklahoma, Norman, OK*

P3-2 **Evaluating botanical powders to control maize weevil, *Sitophilus zeamais* Motschulsky (Coleoptera: Curculionidae), in stored sorghum grain.**
Hame Abdou Kadi Kadi *(hkkadi@gmail.com)[1] and Bonnie Pendleton[2], [1]INRA, Niamey, Niger, [2]West Texas A&M Univ., Canyon, TX*

P3-3 **Keeping up to date on the threat of *Tagosodes orizicolus* and *Rice hoja blanca virus* to Texas rice.**
Jaclyn Martin *(jaclyn.martin@tamu.edu)[1], Estephanie Bernal Jimenez[2], Keyan Zhu-Salzman[1], Michael (Mo) Way[3] and Ismael E. Badillo-Vargas[2], [1]Texas A&M Univ., College Station, TX, [2]Texas A&M AgriLife Research, Weslaco, TX, [3]Texas A&M AgriLife Research, Beaumont, TX*

P3-4 **Ideal tree host shifts in response to increased temperature and rainfall for the fall webworm (*Hyphantria cunea*).**
Amy Adams *(amy.e.adams@ou.edu), Univ. of Oklahoma, Norman, OK*

TUESDAY, APRIL 16, 2019, MORNING

Student Ten Minute Paper Competition: Undergraduate

Promenade Salon A, Second Floor

Moderators: C. Scott Bundy, New Mexico State Univ., Las Cruces, NM and Allen Knutson, Texas A&M Univ., Dallas, TX

10:20 AM **Introductory Remarks**

10:25 AM 1-1 **Sex differences in pollen consumption among blowflies (Diptera: Calliphoridae).**
Stephanie Rodriguez *(s.rodriguez15@tamu.edu), Pierre Lau, Aaron Tarone and Juliana Rangel, Texas A&M Univ., College Station, TX*

10:35 AM 1-2 **Sexual identification of *Oncideres rhodosticta* (Coleoptera: Cerambycidae) using sexual dimorphism analysis and dissections.**
Alejandra Mercado *(amerca@nmsu.edu), Ikju Park, David C Thompson and Danielle Lara, New Mexico State Univ., Las Cruces, NM*

10:45 AM 1-3 **Behavioral responses of *Algarobius prosopis* (Coleoptera: Chrysomelidae) to bimodal cues from mesquite pods.**
Nancy Rodriguez *(nancyrod@nmsu.edu), Ikju Park, Danielle Lara and David C. Thompson, New Mexico State Univ., Las Cruces, NM*

10:55 AM 1-4 **There goes the neighborhood: The federally endangered American burying beetle does not co-occur with the burying beetle brood parasite.**
Mason Taylor *(masonta@okstate.edu)[1], W. Wyatt Hoback[2] and Melissa Reed[2], [1]Oklahoma State Univ., Perry, OK, [2]Oklahoma State Univ., Stillwater, OK*

11:05 AM 1-5 **Evaluating volatile organic compounds emitted from male and female pecan weevils from eastern New Mexico.**
Katherine Arnold *(arnoldk@nmsu.edu), Ikju Park, David Thompson, Jeanette Castañon and Tiffany Johnson, New Mexico State Univ., Las Cruces, NM*

11:15 AM 1-6 **Surfing the waves of host choice in *Aedes aegypti* using electropenetography (EPG).**
Victoria Pickens *(vpicken@ostatemail.okstate.edu) and Astri Wayadande, Oklahoma State Univ., Stillwater, OK*

11:25 AM 1-7 **Decomposition and post-mortem interval estimations are not equal for black and white.**
Madeline Moore *(madeline.r.moore@okstate.edu) and W. Wyatt Hoback, Oklahoma State Univ., Stillwater, OK*

11:35 AM 1-8 **Effects of cargill feed additive on adult *Haematobia irritans* population in cattle.**
Hannah Walker *(hannahag16@gmail.com)[1], Sonja Swiger[2] and Carrie Maryak[3], [1]Tarleton State Univ., Stephenville, TX, [2]Texas A&M Univ., Stephenville, TX, [3]Texas A&M AgriLife Research & Extension, Stephenville, TX*

11:45 AM 1-9 **There can mostly be only one: Temporary waters are dominated by individual mosquito species.**
Liam Whiteman *(liamw@okstate.edu), Thomas Hess, Melissa Reed and W. Wyatt Hoback, Oklahoma State Univ., Stillwater, OK*

11:55 AM **Lunch on your own**

1:00 PM **Reminders of rules**

1:05 PM 1-10 **Genetic variation and dispersal patterns of damselflies along the Guadalupe River (Texas) watershed.**
Ashley Myers *(acmyer7730@schreiner.edu) and Ryan Caesar, Schreiner Univ., Kerrville, TX*

1:15 PM 1-11 **The effect of pesticides on honey bee (*Apis mellifera*, L.) queen reproductive physiology.**
Omar Khan *(omarikhan@tamu.edu), Elizabeth Walsh and Juliana Rangel, Texas A&M Univ., College Station, TX*

1:25 PM 1-12 **Behavioral effects of juvenile hormone on the worker caste of the red imported fire ant, *Solenopsis invicta*.**
Franchesca Rodriguez *(d4sh1ngdr4gonfly@gmail.com)[1], Chloë Hawkings[2] and Cecilia Tamborindeguy[2], [1]Texas A&M Univ., Bellville, TX, [2]Texas A&M Univ., College Station, TX*

Student Ten Minute Paper Competition: Ph.D

Promenade Salon B, Second Floor

Moderator: Juliana Rangel, Texas A&M Univ., College Station, TX

10:20 AM **Introductory Remarks**

10:25 AM 2-1 **Colony structure of the odorous house ant (*Tapinoma sessile*), a native urban invader.**
Alexander Blumenfeld *(alex93@tamu.edu) and Edward Vargo, Texas A&M Univ., College Station, TX*

10:35 AM 2-2 **Assessing host-associated differentiation in *Dermacentor variabilis* (Acari: Ixodidae).**
Mackenzie Tietjen *(kenzietietjen@tamu.edu)[1], Maria Esteve-Gassent[1], Ivan Castro-Arellano[2] and Raul F. Medina[1], [1]Texas A&M Univ., College Station, TX, [2]Texas State Univ., San Marcos, TX*

10:45 AM 2-3 **Upper thermal tolerance variation between *Reticulitermes* spp. and across its range (Blattodea: Rhinotermitidae).**
Mark Janowiecki *(janowiecki@tamu.edu) and Edward Vargo, Texas A&M Univ., College Station, TX*

10:55 AM 2-4 **Relationship of feeding, growth, and parasitism in *Acheta domesticus* (Orthoptera Gryllidae) infected with *Paragordius varius* (Phylum: Nematomorpha).**
Christina Anaya *(christina.anaya@okstate.edu)[1], Ben Hanelt[2], Matthew Bolek[1] and Larisa Vredevoe[3], [1]Oklahoma State Univ., Stillwater, OK, [2]Univ. of New Mexico, Alburquerque, NM, [3]California Polytechnic State Univ., San Luis Obispo, CA*

11:05 AM 2-5 **Importation biological control of crape myrtle bark scale (*Acanthococcus lagerstroemiae* Kuwana) in Texas.**
Kenneth Masloski *(kemasloski@tamu.edu), James Woolley, Peter Krauter, Mengmeng Gu and Kevin Heinz, Texas A&M Univ., College Station, TX*

11:15 AM 2-6 **Investigating the flight capability of the Blattodea, effects of wing morphology, size and behavior in 15 cockroach species.**
Fabian List *(fabian.list@tamu.edu), Bridgett Benedict, Casey Flint, Samuel Howard, Caixing Xiong and Hojun Song, Texas A&M Univ., College Station, TX*

11:25 AM 2-7 **Could the macroinvertebrate cross the road? impact of road-stream crossings on aquatic macroinvertebrates in Oklahoma**
Melissa Reed *(mleath@okstate.edu), James Long and W. Wyatt Hoback, Oklahoma State Univ., Stillwater, OK*

11:35 AM 2-8 **Use of multiple natural enemies for inoculative biological control if *Bemisia tabaci* in greenhouse poinsettia production.**
Erfan Vafaie *(erfanv@tamu.edu)[1] and Kevin Heinz[2], [1]Texas A&M Univ., Overton, TX, [2]Texas A&M Univ., College Station, TX*

11:45 AM 2-9 **Within plant canopy distribution of sugarcane aphid, *Melanaphis sacchari* Zehntner, in commercial grain sorghum.**
Jessica Lindenmayer *(jpavlu@ostatemail.okstate.edu)[1], Mark Payton[1], Kristopher Giles[1], Allen Knutson[2], Robert Bowling[3], Nick Seiter[4], Norman Elliott[5] and Tom Royer[1], [1]Oklahoma State Univ., Stillwater, OK, [2]Texas A&M Univ., Dallas, TX, [3]Texas A&M Univ., Corpus Christi, TX, [4]Univ. of Illinois, Champaign, IL, [5]USDA - ARS, Stillwater, OK*

11:55 AM **Lunch on your own**

1:00 PM **Reminders of rules**

1:05 PM 2-10 **Evidence of host plant specialization among the U.S. sugarcane aphid (Hemiptera: Aphididae) genotypes.**
Sulochana Paudyal *(sulochana.paudyal@okstate.edu)[1], J. Scott Armstrong[2], Karen Harris-Shultz[3], Hongliang Wang[4], Kristopher Giles[1], Philippe Rott[5] and Mark Payton[1], [1]Oklahoma State Univ., Stillwater, OK, [2]USDA - ARS, Stillwater, OK, [3]USDA - ARS, Tifton, GA, [4]USDA - ARS, Manhattan, KS, [5]Univ. of Florida, Belle Glade, FL*

1:15 PM 2-11 **A comparison of monarch butterfly egg laying on native vs non-native milkweed.**
David Berman *(david.berman@okstate.edu) and Kristen Baum, Oklahoma State Univ., Stillwater, OK*

1:25 PM 2-12 **Do larger native bees fly farther and increase seed set in canola (*Brassica napus*) fields?**
Sarah Elzay *(selzay@okstate.edu) and Kristen Baum, Oklahoma State Univ., Stillwater, OK*

1:35 PM 2-13 **Assessing Ant-aphid mutualisms in invasive insect species.**
Jocelyn R. Holt *(holtjocelyn@tamu.edu) and Raul F. Medina, Texas A&M Univ., College Station, TX*

1:45 PM 2-14 **A local and scalar analysis of bee abundance and diversity in the Texas High Plains agricultural region.**
Samuel Discua *(samuel.discua@ttu.edu) and Scott Longing, Texas Tech Univ., Lubbock, TX*

TUESDAY, APRIL 16, 2019, AFTERNOON

Student Ten Minute Paper Competition: Master's

Promenade Salon A, Second Floor

Moderators: C. Scott Bundy, New Mexico State Univ., Las Cruces, NM and Allen Knutson, Texas A&M Univ., Dallas, TX

1:35 PM 3-1 **Engorged with data: Using surveys to assess college students' understanding of ticks.**
Elizabeth Knowlton *(edkbiology@gmail.com), Justin Talley, Bruce Noden and W. Wyatt Hoback, Oklahoma State Univ., Stillwater, OK*

1:45 PM 3-2 **The influence of eastern red cedar on Tabanidae populations in Oklahoma.**
Kylie Sherrill *(kyliekd@okstate.edu)[1], Justin Talley[1], Bruce Noden[1], Laura Goodman[1] and John Scasta[2], [1]Oklahoma State Univ., Stillwater, OK, [2]Univ. of Wyoming, Laramie, WY*

1:55 PM 3-3 **The consequence of avian malarial infection on *Culex quinquefasciatus* survivorship.**
Dayvion Adams *(ajadams968@tamu.edu), Andrew Golnar and Gabriel Hamer, Texas A&M Univ., College Station, TX*

2:05 PM 3-4 **Efficacy evaluations of various insecticidal application methods for the control of horn flies (Diptera: Muscidae).**
Diego Garcia *(dg32695@nmsu.edu) and Brandon Smythe, New Mexico State Univ., Las Cruces, NM*

2:15 PM 3-5 **Eastern grape leafhopper, *Erythroneura comes* (Say), phenology and differential abundance on grape cultivars in an Oklahoma vineyard.**
Kevin Jarrell *(kevin.jarrell@okstate.edu), Eric Rebek, Kristopher Giles and Astri Wayadande, Oklahoma State Univ., Stillwater, OK*

2:25 PM 3-6 **Landrace and commercial varieties of dry beans: some resistance traits to greenhouse whitefly and effect on parasitism by *Encarsia formosa*.**
Renato Villegas-Luján *(renato_villegas1988@hotmail.com) and Sergio Sánchez-Peña, Universidad Autónoma Agraria Antonio Narro, Saltillo, CU, Mexico*

Regular Ten Minute Paper Session Tuesday

Promenade Salon B, Second Floor

Moderator: Laura Weiser Erlandson, Texas A&M Univ., Killeen, TX

3:00 PM **Introductory Remarks**

3:05 PM 4-1 **Technology innovations for development of successful areawide programs for BMSB.**
Danielle Kirkpatrick *(DKirkpatrick@trece.com), Trece, Inc., Adair, OK*

3:15 PM 4-2 **Impact of hickory shuckworm, *Cydia caryana* (Lepidoptera: Tortricidae) on pecan kernel quality.**
Bill Ree *(w-ree@tamu.edu), Texas A&M AgriLife Extension Service, College Station, TX*

3:25 PM 4-3 **Mesquite twig girdler, *Oncideres rhodosticta,* response to volatile organic compounds from hosts – does spillover limit biological control potential?**
David C. Thompson *(dathomps@nmsu.edu), Ikju Park, Danielle Lara and Alejandra Mercado, New Mexico State Univ., Las Cruces, NM*

3:35 PM 4-4 **Host recognition of *Rhinocyllus conicus* to volatile organic compounds from endangered and invasive thistles.**
Ikju Park *(ipark@nmsu.edu) and David C Thompson, New Mexico State Univ., Las Cruces, NM*

3:45 PM 4-5 **Effects of leaf trichomes on herbivore feeding, growth and development.**
Rupesh Kariyat *(rupesh.kariyat@utrgv.edu), Univ. of Texas, Edinburg, TX*

3:55 PM **4-6** **Leaffooted bug joins the complex of sucking bugs that injure cotton bolls, if the timing is right.**
Michael Brewer *(mjbrewer@ag.tamu.edu) and James Glover, Texas A&M AgriLife Research, Corpus Christi, TX*

4:05 PM **4-7** **Role of insecticidal seed treatments managing early season insect pests in cotton.**
Suhas Vyavhare *(suhas.vyavhare@ag.tamu.edu)[1] and Blayne Reed[2], [1]Texas A&M Univ., Lubbock, TX, [2]Texas A&M Univ., Plainview, TX*

4:15 PM **4-8** **From green to brown: Restructuring of arthropod communities following plant invasion in the mid-Atlantic.**
Adam Mitchell *(mitchell.adam.b@gmail.com)[1] and Douglas W. Tallamy[2], [1]Tarleton State Univ., Stephenville, TX, [2]Univ. of Delaware, Newark, DE*

4:25 PM **4-9** **Early autumn parasitism of cereal aphids by Hymenopteran parasitoids in wheat fields and wheat field borders.**
Norman Elliott *(norman.elliott@ars.usda.gov)[1], Kristopher Giles[2], Michael Brewer[3] and Casi Jessie[4], [1]USDA - ARS, Stillwater, OK, [2]Oklahoma State Univ., Stillwater, OK, [3]Texas A&M AgriLife Research, Corpus Christi, TX, [4]Oregon State Univ., Corvallis, OR*

4:35 PM **4-10** **Reducing insect infestations in stored grain facilities.**
Edmond L. Bonjour *(edmond.bonjour@okstate.edu), Oklahoma State Univ., Stillwater, OK*

4:45 PM **4-11** **Sorghum growth and sugarcane aphid-plant interactions are altered when grown under light emitting diodes of the incorrect light spectrum.**
J. Scott Armstrong *(scott.armstrong@ars.usda.gov)[1], Ankur Lamaje[2], W. Wyatt Hoback[2] and Sulochana Paudyal[2], [1]USDA - ARS, Stillwater, OK, [2]Oklahoma State Univ., Stillwater, OK*

4:55 PM **Concluding Remarks**

TUESDAY, APRIL 16, 2019, EVENING

Student Three-Minute Presentations

Tulsa Ballroom Central, First Floor

Moderator and Organizer: Jocelyn R. Holt, Texas A&M Univ., College Station, TX

7:30 PM **5-1** **The giant walkingstick (*Megaphasma denticrus*) feeding on eastern cedar (*Juniperus virginiana*).**
Mark Janowiecki *(janowiecki@tamu.edu), Texas A&M Univ., College Station, TX*

7:33 PM **5-2** **Assessing mutualisms in invasive insect pests.**
Jocelyn R. Holt *(holtjocelyn@tamu.edu) and Raul F. Medina, Texas A&M Univ., College Station, TX*

WEDNESDAY, APRIL 17, 2019, MORNING POSTERS

Regular poster session

Tulsa Ballroom North, First Floor

P4-1 **Insecticide resistance monitoring and training with the Midwest Center of Excellence for Vector-borne Disease.**
Trisha Dubie *(dubietri@msu.edu), Michigan State Univ., East Lansing, MI*

P4-2 **"Economic Assessment of Working Cattle and Technology Adoption in Grazing Cattle Systems": A paper handout survey for cattle producers concentrated on beef production characteristics, technology adoption, and ectoparasite control.**
Samantha Hays *(samanthahays_85@tamu.edu)[1], Pete Teel[1], Sonja Swiger[2], Thomas Hairgrove[3], David Anderson[3] and Jeffery K. Tomberlin[1], [1]Texas A&M Univ., College Station, TX, [2]Texas A&M Univ., Stephenville, TX, [3]Texas A&M AgriLife Research & Extension, College Station, TX*

P4-4 **Function and regulation of serine proteases and their homologs during immune responses of *Manduca sexta*.**
Yang Wang *(yang.wang10@okstate.edu)[1], Xiaolong Cao[1], Michael Kanost[2] and Haobo Jiang[1], [1]Oklahoma State Univ., Stillwater, OK, [2]Kansas State Univ., Manhattan, KS*

P4-5 **Economic injury level for bermudagrass stem maggot in bermudagrass forage production in Texas.**
Allen Knutson *(a-knutson@tamu.edu)[1] and Forrest Mitchell[2], [1]Texas A&M Univ., Dallas, TX, [2]Texas A&M Univ., Stephenville, TX*

P4-7 **Management of early-season insect pests in Texas high plains cotton: Transitioning to dryland production.**
Abdul Hakeem *(abdul.hakeem@ag.tamu.edu)[1], Megha Parajulee[1], Suhas Vyavhare[1] and Katie Lewis[2], [1]Texas A&M Univ., Lubbock, TX, [2]Texas A&M AgriLife Research, Lubbock, TX*

P4-8 **Impact of host plant resistance on interaction between sorghum and sugarcane aphid at transcriptome level.**
Mahnaz Kianifariz *(mahnaz.kianifariz@ag.tamu.edu) and Adrianna Szczepaniec, Texas A&M AgriLife Research, Amarillo, TX*

P4-9 **Native bees and associated forage plants of Parker County, Texas.**
Camille Carey *(camille.carey@go.tarleton.edu), John Montoya, Adam Mitchell and David H. Kattes, Tarleton State Univ., Stephenville, TX*

P4-10 **Pollinator attractiveness of drought tolerant plants in the Texas High Plains.**
Samuel Discua *(samuel.discua@ttu.edu) and Scott Longing, Texas Tech Univ., Lubbock, TX*

P4-11 **Transmission of *Fusarium oxysporum* f. sp. *vasinfectum* VCG 0114 (race 4) by stink bugs to cotton bolls.**
Jesus Esquivel *(jesus.esquivel@ars.usda.gov) and Alois Bell, USDA - ARS, College Station, TX*

P4-12 **BioCeres (*Beauveria bassiana*) and tank mix, do's and don'ts.**
Manuel Campos *(mcampos@biosafesystems.com), BioSafe Systems, East Hartford, CT*

P4-13 **Survey of possible incidence of *Helicoverpa armigera* invasion in Texas.**
Megha N. Parajulee *(m-parajulee@tamu.edu) and Stanley C. Carroll, Texas A&M Univ., Lubbock, TX*

P4-14 **Phantasmagorical phasmids.**
Shane McMurry *(shane.mcmurry@okstate.edu), Oklahoma State Univ., Pawnee, OK*

P4-15 **The spider-mite predator *Oligota* sp. (Staphylinidae) in a sorghum field in Saltillo, Mexico.**
Helmer Botello-Gomez *(doctorsergiosanchez@gmail.com) and Sergio Sánchez-Peña, Universidad Autónoma Agraria Antonio Narro, Saltillo, CU, Mexico*

WEDNESDAY, APRIL 17, 2019, MORNING

Innovations in Entomology Education

Promenade Salon B, Second Floor

Moderator and Organizers: Adrienne Brundage, Texas A&M Univ., College Station, TX and Craig Coates, Texas A&M Univ., College Station, TX

8:00 AM **Introductory Remarks**

8:05 AM **6-1** **Teaching entomology scientific writing with an open access journal: a flipped course method.**
Adrienne Brundage *(Adrienne.Brundage@tamu.edu), Texas A&M Univ., College Station, TX*

8:20 AM **6-2** **Choctaw bug camp experience.**
Tracy Horst *(thorst@choctawnation.com), Choctaw Nation of Oklahoma, Durant, OK*

8:35 AM **6-3** **Our experience with art, science, and education.**
Robert Sober *(bsober@mac.com), art's IMPORTANT, LLC, Tulsa, OK*

8:50 AM **6-4** **Using entomology to connect students to the natural world at liberal arts college.**
Loriann Garcia *(lgarcia@austincollege.edu), Austin College, Sherman, TX*

9:05 AM **6-5** **Hoback's bads: Post-exam student critique of exam questions improves learning and retention.**
W. Wyatt Hoback *(whoback@okstate.edu), Oklahoma State Univ., Stillwater, OK*

9:20 AM **6-6** **Using Monarch butterfly service learning projects to actively engage 500 core curriculum students.**
Craig Coates *(ccoates@tamu.edu), Texas A&M Univ., College Station, TX*

9:35 AM **6-7** **Title to be announced....**
Teaching Award Recipient *(ccoates@tamu.edu), Unknown, PR*

9:50 AM **Concluding Remarks**

Current Research & Extension Topics in Urban & Landscape Entomology in the Southwestern US

Promenade Salon A, Second Floor

Moderators and Organizers: Bob Davis, BASF Corporation, Pflugerville, TX and Michael Merchant, Texas A&M AgriLife Extension Service, Dallas, TX

8:00 AM **Introductory Remarks**

8:05 AM **7-1** **Cost, IPM, and measuring the success of school IPM programs: Lessons learned from a 20-year mandate.**
Janet Hurley *(ja-hurley@tamu.edu)[1], Michael Merchant[2] and Blake Bennett[1], [1]Texas A&M Univ., Dallas, TX, [2]Texas A&M AgriLife Extension Service, Dallas, TX*

8:25 AM **7-2** **Emerging pest problems in southwestern urban landscapes.**
Carol Sutherland *(csutherl@nmsu.edu), New Mexico Dept. of Agriculture, Las Cruces, NM*

8:45 AM **7-3** **Biting mites (Acari: Mesostigmata): Research and extension needs.**
Michael Merchant *(m-merchant@tamu.edu), Texas A&M AgriLife Extension Service, Dallas, TX*

9:05 AM **7-4** **New and better technologies for general pest management in urban environment.**
Raj Saran *(raj.saran@bayer.com), Bayer US LLC, Research Triangle Park, NC*

9:25 AM **7-5** **Integrating new technology into filth fly programs for food production and food service.**
Emory Matts *(emory.matts@rentokil.com), Rentokil, Carrollton, TX*

9:45 AM **7-6** **Managing stored product pests from a pest management perspective.**
Pari Pachamuthu *(pari.pachamuthu@rentokil.com), Rentokil, Houston, TX*

10:05 AM **Break**

10:25 AM **7-7** **New directions and advances in termite baiting systems.**
Phillip Shults *(ptshults@tamu.edu) and Edward Vargo, Texas A&M Univ., College Station, TX*

10:45 AM 7-8 **Subterranean termite (*Reticulitermes* & *Amitermes* spp.) colony activity over time within a 1 acre grid in central Texas.**
Bob Davis *(robert.davis@basf.com), BASF Corporation, Pflugerville, TX*

11:05 AM **Western Gulf Center of Excellence outreach update.**
Sonja Swiger *(slswiger@ag.tamu.edu)[1], Whitney Qualls[2], Patrick Prather[3] and Scott Weaver[4], [1]Texas A&M Univ., Stephenville, TX, [2]Texas Dept. of State Health Services, Austin, TX, [3]Municipal Mosquito, Richardson, TX, [4]Univ. of Texas Medical Branch, Galveston, TX*

11:25 AM **Concluding Remarks**

Regular Ten Minute Paper Session Wednesday

Promenade Salon B, Second Floor

Moderator: Manuel Campos, BioSafe Systems, East Hartford, CT

10:20 AM **Introductory Remarks**

10:25 AM 8-1 **Role of Azadirachtin; benefits and limitations.**
Manuel Campos *(mcampos@biosafesystems.com), BioSafe Systems, East Hartford, CT*

10:35 AM 8-2 **Evaluation of "*Candidatus* Liberibacter solanacearum" induced effects on the feeding behavior of *Bactericera cockerelli* by two distinct haplotypes present in the Americas.**
Kyle Koch *(kyle.koch@ag.tamu.edu), Estephanie Bernal Jimenez and Ismael E. Badillo-Vargas, Texas A&M AgriLife Research, Weslaco, TX*

10:45 AM 8-3 **Community composition and functional diversity in pollinator habitat seed mixes: Do designer plants meet their goals?**
Robert Cox and ***Scott Longing*** *(scott.longing@ttu.edu), Texas Tech Univ., Lubbock, TX*

10:55 AM 8-4 **Identification and lifecycle description of *Caloptilia blandella* (Clemens) (Lepitoptera: Gracillariidae) on commercial pecan trees in New Mexico.**
Tiffany Johnson *(shimsham@nmsu.edu), New Mexico State Univ., Las Cruces, NM*

11:05 AM 8-5 **Gene expression analysis of key antioxidant genes in reproductive tissue of *Apis mellifera* queens reared in pesticide-laden beeswax.**
Juliana Rangel *(jrangel@tamu.edu), Elizabeth Walsh and Tonya Shepherd, Texas A&M Univ., College Station, TX*

11:15 AM 8-6 **How to avoid aggravated pesticide toxicity to honey bees?**
Yu Cheng Zhu *(yc.zhu@ars.usda.gov), USDA - ARS, Stoneville, MS*

11:25 AM 8-7 **Developing RNA interference tools to control the potato psyllid and zebra chip disease of potatoes.**
Ismael E. Badillo-Vargas *(ismael.badillo@ag.tamu.edu) and Estephanie Bernal Jimenez, Texas A&M AgriLife Research, Weslaco, TX*

11:35 AM 8-8 **Supergene in the red imported fire ant (*Solenopsis invicta*) leads to increased gene expression.**
Joan King *(joanie_king@tamu.edu)[1,2], Samuel Arsenault[2], Sasha Kay[3], Kip Lacy[2], Kenneth Ross[2] and Brendan Hunt[3], [1]Texas A&M Univ., College Station, TX, [2]Univ. of Georgia, Athens, GA, [3]Univ. of Georgia, Griffin, GA*

11:45 AM 8-9 **Impacts of environmental exposure of bovine manure on fecal-NIRS detection of the southern cattle tick.**
Brian Rich *(briantaylorrich@gmail.com)[1], Pete Teel[1], Donald B. Thomas[2], Jay Angerer[3], Doug Tolleson[4] and Adalberto A. Pérez de León[5], [1]Texas A&M Univ., College Station, TX, [2]USDA - ARS, Edinburg, TX, [3]Texas A&M AgriLife Research & Extension, Temple, TX, [4]Texas A&M Univ., San Angelo, TX, [5]USDA - ARS, Kerrville, TX*

11:55 AM **Concluding Remarks**

WEDNESDAY, APRIL 17, 2019, AFTERNOON

Blood Feeding Arthropods of Veterinary and Medical Importance: Sharing Discoveries on Surveillance, Biology and Control

Promenade Salon A, Second Floor

Moderators and Organizers: Estelle Martin, Texas A&M Univ., College Station, TX and Brandon Smythe, New Mexico State Univ., Las Cruces, NM

1:00 PM **Introductory Remarks**

1:05 PM **9-1** **Mosquito surveillance and infection with insect-specific viruses in Texas.**
Estelle Martin *(estellemartin@tamu.edu), Texas A&M Univ., College Station, TX*

1:35 PM **9-2** **Towards mosquito sterile insect technique.**
Immo Hansen *(immoh@nmsu.edu), New Mexico State Univ., Las Cruces, NM*

2:05 PM **9-3** **While we were sleeping…case studies of vector-borne diseases in Oklahoma.**
Bruce Noden *(bruce.noden@okstate.edu), Oklahoma State Univ., Stillwater, OK*

2:35 PM **Break**

3:05 PM **9-4** **Increased surveillance and screening of *Culicoides*: A better understanding of vector-host-pathogen interaction.**
Phillip Shults *(ptshults@tamu.edu), Texas A&M Univ., College Station, TX*

3:35 PM **9-5** **Horn fly (*Haematobia irritans*) control for cattle producers: Matching the science with ranch management practices.**
Justin Talley *(justin.talley@okstate.edu), Oklahoma State Univ., Stillwater, OK*

4:05 PM **9-6** **On-going efforts to advance pest management options for the horn fly (Diptera: Muscidae).**
Brandon Smythe *(bsmythe@nmsu.edu), New Mexico State Univ., Las Cruces, NM*

4:35 PM **9-7** **Selected insecticide delivery devices for management of horn flies (*Haematobia irritans*) (Diptera: Muscidae) on beef cattle.**
Sonja Swiger *(slswiger@ag.tamu.edu), Texas A&M Univ., Stephenville, TX*

4:55 PM **Concluding Remarks**

Skills for Women Navigating Their Early Careers

Promenade Salon B, Second Floor

Moderator and Organizers: Andrine A. Shufran, Oklahoma State Univ., Stillwater, OK and Tracey Payton Miller, Langston Univ., Langston, OK

1:00 PM **Introductory Remarks**

1:05 PM **10-1** **Not your grandad's ESA: changing demographics and the 21st century of entomology.**
Robert K. D. Peterson *(bpeterson@montana.edu), Montana State Univ., Bozeman, MT*

1:25 PM **10-2** **Navigating the transition from student to professional.**
Tracey Payton Miller *(ptracey@langston.edu), Langston Univ., Langston, OK*

1:45 PM **10-3** **Sailing to success: Navigating those muddy waters of academia without a rudder.**
Astri Wayadande *(a.wayadande@okstate.edu), Oklahoma State Univ., Stillwater, OK*

2:05 PM **10-4** **Gender is a verb, too.**
Robert N. Wiedenmann *(rwieden@uark.edu), Univ. of Arkansas, Fayetteville, AR*

2:25 PM **Break**

2:45 PM **10-5** **Can you *really* do it all? Juggling work with life**
Wizzie Brown *(ebrown@ag.tamu.edu), Texas A&M AgriLife Extension Service, Austin, TX*

3:05 PM **10-6** **The art of saying yes. How to network smart.**
Molly Keck *(mekeck@ag.tamu.edu), Texas A&M AgriLife Extension Service, San Antonio, TX*

3:25 PM **10-7** **The gender playing field is significantly lopsided: Underemployment of female entomologists.**
Karen Walker *(karen.a.walker@aphis.usda.gov), USDA - APHIS, Riverdale, MD*

3:45 PM **10-8** **Proficiency in professionalism is paramount.**
Andrine A. Shufran *(andrine@okstate.edu), Oklahoma State Univ., Stillwater, OK*

4:05 PM **Concluding Remarks**

Oral Abstracts

Student Ten-Minute Paper Competition

Student Ten Minute Paper Competition: Undergraduate

1-1. **Sex differences in pollen consumption among blowflies (Diptera: Calliphoridae)**

Stephanie Rodriguez (s.rodriguez15@tamu.edu), Pierre Lau, Aaron Tarone and Juliana Rangel, Texas A&M Univ., College Station, TX

Hymenoptera are known to be some of the main pollinators in our ecosystems. However, a recent study showed that blow flies (Diptera: Calliphoridae) are underappreciated as pollinators. Previous research done by former students in our laboratory showed that blow flies collected around rural areas in College Station, TX, consume pollen. The same research group found that there are differences in pollen consumption depending on the sex of blow flies, but they did so using cohorts of five specimens per sample. Therefore, one thing that was not answered was whether the difference in pollen consumption depending on the was consistent on an individual basis. To answer this question, blow flies were caught in different locations near pollinating flowers in College Station, TX. They were labeled according to location and date and were then identified down to species and sex. Then, individual flies were processed by dissecting their gut. The gut contents were then processed by performing pollen acetolysis and then each sample was placed on a slide. The number of pollen grains were then counted and the different pollen was identified to the lowest taxonomic level possible. Our research will continue to inform us about whether there is a difference of pollen consumption among the different sexes in blow flies on an individual basis. This will improve our knowledge on the role that blow flies play in providing pollination services in our ecosystems.

1-2. **Sexual identification of *Oncideres rhodosticta* (Coleoptera: Cerambycidae) using sexual dimorphism analysis and dissections**

Alejandra Mercado (amerca@nmsu.edu), Ikju Park, David C Thompson and Danielle Lara, New Mexico State Univ., Las Cruces, NM

The mesquite twig girdler, *Oncideres rhodosticta* Bates, girdles honey mesquite (*Prosopis glandulosa*) stems in the Southwestern US before oviposition. In some populations, over 80% of stems are girdled, significantly altering the physical structure of honey mesquite. Before initiating host selection behavioral bioassays and other ecological studies, it is important to identify sexes of adult twig girdlers accurately. Previous studies used antennal characteristics to differentiate between males and females; however, significant variability in body size complicates the use of individual body measurements. To improve the accuracy of identifying their sexes, we measured fifteen body characters from twelve pairs of adult twig girdlers and confirmed associated sexes based on dissections. Multiple regression and principal component analyses were conducted using SAS 9.4. The last ventral abdominal segment, one of the main sexually dimorphic characters, was difficult for participants to distinguish between male and female twig girdlers (31% ± 5). Among the fifteen body characters, the full intact antennal length and the distal antennal segment were the best predictors to confirm the sex of twig girdlers. If antennae of collected twig girdlers are undamaged, the full intact antennal lengths may be used to quickly predict the sex of the twig girdlers in both the field and the laboratory. As interest in the biological control potential of twig girdlers increases, accurate identification of sex without dissection is critical in host selection studies.

1-3. **Behavioral responses of *Algarobius prosopis* (Coleoptera: Chrysomelidae) to bimodal cues from mesquite pods**

Nancy Rodriguez (nancyrod@nmsu.edu), Ikju Park, Danielle Lara and David C. Thompson, New Mexico State Univ., Las Cruces, NM

How an insect specialist processes signals in response to physiological changes of plant organs is typically examined using olfactory cues. In nature, herbivorous insects integrate multimodal cues from plants to maximize fitness in the complex environment. Since the bruchid, *Algarobius prosopis* LeConte, feeds exclusively on mesquite (*Prosopis*) seeds, it was introduced as a biocontrol agent for mesquite in South Africa. We examined the role of olfactory and visual cues in the initial host recognition of female *A. prosopis* by collecting volatile organic compounds from two different physiological stages (green and brown pods) of mesquite. To measure the behavioral responses of *A. prosopis* and their searching time, we conducted three behavioral bioassays: only visual cues, only olfactory cues, and the combination of both cues using a y-tube device. We identified 46 chemical compounds in mesquite pods using gas chromatography-mass spectrometry. Of these, 11 were unique to green and 24 were unique to brown

pods. Females showed no preference with only visual cues and 30% chose brown pods with only olfactory cues. In contrast, 65% of females selected brown over green pods when olfactory and visual cues were combined in the behavioral bioassays. Similarly, searching time was shorter for brown over green pods with bimodal cues. We pose that better understanding of olfactory and visual cues associated with initial host recognition of *A. prosopis* could be beneficial to state and federal agencies in the Southwestern US and stakeholders in other countries such as South Africa attempting to manage invasive mesquite.

1-4. **There goes the neighborhood: The federally endangered American burying beetle does not co-occur with the burying beetle brood parasite**

Mason Taylor (masonta@okstate.edu)[1], W. Wyatt Hoback[2] and Melissa Reed[2], [1]Oklahoma State Univ., Perry, OK, [2]Oklahoma State Univ., Stillwater, OK

The American Burying Beetle (ABB), *Nicrophorus americanus,* is an endangered species that is beneficial to many ecosystems by aiding in the decomposition of carrion and reducing fly populations. It is also the largest burying beetle species in North America and is hypothesized to win competition for vertebrate carrion in habitats where it exists. ABB and other *Nicrophorus* fly each night searching for available carrion. The pustulated burying beetle (PBB), *Nicrophorus pustulatus* is also nocturnal and is suggested to be a brood parasite. We used 20 baited pitfall traps spaced a minimum of 2.2 km apart to sample for ABB at Camp Gruber for 5-day periods during July of 2016, 2017, and 2018. We tested the hypothesis that the catch rates of ABB and PBB would be similar for a given trap. When the overall data were analyzed using a Mann-Whitney Rank Sum Test, they significantly differed (T = 4191.5, P = 0.003). In both 2016 and 2018 there were significantly more ABB in traps with fewer PBB and vice versa, while in 2017, the relationship between species occurrence in traps was not significantly different (T – 448; P = 0.310). The results of this study support that the number of ABB and PBB do not co-occur for two out of the three survey periods. Future studies will determine if it is because of competition for carcasses or losses to a brood parasite.

1-5. **Evaluating volatile organic compounds emitted from male and female pecan weevils from eastern New Mexico**

Katherine Arnold (arnoldk@nmsu.edu), Ikju Park, David Thompson, Jeanette Castañon and Tiffany Johnson, New Mexico State Univ., Las Cruces, NM

The pecan weevil, *Curculio caryae* Horn (Coleoptera: Curculionidae), is an obligatory nut feeder that is a major pest of commercial and residential pecan trees due to feeding damage and nut loss. Originating from the eastern United States, feeds and oviposits exclusively during the gel stage of pecan development. Infestation of this pest within Lea, Chaves, Eddy, and Clovis counties requires an insecticide application to reduce yield loss. Timing that corresponds with adult emergence from the soil is critical for effective control. Low capture numbers from pheromone bait traps from infested New Mexico counties have prompted a need to reassess the adult pheromone profile. To reevaluate the chemical composition of the pecan weevil sex pheromone, we collected volatile organic compounds emitted from conspecific pairs of pecan weevils. Field-collected pecan weevils were transported from Eddy and Chaves counties in eastern New Mexico to a biosafety level 2 quarantine facility at New Mexico State University in Las Cruces, New Mexico. Each pecan weevil was placed in a preconditioned glass vial to collect conspecific body odors using a dynamic headspace collection system at 300 ml/min for 12 hours. The eluted analytes were injected into a gas chromatography-mass spectrometry. The preliminary findings from these samples will be reported. The use of these pheromones within bait traps will help with the identification of pecan weevils within orchards on a commercial and residential level.

1-6. **Surfing the waves of host choice in *Aedes aegypti* using electropenetography (EPG)**

Victoria Pickens (vpicken@ostatemail.okstate.edu) and Astri Wayadande, Oklahoma State Univ., Stillwater, OK

One of the most common questions asked about mosquitoes is why they seem to bite some people more than others. Host choice is often studied in mosquitoes by observing behavior when exposed to a specific host characteristic. However, electropenetography (EPG) allows us to directly measure the probing activities of a mosquito while taking a blood meal from a given host. EPG was originally developed for use on Hemipteran phloem-feeding insects to study points of pathogen acquisition and transmission. In this study, we used EPG to identify variations in mosquito feeding patterns for *Aedes aegypti* exposed to three different hosts. The hosts included one typical male, one typical female, and one atypical male. The typical hosts have a past of feeding mosquito colonies and experiencing no issues with regular feedings, including *Aedes aegypti*, and report average mosquito feeding in natural environments. The atypical host reported below average mosquito feeding in natural environments and negative impact when feeding mosquito colonies: the mosquitoes died shortly after the second feed. EPG

recordings from the three hosts were collected using a completely randomized design. Present results show irregular feeding patterns in *A. aegypti* when exposed to the atypical host, such as prolonged probing time lengths and disrupted probing and digestion. The results of this study provide a quantifiable difference between *A. aegypti* feeding when exposed to different hosts.

1-7. **Decomposition and post-mortem interval estimations are not equal for black and white**

Madeline Moore (madeline.r.moore@okstate.edu) and W. Wyatt Hoback, Oklahoma State Univ., Stillwater, OK

When an organism dies, its body begins to decompose aided by a succession of carrion-feeding insects. These insects and the predictable progression of decomposition aid forensic investigators in determining a Post-Mortem Interval (PMI). Although much research has been conducted on factors influencing decomposition rate, the potential effects of the race of a victim has been seldom considered. In particular higher concentrations of melanin may result in differences in attraction to some insects and decomposition rates in some habitats. We tested the hypothesis that rats with more melanin (black rats) would decompose faster and accumulate more insect activity than rats with less melanin (white rats). This research occurred between August and December, 2018 and across three trials. Each trail had three cages: one set in an exposed area with full sun, one in partial shade, and one in full shade. Each cage had two male rats, one white and one black, that had been previously thawed and shaved bare. Photos were taken every day to log stage of decomposition and insect activity. A body decomposition index was created for each rat and compared. Contrary to our hypothesis, rats with less melanin decomposed approximately one day faster and had more insect activity than rats with more melanin in both sunny and fully shaded treatments. For rats in the partial shade treatment, decomposition was faster in the rats with more melanin. This result may be influenced by melanin, which interferes with bacterial growth in the early stages of decomposition. The importance of this research is to demonstrate that forensic cases must account for a person's race in order to be accurate in establishing a PMI.

1-8. **Effects of cargill feed additive on adult *Haematobia irritans* population in cattle**

Hannah Walker (hannahag16@gmail.com)[1], Sonja Swiger[2] and Carrie Maryak[3], [1]Tarleton State Univ., Stephenville, TX, [2]Texas A&M Univ., Stephenville, TX, [3]Texas A&M AgriLife Research & Extension, Stephenville, TX

Horn flies, *Haematobia irritans*, are known for biting cattle 30-40 times a day, resulting in cattle bunching; when cattle bunch they do not eat, resulting in significant decreases in weight gain attributed to stress, annoyance, and blood loss caused by horn flies (Boland et. al., 2008). Cargill has developed a feed additive, Cinnagard, belonging to section 25b- natural products not requiring scientific evaluation by EPA, that decreases horn fly populations. To determine the efficacy of this product, field and lab data were collected and analyzed.

Field data consisted of weekly adult horn fly counts on ten treated and ten untreated cattle, as well as, collection of manure samples as available. Manure samples were grown in lab for insect emergence. Insect emergence was different for treated and untreated samples. Nonparametric tests revealed a significant reduction in adult horn fly abundance in treated cattle verses untreated cattle.

The lab portion of the study evaluated inhibition of adult horn fly emergence from a standardized 50 egg inoculum added to treated or untreated cattle manure. Manure samples were shipped weekly by Cargill in randomly labeled bags. The egg inoculum was added to five equal replicates of each manure sample, grown in a growth chamber for one week, and floated for pupae. Pupae were placed in petri dishes and returned to incubators to grow for another week. Emerged adults were compared to the non-emerged adults per petri dish and recorded. The results revealed horn fly abundance was different in treated groups than in control groups.

1-9. **There can mostly be only one: Temporary waters are dominated by individual mosquito species**

Liam Whiteman (liamw@okstate.edu), Thomas Hess, Melissa Reed and W. Wyatt Hoback, Oklahoma State Univ., Stillwater, OK

Of the 64 known mosquito species in Oklahoma, many are vectors of serious diseases that can be transmitted to humans. Camp Gruber, an Oklahoma Army National Guard training facility in Braggs, OK, lies in an eco-region that is characterized by high precipitation and mild winters which allows it to potentially support some medically significant mosquito species including *Aedes albopictus*, *Aedes aegypti*, and *Aedes japonicus*. *Aedes albopictus* was found at Camp Gruber in 2016-2018, *Aedes japonicus* was found on the Oklahoma/Arkansas border in 2017 and in 2018, the most important invasive mosquito in the world, *Aedes aegypti* was also found on base. Surveys of adult mosquitos at Camp Gruber have found vectors for Japanese Encephalitis, West

Nile Virus, Chikungunya, Yellow Fever, and Dengue. This research analyzed roughly 750 mosquito larvae collected from different water sources located at Camp Gruber and compared results to the >10,400 adults collected in the same area. Several genera were represented as larvae and adults. However, *Culex erraticus* represented about 70% of the adults captured but was nearly absent as larvae. Notably, temporary waters supporting mosquito larvae typically only hosted a single species at a time. The habitat requirements for the adult stage of most mosquitos is known but very little is known about their aquatic larval stage. These data suggest that competition and intraguild predation likely limit numbers of adults. Being able to identify where mosquitos deposit their eggs will allow for targeted management strategies that protect the National Guard from the spread of mosquito-borne diseases.

1-10. **Genetic variation and dispersal patterns of damselflies along the Guadalupe River (Texas) watershed**

Ashley Myers (acmyer7730@schreiner.edu) and Ryan Caesar, Schreiner Univ., Kerrville, TX

We present a preliminary analysis of population genetic variation among common damselflies within and near the Guadalupe River of Texas, between the headwaters and the Gulf of Mexico. Damselflies are charismatic and ecologically-important insects with obligate aquatic larvae and flying adults. Though adults can potentially fly in any direction over kilometer-scale distances, they appear to not stray far from riparian zones. Juveniles, however, may disperse over longer distances within rivers depending on factors such as flow rate, flood/drought cycles, and impediments to water flow (dams, etc.). Standard molecular markers and phylogeographic analyses are used to estimate genetic structure. Specifically, we test the hypothesis that genetic variability is nonrandom among populations and is influenced by the direction of river flow more than by simple geographic distance. We predict that genetic variation will be greater between rivers than within rivers, regardless of distance.

1-11. **The effect of pesticides on honey bee (*Apis mellifera*, L.) queen reproductive physiology**

Omar Khan (omarikhan@tamu.edu), Elizabeth Walsh and Juliana Rangel, Texas A&M Univ., College Station, TX

Honey bees (*Apis mellifera*) are integral to continued food security in the U.S., as they pollinate approximately 1/3 of U.S. food crops and contribute $17 billion annually to the agroeconomy through pollination service fees. Every spring, over 70% of all bee colonies in the U.S. are taken to California to pollinate the almond crop. As these colonies are at high concentrations, this creates a reservoir for pests and pathogens, in addition to high pesticide exposure risk from pollinating the almond bloom. Honey bee colonies are plagued with varroa mite (*Varroa destructor*) infestations that can eventually cause colony mortality. This leads beekeepers to take extreme measures in order to treat varroa mite infestations. Since beeswax is highly lipophilic, any miticides introduced to bee colonies remain in the wax matrix for long periods of time. Previous work shows that when queens are exposed during development to field relevant levels of fluvalinate (active ingredient in Apistan®), coumaphos (active ingredient in Checkmite+®), and amitraz (active ingredient in Apivar®), all ubiquitous miticides found in the beeswax matrix, queen behavior and physiology is negatively impacted. This can also be true when queens are exposed to chlorothalonil and chlorpyrifos, common pesticides used in almond orchards. Our preliminary results suggest that queens reared in pesticide-contaminated environments may have fewer ovarioles than counterpart queens reared in pesticide-free environments. If beekeepers are inadvertently hurting their own queens, then the beekeeping industry must know in order to produce high quality queens which lead high quality honey bee colonies.

1-12. **Behavioral effects of juvenile hormone on the worker caste of the red imported fire ant, *Solenopsis invicta***

Franchesca Rodriguez (d4sh1ngdr4gonfly@gmail.com)[1], Chloë Hawkings[2] and Cecilia Tamborindeguy[2], [1]Texas A&M Univ., Bellville, TX, [2]Texas A&M Univ., College Station, TX

The red imported fire ant (*Solenopsis invicta*) was introduced to the USA in 1930 and has since become an increasingly significant medical, agricultural, and economic pest. Current insecticides are ineffective for fire ant control. Therefore, there is an urgent need to find novel pest control strategies. *S. invicta* are a eusocial Hymenopteran species with a distinct colony caste system. Division of labor in social insects is a complex phenomenon that represents a major evolutionary transition, but the physiological mechanisms that regulate this behavior in are not well understood. Experimental studies have implicated juvenile hormone (JH) as a regulatory factor in social insect workers. Here we investigated the manipulation of JH using a JH analog, S-hydroprene to show a direct behavioral effect when raised JH levels are induced in workers of *S. invicta*. This study shows that raised JH levels result in workers becoming more phototactic ($p<0.05$) and engaging in more extranidal activity, changes that we show reflect the

transition from intranidal work to foraging ($p<0.05$). These behavioral effects on behavior in *S. invicta* are mediated by JH and may be a key endocrine regulator of behavior and the evolutionary success of social insects.

Student Ten Minute Paper Competition: Ph.D

2-1. **Colony structure of the odorous house ant (*Tapinoma sessile*), a native urban invader**

Alexander Blumenfeld (alex93@tamu.edu) and Edward Vargo, Texas A&M Univ., College Station, TX

Biological invasions are becoming more prevalent throughout the world due to the rise of global trade and the increasing abundance of urban areas, and ants are among the most prolific perpetrators of these invasions. Many invasive ants possess a set of shared characteristics which facilitate the success of these invasions, including polygyne colony structure, colony foundation through budding, and reduced inter-nest aggression. However, exotic ants are not the only ants that possess these so-called invasive traits. The odorous house ant *Tapinoma sessile* is one such non-exotic ant demonstrating these representative traits. Originally native to the temperate deciduous forests of North America, the ant has become highly abundant in urban environments throughout much of the United States. Forest-dwelling colonies are typically small (<200 workers), monodomous, and monogyne. On the other hand, urban colonies tend to be large (>100,000 workers), polydomous, and polygyne. Here, we explore the population genetic and breeding structure of *T. sessile* in West Lafayette, Indiana, to compare colonies of the ant both within and between its distinct environments. First, we analyzed the population structure of colonies along the natural to urban gradient to test for an association between the transition to urban environments and unicoloniality. Then, we assessed the breeding structure of *T. sessile* along the same natural to urban gradient, to test for a transition of monogyne colonies in the forest to polygyne colonies in urban areas. Future work will assess if the results found here hold up across its overall distribution within the United States.

2-2. **Assessing host-associated differentiation in *Dermacentor variabilis* (Acari: Ixodidae)**

Mackenzie Tietjen (kenzietietjen@tamu.edu)[1], Maria Esteve-Gassent[1], Ivan Castro-Arellano[2] and Raul F. Medina[1], [1]Texas A&M Univ., College Station, TX, [2]Texas State Univ., San Marcos, TX

The American dog tick, *Dermacentor variabilis,* is the vector of Rocky Mountain spotted fever, bovine anaplasmosis, and tularemia. *D. variabilis* ranges throughout North America and in the US, it has been documented in all contiguous states except Utah, Nevada, and New Mexico. Its' range is continuing to increase due to warmer winters and human assisted dispersal. This tick feeds on a wide variety of hosts. Usually the larval and nymphal stages feed on small mammals and the adults feed on medium sized mammals such as raccoons and dogs. Genetic variation in this tick has been examined and it was found that there are two main clades with the western population being differentiated from the eastern population. Within the eastern population there exists eight other haplotypes that were found not to be associated with geography or infection status. These ticks were mostly examined using specimen collected from the vegetation. However, genetic variation could be associated with host species. The existence of genetically distinct populations associated with host species is called host-associated differentiation (HAD). In this study, ticks were collected from different vertebrate hosts to test for HAD using SNPs. 1,338 *D. variabilis* ticks were collected from 11 mammal species out of 784 individual mammal, bird, and lizard hosts that were caught in the field. DNA extractions were optimized for obtaining high enough quantity and quality for ddRADseq Illumnia sequencing of individual nymphs and adults. The population structure pattern of *D. variabilis* as revealed by SNPs will be discussed.

2-3. **Upper thermal tolerance variation between *Reticulitermes* spp. and across its range (Blattodea: Rhinotermitidae)**

Mark Janowiecki (janowiecki@tamu.edu) and Edward Vargo, Texas A&M Univ., College Station, TX

The Climate Variability Hypothesis (CVH) predicts that thermal breadth increases with absolute latitude and holds true when comparing termite species across large geographical distances. However, the smaller scale differences within and between congeneric species remain unknown. In this project, we investigate the upper thermal tolerance variation in *Reticulitermes* subterranean termites across their range in the eastern United States. Specifically, we test if the upper lethal limit (ULL) differs between species at the same site, if the ULL for *R. flavipes* differs across its range, and finally what climatic variables predict the geographical pattern of thermal tolerances. Samples of *Reticulitermes* spp. were collected from nine locations across the eastern United States and subjected to ULL analysis. Accompanying climate data was obtained from WorldClim version 2. In two sites (Huntsville, TX and

Fayetteville, AR), *R. flavipes, R. hageni,* and *R. virginicus* were collected and we found no difference in ULL by species even though previous studies found species-specific foraging preference for temperature. The ULL of *R. flavipes* was variable ranging from 41.56 °C in Arkansas to 43.69 °C in southern Florida. The pattern of thermal tolerance is negatively correlated to latitude (P = 0.03), opposite of the expectations in the CVH. Specifically, termites exposed to a wider range of temperatures or more seasonality have lower ULLs (P = 0.031, P = 0.020 respectively). The difference in inter- and intraspecific patterns of thermal tolerance may be important to understanding how individual species adapt to a changing climate.

2-4. **Relationship of feeding, growth, and parasitism in *Acheta domesticus* (Orthoptera Gryllidae) infected with *Paragordius varius* (Phylum: Nematomorpha)**

Christina Anaya (christina.anaya@okstate.edu)[1], Ben Hanelt[2], Matthew Bolek[1] and Larisa Vredevoe[3], [1]Oklahoma State Univ., Stillwater, OK, [2]Univ. of New Mexico, Alburquerque, NM, [3]California Polytechnic State Univ., San Luis Obispo, CA

Body size is often a predictor of fecundity in insects however, changes in body size due to resource allocation in parasitized insects could affect reproductive output in female insects. Dietary intake can also affect resource allocation and is often altered in response to parasite infection. Hairworms are macroparasites of crickets and other arthropods with a complex life cycle utilizing aquatic paratenic hosts and terrestrial final arthropod hosts. The purpose of this study was to examine the feeding behavior of female *A. domesticus* infected with *P. varius* and examine the relationship of growth, egg production, and diet choice when provided two complementary diets of proteins and carbohydrates. Compared to uninfected controls, infected crickets consumed the same proportions of macronutrients but consumed 14% less food than the uninfected controls, despite the hairworms increasing their body size more than 5000 times in infected crickets. Infected crickets had less mass, shorter body lengths, and produced no eggs. Therefore, we predicted that infected and control crickets should gain lipids proportionally to the amount of food they eat. However, infected crickets had to consume 74.21 mg of food to gain 1 mg of lipid compared to uninfected control crickets which consumed 23.15 mg of food to gain 1 mg of lipids. Taken together, the increase of food required to produce 1 mg of lipid, smaller body size, and lack of eggs suggests that the developing hairworm sequesters a substantial amount of nutrients consumed by infected crickets.

2-5. **Importation biological control of crape myrtle bark scale (*Acanthococcus lagerstroemiae* Kuwana) in Texas**

Kenneth Masloski (kemasloski@tamu.edu), James Woolley, Peter Krauter, Mengmeng Gu and Kevin Heinz, Texas A&M Univ., College Station, TX

Crape myrtle bark scale (*Acanthococcus lagerstroemiae* Kuwana) is an invasive pest of crape myrtle trees (*Lagerstroemiae indica* Linneaus) in the United States. Large infestations can lead to branch dieback and excessive honeydew accumulation, which encourages the development of sooty mold. Originally from China, the first record of crape myrtle bark scale in Texas occurred in 2004. Current surveys of natural enemies in Texas have not uncovered any native parasitoids using crape myrtle bark scale as a host. Importation biological control efforts are being performed to address this emerging pest problem. Samples of twigs of crape myrtle infested with crape myrtle bark scale were sent to the Texas A&M biological control quarantine facility. Twigs were sent from four locations in China. Only scales from one location yielded parasitoid adults. A total of 52 wasps were recovered, of which four groups of wasps were identified: the genus *Metaphycus* (n=39), the genus *Moranila* (n=3), Tetrastichinae (n=4), and an unknown encyrtid (n=6). *Moranilla* emerged earliest and the unknown encyrtid emerged latest. More samples will be collected from China and colonies of the different wasp species recovered will be established for use in experiments to determine the suitability of each wasp as a control agent for crape myrtle bark scale.

2-6. **Investigating the flight capability of the Blattodea, effects of wing morphology, size and behavior in 15 cockroach species**

Fabian List (fabian.list@tamu.edu), Bridgett Benedict, Casey Flint, Samuel Howard, Caixing Xiong and Hojun Song, Texas A&M Univ., College Station, TX

Cockroaches are a scourge of mankind, that is at least what many people see in them and that is not completely wrong. The order Blattodea (Arthropoda; Insecta) contains many more species than just the common household pests. In fact, the cockroaches that are competing with mankind are but a small fraction of the order. This overshadowing impression that pest species leave in our mind has led to a neglect of the majority of the species that make up Blattodea. The Blattodea are an old order within insects that dates back about 240 Mya, but to this day have been often overlooked by most researchers. This study set out to investigate the flight capability within the Blattodea, using not only morphological traits, but also behavior data. By observing actual behavior of individuals jumping from a simple, reproducible pedestal construction, we gained

insight into strength of flight and functionality. We linked this behavior data to geometric morphometrics data on forewings and hindwings of specimen to find correlations between flight capability and phenotype. Our findings indicate, that while wing morphology is highly likely to impact flight capability, behavior also plays a significant role. Estimating flight ability in the Blattodea is probably more complicated than the morphological techniques used so far. We believe our novel approach to assess flight capability will bring new insights to our understanding of flight in the Blattodea, bringing to light some major issues with current estimates on the flight capability of the Blattodea.

2-7. Could the macroinvertebrate cross the road? impact of road-stream crossings on aquatic macroinvertebrates in Oklahoma

Melissa Reed (mleath@okstate.edu), James Long and W. Wyatt Hoback, Oklahoma State Univ., Stillwater, OK

Existing literature shows that road-stream crossings and culverts pose a threat to fish migration in lower order streams, but less is known about whether culverts disrupt the within stream movement and distribution of aquatic macroinvertebrates. Culverts impact streams by narrowing the stream channel which increases stream velocity and creates a scour pool and an uplifted outflow downstream. In addition, culverts alter the stream ecology by preventing the movement of substrate and large woody debris, causing erosion near the road crossing and subsequent sedimentation further downstream. We investigated the effects of road culverts on the aquatic macroinvertebrate communities in two stream systems (prairie and Ozark highland) in central and eastern Oklahoma. We collected macroinvertebrates from riffles upstream and downstream, at 16 sites, bi-monthly, June through August 2018. The specific aims of this study were to identify changes in abundance, richness, community composition, and functional groups of macroinvertebrates downstream of the culvert. We expect that the channelization and subsequent erosion and sedimentation associated with culverts will affect the downstream benthic macroinvertebrate community. We found a decrease in the benthic macroinvertebrate abundance downstream of culverts at sample sites in both stream systems. Data obtained from this study will aid in the understanding of the ecological impacts of road culverts.

2-8. Use of multiple natural enemies for inoculative biological control if *Bemisia tabaci* in greenhouse poinsettia production

Erfan Vafaie (erfanv@tamu.edu)[1] and Kevin Heinz[2], [1]Texas A&M Univ., Overton, TX, [2]Texas A&M Univ., College Station, TX

Poinsettias [*Euphorbia pulcherrima* (Willd. ex Klotzsch)] were valued at $140M in 2015, comprising approximately 1/6th of the total value of potted flowering plants in the US. The main pest of poinsettias are whiteflies, with *Bemisia tabaci* Gennadius the most commonly occurring in southern USA greenhouses. Whiteflies devalue poinsettia by reducing its aesthetic qualities and limiting interstate transport. Two natural enemies demonstrate promise for use in management of *B. tabaci* in the warmer climates of southern USA; the parasitoid, *Eretmocerus eremicus* Rose, and the predatory mite, *Amblyseius swirskii* Athias-Henriot. The two natural enemies used in this study were selected to exploit different life stages of *B. tabaci* (i.e. resource partitioning) and have differing dispersal abilities. In this study, we investigate which natural enemy composition would best suppress *B. tabaci* populations in large cages (each with 12 potted poinsettias) at release rates economically comparable to current conventional insecticide inputs: *E. eremicus*, *A. swirskii*, or combination of the two. Our results demonstrate the use of two natural enemies provide no additional pest suppression compared to use of either natural enemy alone, however, use of either natural enemy alone provided promising suppression of whitefly nymphs, pupae, and adults by 8 weeks compared to the control. We plan on investigating the robustness of our optimal natural enemy combination to suppress whiteflies in the face of extraneous factors, such as increased whitefly influx, delay in natural enemy release, and performance under commercial greenhouse conditions.

2-9. Within plant canopy distribution of sugarcane aphid, *Melanaphis sacchari* Zehntner, in commercial grain sorghum

Jessica Lindenmayer (jpavlu@ostatemail.okstate.edu)[1], Mark Payton[1], Kristopher Giles[1], Allen Knutson[2], Robert Bowling[3], Nick Seiter[4], Norman Elliott[5] and Tom Royer[1], [1]Oklahoma State Univ., Stillwater, OK, [2]Texas A&M Univ., Dallas, TX, [3]Texas A&M Univ., Corpus Christi, TX, [4]Univ. of Illinois, Champaign, IL, [5]USDA - ARS, Stillwater, OK

Sugarcane aphid, (*Melanaphis sacchari* Zehntner) an invasive pest since 2013, remains an economic pest of sorghum at varying levels throughout much of the United

States, especially the southern region. In the early stages of invasion, the aphid caused rapid and severe yield loss in sorghum which required the implementation of rapid sampling and treatment protocols based largely on previous knowledge and subjective observational data. The most commonly-used protocol used aphid counts from an upper-most and lower-most 90% green leaf to estimate aphid intensity. This study evaluated which leaves within the sorghum canopy were most predictive of the total aphid numbers within a whole plant. We examined 1,644 sorghum plants taken from 134 sampling sites across Kansas, Oklahoma, Texas, and Arkansas. Individual leaves were then classified into upper, middle, and lower canopy then analyzed for predictability of total aphids per plant based on location (e.g. state) and growth stage. Results showed that leaves from the middle of the plant canopy provided the strongest relationship (R^2 = 0.9636) between aphid numbers/leaf and aphid numbers/plant. This study gives conclusive evidence that sampling protocols for estimating sugarcane aphid intensity in sorghum should include leaves from the middle of the plant canopy in order to improve precision and lead to better treatment decisions.

2-10. **Evidence of host plant specialization among the U.S. sugarcane aphid (Hemiptera: Aphididae) genotypes**

Sulochana Paudyal (sulochana.paudyal@okstate.edu)[1], J. Scott Armstrong[2], Karen Harris-Shultz[3], Hongliang Wang[4], Kristopher Giles[1], Philippe Rott[5] and Mark Payton[1], [1]Oklahoma State Univ., Stillwater, OK, [2]USDA - ARS, Stillwater, OK, [3]USDA - ARS, Tifton, GA, [4]USDA - ARS, Manhattan, KS, [5]Univ. of Florida, Belle Glade, FL

The sugarcane aphid (*Melanaphis sacchari* (Zehnter) (Hemiptera: Aphididae)) has become a serious pest of sorghum (*Sorghum bicolor* (L.) Moench) in the U.S. since it was detected in Texas in 2013. The sugarcane aphid was considered only a pest on sugarcane in Florida and Louisiana for over three decades before the 2013 outbreak. Recent studies suggest that the 2013 outbreak in sorghum was due to the introduction of new genotype. Our scope for this study was to quantify the phenotypic behaviors (host suitability as measured through life table statistics) and genetic diversity among sugarcane aphid clones collected from different hosts. We collected a diverse group of sugarcane aphid clones from sorghum (SoSCA), sugarcane (SuSCA), and Columbus grass (CoSCA) and determined host suitability when introduced to five different plants including sugarcane, Columbus grass, Johnsongrass, and a resistant and susceptible grain sorghum. Sugarcane aphid clones from different hosts and geographical regions varied in performance among plant hosts. The survivorship and reproduction of sugarcane collected aphid clone (SuSCA) was significantly higher when offered sugarcane (>85%) as compared to other hosts and in contrast, there was negligible survival and reproduction when SoSCA and CoSCA were offered sugarcane as host. Genotyping of the aphid clones collected from various hosts with microsatellite markers indicated that SuSCA was a different genotype and belonged to multilocus lineage, MLL-D as compared to SoSCA and CoSCA which belonged to MLL-F. Our results suggest that there exist two different biotypes of *M. sacchari* within the U.S., and that they cannot be distinguished by taxonomic or morphometric characteristics.

2-11. **A comparison of monarch butterfly egg laying on native vs non-native milkweed**

David Berman (david.berman@okstate.edu) and Kristen Baum, Oklahoma State Univ., Stillwater, OK

Monarch butterflies (*Danaus plexippus plexippus*) migrate from overwintering grounds in central Mexico to breeding grounds in the Upper Midwest and southern Canada. Texas is critical to the migratory population because it provides nectar for spring and fall migrants and milkweed, which they rely on as a host plant, for 1st and 5th generation caterpillars. There are approximately 36 native species of milkweed in Texas, as well as 5 species of related non-native host plants. There have been concerns about monarchs disproportionately using non-native milkweeds in garden settings for egg laying and the potential for increases in disease and parasitism rates as a result. We evaluated egg laying activity in Texas in 3 main regions over 4 habitat types (garden, field, roadside, and riparian) to determine the number of eggs laid on different milkweed species. At each site, we counted number of milkweed and recorded the number of eggs per plant. We estimated the average number of eggs per plant at each site by dividing the number of eggs found on each species by the number of plants of that species at a site. We also determined the average number of eggs laid on each individual plant by only including plants that had eggs present in the calculation. Preliminary results suggest that non-native tropical milkweed (*Asclepias currassavica*) has a higher number of eggs per plant on average, and has more eggs laid on each individual plant. These results have important implications for monarch use of non-native milkweeds and associated disease concerns.

2-12. **Do larger native bees fly farther and increase seed set in canola (*Brassica napus*) fields?**

Sarah Elzay (selzay@okstate.edu) and Kristen Baum, Oklahoma State Univ., Stillwater, OK

Ongoing declines of bee diversity and abundance are expected to have cascading effects throughout the ecosystem and jeopardize food security. Understanding the scale at which native bees forage within an agricultural landscape is an important component of developing effective conservation efforts to support native bees. Foraging ranges of native bee species will also inform the extent to which native bees pollinate crops species. In the southern Great Plains, *Brassica napus* (canola) is an important biofuel crop that benefits from bee pollination. At three increasing distances into canola fields (75, 150, and 300 meters), we measured body size (using intertegular span) of a common native bee species (*Agapostemon texanus*) as well as seed set of canola. We found positive correlations between body size and distance into canola fields as well as seed set and distance into canola fields. Our results suggest that larger bodied individuals that fly farther into the field may be particularly important in pollinating the interior of canola fields, where seed set increased. Supporting and conserving native bees in modified landscapes may be important for crop production, especially in the context of continued honey bee decline.

2-13. **Assessing Ant-aphid mutualisms in invasive insect species**

Jocelyn R. Holt (holtjocelyn@tamu.edu) and Raul F. Medina, Texas A&M Univ., College Station, TX

Mutualistic interactions between tawnt crazy ants and sugarcane aphids were assessed.

2-14. **A local and scalar analysis of bee abundance and diversity in the Texas High Plains agricultural region**

Samuel Discua (samuel.discua@ttu.edu) and Scott Longing, Texas Tech Univ., Lubbock, TX

Agricultural intensification and the loss of natural habitats are factors that threaten pollinator populations across agroecosystems. On the Texas High Plains, little is known about the influence of broad agricultural production and habitat fragmentation on pollinator communities. This study was conducted to determine the relationships of local and scalar landscape structure on native bee abundance and richness across agroecosystems in a six-county region in western Texas. In 2016 and 2017, pollinator communities were sampled using pan traps and hand netting in 43 agroecosystem habitats. Local habitat was measured in two 60 m x 2 m belt transects. At the landscape scale, land cover/land at 200, 500, and 1000 m buffers surrounding each of the sampling locations was calculated. Generalized mixed-effect models (GLMM) were used to assess the relationships of local habitat and scalar landscapes with wild bee abundances and species richness. Overall, a total of 17,725 bees belonging to five families, 49 genera and 106 species/morphospecies were collected. Farm type and the presence of CRP had a significant effect on bee abundance and diversity ($p < 0.05$), while floral abundance and richness were significant predictors of bee abundance and richness. At the landscape level, native land (with no recent history of farming) was a significant factor increasing bee richness across all scales, while developed land use was a significant predictor of abundance and generic richness. Findings provide basic biological information to support the conservation of pollinators and their services in intensified agricultural grasslands.

Student Ten Minute Paper Competition: Master's

3-1. **Engorged with data: Using surveys to assess college students' understanding of ticks**

Elizabeth Knowlton (edkbiology@gmail.com), Justin Talley, Bruce Noden and W. Wyatt Hoback, Oklahoma State Univ., Stillwater, OK

Ticks (Arachnida: Acari) are common in Oklahoma and cause tick-borne diseases among community members. Because it is difficult to reduce tick populations, and because tick-borne diseases lack vaccines, awareness of tick bite prevention, proper tick removal, and when to seek medical treatment are critical. However, outreach and extension programs are hampered by a lack of knowledge of what community members know about ticks. With Institutional Review Board approval, we surveyed college students enrolled in two non-majors and two Entomology majors courses at Oklahoma State University in 2018. A total of 552 students were invited to take the survey. In total, 405 (73.37% response rate) took the beginning-of-semester survey, 348 (63.04% response rate) took the end-of-semester survey, and 234 students took the survey both times. Beginning-of-semester survey responses indicate lower levels of knowledge of tick biology compared to end-of-semester survey responses. For both beginning- and end-of-semester respondents, the most challenging survey questions were about tick dispersal. Specifically, "ticks can jump" and "ticks reside up in trees" received the *fewest* correct responses of "Not true". In addition, a majority of survey respondents consider the predominant

tick-borne illness in Oklahoma to be Lyme disease—in reality it is not transmitted within the state. With continued analysis, we hope to identify further knowledge gaps and ways to improve safe tick practices. In particular, we hope to improve the understanding of tick dispersal, so that community members are better equipped to avoid tick habitat and use preventative strategies like body checks after entering tick-infested areas.

3-2. **The influence of eastern red cedar on Tabanidae populations in Oklahoma**

Kylie Sherrill (kyliekd@okstate.edu)[1], Justin Talley[1], Bruce Noden[1], Laura Goodman[1] and John Scasta[2], [1]Oklahoma State Univ., Stillwater, OK, [2]Univ. of Wyoming, Laramie, WY

Horse flies (Tabanidae) are commonly associated with pastured beef systems in the southern United States and are one of the most difficult fly pests to control. Tabanids are strong visual predators with a painful bite and can fly miles in order to find their hosts. Cattle are continually exposed to multiple of species of tabanids throughout the summer but little is known about the effect of landscapes and vegetation type on tabanid behavior. In the last few decades there has been an increase in Eastern Red Cedar, *Juniperus virginiana,* encroachment across Oklahoma. The majority of Western Oklahoma is prairie, however, and cedar is taking over and altering the landscape. Biting fly populations as well as the diseases they vector have been on the rise. The objective of this study is to determine if a connection between the Eastern Red Cedar and tabanid populations in Oklahoma exists or if the flies accept any wooded habitat. In 2017 and 2018 we employed two different styled traps into habitat classified on the amount of Eastern Red Cedar to monitor the *Tabanus*, *Chrysops* and *Hybomitra* in the area. Data was collected for 20 weeks and analyzed. The data was analyzed with a SAS statistical package as well as a PCA analysis. Habitat association was significantly different between habitats. The overall goal of this project is to develop a working model that incorporates Eastern Red Cedar density to predict potential tabanid population outbreaks in Oklahoma beef pastures.

3-3. **Title: The consequence of avian malarial infection on *Culex quinquefasciatus* survivorship**

Dayvion Adams (ajadams968@tamu.edu), Andrew Golnar and Gabriel Hamer, Texas A&M Univ., College Station, TX

Haemoproteus is one genus of avian malaria parasite with a metropolitan distribution with upwards of 80% infection prevalence in birds. It has been previously demonstrated that infection of incidental mosquito hosts with *Haemoproteusspp.*has a detrimental impact on the survivorship of the mosquito. Here we infect locally colonized *Culex quinquefasciatus* with locally obtained *Haemoproteus* parasite from Passerine birds. Survivorship analysis is then conducted to ascertain the impact of infection on these mosquitoes. Preliminary data suggests that there is no immediate impact on the survivorship of the mosquitoes, but more work is needed to fully understand if there is an impact.

3-4. **Efficacy evaluations of various insecticidal application methods for the control of horn flies (Diptera: Muscidae)**

Diego Garcia (dg32695@nmsu.edu) and Brandon Smythe, New Mexico State Univ., Las Cruces, NM

Horn flies (*Haematobia irritans*) are considered to be one of the most economically damaging pests of rangeland cattle and on-animal insecticidal application methods have proven to be effective for control. Historically, insecticide delivery systems have included chemically impregnated ear tags and formulated pour-ons, sprays, and dusts. Furthermore, application methods of formulated products have included backpack and handheld spray devices, direct delivery of pour-on products, and self-application devices such as back rubbers. More recently, the use of formulated product enclosed within a gelatin capsule that is delivered by a compressed air rifle has entered the market of horn fly control. Previous studies have shown effective control of horn fly populations using this delivery method in comparison to pour-on and ear tag treatments. However, there is limited information regarding direct comparisons of the different applications methods using equivalent concentrations of formulated products for the control of horn flies. Obtaining such information could provide valuable information regarding expectations of effective control across multiple application methods. Therefore, the objective of the current study was to evaluate the efficacy of a pour on application as well as compressed air treatment in group and individually against horn flies artificially infested in a controlled environment.

3-5. **Eastern grape leafhopper, *Erythroneura comes* (Say), phenology and differential abundance on grape cultivars in an Oklahoma vineyard**

Kevin Jarrell (kevin.jarrell@okstate.edu), Eric Rebek, Kristopher Giles and Astri Wayadande, Oklahoma State Univ., Stillwater, OK

Eastern grape leafhopper, *Erythroneura comes* (Say), an important pest of grapes in the eastern half of the United States, is capable of negatively impacting quality and quantity of the crop. We investigated the phenology (i.e.,

seasonal development) of this insect and its abundance on eight grape cultivars from 2016 through 2018 in an Oklahoma vineyard. The phenology work involved using the single sine wave growing degree-day model to calculate degree days above a lower developmental threshold of 50°F. Leafhopper nymphs were counted weekly on 100 grape leaves distributed randomly throughout the vineyard. We observed three and occasionally four population peaks in 2016 through 2018. We report and discuss degree-day calculations for generational peaks, as well as differences between the abundance of this insect on various cultivars. Finally, we present future research opportunities as well as implications for improved management of eastern grape leafhopper in Oklahoma vineyards based on the findings of this study.

3-6. **Landrace and commercial varieties of dry beans: some resistance traits to greenhouse whitefly and effect on parasitism by *Encarsia formosa***

Renato Villegas-Luján (renato_villegas1988@hotmail.com) and Sergio Sánchez-Peña, Universidad Autónoma Agraria Antonio Narro, Saltillo, CU, Mexico

The whitefly *Trialeurodes vaporariorum* is a major pest in agriculture. Its control is mainly based in chemical insecticides. Application of these has sometimes induced resistance, loss of natural enemies and environmental degradation. Plant resistance to insects and biological control are two sustainable management strategies. Our objective was to assess the effect of two dry bean (*Phaseolus vulgaris*) cultivars on some population parameters of *T. vaporariorum,* and the effect of these cultivars on biological control by the wasp endoparasitoid of whitefly nymphs, *Encarsia formosa*. The cultivars tested were: a Mexican high plains traditional landrace of "Flor de Mayo" type; and a commercial high-yielding type, "Pinto Saltillo". In both choice and no-choice tests, there were usually significantly more whitefly adults/cm^2 of the underside of leaves and more eggs/cm^2 leaves on the commercial cultivar, Pinto Saltillo. There were no statistically significant effects of bean cultivars on percent parasitism by *E. formosa* or on percent emergence of the parasitoid. The landrace bean cultivar "Flor de Mayo" tested here can have significant traits for selection of resistance to whitefly; also, in this case, the landrace was as compatible with parasitoid action as the commercial cultivar.

Regular Ten-Minute Paper Oral

Regular Ten Minute Paper Session Tuesday

4-3. **Mesquite twig girdler, *Oncideres rhodosticta,* response to volatile organic compounds from hosts – does spillover limit biological control potential?**

David C. Thompson (dathomps@nmsu.edu), Ikju Park, Danielle Lara and Alejandra Mercado, New Mexico State Univ., Las Cruces, NM

Honey mesquite (*Prosopis glandulosa* Torr.) is the most common woody plant on more than 28 million ha of semi-arid southwestern rangelands. Attempts to control mesquite using a variety of techniques have been implemented for the past century including mechanical removal (grubbing), adjusting stocking rates, and applying both stem and foliar herbicide either aerially or through individual plant treatments. Regardless of which control measures are used, numerous native insects feed on mesquite. Although native insects commonly cause considerable damage to weed species, their use as a management tool is often overlooked. During 2018, densities of the mesquite twig girdler, *Oncideres rhodosticta* Bates*,* in southern New Mexico were substantial. This insect has potential as a biological control agent in other parts of the world, such as South Africa, where mesquite is an invasive plant. It is critical to establish the mechanisms of host choice and to determine if damage to alternate hosts is simply a transitional spillover due to high densities or the result of a broad physiological host range. We used this opportunity to explore the responses of adult beetles to the volatile organic compounds from mesquite, other native trees and shrubs showing damage. Preliminary research shows that twig girdlers are strongly attracted to undamaged mesquite branches over those recently damaged. Under high population densities, adult beetles will girdle and lay eggs in several congeneric and confamilial native and ornamental hosts. Survival and host choice are under evaluation.

4-4. **Host recognition of *Rhinocyllus conicus* to volatile organic compounds from endangered and invasive thistles**

Ikju Park (ipark@nmsu.edu) and David C Thompson, New Mexico State Univ., Las Cruces, NM

Although more than 99% of released weed biological control agents do not impact native plant populations, direct non-target attacks of native plant species still raise

potential concerns in classical biological weed control programs. It is particularly true for the flowerhead weevil, *Rhinocyllus conicus* Frölich, which was released as a biological control agent for the invasive musk thistle (*Carduus nutans* L.). While weevils successfully suppressed introduced populations of musk thistles and other invasive thistle species, non-target attacks have been reported on native thistles including federally listed threatened and endangered (T&E) thistle species. To investigate the foraging behavior of female *R. conicus* on invasive and native thistles in the Southwestern US, we examined volatile organic compounds (VOCs) emitted from *C. nutans* and a native T&E thistle, Sacramento Mountains thistle (*Cirsium vinaceum* Wooton & Standley) in the Lincoln National Forest, New Mexico. Using a dynamic headspace volatile collection system and gas chromatography-mass spectrometry, we identified 49 chemical compounds, mainly green leaf volatiles and sesquiterpenes, from *C. nutans* and *C. vinaceum*. Among them, female *R. conicus* reacted to several electrophysiologically active chemical compounds in the blends based on gas chromatography-electroantennography. The behavioral response of female weevils was indifferent when VOCs from both thistles were offered in y-tube olfactometry experiments. Yet, they preferred VOCs collected from *C. nutans* to controls in behavioral bioassays. Further, the searching time of female weevils was longer when offered VOCs collected from *C. vinaceum* over controls. Thus, investigating olfactory cues associated with the initial host recognition of released biological control agents may lead to new opportunities to enhance their environmental safety in the United States.

4-5. Effects of leaf trichomes on herbivore feeding, growth and development

Rupesh Kariyat (rupesh.kariyat@utrgv.edu), Univ. of Texas, Edinburg, TX

Trichomes, the hair like projections on plant leaves, have been well studied as an herbivore defense. However, whether variation in trichome type can have negative effects through the different stages of caterpillar life cycle is poorly understood. Using *Solanum elaeagnifolium* that produce non-glandular stellate trichomes, and *Solanum lycopersicum* that predominantly produce glandular, non-branched trichomes, we examined how trichomes affect choice and growth of *Manduca sexta*, a specialist herbivore of plants species belonging to the Solanaceae. To accomplish this, we removed leaf trichomes and added them into artificial diet for caterpillars, and allowed the caterpillars to grow and develop. Our results show that trichomes negatively affected caterpillar body mass and mass gain, although there was no preference or aversion for them in choice assays. Non-glandular trichomes were particularly damaging, as they suppressed mass gain, and increased time to pupation. While glandular trichomes also affected growth, their effects were significantly lower compared to non-glandular ones. Taken together, our results show that feeding on trichomes can have negative effects on herbivore growth and development, and should be examined further.

4-6. Leaffooted bug joins the complex of sucking bugs that injure cotton bolls, if the timing is right

Michael Brewer (mjbrewer@ag.tamu.edu) and James Glover, Texas A&M AgriLife Research, Corpus Christi, TX

Leaffooted bug, *Leptoglossus phyllopus* (Hemiptera: Coreidae), has been observed in large numbers on cotton late season in south Texas and elsewhere, but reports of economic damage are sporadic. Field-collected leaffooted bugs were caged on cotton to characterize boll injury and examine within-plant distribution of boll injury within the context of its late-season occurrence. Boll injury type and symptomology of cotton boll rot observed on leaffooted bug-infested bolls were similar to that documented for stink bugs and plant bugs (Hemiptera: Pentatomidae and Miridae, respectively). There was more boll injury to relatively younger bolls in the middle branch section of the plant than on bolls in lower branches. Associated cotton boll rot generally followed the same pattern: higher frequency of boll rot symptoms on bolls in the middle branches (average of 30%). Despite boll injury and rot at levels known to affect yield, there were no yield differences detected in the late-season cotton caged in these experiments. Overall, leaffooted bug injured bolls, and data supported it as a suspect vector of cotton boll rot. Yet, yield loss was not detected using late season cotton that coincided when leaffooted bug has been observed in commercial fields. We propose that risk of yield impact is low when leaffooted bug movement into cotton is first detected late season, as typically occurs now in south Texas. Should leaffooted bug occur earlier in cotton development, risk to yield likely increases. Further study would help evaluated the degree of risk across boll age and cotton development.

4-7. Role of insecticidal seed treatments managing early season insect pests in cotton

Suhas Vyavhare (suhas.vyavhare@ag.tamu.edu)[1] and Blayne Reed[2], [1]Texas A&M Univ., Lubbock, TX, [2]Texas A&M Univ., Plainview, TX

Thrips are early-season pests of seedling cotton, *Gossypium hirsutum* L. The onion thrips, *Thrips tabaci* and western flower thrips, *Frankliniella occidentalis* are the predominant species in the Texas High Plains region. Thrips attack leaves, leaf buds, and very small squares, causing a silvering of the lower leaf surface, deformed or blackened leaves, and terminal and square loss. Severe infestations can destroy terminal buds, causing excessive branching of the plants and delayed plant growth. Insecticidal seed treatments have become an industry standard. However, additional foliar insecticide application(s) are often required to effectively control thrips incurring high input costs for growers. A field study was conducted on commercial cotton field near Kress, TX to evaluate efficacy of various insecticidal seed treatments to help consultants and producers select proper treatments. At 1 true leaf stage (25 DAP), plots treated with Aeris, Avicta Elite Cotton, and Gaucho 600 + Poncho VOTiVO showed significantly fewer thrips compared to untreated check. At 4 true leaf stage (33DAP), only the plots treated with Avicta Elite Cotton and Gaucho 600 + Poncho VOTiVO sustained fewer thrips compared to untreated check. Thrips damage ratings showed all treatments except Cruiser 5FS to have significantly less damage than the untreated check at 1 true leaf stage. While at 4 true leaf stage, thrips damage ratings showed all treatments except Avicta Duo Cotton to have less damage than the untreated check.

4-8. **From green to brown: Restructuring of arthropod communities following plant invasion in the mid-Atlantic**

Adam Mitchell (mitchell.adam.b@gmail.com)[1] and Douglas W. Tallamy[2], [1]Tarleton State Univ., Stephenville, TX, [2]Univ. of Delaware, Newark, DE

Nonnative plants reduce biodiversity at local scales through the displacement of native plant hosts and the restructuring of trophic relationships between host plants and herbivores. However, how plant invasion affects organisms in other trophic levels is not well understood. We posit that the disconnect between herbivores and novel hosts would result in energy transferring not through the "green" food web (one driven by herbivores), but instead through the "brown" food web (one driven by detritivores), as unconsumed plant biomass accumulates as plant litter. We conducted a field study to determine the restructuring of trophic relationships in native arthropods following plant invasion using a suite of 8 nonnative plant species and their native comparisons throughout the Mid-Atlantic region, summer 2015. Overall, we observed fewer species and abundance of herbivores in 7 of 8 nonnative plants, more detritivores in 5 of 8 nonnative plants, and 2-to-24-fold decreases in the ratio of herbivores to detritivores following plant invasion. We feel these results offer substantial support for a "green to brown" shift in arthropod trophic structure. Many arthropods associated with our nonnative plants were nonnative as well, suggesting that nonnative plants may facilitate further invasions and promote community homogeneity. This shift in trophic structure, coupled with multiple invasions, may have negative consequences on ecosystem services and especially to wildlife that depend on arthropods as a food source. We stress the importance of incorporating arthropod sampling protocols into management programs aimed at restoring ecosystem structure and function following plant invasion.

4-9. **Early autumn parasitism of cereal aphids by Hymenopteran parasitoids in wheat fields and wheat field borders**

Norman Elliott (norman.elliott@ars.usda.gov)[1], Kristopher Giles[2], Michael Brewer[3] and Casi Jessie[4], [1]USDA - ARS, Stillwater, OK, [2]Oklahoma State Univ., Stillwater, OK, [3]Texas A&M AgriLife Research, Corpus Christi, TX, [4]Oregon State Univ., Corvallis, OR

Winter wheat, *Triticum aestivum* L., is widely grown in Oklahoma and is planted in early autumn and harvested in June. Wheat often is infested by cereal aphids. The objective of the research was to determine the relationship between parasitism rates of cereal aphids on plants in the borders of wheat fields and in the wheat fields. Three parasitoid species were reared from cereal aphids on sentinel plants in borders and wheat fields. *Lysiphlebus testaceipes* (Cresson) was the most abundant species, followed by *Aphelinus nigritus* Howard and *Diaeretiella rapae* (M'Intosh). There was no significant correlation for any species between the number of individuals emerging from aphids on sentinel plants in field borders before wheat was planted to the number emerging from sentinel plants in borders after emergence of wheat plants, or for the number of individuals emerging from sentinel plants in field borders after emergence of wheat to the number emerging at the same time from sentinel plants in adjacent wheat fields. Within a habitat there were significant correlations among species for the number of individuals emerging.

4-10. **Reducing insect infestations in stored grain facilities**

Edmond L. Bonjour (edmond.bonjour@okstate.edu), Oklahoma State Univ., Stillwater, OK

There are many steps that can be taken to reduce insect infestations in grain storage facilities. Some of these steps include a good sanitation program for the facility and all grain handling equipment, removing grass and

weeds from around the storage structure, sealing holes and cracks in the structure, maintaining all equipment, applying an empty-structure treatment to kill residual insect populations, and using perimeter insecticides to prevent insects from coming into the facility. Paying close attention to all these details will help protect your grain commodity from deterioration from insects.

4-11. **Sorghum growth and sugarcane aphid-plant interactions are altered when grown under light emitting diodes of the incorrect light spectrum**

J. Scott Armstrong (scott.armstrong@ars.usda.gov)[1], Ankur Lamaje[2], W. Wyatt Hoback[2] and Sulochana Paudyal[2], [1]USDA - ARS, Stillwater, OK, [2]Oklahoma State Univ., Stillwater, OK

We evaluated a set of LED grow panels on sorghum growth and observed for the sorghum / sugarcane aphid interactions when the plants were both infested and not infested on resistant and susceptible sorghums and compared the same to conventional lighting. We also measured the light spectrum with highly sensitive instrumentation. There were only 2 light emmissions detected at 457 nm (blue) and 636 nm (red) for the LED's and the conventional lighting was normal. Sorghum grown under LEDs had significantly greater biomass, but significantly reduced height, less leaves, and less chlorophyll. In trials with aphids, both conditions supported similar numbers of aphids but plants grown under LED had higher damage ratings than those under conventional lights. The bizzare effects on sorghum physiology and the interactions on the aphids will be presented in this presentation.

Student Three-Minute Presentations

Student Three-Minute Presentations

5-1. **The giant walkingstick (*Megaphasma denticrus*) feeding on eastern cedar (*Juniperus virginiana*)**

Mark Janowiecki (janowiecki@tamu.edu), Texas A&M Univ., College Station, TX

Megaphasma denticrus (Stal) is the largest U.S. stick insect and is commonly found across the central part of the country. Previously, it has been reported to feed on oak, elm, mesquite, hackberry, grasses, and grape vines. In both Arkansas and Texas, we found young nymphs (3rd – 4th instar) of this species commonly, and exclusively, on eastern cedar (*Juniperus virginiana*). Following this discovery we tested whether *M. denticrus* is able to complete its lifecycle on exclusively cedar foliage and how this diet impacted body size and fecundity compared to a diet of rose leaves. We found that *M. denticrus* can be successfully reared on cedar. However, adult body length was significantly shorter for females when fed cedar as opposed to rose (P = 0.000172), although this pattern did not extend to males (P = 0.675). As an approximation of fecundity, we measured egg size and found females fed cedar laid lighter eggs compared to those fed rose (P = 0.0108). Despite the size and fecundity decrease, *M. denticrus* nymphs may still be commonly found on cedar either because: (1) the benefit of increased camouflage outweighs the impact on size and fecundity; or (2) these stick insects switch host plants in nature over the course their lifecycle.

5-2. **Assessing mutualisms in invasive insect pests**

Jocelyn R. Holt (holtjocelyn@tamu.edu) and Raul F. Medina, Texas A&M Univ., College Station, TX

When species arrive to a new location, they do not arrive alone. Each introduced species comes with its own microbiome (i.e. bacteria, fungi and viruses) and can establish new mutualisms involving both microscopic and macroscopic organisms in its introduced region. These new mutualisms may facilitate their invasion success. Examining mutualistic interactions between invasive pest species, provides an opportunity to study the evolution of mutualisms among invasive species.

Symposia

Innovations in Entomology Education

Current Research & Extension Topics in Urban & Landscape Entomology in the Southwestern US

7-1. **Cost, IPM, and measuring the success of school IPM programs: Lessons learned from a 20-year mandate**

Janet Hurley (ja-hurley@tamu.edu)[1], Michael Merchant[2] and Blake Bennett[1], [1]Texas A&M Univ., Dallas, TX, [2]Texas A&M AgriLife Extension Service, Dallas, TX

To protect children, the Texas Legislature passed a law in the early 1990's requiring that Integrated Pest Management (IPM) practices be used to manage pests in and around school facilities. The rules require each school board in Texas adopt an IPM policy consistent with the laws governing pesticide use and proven IPM principles. Schools must make their policy available for the public to review. Each district is required to designate an IPM Coordinator who is responsible ensuring that the school follows the IPM policy. The IPM Coordinator's responsibilities include educating staff about the IPM program, monitoring for pest problems, and scheduling and keeping records of all pesticide applications made on District property. Using the state law, surveys, school site compliance audits, IPM Star certification audits, and workgroup research study to look at what schools are spending on their IPM programs we have learned that the number of variables makes it difficult to say that cost is a barrier to adopting integrated pest management in a school setting.

7-2. **Emerging pest problems in southwestern urban landscapes**

Carol Sutherland (csutherl@nmsu.edu), New Mexico Dept. of Agriculture, Las Cruces, NM

The Southwestern US has become an attractive destination not only for people to relocate but also pests. As existing urban landscapes age, weather conditions go through cycles and more people arrive with little or no experience in maintaining landscapes, Extension entomologists and others may expect more inquiries from the public about what is happening entomologically to their beloved trees, shrubs and lawns---and why can't they fix every problem with pesticides?

7-3. **Biting mites (Acari: Mesostigmata): Research and extension needs**

Michael Merchant (m-merchant@tamu.edu), Texas A&M AgriLife Extension Service, Dallas, TX

Mites from the family Macronyssidae and others occasionally serve as causes of human dermatitis and vectors of disease. Yet these arthropods are poorly understood, and little field research has been conducted on applied biology and control. In this paper, a review of the literature is presented along with data from Extension sources about the importance of these pests in urban entomology.

7-4. **New and better technologies for general pest management in urban environment**

Raj Saran (raj.saran@bayer.com), Bayer US LLC, Research Triangle Park, NC

Pests in urban environment are always a challenge to control and the introduction of a novel chemistry just for this market segment is highly cost prohibitive. However, companies such as Bayer with its research and development focus, innovation capabilities, and digital technology has provided very effective formulations and monitoring tools to pest management industry. Deltagard®, Barricor®, and Rodent Monitoring System (RMS) developed by Bayer are some recent products which are developed to increase the operational efficiency of the pest control companies in the field. Deltagard® is a novel mosquito adulticide, a water based formulation proven to be highly effective in both ground and aerial ULV application studies against several mosquito species. Barricor® a new formulation type (Solid Particle, SP) has proven to be effective on challenging surfaces and different environmental situations. Similarly, RMS has demonstrated that it is a great tool for pest management and food safety professionals to reduce rodent infestations and increase the monitoring efficiency.

7-5. **Integrating new technology into filth fly programs for food production and food service**

Emory Matts (emory.matts@rentokil.com), Rentokil, Carrollton, TX

Filth flies are potential sources of food contamination at various stages from raw materials to finished goods so thorough control throughout the process is important. Traditionally, programs mainly consisted of pyrethroid/pyrethrum products, organophosphate fly baits, along with insect light traps. In the past ten years many new items for flies have become available including non-repellent actives, insect growth regulators, along with new fly baits, Insect Light Traps, and bioremediation. Integrating new technology with action thresholds and data analysis can help protect food safety while reducing potential impact to the environment. Example case studies will be explored with several filth fly species.

7-6. **Managing stored product pests from a pest management perspective**

Pari Pachamuthu (pari.pachamuthu@rentokil.com), Rentokil, Houston, TX

Food Modernization act (FSMA, December 2010) has shifted the focus to more on prevention based controls to protect our food chain, starting from farm to table. FSMA relies on Inspection/Compliance/response time/partnership to keep our food safe. Stored product pests

are a major pest group dealt with by pest management professionals in processing/production facilities. It is more challenging due to richness of pest species encountered, regulations resolving conducive conditions, and selecting appropriate IPM strategies for both short/long term solutions. Rentokil-Steritech pest management program in these facilities are set up based on risk-based assessment. The talk will focus on FSMA requirements and strategies to set up an effective program.

7-7. **New directions and advances in termite baiting systems**

Phillip Shults (ptshults@tamu.edu) and Edward Vargo, Texas A&M Univ., College Station, TX

The control of subterranean termites is vital to the protection of our homes and other important structures that incorporate wood as a construction element. This need for effective control measures has only increased with the introduction of the invasive *Coptotermes formosanus* and *C. gestroi*. For nearly 30 years termite baiting systems have been used in lieu of traditional liquid barrier treatments and have been shown to be highly effective with regards to their ability to totally eliminate subterranean termite colonies. The insect growth regulators used in baits disrupt the molting process of the workers and eventually lead to the collapse of the colony. However, the speed at which this happens and the dependence on foragers finding the baits are weaknesses associated with baiting. In this presentation, we will highlight a variety of current research projects being conducted to improve baiting technologies by increasing their durability and versatility. Our results demonstrate the effectiveness of using baits to control subterranean termites and that baiting systems can be used as both a curative and preventative treatment around man-made and natural structures.

7-8. **Subterranean termite (*Reticulitermes* & *Amitermes* spp.) colony activity over time within a 1 acre grid in central Texas**

Bob Davis (robert.davis@basf.com), BASF Corporation, Pflugerville, TX

A field study with a 1.22 acre grid of ATBS Termite Stations was installed in May 2017. Stations (133) were installed within the soil on 20 ft. centers. Each station was comprised of station housing, termite inspection cartridge and termite monitoring boards. Each station was inspected at 2-4 month intervals. Data collected upon inspection included termite activity, termite feeding, presence of mold, component degradation, and presence or absence of ants. When termite were present they were collected and stored for species ID & DNA analysis. Samples (10 each) were genetically analyzed by sequencing the COII gene for species ID. Samples (ca.10 individuals) of *Reticulitermes* spp. were genotyped at several microsatellite loci for colony identification. Presence and location of individual colonies were tracked over time. Data through 20 months after installation will be presented.

. Western Gulf Center of Excellence outreach update

Sonja Swiger (slswiger@ag.tamu.edu)[1], Whitney Qualls[2], Patrick Prather[3] and Scott Weaver[4], [1]Texas A&M Univ., Stephenville, TX, [2]Texas Dept. of State Health Services, Austin, TX, [3]Municipal Mosquito, Richardson, TX, [4]Univ. of Texas Medical Branch, Galveston, TX

The Western Gulf Center of Excellence for Vector-Borne Disease was established in 2016 through funding from the CDC. This center is headquartered at the University of Texas Medical Branch, with multiple academic partners including the University of Texas Rio Grande Valley and Texas A&M University, as well as state and local public health partners. The goals of this center are to advance research in the areas of vector-borne disease, including disease surveillance, insecticide resistance, vector biology and ecology, and control strategies, and to educate current and future public health scientists trough diverse educational and outreach programs.

Multiple applied research projects are being led by individuals within the center, and will be conducted alongside outreach, education, and training programs for both vector-control personnel and students interested in vector-borne disease. In addition to these efforts, we are also engaged in active disease and vector surveillance efforts in the lower Rio Grande Valley, the site of Zika circulation, chikungunya, dengue and West Nile viruses as well as Chagas disease parasites.

Educational outreach programs are being conducted state and region-wide to better enhance and standardize the techniques used by vector management and public health sectors. Since fall of 2017, eleven 3-day training workshops have been held and over 275 individuals have attended the trainings. Five more trainings are planned for 2019 with a need for more.

Regular Ten-Minute Paper Oral

Regular Ten Minute Paper Session Wednesday

8-1. **Role of Azadirachtin; benefits and limitations**

Manuel Campos (mcampos@biosafesystems.com), BioSafe Systems, East Hartford, CT

The Azadirachtin is a widely used botanical insecticide which has been used in controlling insect pests in many organic crops. Three most important arguments support the use of Azadirachtin are: environmental safety, low or no toxicity for vertebrates and as tool to prevent resistance development. However, despite these positive arguments, several limiting factors are associated with Azadirachtin that prevent their wider use or restrict their practical applications. This presentation will mention the advantages and disadvantages of Azadirachtin that limit to their practical use.

8-2. **Evaluation of "*Candidatus* Liberibacter solanacearum" induced effects on the feeding behavior of *Bactericera cockerelli* by two distinct haplotypes present in the Americas**

Kyle Koch (kyle.koch@ag.tamu.edu), Estephanie Bernal Jimenez and Ismael E. Badillo-Vargas, Texas A&M AgriLife Research, Weslaco, TX

The potato psyllid, *Bactericera cockerelli* (Hemiptera: Triozidae), is a significant pest of potatoes throughout Central and North America, as well as New Zealand. Crucially, this psyllid is the vector of the fastidious bacterium "*Candidatus* Liberibacter solanacearum" (Lso), which is the causative agent of diseases in several solanaceous crops, including the economically important zebra chip disease of potatoes. Currently, five Lso haplotypes have been identified, two of which (LsoA and LsoB) are exclusively transmitted by potato psyllids in their shared geographic range within the Americas. However, relatively little is known about the interactions of either Lso haplotype with its plant and insect hosts, due to its fastidious nature. In these studies, we performed 8-hour recordings using the electrical penetration graph (EPG) technique to elucidated the feeding behavior of Lso-infected (LsoA or LsoB) and non-infected psyllids. Critically, these data improve our understanding of the pathogenesis of Lso in its insect vector and provide new information concerning Lso-potato psyllid interactions that ultimately could benefit pathogen transmission of one Lso haplotype.

8-3. **Community composition and functional diversity in pollinator habitat seed mixes: Do designer plants meet their goals?**

Robert Cox and **Scott Longing** (scott.longing@ttu.edu), Texas Tech Univ., Lubbock, TX

The restoration and enhancement of pollinator habitat often follows recommendations of wildflower seed mixes based on known plant-pollinator relationships and bloom characteristics. As descriptors of the functional diversity of plant communities, plant traits provide a means to relate ecosystem services such as pollination and biocontrol to management options and the insect communities resulting from active restoration. Furthermore, the charge among global regions to enhance resources for pollinators precedes an understanding of how selected plant traits influence insect communities including focal species. We compiled a list of 213 pollinator plants from 24 commercial seed sources and conservation recommendations and used this list to analyze 1) the composition of the total seed-mix community, 2) frequencies of specialized bee-plants, and 3) functional traits of seed mixes. We found recommended species represent 28 plant families, though fully half of all recommended species belonged to one of only 3 plant families: (Asteraceae, 68 species; Fabaceae, 31 species; Poaceae, 24 species). In addition, 34% of the recommended species are not native to the region. The SW US endemic plant Nama spp. and its specialist bees highlight a need to consider native and specialized biodiversity in conservation planning.

8-4. **Identification and lifecycle description of *Caloptilia blandella* (Clemens) (Lepitoptera: Gracillariidae) on commercial pecan trees in New Mexico**

Tiffany Johnson (shimsham@nmsu.edu), New Mexico State Univ., Las Cruces, NM

Reported findings of a new leafminer species within the Mesilla Valley in New Mexico triggered a survey to locate and identify the insect creating this new observed damage. A total of 17 micro-lepidopteran specimens were collected from June 6 to July 27, 2018. Observations occurred on young, non-bearing Western Schley cultivars by observing leaves from the lower canopy for leaf miner larval activity. Identified mined leaves were covered by a polyester mesh leaf bag, labelled with an alphanumeric code, and monitored daily until specimen reached adulthood. Collected adult specimens were identified as *Caloptilia blandella* (Clemens), one of two micro-lepidopteran species within the genus that has been has been previously described as feeding on the leaves of walnut family (Juglandaceae) trees. Sightings of this moth have been reported along the eastern coast of the United States

to east Texas, but none have been reported as far west as New Mexico. Assessment of the lifecycle descriptions and larval damage in southwestern commercial orchards is necessary as this new pecan pest may potentially need to be part of a scouting and monitoring program in the future, especially among young and transplanted trees.

8-5. **Gene expression analysis of key antioxidant genes in reproductive tissue of *Apis mellifera* queens reared in pesticide-laden beeswax**

Juliana Rangel (jrangel@tamu.edu), Elizabeth Walsh and Tonya Shepherd, Texas A&M Univ., College Station, TX

The European honey bee (*Apis mellifera*) is an invaluable pollinator, used commercially for the pollination of numerous crops. As eusocial insects, honey bee colonies rely on a single queen to lay all fertilized eggs, while the sterile workers perform all other non-reproductive tasks. Therefore, the longevity and reproductive health of the queen is tied strongly to the success and future of the colony. A queen that is subfertile or performing poorly is typically replaced by the workers through a mysterious process known as supersedure. A potential culprit for the increasing rate of supersedure is the exposure of hives to beekeeper- and field-applied pesticides, which become embedded in the wax used by workers to rear brood. The downstream effects of this exposure are yet to be determined. Previous research indicates that the presence of beekeeper-applied miticides and field-applied agrochemicals in the brood-rearing beeswax has a negative effect on drone sperm viability and queen physiology. Here we investigated the effect of this type of pesticide exposure on the reproductive tissue, spermetheca and ovarioles of queens, and assessed the expression levels of antioxidative genes (*Cat*, *GSTD1*, *GLOD4L*,*Sod1*, *Txn2*, *Txnrd1*, and *Vg*) commonly associated with sperm viability and reproductive health. Our results give further information on the effects of ubiquitous agrochemicals found in hives on the reproductive health of honey bee queens.

8-7. **Developing RNA interference tools to control the potato psyllid and zebra chip disease of potatoes**

Ismael E. Badillo-Vargas (ismael.badillo@ag.tamu.edu) and Estephanie Bernal Jimenez, Texas A&M AgriLife Research, Weslaco, TX

Potato is one of the world's major agricultural crops with global popularity as a staple food. In the Americas and New Zealand its production has been severely affected by a tuber disorder colloquially known as zebra chip disease, which putative causal agent is exclusively transmitted by the potato psyllid, *Bactericera cockerelli*. Following the successful transmission by the insect vector, the bacteria "*Candidatus* Liberibacter solanacearum" can cause economic hardships for potato producers and processors by reducing yield and quality. Currently, no tolerance or resistance exist for this fastidious bacterium in commercial potato varieties and the management of the insect vector, which relies almost entirely on chemical insecticides, continues to be the most common management strategy available for this pathosystem. Therefore, new strategies to control the insect vector and pathogen transmission are need it for the potato industry elsewhere. Our research group has previously developed a tissue-specific transcriptome for *B. cockerelli* that is providing us with the possibility of using RNA interference (RNAi) to control this pathosystem by suppressing the expression of specific genes within the insect vector. The goal of this study was to develop and utilize RNAi tools to silence an essential insect gene to determine the phenotypic effects on the development and survival of this economically important insect vector.

8-8. **Supergene in the red imported fire ant (*Solenopsis invicta*) leads to increased gene expression**

Joan King (joanie_king@tamu.edu)[1,2], Samuel Arsenault[2], Sasha Kay[3], Kip Lacy[2], Kenneth Ross[2] and Brendan Hunt[3], [1]Texas A&M Univ., College Station, TX, [2]Univ. of Georgia, Athens, GA, [3]Univ. of Georgia, Griffin, GA

Understanding the molecular basis of adaptive traits is a complicated topic in evolutionary biology. One mechanism for maintaining complex adaptive phenotypes is a "supergene," which is a group of neighboring genes on a chromosome inherited as a single Mendelian element due to diminished recombination. A growing body of studies are finding supergenes in a variety of organisms. The red imported fire ant, *Solenopsis invicta*, is one such organism that contains an approximately 13Mb non-recombining supergene containing more than 400 protein coding genes. This supergene is responsible for two distinct social forms: a monogyne form and a polygyne form; where the presence of the supergene leads to the polygyne form. Individuals of each social form differ in many morphological, behavioral, and physiological traits. To explore the effect of the supergene and how gene expression varies in virgin reproductive females, we used RNA-Seq of the brains and ovaries of these alates as they were departing on their mating flights. We found that the presence of the supergene overall increases gene expression, regardless of the social form environment in which the female reproductives developed. Differentially expressed genes preferentially localize to the supergene

itself. In addition, we identified candidate genes potentially involved in the regulation of the polygyne phenotype. This study helps us better understand how supergenes contribute to complex phenotypes.

8-9. **Impacts of environmental exposure of bovine manure on fecal-NIRS detection of the southern cattle tick**

Brian Rich (briantaylorrich@gmail.com)[1], Pete Teel[1], Donald B. Thomas[2], Jay Angerer[3], Doug Tolleson[4] and Adalberto A. Pérez de León[5], [1]Texas A&M Univ., College Station, TX, [2]USDA - ARS, Edinburg, TX, [3]Texas A&M AgriLife Research & Extension, Temple, TX, [4]Texas A&M Univ., San Angelo, TX, [5]USDA - ARS, Kerrville, TX

Ticks mediate host immune responses for successful blood feeding. Interactions of host immune, endocrine and digestive systems impact digestion and resulting fecal chemistry. These changes can be observed by fcNIRS, allowing for a non-invasive assessment of tick burden. An ideal application to the detection of the Southern Cattle Tick using this method would involve fecal material that may not have been recently produced. Aged samples that remain viable for detecting ticks can permit a forensic approach to detection, with the option to analyze samples left behind by cattle that have already been moved. Fecal chemistry can be changed by a variety of factors that result from exposure to the open environment. Temperature, humidity and exposure to light have the potential to change chemistry outright, impede or accelerate the activity of coprophagous organisms or influence the growth of microorganisms within the fecal pat itself. A cool season study and a warm weather study, with two treatments each, using fecal samples from six *Bos taurus* heifers infested with *Rhipicephalus (Boophilus) microplus* were exposed to the open environment for twelve days to determine the effect of environmental exposure to a known fecal chemistry. The first treatment sequestered samples beneath a mesh canopy to reduce exposure to the sun, with the second treatment left open to sun exposure. Fecal pats were sampled every other day with those samples subjected to fcNIRS analysis to ascertain at what point the fecal chemistry changed when compared against the chemistry from the original samples. Temperature, humidity and solar exposure were measured with HOBO™ data loggers throughout the twelve days of exposure. The study concludes that fecal chemistry does not change for ten days post exposure, and all samples still clusters near the original samples when analyzed for spectral variation.

Symposia

Blood Feeding Arthropods of Veterinary and Medical Importance: Sharing Discoveries on Surveillance, Biology and Control

9-1. **Mosquito surveillance and infection with insect-specific viruses in Texas**

Estelle Martin (estellemartin@tamu.edu), Texas A&M Univ., College Station, TX

The emergence and re-emergence of mosquito-borne diseases such as Zika, chikungunya and dengue fever remains a global public health challenge that threatens many communities in the continental United States and beyond. The Zika virus invasion into the Americas was declared a public health emergency of international concern due to the rapid spread, unique modes of transmission, and link to birth defects. Local mosquito-borne transmission of Zika virus has now occurred in South Florida and South Texas with extensive transmission across the border in Mexico. To assess the environmental receptivity along the Texas-Mexico border to these mosquito borne viruses, we are conducting enhanced biosurveillance. From September, 2016 to present, we have been gathering data on the mosquito diversity and abundance in multiple communities that represent variable socio-economic conditions using the CDC Sentinel Autocidal Gravid Ovitraps (SAGO traps) to estimate the relative abundance of vector species indoors and outdoors. The mosquito communities in these neighborhoods in South Texas are dominated *Ae. aegypti* (62%) and *Culex quinquefasciatus* (29%) with only a few *Ae. albopictus* (2%) specimens recorded in the households with traps aims to identify risk factors for increased human-mosquito contact indoors. Our results show a similar outdoor mosquito abundance for both low and middle income communities but a higher indoor abundance in low income communities. Additionally, we found that the indoor mosquito population does not show as much seasonal variation in abundance the way the outdoor population does. Mosquitoes collected have been screened broadly for viruses and although none have tested positive for Zika, dengue, or chikungunya viruses, we have detected insect-specific viruses such as cell fusing agent virus (CFAV). Our survey of insect-specific viruses has extended to other regions of Texas, USA focusing on: *Aedes aegypti*, *Aedes albopictus,* and *Culex quinquefasciatus*.

In an effort to understand the interaction of these viral symbionts with human pathogens, we are conducting co-infection experiments in cells and in mosquitoes with arboviruses of human health concern.

9-4. **Increased surveillance and screening of *Culicoides*: A better understanding of vector-host-pathogen interaction**

Phillip Shults (ptshults@tamu.edu), Texas A&M Univ., College Station, TX

Culicoides, or biting midges, are hematophagous flies that feed on birds, mammals, and reptiles and are the vectors of viruses, protozoans, and filarial worms. The majority of the work on *Culicoides* highlights their negative impact on livestock with little attention paid to their effect on wildlife. However, even in the well-studied virus, Bluetongue, not all of the North American vectors are known. This talk will focus on recent studies that have investigated the gaps in our understanding of disease systems associated with *Culicoides*. There are several species of *Culicoides* that have been implicated as potential vectors; however, the stringency applied to vector competency studies has hindered their confirmation. As these new vector species are identified, it is imperative to investigate the host breadth of each. There is an increasing amount of published data which show a clear host preference but a general lack of specificity in the blood meals taken. This varied host feeding could contribute to the perpetuation of viruses in these systems. Future surveillance efforts should also focus on increasing the genetic database of *Culicoides* in North America. Screening for pathogen vectors can only happen with proper, species-level identification, yet the amount of barcoding sequences available for *Culicoides* is severely lacking. *Culicoides* species composition data coupled with ecological data, such as seasonal variation, host breadth, and vector capacity, will help to clarify the elements involved in disease transmission in these pathosystems.

9-5. **Horn fly (*Haematobia irritans*) control for cattle producers: Matching the science with ranch management practices**

Justin Talley (justin.talley@okstate.edu), Oklahoma State Univ., Stillwater, OK

Horn fly (*Haematobia irritans*) control has historically relied upon insecticides to limit the impact these pests have on cattle. However, the reliance on insecticides have led to control failures and less trust from cattle producers on the effectiveness of insecticides. This mistrust combined with insecticide resistance due to mismanagement of the use of insecticidal ear tags has caused cattle producers to either overuse insecticides or use no control practices. The balance between these two extremes usually is how current horn fly control practices can be incorporated into current ranch management practices. The popularity of insecticidal ear tags for controlling horn flies was not only adopted for their initial effectiveness but also for the longevity of adequate control without re-treatment for multiple months. Current research for horn fly control is rarely taken into account how new control strategies can be incorporated into current ranch management practices. This topic will be covered and how certain ranch management practices aide in horn fly control.

9-7 **Selected insecticide delivery devices for management of horn flies (*Haematobia irritans*) (Diptera: Muscidae) on beef cattle**

Sonja Swiger (slswiger@ag.tamu.edu), Texas A&M Univ., Stephenville, TX

The horn fly, *Haematobia irritans* (L.) (Diptera: Muscidae), is one of the most important pests of the beef cattle industry. Horn fly adults are blood feeders that remain in constant contact with cattle, providing management opportunities via insecticide-impregnated ear tags. Controlling horn flies in the United States is time consuming and costly, but failure to implement management can lead to weight loss and decreased weight gain of calves and yearlings. In the past decade, new chemical combinations have been impregnated into ear tags for pest management. The objectives of this project were to 1) evaluate the efficacy of ear tags against horn fly populations and 2) determine if reduced fly density results in economic return. Several years of data compiled by insecticide class show significant reductions in horn fly populations with the use of macrocyclic lactone treatments, pyrethroid treatments, and organophosphate treatments compared with untreated animals. In Texas, this reduction has been shown to be more effective when tagging of cattle is delayed.

Skills for Women Navigating Their Early Careers

10-5. **Can you *really* do it all? Juggling work with life**

Wizzie Brown (ebrown@ag.tamu.edu), Texas A&M AgriLife Extension Service, Austin, TX

Work life balance is a struggle.....can you really have it all? We will discuss what work-life balance means and provide tips on how to somewhat stay sane while progressing through your career.

Poster Abstracts

Student Poster Competition

Student Poster Competition: Undergraduate

P1-1. **Standardizing in-vitro procedures used to determine efficacy of insecticidal feed-through products against filth flies**

Ramon Zepeda (rz@nmsu.edu) and Brandon Smythe, New Mexico State Univ., Las Cruces, NM

Fecal bio-assays are often used to evaluate effective and efficient formulations of insecticidal feed through compounds. However, variables associated with these procedures such as manure moisture, and fly eggs transfer procedures maintain the ability to influence findings. The objective of the current study was to evaluate the effects of manure moisture and the amount of time fly eggs can be held in water on the viability of eggs from multiple fly species. Eggs were collected and submerged in water for varying times and assayed for adult emergence following standard fecal bioassay exposures. Additionally, manure amendments were conducted by adding water to obtain varying concentrations of moisture in untreated cattle manure. Findings from this study will be used to further refine approaches for consistent and dependable results of future efficacy evaluations.

P1-2. **Evaluation of the temperature tolerance of the predatory mite Stratiolaelaps scimitus for biological control of the honey bee ectoparasitic mite Varroa destructor**

Travis Trimm (travistrimm501@gmail.com), Ellie Chapkin, Betty Hernandez and Juliana Rangel, Texas A&M Univ., College Station, TX

We propose using Stratiolaelaps scimitus as biological control agents in managed honey bee (Apis mellifera) colonies against Varroa destructor. In order to test this, we must first consider several factors that may affect the mites while inside of a beehive. One factor that must be explored is the suitable temperature conditions for Stratiolaelaps scimitus. This is important for determining the habitability of the beehive for the mites, and how it may impede their ability to control Varroa destructor. In order to test this, several containers with a set number of mites were placed into incubators at temperatures of room temperature, 26°C, 29°C, 32°C, and 35°C. The containers were then checked every 24 hours and placed back into the incubators after the number of mites alive and dead were recorded. After comparing data from all three trials, it was found that the mites survived best at temperatures of 29°C. This evidence may suggest that Stratiolaelaps scimitus are not suitable to live in the temperature conditions inside of a beehive

P1-3. **Mite"y" Kibbles: Grain mite populations increase on test formula of dog food**

Brandon Henriquez (brandon.henriquez@okstate.edu), Ankur Limaje and W. Wyatt Hoback, Oklahoma State Univ., Stillwater, OK

Grain mites, *Acarus siro,* are pests which can affect different types of stored grains and can also spread mold spores which can affect human health. Some dog foods consist of pieces with different textures and shapes and Smucker's is testing new proprietary formulas of Kibbles and Bits to determine susceptibility to mite infestation. In the experiment, three formulas and 5 or 6 shapes of dog food were tested in benchtop trials. 35 ml vials had 3-5 pieces of individual shapes standardized by mass and then infested with approximately 25 mites. The mite infested vials along with controls were placed in tubs with mineral oil coating the bottom to prevent the spread of any escaped mites. The vials were placed in a growth chamber at 28°C and were kept in 70-85% relative humidity. After four weeks, the vials were removed from the chamber, and mites were counted. The control formula had very few mites on any piece shape. The first test formula had very high mite numbers (thousands per vial and high visible damage in the form of dust). The third test formula had high amounts of mold growth resulting in few mites, but unusable product. The results of these tests show that the existing formula is best at preventing mite population growth and that the new formulations must be altered or the product will lead to customer complaints.

P1-4. **Masonry insect preference in diameter for nesting sites at Tarleton State University, Stephenville**

John Garcia (john.garcia01@go.tarleton.edu), John Montoya, Adam Mitchell and David H. Kattes, Tarleton State Univ., Stephenville, TX

Thousands of Hymenopterans nest in hollow plant stems, cavities and piping. Each of these actively choose where to nest. The purpose of this research was to determine what masonry insects were present at the Permaculture Demonstration and Research site

at Tarleton State University, Stephenville and what diameter of hole they select to nest. The diameter of holes tested were 0.278cm, 0.556cm, 0.595cm, 0.635cm, 0.754cm, and 0.953cm. Three habitat structures of each were created for a total of eighteen habitat structures, each with six holes drilled into them of the same diameter. Once the holes in the structures were capped or once a capped hole showed signs of emergence, the structure was taken down and stored. Forty-one of the holes were capped with twenty showing signs of emergence and eleven of the emerged were captured by the researcher. The insects captured were; nine mason wasps (Genus: *Euodynerus*), one cuckoo wasp (Family: Chrysididae) and one chalcid (Family: Chalcididae) wasp. The mason wasps emerged from a combination of the 0.556cm, 0.635cm and 0.953cm diameter holes, while the cuckoo wasp emerged from the 0.556cm diameter hole and the chalcid wasp emerged from the 0.635cm diameter hole. Although we did not find significant differences in diameter preference (P=0.1035), the information gathered is useful in broad documentation of the diversity present in Stephenville. Further research is underway with an increased number of reps.

P1-5. **Solids versus Stripes: Predatory Hemipteran (*Platymeris biguttatus*) response to normal and artificially colored aposematic prey (*Tenebrio molitor*)**

Leon Tan (leontanlo@hotmail.com) and W. Wyatt Hoback, Oklahoma State Univ., Stillwater, OK

Generally, insects appear in mostly monotone colors that help them to be camouflaged in the environment or they can be aposematic, having bright colors or conspicuous patterns that make them obvious. Conspicuous color patterns have been found to reduce predation attempts by both vertebrates and invertebrates, including Praying Mantises and Jumping Spiders. We tested the effects of artificial patterns applied to mealworm larvae, *Tenebrio molitor*, on predation attempts by the African Two Spotted Assassin bug, *Platymeris biguttatus*. The assassin bug colony is housed at Oklahoma State University's Insect Adventure and is maintained on cockroach nymphs. Mealworms were colored with permanent markers to create conspicuous stripes and then introduced along with an unstripped (untouched) mealworm into an individual test chamber with one Assassin bug. We found that the bugs responded more to movement rather than color and there was no significant difference between the amount of stripped and unstripped prey that was attacked. This experiment would need to be repeated with actual noxious prey and similarly marked non-noxious prey to determine if assassin bugs can recognize and remember interactions with aposematically defended prey.

P1-6. **Host plant and native pollinator relationships in an urban ecosystem**

Haley Vincze (haley.vincze@gmail.com), Tarleton State Univ., Wylie, TX

Host Plant and Native Pollinator Relationships in an Urban Ecosystem

Haley Vincze*, David Kattes, and Adam Mitchell

Approximately 90% of wild plant species and 70% of crops in the world utilize bees for pollination. As factors such as Colony Collapse Disorder, parasitic mites, and diseases reduce European honeybee density, humans may depend more on native bees for pollination. Native bee species abundance have also declined due to habitat fragmentation and changed land use. The purpose of this study was to determine bee genera and their associated host plant species in an urban park. This study was conducted in Wylie, Texas along the Municipal Complex Trail. Native bees were collected in the summer of 2017 from wildflowers using an insect sweep net. Records were kept of which plant species each bee was caught, and bees were identified in lab to genera. A total of 85 bees were collected, including 56 *Apis* spp. and 11 *Halictus* spp. A total of five plant genera were recorded as hosts for pollinators, with beebalm (*Monarda clinopodioides*, 43 individuals) and water primrose (*Ludwigia peploides*, 21 individuals) attracting the most pollinators. Bees from genera *Apis* and *Halictus* are generalist pollinators and were observed at three and four of five plant hosts respectively. Future conservation efforts may target generalists such as *Halictus* and provide host plants such as *Monarda clinopodioides* to encourage native bee populations. Additional studies should determine floral traits of native plants that attract native bees in urban environments.

P1-7. **Aphid, parasitoid and hyperparasitoid populations in different cole crops in the field**

Criselda Aranda-Ramirez (crissaranda10@gmail.com), Francisco Lopez-Monzon and Sergio Sánchez-Peña, Universidad Autónoma Agraria Antonio Narro, Saltillo, CU, Mexico

Populations of pests and natural enemies vary among plants, even closely related crops. Cabbage aphid, *Brevicoryne brassicae* (Hemiptera: Aphididae) causes

losses in cole crops (broccoli, cabbage and Brussels sprouts, among others). *Diaeretiella rapae* is a solitary koinobiont endoparasitoid of aphids of especially *B. brassicae*, and in Saltillo (Mexico) this parasitoid is attacked by the hyperparasitoid *Alloxysta fuscicornis*. The objective of this investigation was to evaluate the phenology of *B. brassicae, D. rapae* and the hyperparasitoid *A. fuscicornis* in five cultivars of the family Brassicaceae in the field at Saltillo, Coahuila, Mexico. We established plants of white radish (*Raphanus sativus*) and *Brassica oleracea* cultivars botrytis (cauliflower) capitata (cabbage), italica (broccoli) and gongyloides (kohlrabi). The numbers of aphids, *D. rapae* and *A. fuscicornis* found on each cultivar were determined. Significantly more cabbage aphids were found on broccoli and cabbage; however, a greater percentage of the population of *D. rapae and A. fuscicornis* was found on kohlrabi; this tendency occurred throughout the spring-summer sampling period of 2018. Most *D. rapae* and *A. fuscicornis* were collected in April. Members of the aphid-parasitoid-hyperparasitoid system vary in their spatial and temporal abundance in different cultivars of Brassicas.

P1-8. **Development of fall armyworm larvae on grass, dry beans, peppers and potato in the laboratory**

Rosadelia Roblero-Gonzalez (DELIROBLERO@hotmail.com), Patsy Guerrero-Espinoza and Sergio Sánchez-Peña, Universidad Autónoma Agraria Antonio Narro, Saltillo, CU, Mexico

It is essential to have insect pest colonies for research and control work. Although artificial diets are a significant development for research with lepidopterans, their cost renders them prohibitive for long-term routine maintenance of colonies, or between tests, for example. We compared methods (natural vegetable diets) for laboratory breeding of fall armyworm, *Spodoptera frugiperda*, to avoid the high cost of artificial diets. Larvae of fall armyworm were collected in vegetative maize plants (*Zea mays*) at the Universidad Agraria Antonio Narro, Saltillo, Mexico. Larvae were placed in plastic cups with bermuda (*Cynodon*) and *Pennisetum* grass as food until reaching the adult stage (moths); these were placed in 1000 ml plastic containers with water+soda in 50 ml cups as food. From larvae obtained from these adults (F1), 50 specimens of 1st larval stage were used for diet treatments. Four diets were evaluated: mixed grasses as described, soaked beans (*Phaseolus vulgaris*), jalapeño pepper (*Capsicum anuum*), and raw white potatoes (*Solanum tuberosum*). Tests were repeated three times. Mortality and development were evaluated. The best treatment was the grass-based diet: 90% of the individuals completed their life cycle to adulthood, followed by jalapeño pepper (50%), raw potatoes (30%) and finally soaked beans (20%). In the case of pepper and potato, the larvae reached the last larval stages (5 and 6), sometimes reaching great size, but many died right before or after pupating, and pupae were often deformed and died; in soaked bean the development was poor (larvae remained small and most died). This work indicates the difficulty of using diet based on several non-host plants as food.

P1-9. **A comparison of a degree day model for pecan nut casebearer (*Acrobasis nuxvorella* Neunzig) to historical data in Mesilla Valley, New Mexico**

Jeanette Castañon (jevelyn@nmsu.edu), Larry Blackwell and Dave Thompson, New Mexico State Univ., Las Cruces, NM

Pecan nut casebearer *Acrobasis nuxvorella* (Neunzig), is a primary pest in western pecan orchards. Pecans are an important cash crop to New Mexico growers, bringing in $220 million dollars in revenue in 2017. The adult moth oviposits on the nutlet stigma. Larvae emerge and burrow into the base of the nutlet, feeding on the center of the nut. In early infestations, the larvae can consume an entire cluster. Chemical control methods focus on reaching the larvae after it emerges and before it enters the nutlet. Timing of insecticide application is critical for controlling this pest. Current scouting methods include using pheromone traps to detect adult male moths, and scouting for eggs/larvae. Scouting for eggs on the nuts is problematic due to the small size of the eggs and the low density. Predictive models for PNC emergence were developed for central Texas and have been adapted for use in other locations. The purpose of this study is to determine how applicable the model is to southern New Mexico pecan growing regions. The model will be applied for the Mesilla valley over seven years at five locations to compare predicted values with recorded data. Values for moth emergence and flight duration will be compared to sex pheromone trap numbers.

P1-10. **Neonicotinoid insecticide resistance in populations of the potato psyllid (*Bactericera cockerelli)* across Texas (and beyond)**

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The potato psyllid (*Bactericera cockerelli*) is a vector of a pathogen (*Candidatus* Liberibacter solanacearum) that causes zebra chip (ZC) disease in potato. The insect and the diseases are primarily managed through intense insecticide control. One of the insecticides used frequently to suppress the psyllid are neonicotinoids, group 4A insecticides. Frequent use of neonicotinoid insecticides throughout the season poses a risk of location-specific insecticide resistance within Texas, with increased probability of resistance to a wide range of chemicals in psyllids migrating from the south. We hypothesized that 1) populations of psyllids in Texas were resistant to neonicotinoid insecticides and that 2) psyllids collected from each distinct potato-producing region in Texas would differ in their level of resistance to a particular neonicotinoid insecticide. To test these hypotheses we established colonies of the potato psyllid from major potato-producing regions in Texas and exposed their progeny to several doses of two neonicotinoid insecticides, imidacloprid and thiamethoxam. Survival of the psyllids was monitored for seven days, and each dose level was replicated 12 times for each insecticide. Our results indicated that psyllids in each region of the state were resistant to both insecticides and the severity of resistance depended on the origin of each psyllid colony. Thus, resistance incidence to each of the most frequently used insecticides ought to be tested frequently across Texas and region-specific recommendations are needed.

P1-11. **A pre-assessment of entomological knowledge and student fears**

Jonathan Harris (jonathan.harris10@okstate.edu) and W. Wyatt Hoback, Oklahoma State Univ., Stillwater, OK

Insects and Society is a popular non-majors course taught to more than 600 students per year. In 2019, students enrolled in the course were given a coloring sheet with one of three images and set of markers on the first day of class. The images were of a lady beetle, monarch butterfly, a honey bee, and a burying beetle. Students were asked, what the organisms is, what good is it, what they feared about it, and how many kinds were in Oklahoma. We analyzed the responses of 231 students. The majority of students correctly identified the order (98%). Fears of bees/ wasps were from stinging while fears of other orders were because of small legs, strange eyes, or general appearance. Most common benefits listed were pollination (bees and monarchs), decomposer (burying beetle), and predator (lady beetle). Student knowledge of how many kinds ranged from 1 to more than eight million. The results of the survey show that college student non-majors have a basic awareness of insect diversity and recognize examples of common orders. This type of survey helps frame a course by providing information of misconceptions and student biases.

P1-12. **Above or below: How culverts affect aquatic macroinvertebrate activity in Oklahoma streams**

Rayne Key (rayne.key@okstate.edu), Melissa Reed and W. Wyatt Hoback, Oklahoma State Univ., Stillwater, OK

Leaves provide the major food base in many streams. Leaf-liter is broken-down by a combination of physical, chemical, and biological processes, including macroinvertebrate feeding. Ingestion of leaf material by macroinvertebrates, or shredders isan important action that provides energy and nutrients to many aquatic organisms. Little is known about the impact human landscape alterations, such as road culverts, have on the breakdown rates of leaves. We examined the break-down rates of Oak Quercus spp. and Sycamore Platanus occidentalis in two stream ecosystems (prairie and Ozark highland) in central and eastern Oklahoma to assess the effect of culverts. Since culverts impact downstream stream habitat, we anticipate a decrease in the abundance of shredders and the subsequent breakdown rate of leaf-packs in areas downstream of culverts. We secured leaf-packs to the streambed upstream and downstream of road culverts for one month in winter 2019. The specific aims of this study were to determine breakdown rates of leaf packs and to identify changes in macroinvertebrate abundance downstream of the culvert. Our current data shows a decrease of leaf breakdown in sampling sites located downstream.

Student Poster Competition: Master's

P2-1. **A layered approach to IPM of *Spodoptera*: Insecticidal residues do not reduce parasitism of *Telenomus* parasitoids**

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Lepidoptera in the genus *Spodoptera* are serious pests of many crops worldwide and are targeted with control measures including pesticides and egg parasitoids. Spodopera females deposit eggs in layered masses, limiting most parasitoids except *Telenomus remus* Nixon (Hymenoptera: Scelionidae) which can reach all egg layers. Little information is currently available concerning the effects of insecticide residues on parasitism rates and survival of egg parasitoids. We tested the hypothesis that commonly used pesticide residues would be harmful to the immature and adult stages of *T. remus*. Laboratory experiments were conducted in cages consisting of 2.5 cm^2 boxes that had the bottom and cover made of glass and the remainder lined with black fabric with ventilation holes. To assess non-target effects to adults *T. remus*, the glass surfaces of the cages were sprayed with insecticide using a Potter® Tower. The pesticide was allowed to dry before placing *Spodoptera* egg masses into the cage. To assess effects on the immature phase, *Spodoptera* egg masses that had *T. remus* pupae were sprayed directly with the pesticide and then left in the cages. In the pupal phase chlorpyrifos (-77.8% parasitism), Methomyl (- 66% parasitism) and Lambda-cyhalothrin + Thiamethoxam (- 38.6% parasitism) lowered parasitism rates. All pesticides were innocuous (<30% of reduction) to pupae except chlorpyrifos (- 64% egg viability), Methomyl (- 74.54% egg viability) and Lambda-cyhalothrin + Thiamethoxam (- 34.20% egg viability). In the adult stage lambda-cyhalothrin + chlorantraniliprole (-100% parasitism and viability), methanol + methomyl (- 98.4% of parasitism and 48.77% of eggs viability), methomyl (- 98.93% parasitism and 100% egg viability), lambda-cyhalothrin + thiamethoxam (- 99.35% of parasitism and 100% egg viability) were harmful, while the remaining treatments were innocuous (<30% of reduction). The results of this study suggest that *T. remus* parasitoids can be used in combination with most pesticides to provide control of *Spodoptera* larvae with spray timing helping parasitoid survival.

P2-2. **Comparative Gene Expression and Upregulation of Possible Antimicrobial Peptide-Producing Genes of *Nicrophorus orbicollis* and *Nicrophorus pustulatus***

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Burying beetles (Silphidae: Nicrophorinae), are unique among insects in their method of brood rearing. Working in a biparental tandem they sequester suitably-sized carrion underground and limit is decomposition through the production of antimicrobial oral and anal protein secretions. This study compared two burying beetles with different life histories: *Nicrophorus orbicollis* Say, which engages in typical burying beetle behavior, and *Nicrophorus pustulatus* Herschel, a brood parasite which does not produce antimicrobial secretions. Salivary gland tissue was excised from fed (provided ground beef) or unfed (no food for 48 hours) individuals from both species. Next generation sequencing of cDNAs was synthesized from RNA isolated from the glands and differences in gene expression were assessed. Both species exhibited higher expression in sequences coding for innate immune response proteins when exposed to food (6.58%/5.19% of overall characterized sequences) than when unfed. Between both species, *N. orbicollis* had higher expression of innate immunity proteins than *N. pustulatus* (7.14%/4.22%). This suggests that these compounds are linked to the feeding process and supporting the hypothesis that burying beetle secretions produce antimicrobial peptides, rather than only relying on compounds produced by gut bacteria.

P2-3. **Acaricidal effect of plant extracts on *Tetranychus urticae* Koch. (Acari:Tetranychidae)**

José Ontiveros (uaaan12@gmail.com), Universidad Autónoma Agraria Antonio Narro, Saltillo, CU, Mexico

The two-spotted spider *Tetranychus urticae* Koch, is one of the most important pests economically, is found in a wide range of crops around the world. The research was conducted at the Laboratory of Entomology and Acarology Agricultural Parasitology Department of the Universidad Autonoma Agraria Antonio Narro (UAAAN). 21 plant extracts were evaluated on *T. urticae* from grapevine and multiplied on bean (*Phaseolus vulgaris*)

under laboratory conditions. The leaf arena technique was utilized to set up trials, evaluating at 72 h and in a design completely randomized with 8 concentrations with 10 repetitions. Mortality was corrected according to Abbott (1925) and a Probit Analysis was performed to obtain the dose-mortality response curve, as well as the quantification of the main phytochemicals present in the extracts by the infrared spectrophotometer. The results show a high susceptibility to the extracts of Sangre de Drago (*Jatropha dioica*), Catclaw (*Mimosa zygophylla*), Black Pepper (*Piper nigrum*), Mezquite (*Prosopis laevigata*), with an LC_{50} of 278, 323, 375, 324 ppm respectively.

P2-4. **Selection of an internal reference gene for functional genomics or gene expression analysis in *Dalbulus maidis* (Hemiptera: Cicadellidae)**

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The corn leafhopper, *Dalbulus maidis* (DeLong and Wolcott), is considered one of the most important pests of maize in South America for its ability to transmit several viral and bacterial pathogens to corn. Even though it has a broad distribution from southern United States to Argentina, not much is known about the molecular characteristics of this insect. The use of interference RNA (RNAi) has advanced functional genomics studies by allowing simultaneous study of gene functions and linkage of function to a phenotype. The reduction of transcript levels due to RNAi of the target gene is usually measured by RT-qPCR. However, a reliable quantification will depend on the choice of a good internal control (usually a housekeeping gene), that has proven to have stable expression. As the stability of the reference genes can change depending upon the sample, the aim of this work was to evaluate four common housekeeping genes from *D. maidis*: cytosolic actin (*Actin*), electron transfer flavoprotein (*ETF*), ribosomal protein 18 (*18S*) and TATA-binding protein (*TATA*). This evaluation was conducted at three different developmental stages (early nymph, late nymph and adult) by performing RT-qPCR and analyzing the data using the three software packages: BestKeeper, NormFinder and geNorm. NormFinder and geNorm which use standard curve-transformed data found electron transfer flavoprotein gene, ETF, to be the most stable. In contrast, the software BestKeeper which uses raw Ct data found TATA to be the most stable gene. Our results demonstrate that the expression of the gene ETF in *D. maidis* has acceptable stability as an internal reference control for functional genomics or gene expression analysis.

P2-5. **Intestinal proteolytic activity of *Anticarsia gemmatalis* (Hübner) (Lepidoptera: Noctuidae)**

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Ecofriendly control strategies can be developed with insect physiology knowledge and specially, in the case of the digestive process, it relays on digestive enzymes functions. *Anticarsia gemmatalis* (Hübner) is a voracious and abundant defoliator of soybean fields in the tropics of Mexico. Reduction in the activity of digestive enzymes can be affected by mineral agents, such as the presence of divalent cations, including copper or zinc, which can affect the hydrolytic capacity. We evaluate the effect of cations on the total proteolytic activity from fourth larval instar guts of *A. gemmatalis* collected from soybean crops in Mante, Tamaulipas, Mexico, in September 2018. The enzymes were extracted from the intestines according to what was suggested by Aguirrezabala-Campano et al., (2013). The detection of proteolytic activity was according to Mendonça et al., 2012 and Torres-Castillo et al., 2016. It was found that the predominant proteolytic activity was associated with enzymes of the trypsin and cystein-poteinases type. The proteolytic activity was independent of the presence of naturally occurring divalent cations. We observed that the salts with Ca, Mg, Mn, Co and Al increased the proteolytic activity. While the salts with Zn, Cu and Ni decreased the proteolytic activity up to 50% lower compared with the control activity. These results support the differential sensitivity of the proteolytic enzymes against the different cations, some of which have been indicated as commercial agents used to control the incidence of pests. Authors thank the financial support of the PRODEP project UAT-PTC-241.

P2-6. **Entomochemicals and antioxidants from the central American locust (*Schistocerca piceifrons piceifrons*, Walker)**

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Secondary metabolites from organisms have implications in all ecological interactions and also in regulation of physiological processes. In the case of insects, it has been reported that these compounds are widely diverse; which are synthesized by the organism itself, while others could be obtained through their diet. Insects are considered an important group to be explored for bioactive compounds. Orthoptera is an interesting group due their diversity, high reproductive size and variety in their diet. This research is focused on the secondary metabolites present in adults of the Central American locust (*Schistocerca piceifrons piceifrons*, Walker) (Orthoptera: Acrididae). *S.p. piceifrons* is an important pest for Mexican agriculture, particularly in southern Tamaulipas and presents generalist feeding habits, affecting to several crops. Its nymphal stage passes through six instars and the adult instar, all instars vary in color and preference in their diet. Because of this, they constitute an interesting model to explore the presence and variation of entomochemicals (synthesized or accumulated from diet). As part of the initial result, the presence of phenolic compounds, alkaloids, sponins, flavonoids and antioxidants against the DPPH and ABTS radicals has been determined by using colorimetric and spectrophotometric tests. These allow us to consider this species as a source of bioactive compounds of biotechnological interest, mainly for pharmaceutical or food components.

P2-7. **Season long, base-wide monitoring needed to characterize adult mosquitoes at an Army National Guard Training Facility**

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Army National Guard training requires personnel to occasionally visit wild areas for one weekend a month and two weeks a year. During this time, the soldiers may be exposed to mosquitoes and be at risk of mosquito-borne pathogens. Our survey investigated the mosquitoes at the Camp Gruber Military Training Base, and in the adjacent town of Braggs, OK. Thirty traps (10 BG Sentinel Traps and 20 modified CDC light traps), using CO2 as attractant, were placed every other weekend (Friday morning-Sunday morning) for 23 collection periods between mid-April and late October. A total of 10,405 mosquitoes from 7 genera and 26 species were collected, representing about 40% of the 64 species known from Oklahoma. The majority (98.4%) of mosquitoes were collected from CDC traps which mainly collected *Culex spp*. (71.8% of total). Of the BG trap collected mosquitoes, 40.2% were *Aedes spp*. The most abundant species were in the genus *Culex*, of which some can transmit West Nile Virus. A single *Aedes aegypti* was captured on the base, potentially as a result of the movement of military and D.o.D equipment from Louisiana. This capture, along with the capture of Asian tiger mosquito, *Aedes albopictus*, highlights the need for regular season-long monitoring to protect troops during training. Information generated from this study is being used to create a management plan for the base.

P2-8. **The impact of sorghum phenology and variety on population growth and longevity of sugarcane aphid (*Melanaphis sacchari*, Zehntner (Hemiptera: Aphididae))**

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Sugarcane aphid (*Melanaphis sacchari)* is an economically important pest of grain sorghum throughout much of the U.S. since 2013. Since the outbreak these aphids have resulted in severe losses in sorghum and the issue has progressed each year both in area and scale economic of damage. To have a better understanding about growth potential based on different level host suitability is very important for assessing the potential risk and control measures of these insects. We conducted a greenhouse experiment evaluating sugarcane aphid reproduction and longevity at 5th true leaf, primordial panicle initiation, milk and hard dough plant growth stages on sugarcane aphid resistant and susceptible grain sorghum hybrids. The number of sugarcane aphid progeny per female, net reproduction (Ro), intrinsic rate of increase (Rm), and population doubling time for sugarcane aphid was greater on the susceptible sorghum hybrid relative to the resistant hybrid. Among sorghum growth stages, sugarcane aphids lived significantly longer on sorghum at the milk and primordial panicle initiation stages relative to the 5th true leaf and hard dough stages. These data suggest that antibiosis is probably involved as a mechanism of host-plant resistance and that aphid population growth will be quicker when infestations

occur during the early reproductive period of plant development.

P2-9. Evaluation of resistance to bird cherry-oat aphid (*Rhopalosiphum padi*) in wheat germplasm

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Wheat (*Triticum* sp.) is the world's most farmed crop by surface area and is widely grown across the southern-central areas of the United States such as Oklahoma, Texas, and Kansas. Wheat in these areas is generally used for grain harvest, as forage for grazing cattle, or both. One of the most important pests of wheat in many areas of the world, including the United States, is the bird cherry-oat aphid or BCOA (*Rhopalosiphum padi*). BCOA are capable of harming the wheat through their feeding on the wheat as well as through the transmission of Barley Yellow Dwarf Virus. Because of the significant damage caused by BCOA, the search for effectively resistant hybrids of wheat is increasingly important. A BCOA-phenotyping assay was developed specifically for the Wheat Improvement Team (WIT) by Drs. Zarrabi and Giles of Oklahoma State University. Hundreds of lines from different OSU segregating populations have gone through the screening and re-confirmation through growth chamber trials as well as field trials. The objective of this study will be to describe the selected plants with different types of behavior as antixenosis, antibiotic, or tolerance. The methodology of the conducted trials will be discussed.

P2-10. Crapemyrtle bark scale *Acanthococcus lagerstroemiae* (Hemiptera: Eriococcidae) ecology

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Sustainable, effective management of crapemyrtle bark scale, *Acanthococcus lagerstromiae* (Kuwana), a non-native pest from Asia, will likely include biological control. Before this strategy can be implemented an examination of the ecology associated with the scale in its introduced environment is necessary. In Texas, surveys of the crapemyrtle (*Lagerstroemiae* spp.) ecology were undertaken in Tarrant and Brazos counties. A rich arthropod community was discovered, including predators such as spiders (Araneae), ladybeetles (Coccinellidae), lacewings (Chrysopidae), assassin bugs (Reduviidae), and pirate bugs (Anthocoridae). The most commonly collected insect species were consistently found in the spring, summer and fall, and between the two sites. A number of parasitic Hymenoptera species were collected in this survey, but none were found to be parasitizing *A. lagerstroemiae*. In Brazos county, experiments were carried out to discover which crapemyrtle-inhabiting predatory insects consumed *A. lagerstroemiae*. The coccinellids *Chilocorus cacti* (Linnaeus) and *Harmonia axyridis* (Pallas), were the most commonly collected predators in this experiment and both displayed high rates of scale consumption. Aided by these studies and scientific literature, a food web was constructed to illustrate direct and indirect effects of the predator community on *A. lagerstroemiae* in Texas.

P2-11. Analyzing the significance of photoperiod on fitness of sugarcane aphid,*Melanaphis sacchari*, on sorghum

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Little is known of the biology of sugarcane aphid, *Melanaphis sacchari* (Zehntner), that became a persistent pest of sorghum, *Sorghum bicolor* (L.) Moench, in North America in 2013. Understanding fitness of sugarcane aphid in relation to environmental conditions would aid in understanding how aphids develop and evaluating sorghum for resistance to this major insect pest. Effect of three photoperiods of 14:10, 13:11, and 12:12 light:dark hours were evaluated on sugarcane aphids on susceptible 'Tx399 x RTx430' sorghum at daily light (day) and dark (night) temperatures of 30 and 20°C in an incubator. A sugarcane aphid from a pure colony was put individually into a clip cage, with two clip cages per each of four plants in six pots. When each aphid produced a nymph, the mother was discarded and the nymph retained and allowed to mature and produce offspring until it died in the clip cage. Nymphs produced were counted and removed each day. The pre-reproductive period was ~53% longer (6.6 days) at 14:10 light:dark hours than at the other photoperiods. The reproductive period at 14:10 was 13.9 days, 2 days longer than at 13:11 (11.8 days). The post-reproductive period averaged 7.1 days at 13:11, 4.7 days longer than at 12:12 (2.4 days). Total fecundity at 12:12 (82.8 aphids) was 17 aphids more than at 13:11 (65.7), and 26 more than at 14:10 (56.2). Developmental times and fitness of sugarcane aphids differed significantly at the different photoperiods. Photoperiod should be considered when

evaluating sorghum for durable resistance against sugarcane aphids.

P2-12. **From invasive pest to ecological supporter: Benefits of the sugarcane aphid (*Melanaphis sacchari*) to native Hymenoptera**

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Invasive species cause devastating effects to the ecology in areas where they are introduced. Unlike an invasive insect's native range, foreign ecosystems often lack natural predators and diseases that regulate their population. Sometimes, a native species switches hosts and functions like an invasive species, as is the case for the sugarcane aphid (SCA), *Melanaphis sacchari*. Beginning in 2014, the SCA has impacted sorghum growers throughout the sorghum belt in the central United States. The aphids colonize grain sorghum in June, and colonies quickly build causing chlorosis. In addition, the aphids excrete honeydew, which accumulates on the leaf below their feeding site leading to sooty mold growth and further limiting plant photosynthesis. We observed various species of native Hymenoptera visiting SCA colonies on sorghum feeding on the excreted honeydew. In this study we document twenty-four species belonging to ten different families. These include many natural enemies or predators of potential pests in Oklahoma. The observed high diversity of beneficial insects in a monoculture crop highlights an unrecognized potential benefit of SCA, which aids the surrounding natural biodiversity by providing a sugar resource in an otherwise low diversity environment.

P2-13. **Strategy to eliminate *Candidatus* Liberibacter solanacearum from *Bactericera cockerelli* (Sulc.) by applying antibiotic**

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The psílido of the potato and the tomato *Bactericera cockerelli* (Sulc.) (Hemiptera: Triozidae), is an important pest in horticultural crops worldwide. Transmits the bacterium *Candidatus* Liberibacter solanacearum causing the disease of zebra chip in potato causing internal necrosis in the tubers, in tomato the disease is known as permanent tomato and chile variegated chile, in addition to preferentially affecting other solanaceae species. *Ca.* Liberibacter is a bacterium recently introduced in Mexico, which is associated with disease HLB of citrus. Plants solanaceae affected with *Ca.* Liberibacter solanacearum symptoms such as leaf yellowing, shortened internodes, overgrowth of axillary buds and growth retardation to name a few occur. *Ca.* Liberibacter solanacearum control focuses on reducing inoculum sources, such as the use of healthy plants, symptomatic plant removal, chemical control of the vector insect and the use of antibiotics to reduce the transmission of the bacteria. Keywords: *Bactericera cockerelli, Candidatus* Liberibacter solanacearum, antibiotic.

P2-14. **On-plant bioassays of *Metarhizium rileyi* and *Heterorhabditis* nematodes against fall armyworm, *Spodoptera frugiperda***

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The fall armyworm, *Spodoptera frugiperda*, is one of the most important corn pests; entomopathogens could play an important role in fall armyworm management. *Metarhizium* (=*Nomuraea*) *rileyi* and *Heterorhabditis* nematodes are pathogens of lepidopterans. Bioassays were carried out to evaluate the mortality caused by native strains of these pathogens on 3rd instar fall armyworm larvae, in the laboratory and on plants in the greenhouse. In the laboratory, *M. rileyi* spores were suspended in water with Bionex (0.3%), the treatments were T1=$1x10^9$, T2=$1x10^8$, T3=$1x10^7$, T4=$1x10^6$, T5=$1x10^5$ (all spores/ml). The treatment 1-4 caused quick mortality after between 72-120 hours, killing almost 100% of larvae; the treatments 2, 3 and 4 also killed almost 100% of larvae between 72-168 h; but more sporulation was observed on killed worms at lower concentrations, especially in Treatment 4 (60 % sporulation). In the greenhouse test on corn plants, we sprayed three concentrations of *M. rileyi* spores/ml (T1=$1x10^6$, T2=$1x10^7$, T3=$1x10^8$), and one suspension of Heterorhabdtis nematodes (700 nematodes/ml) was applied using a micropippete. All were applied at 5 ml/plant (n=32 plants/treatment). Treatments were evaluated every 24 hours. Treatments 2 and 3 induced the highest mortality (82 and 72 %) with no significant differences. Heterorhabditis induced 32% of mortality. These native strains are interesting biological control agents of fall armyworm that should be tested in open field.

P2-15. **The effects of below-ground chemical cues from entomopathogenic nematodes on host plant selection of diabroticite beetle larvae**

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Chemical cues play important roles in mediating interactions among organisms at different trophic levels. Insect herbivores frequently use plant odors to locate suitable host plants and natural enemies, such as predators and parasitoids, are often attracted to cues associated with their prey animals. It is increasingly clear that belowground chemical cues are ecologically important for soil-dwelling organisms. In this study, we investigated the influence of belowground chemical cues from natural enemies on herbivore foraging behavior. More specifically, we examined whether root-feeding diabroticite larvae avoided cucumber plants with odor cues from their entomopathogenic nematode (EPN) natural enemies. We found that EPN-infected insect cadavers emit characteristic volatile cues different from those of dead insects. Our findings also revealed that striped cucumber beetle larvae (*Acalymma vittatum*), a specialist herbivore of plants in the family Cucurbitaceae, preferred roots of cucumber plants (*Cucumis sativus*) without EPN cues. In contrast, spotted cucumber beetle larvae (*Diabrotica undecimpunctata howardi*), a generalist herbivore, did not exhibit a preference for plants without EPN cues. Our results indicate that some herbivores avoid cues from their EPN natural enemies while still locating an alternate food source and that their response to EPN cues appears to be related to host plant specialization. These findings have important implications for pest management in agricultural systems and suggest growers could experience additional benefits of using EPN for biological control. The use of EPN could offer growers a control method with two aspects of plant protection by directly killing insect herbivores as well as altering host plant their selection.

P2-16. **The Lost Cricket Project: engaging citizen scientists in acoustic biomonitoring to establish occurrence of a cryptic Orthopteran species**

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Gryllotalpa major (prairie mole cricket) is the largest species of cricket in North America. Male prairie mole crickets construct acoustic chambers in the soil from which they call to attract flying females. The prairie mole cricket is listed as a Tier 1 species of greatest conservation need by the Oklahoma Department of Wildlife Conservation and as data deficient by the International Union for Conservation of Nature. Little is currently known about the spatial distribution of this species in Oklahoma. This study aims to achieve the following objectives: 1) Create a citizen science program to raise awareness, promote community involvement, and obtain scientific data. 2) Produce logistic models that can predict when males will call and when females will fly. A citizen science program, called the Lost Cricket Project, was developed to locate new prairie mole cricket populations in Oklahoma. This was achieved by creating a mobile phone app using survey123 for ArcGIS. This app allowed citizen scientists to submit recordings of the prairie mole cricket, along with their location and habitat information. To provide accessible training to participants, a video series was developed that covered the following topics: 1) Lost Cricket Project Overview 2) Prairie Mole Cricket Ecology 3) How to Identify the Prairie Mole Cricket Call 4) How to use the Lost Cricket Project App. To recruit participants, 402 potential stakeholders were identified and contacted. Ultimately, this data will be used to update the species distribution map for Oklahoma and to help create protocols for future acoustic surveys.

Student Poster Competition: Ph.D

P3-1. **The role of habitat heterogeneity and plant quality in structuring grassland arthropod communities**

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Habitat heterogeneity can influence arthropod abundance, diversity, and composition through its effects on biotic and abiotic factors. Because plant biomass and diversity are often correlated with arthropod abundance and diversity, manipulating the plant community by adding nutrients or altering vegetation structure should have a cascading effect on the arthropod community. We explored how habitat heterogeneity and quality work together to regulate grassland arthropod communities. To do this, we manipulated both habitat heterogeneity (using three vegetation clipping treatments) and plant biomass and nutrient availability (using NPK and micronutrient fertilization). From May through August 2017, we monthly quantified how these treatments affected plant biomass, plant C:N ratios, and microclimate. We also collected arthropods

using vacuum sampling and pitfall traps to measure arthropod abundance, diversity, and richness. We found that both clipping and fertilization treatments affected plant biomass and microclimate, including light availability, temperature, and humidity. By decreasing plant biomass, clipping simplified habitat structure and reduced arthropod abundance, diversity, and richness. This reduction was mediated by fertilizer addition, which increased plant biomass and habitat volume, resulting in lower average surface temperature and higher average humidity on plots. By itself, increasing plant biomass through fertilization increased arthropod abundance and richness. In addition, we show the indirect effects of changing microclimate and plant biomass promoted shifts in arthropod community composition. These results demonstrate the role of habitat heterogeneity and plant quality in structuring arthropod communities, specifically by regulating microclimate and providing habitat space.

P3-2. Evaluating botanical powders to control maize weevil, *Sitophilus zeamais* Motschulsky (Coleoptera: Curculionidae), in stored sorghum grain

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Botanicals were evaluated as alternatives to control maize weevil, *Sitophilus zeamais* Motschulsky, in stored sorghum, *Sorghum bicolor* (L.) Moench. Beetles and moths of stored grain at farm and consumer levels damage 5-35% worldwide and >40% in tropical countries. Maize weevil is the most damaging storage insect of sorghum grain. Management of storage insects relies on insecticides that leave residues in food and the environment. Treatments were powders of neem bark, *Azadirachta indica*; mesquite pods, *Prosopis glandulosa*; milkweed leaves, *Asclepias speciosa*; and a check (no botanical powder). Eight newly emerged maize weevils were provided 5 g of Malisor-84 grain treated with three doses of each plant powder. Every 2 days, data were recorded on the number of adults killed by each treatment. Percentage killed was calculated by dose per treatment and compared with the check. Grain loss was calculated based on initial and final weights. LD_{50} was determined by Probit analysis, and associations between variables were assessed by simple linear correlation. Powder of mesquite and milkweed at 0.2 g were more effective than neem or the check in killing *S. zeamais* (>90%) and reducing grain damage (34-35.2%) and weight loss (0.8%). Milkweed at 0.1 g and neem at 0.2 g killed 78.1% of weevils. Neem at 0.05 g was slow acting, resulting in 62.5% dead and more grain damage (59.5%) and weight loss (3.6%). Botanicals at low doses (LD_{50} = 0.2-0.4 g) showed efficacy in controlling maize weevils and are recommended alternatives to guarantee quantity and quality of stored cereal grains.

P3-3. Keeping up to date on the threat of *Tagosodes orizicolus* and *Rice hoja blanca virus* to Texas rice

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Rice hoja blanca virus (RHBV) is transmitted to rice by the rice planthopper, *Tagosodes orizicolus*. This plant virus has four single stranded RNA (ssRNA) genome segments and is transmitted in a persistent-propagative manner by its vector. *T. orizicolus* is the most damaging pest of rice in tropical regions of South and Central America, and when combined with RHBV, causes up to 100% yield loss. *T. orizicolus* was found in the United States in the 1950s and 1960s and not again until the Fall of 2015 when it was detected attacking ratoon rice fields west and south of Houston, TX. In 2015, *T. orizicolus* caused severe yield loss, up to 25%, on ratoon rice from direct feeding and oviposition damage, commonly known as 'hopperburn'. Moreover, *T. orizicolus* was found again on ratoon rice during the Fall of 2018 in Galveston, Matagorda and Calhoun Co., TX. Field-collected specimens of *T. orizicolus* from the 2015 and 2018 outbreaks in Texas were tested for RHBV either individually or in pools, respectively, using RT-PCR. All *T. orizicolus* samples tested were negative for two ssRNA segments of RHBV used in our molecular diagnostic assays. With the recent 2018 United Nations Intergovernmental Panel on Climate Change report of warming temperatures, this normally tropical insect vector and plant virus continue to threaten rice production in Texas and the United States. It is crucial to remain vigilant for future outbreaks of *T. orizicolus* and the potential introduction of RHBV to Texas to safeguard the rice industry of our country.

P3-4. **Ideal tree host shifts in response to increased temperature and rainfall for the fall webworm (*Hyphantria cunea*)**

Amy Adams (amy.e.adams@ou.edu), Univ. of Oklahoma, Norman, OK

Understanding insect herbivores' stress tolerances is an important ecological and agricultural objective, as it allows for more effective predictions and management regarding a population's abundance and plant consumption. Consistent with the principle of allocation, I suggested that there may be a trade-off between tolerance to chemical stress (specifically defense chemicals produced by host plants) and tolerance to physical stress (such as heat and drought) in the fall webworm (*Hyphantria cunea*). To test this hypothesis, I ran a multifactorial foliage feeding experiment. The experiment exposed larvae of this native North American moth species to leaves from its two most common deciduous tree hosts: the persimmon (*Diospyros* sp.), which has a lower leaf toxicity, and pecan (*Carya* sp.), which has a higher leaf toxicity. The experiment also featured abiotic conditions that mimicked summer and fall temperatures and the natural precipitation gradient in Oklahoma, USA, in which rainfall is highest in the east and decreases westwards. As expected, there was a trade-off between heat and toxin tolerance. Larvae fed pecan leaves in hot, wet conditions had the highest mortality and lowest growth rate of any treatment. Unexpectedly, in dry conditions larvae on pecan leaf diet had a higher survivorship, growth rate, and pupal mass than larvae on persimmon leaf diet. Larvae on a persimmon leaf diet achieved almost double the mass of larvae on a pecan leaf diet in the final instars, except when conditions were dry.

Regular Posters

Regular poster session

P4-4. **Function and regulation of serine proteases and their homologs during immune responses of *Manduca sexta***

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Serine proteases (SPs) and serine protease homologs (SPHs) participate in digestion, development and defense of insects. We have identified 237 SP-related genes in the *Manduca sexta* genome. Their structural features and phylogenetic relationships are examined, and so are their expression profiles in tissues of the insect at different stages. Proteomic analysis has revealed the presence, abundance and posttranslational modification of these proteins. With specific antisera available to some of them, we have started to examine the network constitution and function during immune responses. Here we present overview of the insect immune system, roles of SPs and SPHs in mediating prophenoloxidase (proPO) activation and cytokine production in relation to melanization, encapsulation, Toll signaling and antimicrobial protein induction. The system consists of at least 4 recognition proteins, 9 SPs, 2 SPHs, PO heterodimer, Spätzle-1, and a few stress responsive peptides (*e.g*. plasmatocyte spreading and growth blocking peptides). Two positive feedback loops up-regulated the SP-SPH network whereas twelve serpins inhibit the SPs by forming inactive complexes. These represent the best knowledge on extracellular immune signaling system of an insect and serve as a background for the complete system elucidation in *M. sexta* as well as comparative studies in other holometabolous species.

P4-5. **Economic injury level for bermudagrass stem maggot in bermudagrass forage production in Texas**

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The bermudagrass stem maggot, *Atherigona reversura* Villeneuve, is a relatively new pest of bermudagrass *Cynodon dactylon* (L.) Pers grown for forage in the southeastern US. Damage results from a single larva that feeds internally on the vascular tissue just above the terminal node of the grass stem. Damage slows plant growth and reduces forage accumulation. To address the need for guidelines to manage this new pest, the relationship between the percent of tillers damaged by bermudagrass stem maggot and forage yield was measured in commercial bermudagrass hay fields in northcentral Texas. Yield loss was estimated at 8.9 lbs per acre for each percentage of stems damaged by bermudagrass stem maggot. Economic injury levels and economic thresholds were calculated for a range

of hay market values and control costs. The impact of stem damage on protein content and digestibility of bermudagrass hay was also investigated.

P4-7. Management of early-season insect pests in Texas high plains cotton: Transitioning to dryland production

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The Texas High Plains (THP) is a semi-arid region with characteristic low rainfall, with production agriculture supported by limited irrigation or rain-fed. As a result, the cropping system in this region is largely low-input and the producer decision-making in economically profitable input use is a challenge. THP has been facing some significant drought conditions in recent years, including the drought of 2011 that claimed much of the Texas production agriculture, reducing total cotton yield that year by 55%. Drought conditions ensued the next 3 years that disproportionately depleted the underground water, significantly shifting the cotton production outlook in THP to even more low-input with dryland acreage reaching to >65%. The shift in cotton production system due to devastating droughts in an already semi-arid region has altered our input resources, cultivars, and management practices. Low cotton market price, increased nitrogen fertilizer price, and reduced water availability have forced farmers to move toward reorganizing available input resources to sustain their production enterprise. Thus, transitioning to the new crop production reality via developing economic data-based input management practices has become our priority to sustain producer profitability.

The objectives of this project were to: 1) quantify the impact of single (thrips or cotton fleahoppers) versus multiple (thrips and cotton fleahoppers sequentially) pest infestations on cotton lint yield and fiber quality under two irrigation water regimes (water-deficit treatments), and 2) develop a dynamic optimization economic model that maximizes the net returns from management of single versus multiple pest infestations under water-deficit crop production conditions. Thus, the scope of this proposed work entails integrating production practices and pest management options under numerous cotton management scenarios (10 total scenarios) and the management options would be developed based on breakeven value and net return of each option for farmers to choose depending on the availability of water resources on their farms.

In 2018, thrips and fleahoppers impacting cotton production risks were evaluated with five combinations of single versus sequential infestations under two water-deficit (near-zero deficit or full irrigation and high deficit or dryland) regimes, replicated four times (total 40 plots). Water deficit conditions and insect infestations impacted crop growth profile as well as lint yield. For example, fleahopper infestation resulted in increased apical growth of the plants in water-deficit conditions, whereas sequential infestation of two insect pests increased the plant apical growth in irrigated plots. Lint yield was similar across all five treatment combinations under dryland condition while the sequential infestation of two pests significantly reduced the lint yield compared to that under irrigated condition, indicating the impact of drought conditions on modulating the effect of insect pests as well as the plant's compensatory ability. Once multi-year data are available, a robust economic analysis will be presented.

P4-8. Impact of host plant resistance on interaction between sorghum and sugarcane aphid at transcriptome level

Mahnaz Kianifariz (mahnaz.kianifariz@ag.tamu.edu) and Adrianna Szczepaniec, Texas A&M AgriLife Research, Amarillo, TX

Sugarcane aphid (*Melanaphis sacchari*) outbreaks in sorghum are now the most significant threat to this crop in all major sorghum production areas in the U.S. The outcomes of interactions between sugarcane aphid and sorghum and thus the severity of the outbreaks depend on sorghum genotype and potentially also on the phenology of sorghum. Mechanisms underlying these interactions are not known, however. Thus, the goal of this research was to characterize transcriptional changes in a commercially available resistant and a susceptible genotype of sorghum at 2- and 6-wk post-emergence exposed to *M. sacchari* herbivory.

A higher number of diffentially expressed genes (DEGs) was recovered from the 2-wk plants exposed to aphid herbivory compared to the 6-wk plants across genotypes. Further, gene ontology and pathway analysis indicated a suite of transcriptional changes in the resistant genotype that were weak or absent in the susceptible sorghum.

Specifically, the aphid-resistant genotype exposed to *M. sacchari* up-regulated several genes involved in defense, which was particularly evident in the 2-wk plants that showed the most robust transcriptional responses. These transcriptional changes in the younger resistant sorghum were characterized by induction of hormone-signaling pathways, pathways coding for secondary metabolites, glutathion metabolism, and plant-pathogen interaction and genes involved in detoxification. These transcriptional responses were reflected in the aphid population growth, which was significantly faster in the susceptible and older sorghum than in the resistant and younger plants. This experiment provided the first insights into molecular mechanisms underlying lower population growth of *M. sacchari* on the resistant sorghum genotype.

P4-9. **Native bees and associated forage plants of Parker County, Texas**

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A number of native bee species have exhibited sustained declines over the past century (Bartomeus et al., 2013), with most declines being tightly linked to reductions in local and landscape-level nesting and food availability, often as a result of agricultural and urban intensification (Winfree et al., 2009), as well as habitat loss and fragmentation (Kremen et al., 2002; Rathcke and Jules, 1993; Steffan-Dewenter and Westphal, 2008; Tscharntke et al., 2005). The purpose of this research was to collect and identify native bee species (Hymenoptera: Apoidea), and the plants they were collected from, in Parker County, Texas, to provide a baseline dataset of pollinator-host relations in the North-Central region of the state. Collections took place from February through August 2018. GPS coordinates were recorded for each host plant collected. Both native bees and plant hosts were identified to species. Over 1,800 individual bees were collected from 45 plant families. The plant family Asteraceae was observed to attract the largest diversity of bees while Fabaceae was observed to attract mostly bees from the Halictidae family. *Peponapis* bees were observed to be predominantly attracted to the plant family Cucurbitaceae. A replication of the experiment has been proposed with the goal of observing seasonal change in pollinator diversity and may include nearby counties for regional comparisons.

P4-10. **Pollinator attractiveness of drought tolerant plants in the Texas High Plains**

Samuel Discua (samuel.discua@ttu.edu) and Scott Longing, Texas Tech Univ., Lubbock, TX

The effectiveness of plantings to enhance habitat resources for pollinators depends on the attractiveness of native and non-native plants to foraging individuals. The objective of this study was to determine the attractiveness of 30 drought tolerant plants to foraging insect pollinators located in 60 plant/patches in the Texas High Plains. Plants were selected based on prior observation of pollinator visits, drought tolerance, and on their commercial availability. On 10 dates in 2017, we measured floral abundance and quantified the number of pollinators visiting plants using 10-second snapshot observations across 60 plant/patch replicates. A total of 46 insect morphospecies were observed from experimental plots. Bees (Apoidea: Anthophila) dominated the total abundance of pollinators, with honeybees (*Apis mellifera*) the most frequently observed insect and accounted for on 31.1% of all observations. Russian sage (*Salvia farinacea*) and Catmint (Nepeta x faassenii 'Walker's Low') attracted the greatest total number of insect visitors, with both attracting high relative abundances of honey bees. Native plants attracted the highest diversity of insect species, with Indian blanket (*Gaillardia pulchella*) attracting a total of twelve bee, three butterfly, and two fly species across sampling dates. Results from this study provide recommendations for pollinator friendly plants in the Texas High Plains, while determined taxonomic affinities provide greater options for landowners and farmers when making recommendations.

P4-11. **Transmission of *Fusarium oxysporum* f. sp. *vasinfectum* VCG 0114 (race 4) by stink bugs to cotton bolls**

Jesus Esquivel (jesus.esquivel@ars.usda.gov) and Alois Bell, USDA - ARS, College Station, TX

Fusarium oxysporum f. sp. *vasinfectum* VCG 0114 (race 4) (i.e., FOV race 4) is an emerging pathogen that causes severe root rot and wilt of cotton. Unlike other vegetative compatibility groups (VCG) of *F. oxysporum* that occur in the U.S., FOV race 4 occurs on clay and loam soils and does not require nematodes for disease development. FOV race 4 is seed-borne, but the mode of seed invasion is uncertain. Because stink bugs can ingest and introduce bacterial and yeast pathogens into cotton bolls, we determined whether stink bugs could

ingest and transmit FOV race 4. Brown and southern green stink bugs fed on FOV race 4 agar culture and readily transmitted the fungus to cotton bolls. Thus, management of FOV race 4 may require management of stink bugs to mitigate the spread of the disease in cotton.

P4-12. **BioCeres (*Beauveria bassiana*) and tank mix, do's and don'ts**

Manuel Campos (mcampos@biosafesystems.com), BioSafe Systems, East Hartford, CT

BioCeres is a biological insecticide based on *Beauveria bassiana*. This biological insecticide works by infecting the insect populating the insect's cuticle and it moves through the hemolymph. For a successful application, the environmental, crop, product compatibility and equipment conditions have to be under certain manner to deliver conidia onto the insects. This presentation will mention some "do's and don'ts" that will impact on insect infection.

P4-13. **Survey of possible incidence of *Helicoverpa armigera* invasion in Texas**

Megha N. Parajulee (m-parajulee@tamu.edu) and Stanley C. Carroll, Texas A&M Univ., Lubbock, TX

A four-year pheromone trap survey evaluated pheromone lure and types in capturing Helicoverpa moths with the overall goal of surveying the possible incidence of *Helicoverpa armigera* invasion in Texas. Five combinations of pheromone lures x trap types were evaluated from mid-July to early November. Surveys were conducted once a week and sample specimens were either dissected for morphological diagnosis or analyzed at USDA Laboratory for molecular diagnostic of *H. armigera* incidence. Based on our limited survey locations, we found no evidence that *H. armigera* invasion has occurred in Texas.

P4-14. **Phantasmagorical phasmids**

Shane McMurry (shane.mcmurry@okstate.edu), Oklahoma State Univ., Pawnee, OK

Walkingstick insects are a key living feature of the entomological outreach program that is the OSU Insect Adventure. The Insect Adventure facility houses seven species of live walkingsticks including *Medauroidea extradentata* (Annams), *Heteropteryx dilatata* (Jungle Nymphs), *Eurycantha calcarata* (Thorny Devils), *Phyllium philippinicum* (Walking Leaves), Phobacticus serratipes (Giant Malayan Walkingsticks), and *Peruphasma schultei* (Black Beauties). Each of these animals are specialist folivores and only feed on shrubs and trees. A restricted diet means special care is taken to maintain a steady supply of food the whole year. Since the diet of wild tropical walkingsticks is available year-round, a greenhouse is used to maintain availability of leaves throughout the year. There are various tips and tricks to keeping walkingsticks and plants healthy. In this situation rearing walkingsticks is worth the effort to share these fascinating animals with the public by being available in outreach presentations.

P4-15. **The spider-mite predator *Oligota* sp. (Staphylinidae) in a sorghum field in Saltillo, Mexico**

Helmer Botello-Gomez (doctorsergiosanchez@gmail.com) and Sergio Sánchez-Peña, Universidad Autónoma Agraria Antonio Narro, Saltillo, CU, Mexico

Spider mites (Acari: Tetranychidae) are cosmopolitan polyphagous key pests. They often increase (flare) their populations on crops after chemicals are applied for control of other arthropods. We observed the little-studied spider mite predator, *Oligota* sp. (Coleoptera: Staphylinidae) on sorghum (*Sorghum bicolor*) sprayed for control of sugarcane aphid (*Melanaphis sacchari*) and other pests. Sorghum was planted on May 19 2018 at Saltillo, Mexico. The crop received aplications of: endosulfan (5 and 8 June), chlorpyrifos + permethrin (11 July), and chlorpyrifos (16 August). By 10 October, sugarcane aphids numbers were extremely low (0-10/plant), but two-spotted spider mites were moderately abundant with some leaf bronzing apparent. We sampled 25 R7 (grain-filling) plants on each of four dates. Sampling was separated as medium and high strata. Numbers of adult *Oligota* individuals/plant and (total/date) were as follows: 2.6 (64/10 October); 2.4 (60/12 October); 2.44 (61/14 October); 1.12 (28/16 October). Most *Oligota* were on the middle stratum. The population appeared to be declining. Few larvae were observed. Spider mite numbers and bronzing were moderate (around 100 mites of all sizes/ fully expanded leaf) apparently below EIL. The abundance of *Oligota* appeared to be associated with the relatively low spider mite numbers; some leaves had three beetles. Its abundance suggests that it is justified to study the impact of this beetle on spider mite abundance on sorghum.

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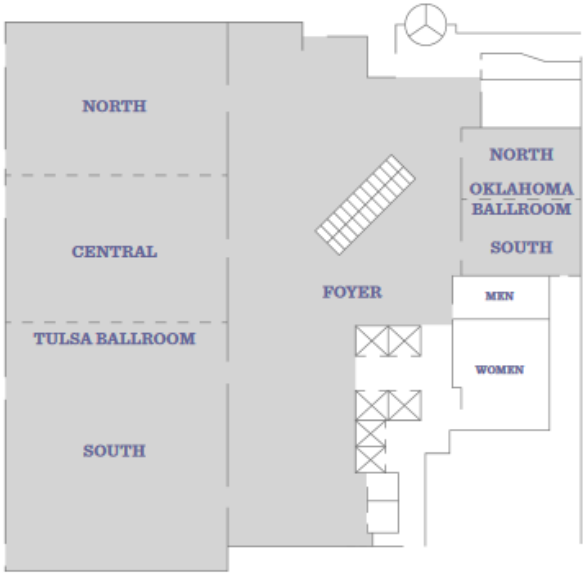
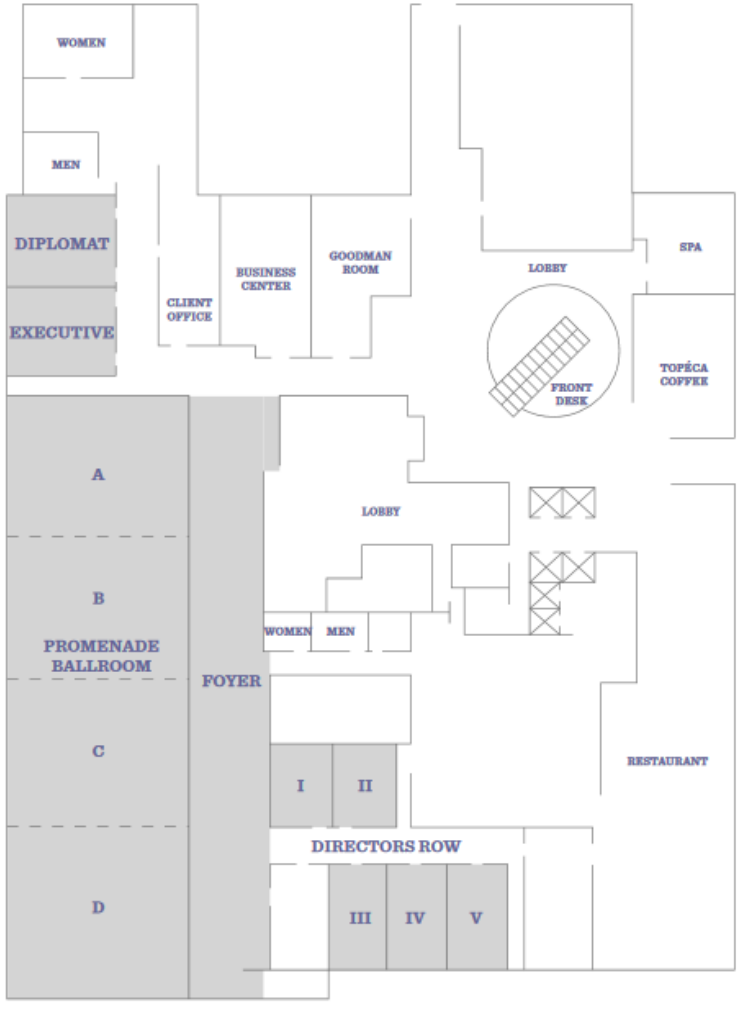
FLOOR PLAN

FIRST FLOOR
CONCOURSE LEVEL



SECOND FLOOR
LOBBY LEVEL



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Registration & Housing opens	JUNE 5, 2019
Function deadline (no fee)	JUNE 14
Virtual Poster deadline	JULY 31