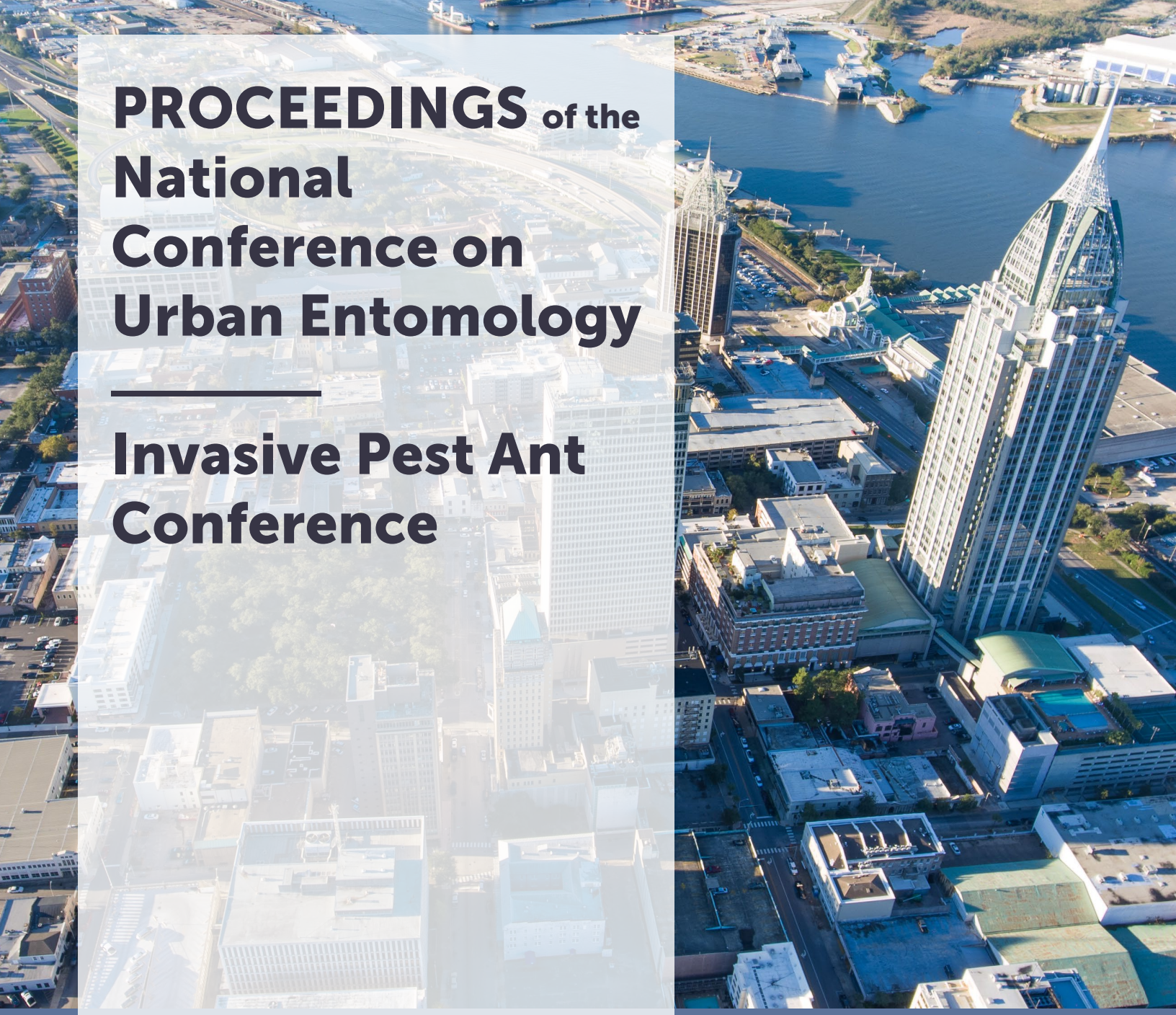

PROCEEDINGS of the National Conference on Urban Entomology

Invasive Pest Ant Conference

MAY 19-22, 2024

MOBILE, ALABAMA

Renaissance Mobile Riverview Plaza Hotel

Edited by: Erin Monteagudo, Veseris

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INTRODUCTION

This publication documents the 19th National Conference on Urban Entomology and Invasive Pest Ant Conference, held May 19th through May 22nd, 2024, in Mobile, Alabama—the hometown of renowned biologist E.O. Wilson. The conference provides an opportunity for urban entomologists in academia, industry and government to come together in an intimate setting and share research and observations specific to the field. Another goal of the conference is to provide scholarships to help support students working towards earning degrees in urban entomology. In addition to the bachelor's, master's and doctoral awards and the master's and doctoral student paper competitions, the conference was able to provide 11 student travel awards this year.

The conference saw a significant increase in attendance, growing from 142 participants at the 2022 conference in Salt Lake City, Utah, to 217 in Mobile. Salt Lake City marked the first physical gathering after the 2020 event had to be held virtually in 2021 due to the global COVID-19 pandemic. The rise in participation reflects not only a return to in-person gatherings but also the growing importance of addressing urban entomology and invasive pest ant challenges.

The next conference is scheduled for May 2026 in Atlanta, Georgia. The planning committee encourages everyone to keep in touch by subscribing to the mailing list or following NCUE on LinkedIn for updates on future events.

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AWARDS PRESENTATIONS

Distinguished Achievement in Urban Entomology
THE ARNOLD MALLIS MEMORIAL AWARD

Past Recipients

1986	Walter Ebeling – University of California, Los Angeles James Grayson – Virginia Polytechnic Institute & State University
1988	John V. Osmun – Purdue University Eugene Wood – University of Maryland
1990	Francis W. Leichleitner – Colorado State University
1992	Charles G. Wright – North Carolina State University
1994	Roger D. Akre – Washington State University Harry B. Moore – North Carolina State University Mary H. Ross – Virginia Polytechnic Institute & State University
1996	Donald G. Cochran – Virginia Polytechnic Institute & State University
1998	Gary H. Bennett – Purdue University
2000	Michael K. Rust – University of California, Riverside
2004	Roger E. Gold – Texas A&M University
2006	Coby Schal – North Carolina State University
2008	Nan-Yao Su – University of Florida
2010	Don Reierson – University of California, Riverside
2012	Shripat Kamble – University of Nebraska-Lincoln
2014	Jules Silverman – North Carolina State University
2016	John Klotz – University of California, Riverside
2018	Brian Forschler – University of Georgia
2021	Edward Vargo – Texas A&M University
2022	Chow-Yang Lee – University of California, Riverside

Learning the Language and Foraging Cues of Urban Arthropods…and How to Talk Back

Gerhard Gries

Department of Biological Sciences, Simon Fraser University, Burnaby,
British Columbia V5A 1S6, Canada

The talk aimed to present Gries-lab research on multi-modal animal foraging cues (1–3) and communication signals (4–9) in diverse animal taxa. Using select projects on arthropod foraging cues, the talk presented recent finding on (1) macro-nutrient foraging in western carpenter ants and European fire ants, (2) polarized light cues informing host plant selection by cabbage butterflies, and (3) rodent odor cues guiding queen bumble bees to suitable nest sites in early spring. The talk then proceeded to projects on arthropod and rodent communication signals. These projects included (4) research on novel courtship signals in German cockroaches, (5) waggle dance communication in honey bees, (6) the aggregation pheromone and antimicrobial peptides of common bed bugs, (7) wing light flash mate recognition signals in blow flies, (8) sonic and pheromonal communication signals in brown rats and house mice, and (9) web-borne contact pheromone components and volatile sex attractant pheromone component of female false black widow spiders. Each topic was based on complex experimental design and extensive data that cannot be detailed in this abstract. Instead, the publications that provided the basis for this talk are listed below as references, in the same sequence of topics numbered above.

NCUE Awards Chair Molly Keck & Gerhard Gries

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DOCTORAL AWARD

A Review on the Impacts of Indoor Vector Control on Domiciliary Pests: Good Intentions Challenged by Harsh Realities

Christopher C. Hayes & Coby Schal

Department of Entomology and Plant Pathology, North Carolina State University, Campus Box 7613, Raleigh NC 27695-7613, USA

Arthropod vectored diseases have been a major impediment to societal advancements globally. Strategies to mitigate transmission of these diseases include preventative care (e.g., vaccination), primary treatment, and most notably the suppression of vectors in both indoor and outdoor spaces. The outcomes of indoor vector control (IVC) strategies, such as long-lasting insecticide-treated nets (LLINs) and indoor residual spraying (IRS), are heavily influenced by individual and community-level perceptions and acceptance. These perceptions, and therefore product acceptance, are largely influenced by the successful suppression of non-target nuisance pests such as bed bugs and cockroaches. Adoption and consistent use of LLINs and IRS is responsible for immense reductions in the prevalence and incidence of malaria. However, recent observations suggest that failed control of indoor pests, leading to product distrust and abandonment, may threaten vector control program success and further derail already slowed progress towards malaria elimination. We review the evidence of the relationship between IVC and nuisance pests and discuss the dearth of research on this relationship. We make the case that the ancillary control of indoor nuisance and public health pests needs to be considered in the development and implementation of new technologies for malaria elimination.

NCUE Awards Chair Molly Keck & Christopher Hayes

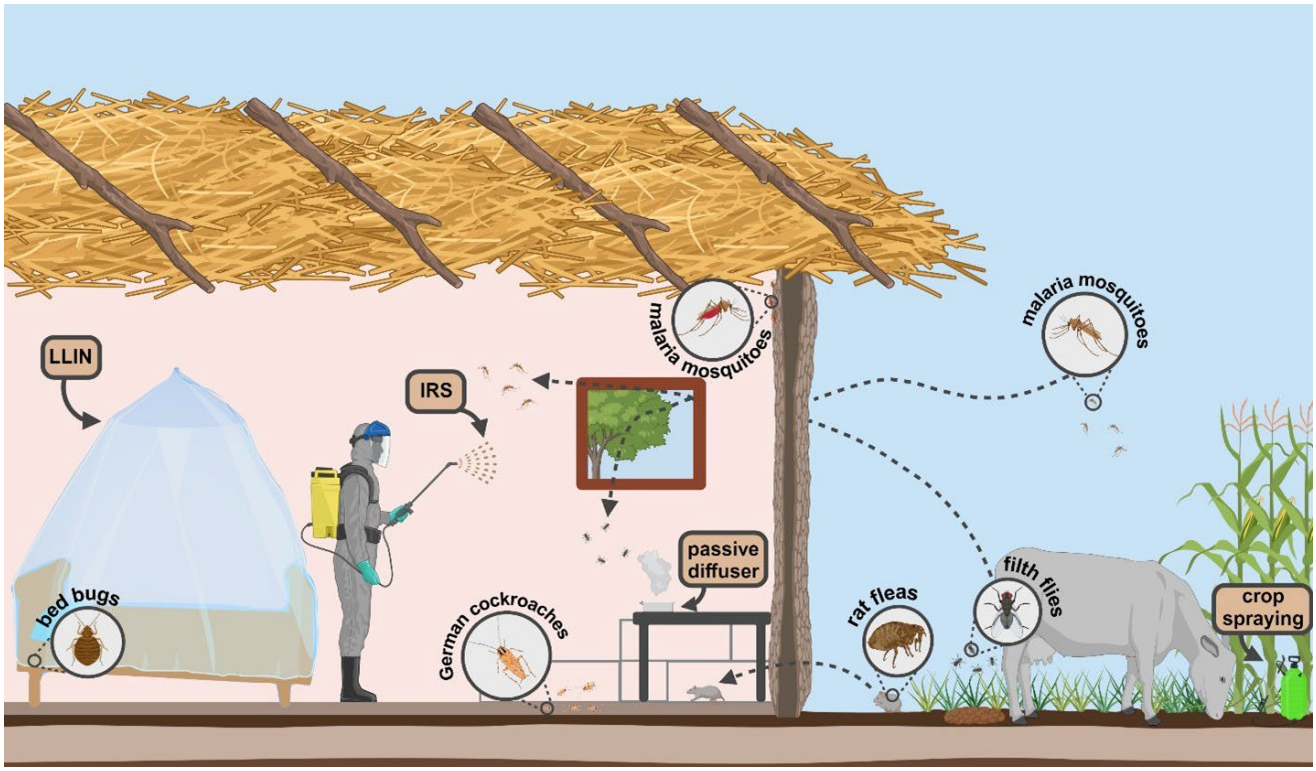

Figure 1. The overlap of indoor vector control tactics and domiciliary pests. The success of indoor vector control in malaria-endemic communities can be impacted by obligate domiciliary pests and transient pests that occasionally enter the home. Outside the home, highly mobile insects (house fly, *Musca domestica*; flea, *Ctenocephalides* and *Xenopsylla* spp.) are exposed to insecticides outdoors via targeted or crop sprays. In the home, obligate indoor pests with low mobility (bed bug, *Cimex* spp.; German cockroach, *Blattella germanica*) and those that have entered the home from outside are exposed to insecticides from consumer products (e.g., passive insecticide diffusers, aerosols), indoor residual sprays (IRS), and insecticide treated bed nets (ITNs), including long-lasting insecticide treated nets (LLINs). Each of these nontarget exposures exerts strong selection pressure on indoor pests in malaria endemic communities, leading to the widespread emergence of insecticide resistant pest populations, which greatly hinder and disrupt vector control programs. Figure created with BioRender.com.

MASTER'S AWARD

Ant Alarm Pheromones Deter Blacklegged Ticks, *Ixodes scapularis*

Claire Gooding, Charlotte Pinard, Regine Gries & Gerhard Gries

Simon Frasier University

Abstract

Blacklegged ticks, *Ixodes scapularis*, are obligatory blood feeders and transmit more disease-causing microbes than any other blood-feeding arthropod. Despite their reputation as blood-feeders, ticks spend most of their lifespan off hosts. Off-host ticks are highly susceptible to predation, particularly by ants, but the mechanisms underlying ant avoidance behavior have not yet been studied. Because foraging ants deposit semiochemicals to communicate with nestmates, and because blacklegged ticks have no defenses against ant predation, we tested the hypothesis that ticks avoid ant-frequented areas by sensing the ants' semiochemical deposits. In two-choice still-air olfactometers, we show that semiochemical deposits of thatching ants, *Formica rufa*, deter adult female blacklegged ticks. The deterrent semiochemicals originate from both the poison gland and Dufour's. Extracts of both glands combined, but not of either gland alone, proved deterrent to ticks. Additionally, we test synthetic gland extracts for potential future use in tick management.

Claire Gooding & NCUE Awards Chair Molly Keck

BACHELOR'S AWARD

Efficacy of Essential Oils in German Cockroach Control

Daniela Jackson, Angela Sierras & Zachary DeVries

University of Kentucky

Abstract

German cockroaches (*Blattella germanica*) are a challenging urban pest to control. The natural pest control market is rising due to environmentally conscious customers interested in products labeled as "natural," "nontoxic" and "plant based." To address the growing demand for natural products against urban pests, especially cockroaches, several products have been formulated with essential oils (EOs). The insecticidal profile of products with EOs are environmentally ideal; however, their effectiveness against the German cockroach, especially in terms of residual activity, remains to be investigated. Integrated pest management (IPM) approaches, such as the use of EO products have been proposed for their control. This study aimed to define the residual and direct exposure activity from commercially available EO products. The results will be discussed in the broader context of sustainable German cockroach management.

NCUE Awards Chair Molly Keck & Daniela Jackson

STUDENT TRAVEL AWARD WINNERS

From left to right: Jin-Jia Yu, Joey Yin Xin Chang, Fang-Ling Liu, Johnalyn Gordon, Elizabeth Wiles, Molly Keck, Grace Kolb, Benjamin Grady, Karen Corsetti, John Agnew, Benjamin Grady & Simona Principato.

STUDENT PAPER COMPETITIONS

MASTER'S

Utilizing +ssRNA Viruses Within Alginate Hydrogel to Combat the Invasive Big-Headed Ant, *Pheidole megacephala*

Joey Yin Xin Chang[1], John Lawrence[1], Chin-Cheng "Scotty" Yang[2] & Jia-Wei Tay[1]

[1]University of Hawai'i at Mānoa, [2]Virginia Tech

Abstract

The invasive big-headed ant, *Pheidole megacephala*, poses significant threats to agriculture and biodiversity, necessitating innovative and sustainable pest management strategies. This study explores a novel approach by integrating positive-sense single-stranded RNA (+ssRNA) viruses with alginate hydrogel as a delivery system for controlling the invasive *P. megacephala*, on the island of Oahu, Hawaii. This approach utilizes alginate hydrogel as a carrier that not only ensures the gradual release of the +ssRNA viruses, but also acts as a stable and eco-friendly platform for sustained viral delivery. The selection of +ssRNA is contingent upon the prevalence of a specific virus within the ant colonies, leveraging their potential as biopesticides against the target ant species. Through laboratory experiments, we assess the efficacy of this integrated approach in limiting the proliferation and impact of *P. megacephala* colonies. We expect promising results in terms of increased ant mortality and reduced colony sizes. This study not only addresses the immediate challenges posed by the *P. megacephala* in agriculture, but also lays the groundwork for developing targeted and sustainable pest management strategies using biopesticides within innovative delivery systems. As we strive to balance ecosystem sustainability with human activities, the integration of +ssRNA viruses and alginate hydrogel presents an environmentally friendly tool to control invasive ant species.

Bait Acceptance and Seasonal Activity of the Asian Needle Ant, *Brachyponera* (=*Pachycondyla*) *chinensis* (Emery), an Emerging Medically Important Species, in Central Georgia

Karen Corsetti & Daniel R. Suiter

University of Georgia

Abstract

The Asian needle ant, *Brachyponera* (=*Pachycondyla*) *chinensis* (Emery), is an invasive ant that inhabits our hardwood forests in the southern states. These ants have a negative ecological impact on mature temperate forests. This ant fauna eliminates the native species or reduces their abundance. Therefore, significant roles, such as seed dispersal and predation of forest pests, are unfilled. *B. chinensis* can pose a public health threat due to their ability to sting. There is no formal effective management plan to control *B. chinensis*. I developed three objectives to determine bait efficiency, bait preference, and seasonal activity for *B. chinensis*.

Objectives include (1) bait preference field and lab trials to evaluate the acceptance rate of four commercial baits: Advance® 375 A, granular bait (0.011% abamectin), Advion® Insect Granule bait (0.22% indoxacarb), Niban® Granular bait (5% orthoboric acid), Advion® Fire Ant (0.045% indoxacarb). I designed this assay so Asian needle ants would eventually encounter a bait granule while foraging. (2) In field bait efficiency trials, I constructed a twenty-plot transect to establish whether *B. chinensis* carries the bait to the colonies under field conditions. I baited each plot with one of the four baits and a control. (3) Pitfall traps to establish the seasonal abundance of *B. chinensis* with native ant taxa.

Evaluation of Menadione Toxicity in Various Food Sources on German Cockroaches (*Blattella germanica* L.)

Mohamed Sadiq Shaik, Qian Sun, James Ottea & Aaron R. Ashbrook

Louisiana State University

Abstract

Blattella germanica L. is a widespread indoor structural pest. One of their management strategies is to apply insecticidal baits. Residents may try to create bait to feed and manage cockroaches by mixing household foods with natural compounds (e.g., boric acid). Menadione is a synthetic vitamin K derivative, commonly utilized in animal feeds, and is structurally similar to naphthoquinones. Although menadione has insecticidal activity, its efficacy against *B. germanica* has not been previously tested. Thus, this study's goal is to assess the toxicity of menadione against *B. germanica* when combined with different foods. This goal was achieved by: 1) Conducting no-choice and choice dose-mortality response experiments where laboratory and field collected *B. germanica* were fed menadione mixed with household foods (sugar or banana chips), related pure ingredients (fructose or starch), and rodent chow (control). 2) Evaluate the weight of the bait mixture consumed, by both food and population type. Dose-dependent mortality was found in no-choice tests with menadione. In both J-wax and BR strains, menadione's efficacy varied by food: rodent chow was most effective, followed by starch, banana chips, fructose, and sugar. However, mortality of BR strain is less compared to the J- Wax. The food consumption was also less with the BR strain when compared ($p=0.03, 0.001$) for J-wax and BR strains respectively. In choice bioassays, menadione was much less effective, indicating repellency or unpalatability. These findings have implications for the usage of menadione against German cockroaches and residents attempting at home cockroach management.

Optimizing Comfort of CNC Knitted Micro-Resolution Mosquito Bite Blocking Textiles

Kyle Oswalt & John Beckmann

Auburn University

Abstract

Mosquitoes and other biting arthropods transmit diseases worldwide, causing over 700,000 deaths each year, and costing about 3 billion USD annually for Aedes species alone. Insect vectored diseases also pose a significant threat to agricultural animals, for example Eastern Equine Encephalitis can be fatal to horses. While clothing could provide a simple solution to vector-borne diseases, modern textiles do not effectively block mosquito bites. To address this issue, we have designed three micro-resolution knitted structures, with five adjustable parameters that can block mosquito bites. These designs, which exhibit significant bite reduction were integrated into a computer numerical control knitting robot for mass production of bite-blocking garments with minimal human labor. We then quantified the comfort of blocking garments. Our knits enable individuals to protect themselves from insects amidst their day-to-day activities without impacting the environment.

Assessing the Efficacy of Multiple Insecticidal Classes Against the Common Bed Bug (*Cimex lectularius*)

Bandana Shrestha, James A. Ottea, Qian Sun & Aaron R. Ashbrook

Louisiana State University

Abstract

Pest control professionals use different classes of insecticides for bed bug management. Insecticides are sometimes used before or after a heat treatment for better management of bed bug infestations. However, insecticide efficacy can vary at elevated temperatures. Therefore, the overall project goal is to determine how insecticide efficacy is impacted at varied environmental conditions with bed bugs. To do this, we must first establish effective insecticide doses under standard conditions. Thus, the objective is to determine the LD50 for three different insecticides using bed bugs, enabling further studies to assess their efficacy at varied environmental conditions. Topical application bioassays were conducted on the Harlan strain with clothianidin, bifenthrin, or chlorfenapyr. Mortality was scored every 24 hours for up to 10 days. Acetone was applied as the control. The dose-mortality responses of the Harlan strain to each insecticide were analyzed using the PROC probit procedure. LD50 values were determined at different observation days: bifenthrin, clothianidin and chlorfenapyr on day 1, 2 and 6, respectively. Bifenthrin showed the highest efficacy with an LD50 of 0.0112 µg/insect (Fiducial Limits: 0.003–0.73 µg/insect) followed by clothianidin and chlorfenapyr with LD50 of 0.289 µg/insect (Fiducial Limits: 0.13–0.76 µg/insect) and 0.215 µg/insect (Fiducial Limits: 0.06–0.45 µg/insect) respectively. Doses were then validated against bed bugs, to confirm they could cause the desired level of mortality. These results will enable experiments where sub-lethal environmental conditions can be combined with the above-mentioned insecticides, contributing to the development of pest management strategies.

DOCTORAL

Termite Damage and Area-Wide Management of Korean Wooden Heritages

Sihyun Kim, Changwook Jo & Suji Kim

National Research Institute of Cultural Heritage
132, Munji-ro, Yuseong-gu, Daejeon, Republic of Korea

Abstract

South Korea is located in Far East Asia and has a large number of wooden heritage buildings. Termites and wood decay fungi are the main causes of damage, and a recent study found that about 51% of Korea's nationally designated wooden cultural heritage sites have termite damage [Kim and Chung, 2022a]. The dominant termite species in Korea is *Reticulitermes speratus* [Kim and Kim, 2024]. In addition, trade with foreign countries has led to the introduction of invasive termites, and increased winter temperatures enabled them to survive and establish. For example, *Incisitermes minor*, a worldwide invasive termite species, is found in Korea [Lee et al., 2024]. There are also concerns about the introduction of *Coptotermes formosanus* and other invasive termites due to the ongoing climate change [Lee et al., 2021].

The damage by termites alters the original form of wooden cultural heritage and reduces structural stability. Therefore, termite monitoring and control is very crucial to the conservation of cultural heritage [Su, 2024]. Termite control methods that can be applied to wooden cultural heritages, such as installing bait around the building or injecting termiticide into the surrounding soil. The basic conservation principle of not damaging the materials of cultural heritage sites limits the application of above-ground baits. In addition, the presence of several wooden structures and large forested areas surrounding the site can provide a constant source of termites [Kim and Chung, 2022b]. Therefore, the application of IPM or ITM to the entire cultural heritage area rather than individual buildings is necessary for sustainable termite management of wooden cultural heritage [Su et al., 2016; Su, 2023]. The National Institute of Cultural Heritage is conducting a study on the application of In-Ground Bait (IGB) and Above-Ground Bait (AGB), and will propose termite control guidelines that can be applied to Korean wooden cultural heritage in general based on the results. The results of this research are expected to reduce termite damage to Korean wooden cultural heritage.

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Morphology of *Coptotermes formosanus* on O'ahu

Joel Melia, Reina Tong & Jia-Wei Tay

University of Hawai'i at Mānoa

Abstract

O'ahu, the most populated island in the Hawaiian Archipelago, is a hotspot for invasive species. Of the eight species of termite found on the island, all have the potential to be destructive. Particularly of interest for its ability to damage homes and other structures are the subterranean *Coptotermes* species (Blattodea: Rhinotermitidae). Two species from the genus can be found competing for range across Oʻahu. Recently, a visually distinct *C. formosanus* Shiraki colony was located on the island. Due to their unusual shape and size, individuals from the colony were collected for further study. Unique morphology may show novel ecological behaviors with potential greater implications regarding O'ahu's peculiar island ecology. Initial observations indicate that the newest colony to be studied has soldiers that are significantly larger than those of other colonies on the island.

SINV-Infected Fire Ants Are Less Responsive to Baiting

Fang-Ling Liu & Chin-Cheng "Scotty" Yang

Virginia Polytechnic Institute and State University

Abstract

Bating has been a major control strategy controlling the red imported fire ant (*Solenopsis invicta*), a widespread invasive species causing substantial economic and ecological impacts in the U.S. Effective baiting requires ant workers to actively transport the baits back to their colony till the ants consume a lethal dosage. Our previous findings indicated that Solenopsis invicta virus (SINV) infection, despite being asymptomatic, leads to reduced foraging activity, raising a concern that baiting may not be effective against virus-infected fire ants due to insufficient intake of baits. We thus hypothesize that uninfected fire ant colonies are selectively eliminated following baiting, which subsequently leads to a higher proportion of virus-infected colonies in the population. To test this hypothesis, we first showed that virus-infected colonies foraged significantly less than uninfected conspecifics, regardless of the infection pattern (i.e., single, double, or triple infection). We then tested the bait efficacy on both uninfected and infected fire ant colonies under laboratory conditions and found that baiting resulted in higher and faster mortality in uninfected colonies when compared to infected ones. These findings are consistent to our hypothesis that viral infection likely selects for virus-infected colonies that are less responsive to baiting through selective elimination of uninfected colonies.

Common Consumer Residual Insecticides Lack Efficacy Against Insecticide-Susceptible and Resistant Populations of the German Cockroach (Blattodea: Ectobiidae)

Johnalyn Gordon[1], Marla Eva[2], Sudip Gaire[1], Arthur Appel[2] & Zachary DeVries[1]

[1]University of Kentucky
[2]Auburn University

Abstract

The German cockroach, *Blattella germanica* (L.) (Blattodea: Ectobiidae), is a ubiquitous pest in affordable housing. They represent a major threat to human health due to their contribution of asthma-exacerbating allergens and the potential to transfer pathogenic microorganisms indoors. Despite well-documented pyrethroid resistance, pyrethroid-based broadcast residual insecticide products are often used by residents to control cockroaches in their homes. Additionally, there is little empirical independent testing of these products. Thus, it remains unclear how effective these commonly used do-it-yourself products are at controlling German cockroaches. This study represents a comprehensive examination of the efficacy of these products with direct, limited, and continuous exposure assays on a variety of common household surfaces on field populations of cockroaches with varying levels of pyrethroid resistance. While most products performed well when applied directly to test insects, mortality was substantially lower across all surfaces with limited exposure (30 min). In continuous exposure assays on a nonporous surface, products took at least 24 hr to cause 100% mortality in a field population, with some products taking up to 5 d to achieve 100% mortality. The findings of this study demonstrate a lack of residual efficacy from common pyrethroid-based consumer-use pesticides products. Given that it is not feasible to find and treat every cockroach in a home directly, the residuality of spray-based formulations is critical for products designed to control German cockroaches. Without residual efficacy, as shown in the consumer aerosol and spray products tested, we expect these products to add little to no value to cockroach control.

The Prevalence and Abundance of Mite Ectoparasites on House Mice in Residential Buildings and a Farm

Jin-Jia Yu & Changlu Wang

Rutgers University

Abstract

The house mouse (*Mus musculus domesticus* Schwarz and Schwarz) is a common urban pest that lives in/around human dwellings. Their feeding and gnawing behavior cause property damage and food loss. House mice also host various ectoparasites which act as vectors of several important zoonotic diseases to humans. Mites are the common ectoparasites found on house mice, however, there are few studies documenting the prevalence and abundance of mites on house mice in the United States. In this study, 302 house mice were trapped using Sherman live traps (114 mice) and snap traps (188 mice) from four sites including residential buildings and a farm located in New Jersey. In residential buildings, the mite infestation rates were 25–66% from Sherman-trapped mice and 47–92% from snap-trapped mice. At the farm site, the mite infestation rates of Sherman-trapped mice and snap-trapped mice were 84% and 89%, respectively. Of all examined house mice, four species of mites were found. In residential buildings, three species of mites were identified with *Liponyssoides sanguineus* being the most common species both in prevalence (52%) and relative abundance (43%). The farm site also had three mite species identified with *Myocoptes musculinus* being the most common species (86% in prevalence and 96% in relative abundance). Both *L. sanguineus* and *E. butantanensis* are vectors of human disease pathogens. *Liponyssoides sanguineus* was only found in residential building sites and *E. butantanensis* was only found at the farm site. The results revealed the potential health risks from mouse ectoparasites, and their presence is associated with building types.

An Entomological Perspective: Detailed Review of 150 Delusional Parasitosis Case Reports

Grace Kolb, Tim Gibb & Ameya Gondhalekar

Purdue University

Abstract

Delusional parasitosis (DP) is a difficult to treat psychological disorder where individuals have a persistent belief that their body or environment is infested with parasites when there is no evidence to support it. Ruling out an ectoparasite infestation is essential to diagnosis and thus entomologists play a role in the early course of disease diagnosis, primarily by evaluating specimen signs. Although doctors publish detailed case reports on DP, they have never been evaluated from an entomological. We reviewed 150 detailed medical case reports on DP from 117 published articles to collect data on information such as specimen analysis by entomologist, prior or follow up contact with pest management professionals and insecticide usage. Although it is essential to rule out real pest infestations in suspected DP cases, we found medical professionals infrequently investigated specimen signs collected by patients, and rarely asked about contact with pest management professionals. Among the minority of the case reports in which pesticide use was reported there was a pattern of excessive and potentially unsafe insecticide usage, either self-directed by patients or prescribed by medical doctors without evidence of an insect pest infestation. These findings reinforce that in the absence of involved entomologists, diagnosis becomes more difficult, and patients are potentially more likely to be exposed to insecticidal compounds that may cause additional risks.

Wolbachia-Free Bed Bugs Help Us to Understand Their Nutritional Requirements

Elizabeth Wiles, Madhavi Kakumanu & Coby Schal

North Carolina State University

Abstract

Bed bugs have evolved an obligate mutualism with the bacterial endosymbiont, *Wolbachia*. The absence of *Wolbachia* leads to significant physiological defects, including reduced egg production and slower development. Blood is the sole source of nutrition for bed bugs, but, while it is rich in protein, it is deficient in vitamins that are critical for bed bug survival. The primary driver for the *Wolbachia*-bed bug mutualism is the supplementation of B-vitamins. We have generated and maintained a Wolbachia-free strain of bed bugs to associate fitness parameters with the absence of specific B-vitamins from the bed bug diet. We have found evidence that *Wolbachia*-supplemented vitamins B2 (riboflavin) and B7 (biotin) play a role not only in egg production, but also in blood digestion and seminal fluid production in males. Thus, *Wolbachia* affects reproductive parameters of both sexes and the ability of bed bugs to acquire nutrition from blood. The *Wolbachia*-bed bug symbiosis is a weak link that can be exploited in bed bug control.

Repellency of DEET During Host-Seeking Behavior of Bed Bugs (Hemiptera: Cimicidae) in Binary Choice Olfactometer Assays

Christopher Hayes & Coby Schal

[1]Department of Entomology and Plant Pathology, North Carolina State University, Campus Box 7613, Raleigh NC 27695-7613

Abstract

The bed bug (*Cimex lectularius* L.) is the most prolific and burdensome indoor pest, and suppression of bed bug populations is a global priority. Understanding bed bug behavior is important to the development of new tactics for their control. Major gaps exist in our understanding of how host cues, insecticide resistance, and exposure modality impact the repellency of formulated products to bed bugs. Here, we validate the use of a binary choice olfactometer for assessing bed bug repellency behaviors using N,N-diethyl-3-methylbenzamide (DEET) in a dose-dependent manner, while considering the role of host-associated stimuli (with vs. without CO_2), exposure modality (olfactory vs. olfactory and contact), and resistance status (susceptible vs. resistant) on repellency. We observed that host-seeking insecticide susceptible bed bugs were repelled only when olfactorily exposed to high concentrations of DEET. However, exposure to DEET by contact repelled insecticide susceptible bed bugs at 100-fold lower dose of DEET. Further, we demonstrate for the first time that insecticide resistant bed bugs were significantly more responsive to DEET than susceptible bed bugs. We conclude that the 2-choice olfactometer is an effective tool for assessing behavioral responses of bed bugs to spatial and contact repellents.

Bed Bug Repellency to Common Control Products

Benjamin Grady & Zachary DeVries

University of Kentucky

Abstract

Bed bugs (*Cimex lectularius*) are small, hematophagous insects that, in addition to being massive household pests, are classified as a public health concern by the CDC. The cryptic nature of bed bugs results in the need for effective residual insecticides in their control. While repellency is a benefit for various chemicals, insecticides used in bed bug control must be placed intentionally to cause mortality, and therefore repellency can reduce efficacy. There is disagreement among researchers over the repellency of pyrethroid products, and repellency of other common products such as CimeXa has been observed. This project aims to determine how bed bugs respond behaviorally to different commonly used pesticides. Real-time assays will be conducted using circular arenas with one side treated with the chemical of interest. Insects will be allowed to wander the arena and their behavior and time spent in each section will be monitored with video-tracking software. Additionally, harborage arrestment assays will be performed to assess repellency/excito-repellency in the presence of shelter for the insect. Thus far, we have completed method development for this experiment and completed control trials. These trials were done for both our positive control (DEET) and negative control (water) and verified that our arena designs worked. These trials also verified that that bed bugs will avoid the side of the arena that was treated with a repellent compound, and that bedbugs evenly distribute their time in each zone with the water treatment.

Effects of Surface Type and Distance Traveled on the Efficacy of a *Beauveria bassiana*-Based Biopesticide (Aprehend®) for Bed Bug (Hemiptera: Cimicidae) Control

Simona Principato & Zachary DeVries

Department of Entomology, University of Kentucky, Lexington, KY

Abstract

The elusive behavior exhibited by bed bugs (*Cimex lectularius* L.) makes them one of the most challenging indoor pests to manage. Consequently, the utilization of products with prolonged residual efficacy plays a crucial role in effective bed bug control. Aprehend® is a biopesticide designed for bed bug management, employing the entomopathogenic fungus *Beauveria bassiana* as an active ingredient. This product is a promising tool for controlling pyrethroid-resistant bed bugs since it can induce mortality upon contact with treated surfaces. However, uncertainties persist regarding how surface type and crawling distance impact its efficacy. In this study, we assessed the effectiveness of various Aprehend® band widths applied to different substrates commonly encountered by bed bugs. We focused on examining the average time to mortality and overall mortality. Findings revealed that fresh applications of Aprehend® resulted in high mortality over very short distances (1 cm) on certain surfaces, such as vinyl tile and cotton jersey fabric. Conversely, other surfaces, like unfinished pinewood and painted drywall, exhibited much lower mortality over longer distances (5 cm). Additionally, bed bugs crawling on cotton jersey fabric picked up a significantly higher number of spores compared to those on unfinished pinewood. These results suggest that newly applied Aprehend® can be effective when bed bugs traverse very small bands, with surface type playing an important role in the product's success. This information serves as valuable guidance for pest management professionals employing *Beauveria bassiana* for bed bug control.

SYMPOSIUM

Biology and Management of Blood-Feeding Arthropods

Alvaro Romero[1] & Sudip Gaire[2]

[1]New Mexico State University, [2]Rentokil Initial

Abstract

Important changes in ecology, human behavior, and management have favored the resurgence and escalation of hematophagous arthropods that cause health and economic problems. Our primary goal is to facilitate the exchange of research-based information on bed bugs and other blood-feeding arthropods. The concept of this symposium is that each speaker will share the latest findings from their laboratory regarding basic and applied research on biology and management of blood-feeding arthropods, primarily bed bugs.

Emerging Bed Bug Biocontaminants

Zachary DeVries[1], Johnalyn Gordon[1], Coby Schal[2], Simona Principato[1] & Sudip Gaire[3]

[1]University of Kentucky, [2]North Carolina State University, [3]Rentokil Initial

Insecticide Studies on Bed Bugs

Alvaro Romero

New Mexico State University

Effectiveness of Various Monitoring Methods for Detecting Bed Bugs in Apartments

Changlu Wang

Rutgers University

Evaluation of Vikane Fumigation for Efficient Bed Bug (*Cimex lectularius*) Elimination

Morgan M. Wilson[1], Dakota B. Todd[1], Dini Miller[1] & Jennifer R. Gordon[2]

[1]Virginia Tech, [2]Douglas Products

Spatio-Temporal Genetic Structure of the Bed Bug, *Cimex lectularius*, in the United States

Warren Booth[1], Cari D. Lewis[2], Coby Schal[3] & Edward L. Vargo[4]

[1]Virginia Tech, [2]The University of Tulsa, [3]North Carolina State University, [4]Texas A&M University

Understanding and Mitigating Emerging Health Impacts of Bed Bugs

Jose Pietri

University of South Dakota

Bed Bug (Hemiptera: Cimicidae) Response to Wet Surfaces

Jorge Bustamante & Dong-Hwan Choe
University of California, Riverside

New Entrapment Material Captures More Bed Bugs Than Selected Commercial Monitoring Devices

Catherine Loudon[1], Jorge Bustamante[2], Dong-Hwan Choe[2], Kathleen Campbell[2], Patrick Liu[1] & Andrew Sutherland[3]
[1]University of California, Irvine, [2]University of California, Riverside,
[3]University of California (UC ANR, UC IPM)

Identifying and Monitoring for Rat Mites and Bird Mites(Macronyssidae: *Ornithonyssus* spp.) Within Structures

Andrew Sutherland
University of California (UC ANR, UC IPM)

SYMPOSIUM

Training in Urban Pest Management

Nancy Troyano

Rentokil Terminix

The Importance of On-the-Job Training

Nancy Troyano

Rentokil Terminix

Abstract

While textbooks and e-learning courses are important, the majority of learning takes place on the job. Most pest management companies recognize this and send their new employees to ride along with their experienced technicians as part of their training. But the reality is that not much thought is given to how learning is actually taking place during this time. Often, the experienced technicians "train" by having the trainee watch them work or may view the trainee as an extra set of hands, sending them off to do the mindless tasks in order to get the service done faster. As a result, learning is haphazard and slow to take place, among other things. However, when set up correctly, on the job training (OJT) can accelerate learning while minimizing safety risks and expensive mistakes. A solid field training program can also increase year 1 employee retention and customer satisfaction.

Effective OJT should include several fundamental components. At a minimum, this includes having a structured OJT program and having a trained trainer to deliver the training. A structured OJT program includes an organized list of critical skills for the trainee to demonstrate as well as a place for the trainer to verify the trainee's competency. A trainer must also be certified to train in the field, and that certification process should include topics such as effective coaching, feedback and documentation, as well as communication with both the trainee and leadership.

To ensure a successful program, two additional components are also recommended. These components include compensation for the certified field trainer that consistently pays a set amount of money for each field training day, and education for leadership buy-in, to ensure that roles and responsibilities of the trainer, trainee and hiring manager are clear.

Study Preparation for State Licensing Exams

Glen Ramsey
Orkin

Best Practices in Pest Technician New Hire Training

Morgan Manderfield
Ecolab

Vendor Training Resources

Tim Husen
Syngenta Professional Pest Management

The Use of Technology in Pest Management Training

G. Wyatt West

Arrow Exterminators

Abstract

When it comes to training individuals, the concept of the 'curse of knowledge' is highly relevant. As we become experts in a topic, we often forget what the struggle was like before we were proficient. Let's take the example of using a computer mouse: can you remember the first time you used a computer mouse? How old were you? Did you grow up using one, or did you have to change what you knew? Do you use one daily or just on occasion? All of these will influence our perspective on using a mouse. If we grew up with it, we might assume everyone knows how to use a mouse, but if you had to learn it as an adult, you might have an easier time putting yourself in someone else's shoes. If you use one daily, you may forget the difficulties of using a mouse and assume everyone is as proficient with a mouse as you are; this is the curse of knowledge. We must be self-aware and consider that not everyone knows everything about the topic we are teaching – you must know your audience. When considering where to start in the training process, you have to consider the knowledge level of the audience you are teaching. Do they need to see the forest or the trees? If someone is just beginning, you need to introduce them to the forest before showing them the trees, or in other words, show them the big picture before you show them the plan to achieve it. Let's apply the concept of the forest and the trees to the task of making a peanut butter and jelly sandwich. For many of us, this is something we have done 100 or even 1,000 times. However, if someone has never seen a peanut butter and jelly sandwich, you need to show them what it is before you start explaining which bread to use, what peanut butter is best, the greatest jelly flavor, or any part of the construction process. Now, suppose someone is familiar with making a PB&J (the forest) and would like to refine their skills to make the best-quality PB&J. In that case, you can skip showing them the

forest and focus more on the trees--each part of the ultimate PB&J-making process. When you take complex topics and think of them as parts of a whole, explaining the task at hand becomes more manageable. This same concept can be applied to integrating technology in training.

In the age of technology, we have little choice but to integrate it into our training programs. Love it or hate it, technology has changed how we disseminate information. Shying away from it is like shying away from the ticking of time — it's inevitable, so we must learn to embrace it. The great thing about integrating technology in education and training is that it caters to every size company and type of learner. If you are hesitant about incorporating technology, you can start small by adopting gamification techniques. Gamification of training through software like Kahoot will make your learning programs more enjoyable and learners more receptive. If you want to take it to the next level, there are numerous platforms and software you can use to continue integrating technology into learning. As your company's training program grows, you can combine technology with other resources to incorporate a learning management system (LMS). While adopting an LMS is a big commitment, it provides tangible metrics about your training programs. An LMS allows you to gauge a learner's retention level and measure how receptive they are to training based on numerical ratings and feedback. Some systems also allow you to track other metrics like licensing or mentoring. Artificial intelligence is another hot topic at the moment, and many companies are finding uses for AI in training. From text-to-voice software like NaturalReader to chatbots like ChatGPT, artificial intelligence is a new branch of technology that will only continue to improve. With technology, the possibilities are close to endless, and since we're in the age of technology, all that's left is to determine what's right for you!

For more information on integrating technology in training, scan the QR codes below:

SYMPOSIUM

Formosan Subterranean Termites: From Their Inevitable Spread to Local Solutions

Mark Janowiecki

City of New Orleans Mosquito, Termite & Rodent Control Board

Abstract

The Formosan subterranean termite (*Coptotermes formosanus*) was first detected in the US in 1957 in Charleston, NC. However, it is presumed that this invasive termite pest species established in various southern states several decades prior this first record through a Hawaiian bridgehead. In the past 65 years, the Formosan subterranean has spread extensively and is now documented to be established in most major and coastal cities throughout the Southeastern US. Each year, new county, city, and sometimes state records are reported confirming that the species continue its ongoing geographic spread through human activities. Such observation raises important issues to be addressed. First, there is an inherent delay between the initial establishment of this termite species in a new location and its subsequent discovery, from years to decades. Second, local pest control communities have to adapt their protocols and sometimes business models to this new threat, often accompanied by a necessary cultural and technological shift. This symposium addresses the ongoing need to expand the effort for documenting the establishment of *Coptotermes formosanus* in new locations from regional to local levels, so as to better prepare communities that have been spared so far from this pest species. Ultimately the experience from providers who have been dealing with this termite species should benefit other communities who are new to this issue. The Formosan subterranean termite will inevitably continue to spread, but local solutions can mitigate their overall impacts to communities at risk.

Deciphering the invasion history of the Formosan subterranean termite in the U.S.

Edward Vargo[1], Pierre-André Eyer[1], Claudia Husseneder[2], Kenneth Grace[3] & Jianchu Mo[4]

[1]Department of Entomology, Texas A&M University
[2]Department of Entomology, Louisiana State University
[3]Department of Entomology, University of Hawaii
[4]Zhejiang University, China

Abstract

Native to eastern Asia, the Formosan subterranean termite *Coptotermes formosanus* is one of the most destructive invasive pests in the world, with established populations in Japan, Hawaii and the southeastern US. Using a panel of single nucleotide polymorphisms (SNPs), we retraced the invasion history of this species through approximate Bayesian computation. We found a complex invasion history, with initial introductions to Hawaii which then served as the source for an introduction to the southeastern US. A separate introduction event from southcentral China subsequently occurred in Florida. We also examined the breeding structure of colonies in various native and introduced populations. We found population varied in the proportions of colonies forming simple families (a single queen and king present) and those headed by extended families (multiple inbreeding queens and kings), but no consistent difference between native and invasive populations. Overall, these findings reinforce the pivotal role of bridgeheads in the spread of invasive species and illustrate that the global distribution of *C. formosanus* has been shaped by multiple introductions out of China, which may have prevented and possibly reversed the loss of genetic diversity within its invasive range, and that changes in colony breeding structure cannot account for the invasion success of this species.

Present Status of Formosan Subterranean Termite Infestations in California

Chow-Yang Lee[1], Shu-Ping Tseng[1,2], Siavash Taravati[3], Dong-Hwan Choe[1] & Michael K. Rust[1]

[1]Department of Entomology, University of California, Riverside, CA 92521
[2]Present address: Department of Entomology, National Taiwan University, Taipei, Taiwan
[3]University of California Cooperative Extension, Riverside County, Riverside, CA 92506

Abstract

The Formosan subterranean termite (FST), *Coptotermes formosanus* Shiraki, is an invasive termite species that accounts for more than $4 billion in management and damage repairs of structures in the United States annually. In California, it was first discovered a shipyard in San Francisco in 1927, but the population was eliminated. It was not until 1992 that the FST was found again in La Mesa. Since then, the FST has been discovered infesting homes in La Mesa (2018), Canyon Hill (2020), Rancho Santa Fe (2021), Highland Park (2021), La Verne (2022), and Hollywood Hills (2022). In 2023, a shipping container from Guangzhou, China, was found infested with FST in Eastvale. We collected the termites from these locations and used mitochondrial DNAs and polymorphic microsatellite markers to characterize their genetic relationships and breeding systems. The investigated colonies consisted of simple families and extended families. Structure analyses of microsatellite genotypes revealed at least three introductions of FST in Southern California. The sources of the introductions remain unknown. Most of these infested homes were in areas with heavily irrigated landscapes. The future of FST dispersal in California is discussed.

Disparate Morphology of *Coptotermes formosanus* Colonies on O‘ahu

Joel Melia, Reina Tong & Jia-Wei Tay

Department of Plant and Environmental Protection Sciences, University of Hawaii at Manoa, Honolulu, HI 96822

Abstract

O‘ahu, the most populated island in the Hawaiian Archipelago, is a hotspot for invasive species. Of the eight species of termite found on the island, all have the potential to be destructive. Particularly of interest for its ability to damage homes and other structures are the subterranean *Coptotermes* species (Blattodea: Rhinotermitidae). Two species from the genus can be found competing for range across O‘ahu. Recently, a visually distinct *C. formosanus* Shiraki colony was located on the island. Due to their unusual shape and size, individuals from the colony were collected for further study. Unique morphology may show novel ecological behaviors with potential greater implications regarding O‘ahu’s peculiar island ecology. Initial observations indicate that the newest colony to be studied has soldiers that are significantly larger than those of other colonies on the island.

A Prediction of *Coptotermes* Termites Distribution Using a Species Distribution Model

Sang-Bin Lee, Thomas Chouvenc & Nan-Yao Su

Entomology and Nematology, Ft. Lauderdale Research and Education Center, University of Florida

Abstract

The Formosan subterranean termites, *Coptotermes formosanus* Shiraki, and the Asian subterranean termites, *C. gestroi* (Wasmann), are two invasive species causing structural damage in the southeastern United States. Species distribution models may provide guidelines to predict potential distribution limits and to monitor the spread of invasive termites. We established species distribution models for both C. formosanus and C. gestroi using the maximum entropy approach (Maxent). We used occurrence data collected from the extension program at the University of Florida and various climate variables such as temperature and precipitation to predict the potential distribution of *C. formosanus* and *C. gestroi*. The occurrence data showed that the current distribution of C. formosanus is along the coastal line in southeastern states including FL, GA, SC, LA, TX, etc. Potential habitats based on current climate data showed that most regions in southeastern states will be suitable for *C. formosanus*. However, the potential distribution of *C. gestroi* will likely be restricted to FL based on the current climate.

Trapping Methods and Distribution of FST in Louisiana

Mark Janowiecki, Eric Guidry, Carrie Cottone, Barry Yokum, Kenneth Brown, Edward Freytag & Claudia Riegel

City of New Orleans Mosquito, Termite & Rodent Control Board

Abstract

Since the first detection of the Formosan subterranean termite (FST) in Louisiana in 1966, it has spread across the state by means of human-mediated transportation. The City of New Orleans Mosquito, Termite, and Rodent Control with the help of pest management professionals and private citizens has worked to document this spread in Louisiana parishes. Previous statewide surveys resulted in positive records in 34 parishes. In 2008 and 2009, physical inspections and samples submitted yielded positive FST samples from eight additional parishes. Despite further active collecting trips in 2010, 2011, 2013, 2017, and 2023, no additional parishes were found to have FSTs. The current known distribution of FST in Louisiana consists of the southern portion of the state with a northern boundary from Sabine to Concordia Parish. There are additional isolated parishes in northern Louisiana around the population centers of Shreveport and Monroe with known FSTs.

Decades of Industry-Academia Partnership Toward Monitoring Invasive Termites in Florida

Thomas Chouvenc

Department of Entomology, University of Florida, Davie, FL 33314

Abstract

Invasive termite species with an important pest status continue to spread in various parts of the U.S., the most notable one being the Formosan subterranean termite (*Coptotermes formosanus*). In the past 65 years, the Formosan subterranean has spread extensively and is now documented to be established in most major and coastal cities throughout the Southeastern US. Each year, new county, city, and sometimes state records are reported confirming that the species continue its ongoing geographic spread through human activities. Consequently, local pest control communities have to adapt protocols and sometimes business models to this new threat, often accompanied by a necessary cultural and technological shift. In Florida, an Academica-Industry partnership initiated three decades ago has resulted in a comprehensive distribution map of all major termite species established in the state. The data was made public through an accessible distribution map in the form of an embedded google map layer. This map is updated annually to take into account the 500+ samples provided by pest control providers, continuously revealing new locations of infestation for invasive termite species across Florida. The Formosan subterranean termite and others will inevitably continue to spread, but local solutions can mitigate their overall impacts to communities at risk. This map therefore enables pest control providers to tailor their approach to each species at the local level.

Surveying Termite Diversity in SUS Working Group

Aaron Ashbrook[1], Santos J. Portugal[2] & Anamika Sharma[3]

[1]Department of Entomology, Louisiana State University, Baton Rouge, LA 70803
[2]Department of Biochemistry, Molecular Biology, Entomology & Plant Pathology, Mississippi State University, Starkville, MS 39762
[3]Center for Biological Control, Florida A&M University, Tallahassee, FL 32307

Abstract

Termite distribution maps play a crucial role in guiding pest management professionals (PMPs) in identifying and proactively preventing termite damage to structures. However, comprehensive surveys for termite species distribution, biodiversity, and seasonality in the Southern US are infrequent, the length of survey time varies and is limited to specific regions. Updated surveys will inform PMPs about the termite threat in areas lacking recent assessments, potentially unveiling changes in distribution or new termite species. To address the needs of termite management within the Southern US, a working group of urban entomologists was created with the support of collaborators and the Southern IPM Center. Our goals are to: 1) Develop project outputs that train and assist target clients in identifying termites, 2) Implement a trap-based termite alate survey during swarm season and specimen submission program in collaboration with pest management professionals, extension agents, and other interested groups to create termite distribution maps for the Southern US. The trap survey will be done to understand termite diversity with the major focus on *Coptotermes formosanus*. 3) Produce and distribute an identification guide for termite alates in the Southern US. To achieve these goals, we have planned to develop and implement a termite identification training program for pest termites of concern, conduct a termite collection survey, and create termite identification guides for pest management professionals and extension agents within the Southern Region. We encourage interested individuals, including pest management professionals and extension agents, to participate in our survey and training events.

Sustainable Formosan Subterranean Termite Control Efforts

Carrie Cottone, Claudia Riegel & Mark Janowiecki

City of New Orleans Mosquito, Termite & Rodent Control Board, New Orleans LA 70122

Abstract

Since its introduction to New Orleans following World War II, the Formosan subterranean termite has supplanted native termite species and is now the most destructive structural pest in the city. Lessons learned from Operation Full Stop (1998-2012) in the French Quarter and Louis Armstrong Park have taught us that using baits is a sustainable way to reduce termite populations. Currently, the City of New Orleans Mosquito, Termite & Rodent Control employs bait products to control termite populations that threaten our city buildings, as well as state and federal buildings. One of these state-owned sites is Jackson Barracks, which has had baiting systems in place for the past ten years. We have been able to monitor termite activity at this site, and we have been monitoring termite reproductive flights in the area, which shows the ongoing threat of re-invading colonies. Using this as a model for sustainable termite control, we can determine that baits are a sustainable means to control termite populations and should remain in place once employed.

Possible Behavioral Changes During US Invasion in *Coptotermes formosanus*

Nobuaki Mizumoto

Department of Entomology & Plant Pathology, Auburn University

Abstract

Among more than 3,000 species of termites worldwide, *Coptotermes formosanus* in the US is the most destructive population. In this presentation, I will focus on tandem running, which is a nest-searching behavior by mating pairs, and highlight how *C. formosanus* in the US is different or similar to other termite lineages, other *Coptotermes* species, and other populations than the US. First, the phylogenetic comparative analysis estimated that the ancestor of termites did tandem runs with both females and males serving the leader role. Subsequently, the ancestor of neoisopteran termites acquired the fixed female-leader role, while several one-piece nesting termites lost tandem running behavior. Within *Coptotermes* termites, *C. formosanus* showed more stable tandem runs compared to *C. gestroi* or *C. lacteus*, but *C. formosanus* from the invasive US population showed less stable tandem runs than those from the native Japanese population. From all this available information, I infer that *C. formosanus* has an intraspecific variation in nest-site selection behaviors among populations, which I discuss has played an important role in the invasion process.

To Bait or Not to Bait? Why Is It Still a Question 30 years later?

Nan-Yao Su

Department of Entomology, University of Florida, Davie, FL 33314

Abstract

The commercial introduction of bait products for subterranean termites in 1995 marked a significant advancement in termite management technology. Unlike traditional soil termiticides, baits utilize a less toxic insecticide (noviflumuron rat LD50>3,160 mg/kg) in significantly lower quantities (0.043 kg per hectare) than soil termiticides (32.4 kg/hectare at 0.06% solution) such as fipronil (rat LD50: 97 mg/kg). This contrast implies that baits have approximately 24,865 times less environmental impact than termiticide applications. Over the past three decades, data have consistently demonstrated that baits containing chitin synthesis inhibitors such as noviflumuron or novaluron, are effective in eliminating colonies of subterranean termites. This effectiveness positions baits as a more socially and economically sustainable option in termite control. Despite these clear benefits, as of 2022, about 42% of termite control firms still exclusively use soil termiticides, while 38% employ a combination of both baits and soil termiticides. The proportion of firms relying solely on bait has increased from 3% in 2007 to 16% in 2022. However, the percentage of firms using only soil termiticides has remained constant at 42% over the same period. This continued reliance on soil termiticides within the industry, despite the demonstrated advantages of bait systems, warrants further discussion and analysis.

The Impact of Extension Programs in the Management and Control of Subterranean Termites

Faith Oi

Department of Entomology, University of Florida, Gainesville, FL 32611

Abstract

Extension programming is critically important in training pest management professionals in identification and management of subterranean termites. Pest Management University, a University of Florida Extension program, is an academy designed to provide state-of-the-art training in pest biology and control, laws, and regulations. As part of measuring our impacts, we evaluate knowledge gained. Over a decade, we have discovered some disturbing trends. Pre-test scores indicate that even experienced practitioners have difficulty in identification and basic math (required to calculate the correct amount of liquid termiticide). There also appears to be a trend of knowledge reaching a plateau as years increase in the field. These disappointing findings can be remedied by focused, science-based Extension programming. Our hands-on and lecture hybrid methods, delivered by a team with diverse skills, has been able to increase knowledge gained by an average of over 20 points, regardless of years in the industry.

SYMPOSIUM

David Oi

Advances in Invasive and Pest Ant Management

USDA, ARS, Center for Medical, Agricultural & Veterinary Entomology, Gainesville, FL

Prevalence of Microsporidium *Kneallhazia solenopsae* among Invasive Fire Ant Populations in Tennessee and Its Relationship with Monogyne and Polygyne Social Forms

Marina S. Ascunce[1], Jason Oliver[2], Steve Valles[1], Karla Addesso[2], Nadeer Youssef[2], Rachel Atchison[1] & David Oi[1]

[1]USDA, ARS, Center for Medical, Agricultural & Veterinary Entomology, Gainesville, FL

[2]Tenn. State Univ., Otis Floyd Nursery Research Center, McMinnville, TN

Efforts to Develop Pre- and Post-Harvest Imported Fire Ant Quarantine Soil Treatments for Field-Grown Nursery Trees

Jason Oliver[1], Karla Addesso[1], David Oi[2], Anthony Witcher[1], Nadeer Youssef[1], Paul O'Neal[1], Ronald Weeks[3] & Lisa Alexander[4]

[1]Tennessee State University, Otis L. Floyd Nursery Research Center, McMinnville, TN
[2]USDA-ARS Center for Medical, Agricultural & Veterinary Entomology, Gainesville, FL
[3]USDA-APHIS-PPQ, Raleigh, NC
[4]USDA-ARS, U.S. National Arboretum, Otis L. Floyd Nursery Research Center, McMinnville, TN

Red (*Solenopsis invicta* Buren) and black (*Solenopsis richteri* Forel) imported fire ants and their *S. invicta* x *S. richteri* hybrid (IFA) are serious quarantine pests for nursery producers. Nursery plants, which include containerized (i.e., plants grown in artificial soil substrates like pine bark) or field-grown (plants grown directly in field soil and typically harvested as bare root or as balled and burlapped root balls), shipped outside of the Federal Imported Fire Ant Quarantine (FIFAQ) regulated area with roots and substrate attached must be treated with an approved insecticide. Although both container and field-grown plants can be treated with drench or dip treatment methods, most container producers opt for a substrate granular bifenthrin incorporation at the beginning of the production cycle, which requires no additional inputs or handling if the "continuous" certification rate is used. However, field-grown nursery producers cannot use the granular incorporation method, which limits their options. At the present time, field-grown producers are limited to only three methods for FIFAQ certification, including 1) root ball dip immersion in chlorpyrifos (0.015 kg active ingredient {AI} / 100 liters [0.125 lb AI / 100 gal]) providing 30-day certification or bifenthrin (0.003 to 0.014 kg AI / 100 liters [0.025 to 0.115 lb AI / 100 gal]) providing 2 to 6 months certification 2) 10% root ball volume drench in chlorpyrifos (same rate as dip treatment) followed by a 180° root ball rotation and another 10% volume drench providing a 30 day certification, or 3) FIFAQ approved broadcast bait followed 3-5 days later with granular chlorpyrifos (6.72 kg AI / hectare [6 lb AI / acre]) providing 12-weeks certification after a 30-day exposure period and another 12 weeks with a second repeat chlorpyrifos application. Few producers are using the dip procedure for field-grown plants due to labor costs and inability to treat large volumes of plants. Likewise, few producers use the broadcast bait and granular chlorpyrifos option because the treatment is very expensive, there are very few chlorpyrifos labels in existence allowing 13.4 kg AI / hectare (12 lb AI / acre) per year, and producers typically harvest over 3-year periods, making the treatment even more cost impractical. Most producers are using the chlorpyrifos drench option. However, there are growing Environmental Protection Agency restrictions on chlorpyrifos for plants used for food use, and lost chlorpyrifos manufacturing incentives making the product difficult to obtain.

The primary objective of this study was to find alternative and environmentally friendlier insecticide products (bifenthrin and lambda-cyhalothrin) with sufficient IFA control efficacy to replace chlorpyrifos as a post-harvest FIFAQ treatment. A secondary objective was to find new treatment methodologies to apply these treatments, including post-harvest root ball drenches with injections or pre-harvest individual tree drench treatments. Because of time constraints, the pre-harvest

treatment work was not presented at the NCUE meeting, and thus, will not be presented in this proceeding. This proceeding will focus on the drench-only and drench plus injection combination treatments with pyrethroids for cleansing post-harvest balled and burlapped (B&B) root balls of IFA.

To perform drench tests, field-grown nursery trees were selected at middle Tennessee nurseries with mature IFA colonies in the 24-inch root ball harvest zone (Fig. 1). Tests were performed during spring 2019, fall 2020, spring 2021, fall 2021, and spring 2022. For quantification purposes, ant numbers were estimated at a minimum 1,000+, but all colonies used in testing were mature colonies likely having >50,000 worker ants. Trees were machine harvested by nursery personnel and wrapped in burlap that was pre-treated with a low dosage of bifenthrin (OnyxPro Insecticide mixed at 0.25 ml product per liter). The burlap spray was a technique used by the former USDA-APHIS Biloxi-Gulfport, MS IFA Laboratory to prevent colonies from exiting root balls following harvest. The burlap spray treatment will not kill colonies inside the root ball based on previous USDA-APHIS testing (Callcott and King 2017). Insecticides evaluated as drench or drench plus injection treatments included chlorpyrifos 4E (0.015 kg AI / 100 liters [0.125 lb AI / 100 gal]) (FIFAQ standard), bifenthrin (OnyxPro Insecticide at 0.024 kg AI / 100 liters [0.2 lb AI / 100 gal]) or lambda-cyhalothrin (Lambda-Cy EC RUP Insecticide at 0.004 kg AI / 100 liters [0.034 lb AI / 100 gal]). Treatments also had Signal Green dye (Precision Laboratories, Inc., Kenosha, WI) added to the tank mix at 5 ml / liter to facilitate treatment visualization during drenching of the burlap (Fig. 2). Drench and injection delivery volumes were calibrated with a stopwatch. To calculate root ball volumes, a truncated cone formula was used with the root ball side height and top and bottom diameters. The root ball top and bottom diameters were measured at the widest point and then perpendicular to the widest point (and the two top and bottom values averaged to get the average top and bottom diameter). Across all tests, root balls had an average total volume of 83.7 liters (range 44.1 – 125.5 liters). All root balls received a 20% total volume in varying treatment combinations. For drench-only treatments currently used in the FIFAQ, a 10% root ball volume drench was delivered to one root ball side, the root ball was rotated 180° 30 minutes later, and the opposite side was drenched again with a 10% tank mix volume. For root balls receiving combination injection treatments, the drench volume was 5% on each side, and a total 10% injection volume was delivered equally among the various numbers of treatment injections. To evaluate colony survival from treatments, root balls were broken apart and live ants (apparently healthy or sick) were estimated (Fig. 3). Soil samples were harvested at different internal and external root ball locations during the process of breaking the root balls apart. These soil samples were placed in no-choice laboratory bioassays with red IFA female alates (n=10) per replicate and monitored for 14 days after exposure.

As expected, the control treatment root balls receiving only water had high colony survival in the root balls and high post-treatment female alate survival in the soil bioassays (Table 1). Likewise, the FIFAQ approved chlorpyrifos drench treatment also had higher survival than expected in root ball colony survival assessments (~ 389 live ants per root ball on average) (Table 1). The no choice alate bioassays with chlorpyrifos drenched root balls generally had higher ant toxicity with outer root ball soil samples, but the inner middle soil samples were not completely toxic (although still nearly 6× more effective than the water-only control) (Table 1). Like chlorpyrifos, the OnyxPro Insecticide drench only treatment also had unacceptably high colony survival in root ball assessments (~283 live ants per root ball) (Table 1). However, all OnyxPro treatments including the drench-only treatment

provided complete control of female alates in laboratory soil bioassays, indicating bifenthrin was likely making soil toxic at both outer and inner areas of the root ball.

Among the various injection treatments that were evaluated, colony control efficacy was generally better with more injection points on the root ball. The three most effective injection treatment methods were 3 lateral side injections on both sides of the root ball, 5 injections from the top of the root ball, or 6 lateral injections in an inverse pyramid pattern (Table 1). However, the '3 lateral injections on each side' method was a laborious procedure likely to be impractical for producers, and the '5 top angled injections' also had issues with roots and doubled layers of burlap on the ball top blocking the injection rod insertion. In contrast, the 6 lateral pyramid injection method was very easy to apply to a single root ball side, did not require root ball handling, and had minimal issues with tree roots as well as no double layer of burlap. Both the OnyxPro and Lambda-Cy treatments using 6 lateral injections in an inverse pyramid pattern provided nearly 100% colony control (Table 1). Among the three most effective injection methodologies, live ants that were found were moribund and unlikely to survive (Table 1, yellow highlight). Unlike OnyxPro, Lambda-Cy was not as effective at making outer and inner soil sample sites toxic in no-choice laboratory alate bioassays (Table 1).

In conclusion, there are limitations to drench applications. Results show both chlorpyrifos and bifenthrin were not penetrating deeply enough into root balls to control colonies. However, the injection procedure applied in a 6-inverse pyramid pattern did achieve nearly a 100% efficacy with both bifenthrin and lambda-cyhalothrin and the few live ants that were recovered in colony assessments were moribund and unlikely to survive. Therefore, if producers are harvesting plants with colonies in the harvest zone, they should be doing a drench and injection combination or another option like the root ball dip, because results indicate drenching alone will be insufficient in this situation.

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Callcott, A., King, R. Efficacy of rootball injection treatments to eliminate IFA colonies – Mississippi, 2015. 2015-2017 CPHST Imported Fire Ant Report Biloxi Station. USDA-APHIS-PPQ, CPHST Biloxi Station, Biloxi, MS. pp. 10–15. (presently unavailable online).

Fig. 1. Field-grown nursery tree with a mature fire ant colony in the harvest zone.

Fig. 2. Drenching with a hand wand using a breaker nozzle (left image) or injecting root balls with a B&G termite injection rod (right image) using a tractor roller-pump-supplied hose line. Note the green coloration of the drench treatment from Signal Green dye.

Fig. 3. Personnel breaking root balls apart and sifting through the soil to estimate colony survival following a treatment. Soil samples were taken from various internal and external locations during the process of breaking the root balls apart.

Table 1. Average total estimated live ant survival in root ball assessments and average percentage survival of red imported fire ant (IFA) female alates in laboratory soil bioassays - summarized across tests.

Chemical[a]	Rate[b]	Injection Method[c]	No. of Tests[d]	Average Total Live Ants Per Root Ball[e]	Average % Survival of Female Alates[f]	
					Outer Root Ball	Inner Root Ball
Water	0.000	None	5	577+	75.4	77.1
Chlorp	0.015	None	5	389+	0.2	12.1
OnyxPro	0.024	None	2	283+	0.0	0.0
		2 Lat.	2	265+	0.0	0.0
		3 Lat. / 2 Flank	2	37+	0.0	0.0
		3 Lat. (Each Side)	2	25+	0.0	0.0
		5 Top	2	14+	0.0	0.0
		6 Lat. (IP)	4	1	0.0	0.0
Lambda	0.034	6 Lat. (IP)	3	0	3.0	7.4

[a] Water was the non-treated control, Chlorp is Chlorpyrifos 4E, OnyxPro is OnyxPro Insecticide, and Lambda was Lambda-Cy EC Insecticide RUP.

[b] Rate unit is kg active ingredient per 100 liters.

[c] All treatments received two drenches. For treatments with no injections (None), drenches were applied at the required FIFAQ 20% of the total root ball volume (10% on each root ball side). For treatments with injections, drenches were applied at 10% of the total root ball volume (5% on each root ball side), and injections were applied at 10% of the total root ball volume divided equally among the number of injections. 'Lat.' indicates lateral root ball side. The 'Top' injection was from the ball side where the tree stem exits, achieved by propping the ball with the stem-side-facing-upward to allow a downward directed injection. The '6 Lat. IP' consisted of 6 lateral injections applied in an 'inverse pyramid' (IP) pattern with three equally spaced injections along the upper portion of the root ball, two along the middle, and one near the bottom.

[c] Tests were performed in spring 2019, fall 2020, spring 2021, fall 2021, or spring 2022. Some treatments were not performed in all test years, and thus, test averages are based on the number of test years.

[d] Average total live ants per root ball consisted of the estimated number of live ants in each root ball averaged among treatment replicates in a test and then averaged among tests to obtain an approximation of overall survival for the treatment. Yellow highlighting indicates all live ants observed were moribund and probably unlikely to survive.

[e] Alates were female red IFA. Alates were placed with treatment soil in no choice assays, and survival measured at 14 days post-exposure. Percentage survival values were averaged among treatment replicates in a test and then among the tests to obtain an overall percentage survival for the treatment. The 'outer root ball' were soil samples collected from external surface parts of the root balls, and the 'inner root ball' were soil samples collected near the inner middle of the root balls.

Insecticidal Effects of Receptor-Interference Isolated Bioactive Peptides on Fire Ant Colonies

Robert K. Vander Meer[1], Satya P. Chinta[2] & Man-Yeon Choi[3]
[1]USDA, ARS, Center for Medical, Agricultural & Veterinary Entomology, Gainesville, FL
[2]Foresight Science and Technology, Hopkinton, MA
[3]USDA, ARS, Horticulture Crops Research Unit, Corvallis OR

A New Approach for Enhancing Ant Bait Specificity

Jian Chen
USDA, ARS, National Biological Control Laboratory, Stoneville, MS

Regulating Ant Populations in Either Direction Using Biodegradable Hydrogel Baits

Jia-Wei Tay
Dept. of Plant & Environmental Protection Sciences, University of Hawaii at Manoa, Honolulu, HI

Invader at the Gate: Current Status and Research Update of the Yellow Crazy Ant

Chin-Cheng "Scotty" Yang
Dept. Entomology, Virginia Polytechnic Institute & State University, Blacksburg, VA

Past, Present, and Future: Little Fire Ant Management in Hawaii and Beyond

Michelle Montgomery
Hawaii Ant Lab, Pacific Cooperative Studies Unit, University of Hawaii, Hilo, HI

Developing a Baiting Strategy for the Control of Tawny Crazy Ants

David Oi & Rachel Atchison
USDA, ARS, Center for Medical, Agricultural & Veterinary Entomology, Gainesville, FL

SYMPOSIUM

The Southern Region Delusional Infestation Working Group and DI Outputs

Karen Vail[1] & Nancy Hinkle[2]

[1]University of Tennessee, [2]University of Georgia

Abstract

Delusional infestation (DI) is a psychiatric disorder in which a person mistakenly believes they are infested with insects, mites, other organisms or items. Delusional infestation is more inclusive than delusional parasitosis or delusory parasitosis because it includes delusions involving infestations of homes and vehicles and those not caused by parasites. Extension agents, entomologists, pest management, and other professionals are often sought to help identify unknown causes of skin irritation suspected to be caused by insects or other parasites. After a Tennessee needs assessment of these professionals was conducted, working groups in Tennessee and the Southern Region were formed to create reliable resources and standardized procedures for these professionals to interact with individuals with suspected DI to guide them safely and respectfully to medical care.

Delusional Infestation Has No Temporal or Spatial Limits, and Its Ripples Have a Wide Impact

Nancy C. Hinkle[1], Mike Waldvogel[2], Rich Pollack[3] & Mike Merchant[4]

[1]University of Georgia
[2]North Carolina State University
[3]Harvard University
[4]Texas A&M AgriLife Extension Service

Abstract

People who suffer from Delusional Infestation almost invariably contact pest professionals and entomologists in their unending quest to find someone to help them with their putative infestation. While pest professionals and entomologists can realistically play no role in solving a psychological illness involving invisible bugs, they will, nevertheless, be drawn into these situations so should be prepared for this eventuality. Considering this reality, the Southern Region Delusional Infestation Working Group was formed to prepare training materials to assist the pest management industry and Cooperative Extension in preparing people to effectively assist DI callers.

Consider the wasted time and effort due to DI. Sufferers spend time in emergency rooms (paid for by your tax dollars and insurance) and they use physician and staff time that could go to treatable illnesses and injuries. Their condition often leads to loss of friends, withdrawal of family, divorce and alienation. Everyone is frustrated – the sufferer, physicians, friends, family, care providers, insect identifiers, pest management professionals, etc. And with all this attention and effort, the sufferer never gets better because the actual problem is not identified and suitable treatment pursued.

Entomologists are generally correct in assuming when they receive carefully curated samples, taped on paper with labels, or collections of skin ripped from someone's body that they are dealing with a likely DI situation. However, because DI is a medical condition, the individual must still be examined by a physician who recognizes DI for the official pronouncement.

Why do Extension entomologists and pest professionals need special assistance? To help them do their job and provide a better service for their clientele, a particularly needy group. While we can neither provide medical advice nor attempt psychological intervention, we should be prepared to provide encouragement and efforts to get DI sufferers the medical care they need.

A Needs Assessment of Extension Agents and Pest Management Professionals and the Formation of DI Working Groups

Karen Vail, Sandra Peña & Rebecca Trout Fryxell

University of Tennessee

Abstract

Professionals in entomology, pest management, Extension and public health are often called upon to help individuals with unknown skin irritations suspected of being caused by arthropods. The University of Tennessee One Health Initiative Delusional Parasitosis Working Group (UT OHI DP WG) was formed to understand better the interactions among these individuals and what resources were needed to create better outcomes. Results from the UT working group's 2022 needs assessment revealed that 73% of responding Tennessee pest management and Extension professionals had interacted with an individual suspected of having delusional infestation within the prior year. These professionals spent more time and had more interactions with suspected delusional parasitosis cases than general inquiries and needed resources and training to help these individuals find the support they needed. Committees were formed to distribute the workload, and publications were created that described and provided checklists for possible sources of skin irritation. A protocol incorporating these new publications was developed for Extension agents. We focused deliverables on Extension agents first because they were less likely to have a protocol for this subject than pest management professionals and had significantly less training. Thirty-four Extension specialists, entomologists, pest diagnosticians, pest management professionals, and mental health professionals from 12 of 13 southern states applied the Tennessee working group template to create the Southern Region Delusional Infestation Working Group (SRDIWG). This symposium highlights the work and outputs of the SRDIWG including:

1) A factsheet, "Unknown skin irritations: A General Guide," presented below as A Factsheet Explaining DI to the Public, What Could Be Bugging You?
2) A publication with color images and descriptions of many arthropods encountered when working with someone suspected of delusional infestation titled "Guide to Arthropods Associated with Delusional Infestations" and presented as Arthropods Associated with True Infestations and Those Submitted as Suspects in Potential DI Cases.
3) An Extension agent protocol, "Extension Agent Protocol for Unknown Skin Irritations," presented as A Step-by-step Protocol for Interacting with Suspected DI Individuals.
4) A manual that is an accumulation of the DI publications produced by Tennessee and the Southern Region, "Manual for Extension Agents Working with Suspected Delusional Infestation (DI)" presented as The DI Manual for Extension Agents.
5) A PowerPoint presentation, "Delusional Infestation Agent/PMP Training" was created for Extension agents and modified for pest management professionals, and presented as A Training for Professionals Working with Suspected DI.

We wrapped up the symposium with a discussion on Additional Concerns from the PMP Perspective and a Question-and-Answer session. Currently, these working group products may be behind password-protected websites for Extension agents in their respective states.

A Factsheet Explaining DI to the Public

Jonathan Larson[1], Robert Puckett[2], Sydney Crawley[3], Zach DeVries[4], Steve Murphree[5], Abelardo Moncayo[6], Karen Vail[7], Faith Oi[8], Jeffery Stovall[9], Macy Kosinski[7] & Emma Lamb[7]

[1]University of Kentucky
[2]Texas A&M AgriLife Extension Service
[3]Rentokil-Terminix
[4]University of Kentucky
[5]Belmont University
[6]Tennessee Department of Health
[7]University of Tennessee
[8]University of Florida
[9]Vanderbilt University

Abstract

Factsheets are standard Extension tools used by entomologists to educate the public on the basic biology of arthropod pests and methods of control. To help those suspected of suffering from delusional infestation, this working group created a factsheet that explained numerous causes of irritated skin that can mimic insect contact or biting sensations. Beyond these basics, the factsheet also included information on real biting pests, alternative sources of inflammation and itching symptoms, and a pair of checklists that an Extension agent and medical professional could use to help determine possible causes of an individual's skin irritation. The end goal of the factsheet would be to help start the process of accepting that the skin sensations may be caused by something other than insects or other parasites and to encourage the individual to seek a healthcare provider to receive proper diagnosis and support.

What Could Be Bugging You? Arthropods Associated with True Infestations and Those Submitted as Suspects in Potential DI Cases

Matt Bertone[1], Molly Keck[2], Lyle Buss[3] & Macy Kosinski[4]

[1]North Carolina State University
[2]Texas A&M AgriLife Extension Service
[3]University of Florida
[4]University of Tennessee

Abstract

Numerous types of arthropods can be found in homes, whether by accident or as part of their lifestyle. Some species are harmful pests, while others simply reside in the home. Correctly identifying potential parasites and incidental arthropods can help healthcare providers diagnose Delusional Infestation (DI) cases. Here, we discuss the identification and biology of select arthropods that may be causing actual infestations and parasitism symptoms, and those found in homes but mistakenly implicated by DI sufferers. Groups covered include bed bugs and relatives (Cimicidae), fleas (Siphonaptera), no-see-ums (Ceratopogonidae), various mites ("Acari", including chiggers, cheyletids, itch mites, scabies, face mites, and bird/rodent mites), spiders (Araneae), stinging ants (Formicidae), bethylid wasps (Bethylidae), carpet beetles (Dermestidae), springtails (Collembola), scuttle flies (Phoridae), and dark-winged fungus gnats (Sciaridae). We also show examples of non-arthropod materials (usually various debris) mistaken for arthropods by those suffering from DI.

A Step-by-Step Protocol for Interacting with Suspected DI Individuals

Eric Benson[1], Nancy Hinkle[2], Aaron Ashbrook[3], Xing Ping Hu[4], Meredith Shrader[4], Molly Deinhart[5], Karen Vail[5] & Faith Oi[6]

[1]Clemson University
[2]University of Georgia
[3]Louisiana State University
[4]Auburn University
[5]University of Tennessee
[6]University of Florida

Abstract

The Southern Region Delusional Infestation (DI) Working Group developed a step-by-step protocol for interacting with individuals suspected of suffering from DI. The main purpose of the protocol is to train county Extension staff to help individuals suffering from unknown skin irritations, find a potential cause by identifying arthropods or suggesting they consult a healthcare provider to consider other environmental factors or medical causes. Aspects of the protocol include the initial contact with a suspected DI individual, emphasizing not to conduct a physical examination, not to render a medical diagnosis, to dissuade the use of do-it-yourself pesticide applications, and to be open-minded, polite, and respectful. Methods to request and process samples from suspected DI individuals are outlined with an emphasis on following state guidelines if in place.

The protocol outlines possible events that can trigger DI, some common statements from sufferers and common signs from sufferers. It also instructs the individuals helping potential DI sufferers on procedures for working with situations if no arthropods are present, de-escalating tense situations, and giving follow-up guidance. Extension agents are instructed to direct people to the “Unknown Skin Irritations: A General Guide” developed by the Southern Region Delusional Infestation Working Group. They are given a questionnaire that individuals complete concerning their situation and can be taken to a healthcare provider. Finally, a flow sheet was developed to describe the entire protocol process visually.

The DI Manual for Extension Agents

Wizzie Brown[1], Bryant A. McDowell[1], Karen Vail[2], Jon Zawislak[3], Leticia Flores[4], Rebecca Trout Fryxell[2] & Francesca Size[2]

[1]Texas A&M AgriLife Extension Service
[2]University of Tennessee
[3]University of Arkansas
[4]University of Tennessee Psychology Clinic

Abstract

Cooperative Extension began in 1862 with the Morrill Act, which provided for a university in every state to offer education in agriculture and mechanical fields. Over the years, Extension has changed to continue to deliver pertinent information and programming as the majority of Americans have moved from rural farming areas to more urban and suburban areas.

The Manual for Extension Agents Working with Suspected Delusional Infestation (DI) is a guiding document for Extension agents who may not have experience with delusional infestation. The manual stresses that, as Extension agents, we do NOT provide medical advice. It is a collection of all the publications developed by the Southern Region Delusional Infestation Working Group and the University of Tennessee One Health Initiative Delusional Parasitosis Working Group. An additional chapter describes more thoroughly the condition of delusional infestation and treatment options discussed in the literature. This chapter informs Extension agents of the successes of treating DI so they can be hopeful for their clients' outcomes. The manual is the only product that has not been completed yet.

A Training for Professionals Working with Suspected DI

Bryant A. McDowell[1], Jon Zawislak[2], Matt Bertone[3], Sydney Crawley[4], Theresa Dellinger[5] & Francesca Size[6]

[1]Texas A&M AgriLife Extension Service
[2]University of Arkansas
[3]North Carolina State University
[4]Rentokil-Terminix
[5]Virginia Tech
[6]University of Tennessee

Abstract

"A Training for Professionals Working with Suspected DI" is a comprehensive PowerPoint training program designed for Extension agents, specialists, and pest management professionals dealing with suspected Delusional Infestation (DI) cases. The training provides a clear definition of DI and familiarizes participants with telltale signs and behaviors exhibited in previous cases. It emphasizes the professional's responsibility in these situations, explicitly stating that they cannot give medical advice or make diagnoses. The program concludes with clear instructions on managing DI interactions and providing information to guide sufferers toward appropriate medical providers. This training aims to equip professionals with the knowledge and skills necessary to handle these sensitive situations effectively and empathetically.

Additional Concerns from the PMP Perspective

Santos Portugal[1], Sydney Crawley[2] & Wally Holden[2]

[1]Mississippi State University
[2]Rentokil-Terminix

Abstract

Pest Management Professionals (PMPs) must take into account additional considerations when dealing with suspected cases of delusional infestation (DI). Because professional pest management services are revenue and customer-driven, individual PMPs face the dilemma of deciding between providing what they perceive to be a quality service for their customers suffering from "bites" from an unidentified "pest," and withholding a revenue-returning treatment when it cannot be justified with evidence of pest activity. There is a worrisome lack of guidelines and best practices available for PMPs dealing with a DI account, and training to recognize and handle suspected DI cases is not readily available. This is especially true for smaller companies lacking the means to employ a Technical Director. Thus, this working group looks to provide targeted training and resources for PMPs to recognize these cases better, avoid unnecessary applications of pesticides, and suggest these customers consult healthcare providers.

SUBMITTED PAPERS

ANTS

Fire Ant Males Prevent Multiple Mating of Conspecific Females through Male Produced Tyramides

Satya P. Chinta[1], Robert K. Vander Meer[2] & Tappey H. Jones[3]

[1]Foresight Science and Technology
[2]USDA-ARS Center for Medical, Agricultural & Veterinary Entomology
[3]Virginia Military Institute

Abstract

Red imported fire ants (*Solenopsis invicta*) mate about 150 m in the air when weather conditions are right (warm temperatures, low wind, and recent rain). Males fly first forming an areawide lek. Female sexuals fly into the male lek and are quickly mated. The newly mated queens make their way to the ground, but there are ample opportunities for additional matings. Remarkably, fire ant queens have been shown to be mated by a single male. Here we report a mechanism that has evolved to prevent multiple female matings. Fire ant males produce specific compounds called tyramides in their reproductive system that are transferred into the female at the end of the mating process. Newly mated queens have a specific enzyme that hydrolyzes tyramides to tyramine, which activate reproductive development. Interestingly, tyramides were also found in significant quantities on the gaster surface of newly mated queens. Investigation into a potential function for these tyramides led to the discovery that tyramides act as repellents to males through close proximity or contact in an olfactometer bioassay. This unique method of preventing multiple matings may be a general phenomenon within the Myrmicine ant subfamily (>6,000 species), since tyramides are only produced by males in this this ant subfamily.

The Relationship Between Fire Ants and the Nitrogen-Fixing Bacteria of Legumes

Ashley Morris[1], Robert Vander Meer[1] & Roberto Pereira[2]

[1]USDA-ARS Center for Medical, Agricultural & Veterinary Entomology
[2]University of Florida

Abstract

Bradyrhizobium (Hyphomicrobials: Nitrobacteraceae) is a genus of soil-dwelling, gram-negative bacteria that have been reported in both tropical and temperate soil ecosystems throughout the world. Certain species are capable of forming symbiotic nodulation with leguminous plants (Fabaceae), making them essential to the legume rhizosphere due to their ability to supply plants with nitrogen and maintain soil health. Fire ants (*Solenopsis* spp.) are hypothesized to alter the microbiome of their environment through the consistent use of chemicals, including 2-methyl-6-alkyl or alkenyl piperidine alkaloids, as well as certain pyridines, in and around their nest. These chemicals, which are stored in the venom sac and released through a sting, are used for food procurement and defense by the fire ants and have antibiotic, antifungal, antiparasitic, antiviral, and hemolytic properties. In this study, extracts of the red-imported fire ant (*S. invicta*) and the tropical fire ant (*S. geminata*) were obtained and tested through disc-diffusion against *B. japonicum* and *B. elkanii* – The two most important nitrogen-fixing symbionts of soybean (*Glycine max* L.), an agricultural crop of worldwide importance. The venom-containing extracts were found to inhibit the growth of both bacteria, with *S. geminata* extracts having a greater inhibitory effect on average than *S. invicta* and *B. japonicum* being more susceptible.

The ManhattAnt: Tracking the Spread of a New Pest Ant in New York City

Clint Penick[1], Samantha Kennett[2], Todd Pierson[3], Bernard Seifert[4] & Robert Dunn[5]

[1]Auburn University
[2]Clemson University
[3]Kennesaw State University
[4]Senckenberg Museum of Natural History
[5]North Carolina State University

Abstract

A new ant species was discovered in the heart of New York City in 2011, which garnered national headlines and created the memorable nickname "ManhattAnt." New York City is one of the oldest and largest cities in North America and has been the site of introduction for some of North America's most damaging invasive pests. Nevertheless, there has been little follow up research on the ManhattAnt since its discovery, and it has yet to be formally identified. Here we use genetic and morphological approaches to confirm the identity of the ManhattAnt and characterize its introduced range and colony structure. Results from genetic analyses placed the ManhattAnt within the *Lasius emarginatus* species complex, and morphological comparisons ruled out closely related species to identify the ManhattAnt as the European ant *L. emarginatus* with 93% certainty. Since its initial discovery, the ManhattAnt has become one of the most common ants in New York City, and based on its native range, *L. emarginatus* could expand to cover much of the eastern United states from Massachusetts to Alabama. Continued monitoring of *L. emarginatus* is warranted, as it has been increasingly reported as an indoor pest and is known to form mutualisms with honeydew producing pests of street trees.

SUBMITTED PAPERS

IPM & INDUSTRY

IPM in Urban Agriculture and Landscape

Anamika Sharma

Center for Biological Control, College of Agriculture and Food Sciences, Florida A&M University, Tallahassee, FL 32307-4100, USA

Abstract

Approximately 30% to 40% of pesticide use is in urban areas. Since the use of chemicals to control pests is considered cheap, easily accessible, and effective, therefore conventional pesticides remain a major pest management strategy in the Urban landscape. Plants/crops grown in urban landscapes, greenhouses, community gardens, rooftop farms, and hydroponic, aeroponic, and aquaponic facilities encounter unexplored challenges. Several insect pests, diseases, and weeds are common in urban agriculture and urban landscapes. The use of IPM in the urban agroecosystem is not much explored. The majority of urban growers are organic growers and IPM enables them to manage the problems without depending on the chemicals. Currently, a limited number of cultural, chemical, and biological strategies are used in urban farming. Commercially available environmentally friendly products have their limitations. A constant challenge is faced by small-scale farmers, urban growers, and pesticide applicators. The incorporation of a holistic integration of the available strategies could enable sustainable urban farming and provide realistic solutions to the issues faced by urban growers. Integration of these strategies will enable researchers to explore the effective synchronization of the strategies. Here I will focus on major challenges and their possible management by using IPM strategies.

Pulling Back the Curtain: Open Records and Federal Data Bases Reveal Objective, Verifiable Revenue and Employment Estimates for Professional Pest Management Services

Jacob L. Winkles & Brian T. Forschler

University of Georgia

Abstract

Economic studies on the Professional Pest Management Industry (PPMI) are often conducted without attribution to published sources. US Census and Bureau of Labor Statistics data represent an infrequently used, but accessible, resource to estimate the economic contributions of the PPMI. We conducted a search of those records to estimate the economics of the PPMI in Georgia for 2021 and found both revenue and employment increased 117% from 1997-2021. We describe the methods and provide tutorials for other states or national organizations to follow to generate comparable economic information on the PPMI.

SUBMITTED PAPERS
WDO/TERMITE

Distribution Survey of Termites on Oahu, HI

Reina L. Tong & Jia-Wei Tay

University of Hawai'i

Abstract

Oahu, Hawai'i, is home to eight species of invasive termites. A timed hand-collection survey of termites was carried out along major roads from 2023-2024 and compared to previous termite surveys. The Asian subterranean termite, *Coptotermes gestroi* (Wasmann), was found in the northwest of the island outside of its previously limited distribution of the southwestern region of Oahu. The locations of *Incisitermes immigrans* were similar to previous surveys. The Formosan subterranean termite (*C. formosanus* Shiraki) was found less frequently than in previous surveys.

Architects of Apoidea: A Study of the Eastern Carpenter Bee, *Xylocopa virginica*, and its Role in Constructing New Environments

Anders Stevenson & Brian T. Forschler

University of Georgia

Abstract

Xylocopa virginica, the Eastern Carpenter Bee, is a familiar sight in the warmer months across eastern North America. The holes that mark the entrance of their nests can be readily found across patio decks, benches, and exposed wood in general, yet suppositions about the interior structure of *X. virginica* nests are difficult to make from examination of the exterior. This study collected and exposed the interior structure and contents of multiple nests found on bench boards collected in Athens, Georgia in the summer of 2023. This work gives a detailed account of the interior structure and inhabitants of 55 holes in 7 boards. Boards were collected, cut into 46-cm lengths, and frozen before careful chiseling along the length of bee-occupied boards. Imaging and measurements of the exposed gallery systems and collection of their contents was performed. Through our sampling, it was found that carpenter bees do construct expansive gallery networks per hole with some containing multiple galleries, and occasionally, access to multiple holes. It was found that, in addition to *X. virginica*, other species can make use of carpenter bee nest sites. These findings reveal how *Xylocopa virginica* are not only underappreciated pollinators in the built environment, but their nest construction enables these ecosystem engineers to contribute to biodiversity in urban landscapes.

Flight Times for Five *Reticulitermes* species (Blattodea: Rhinotermitidae) Collected Over 30 Years from the Southeastern United States

Conor G. Fair & Brian T. Forschler

University of Georgia

Abstract

The University of Georgia urban entomology research program amassed a collection of 26,898 adult (alate) termites representing 5 *Reticulitermes* species from 500 colonies over the past 30 years. Termite alates were collected every month of the year with the majority obtained from March-May. All conspecific samples were recorded in consecutive months with *R. flavipes* covering 7, *R. nelsonae* 5, *R. malletei* 4 and *R. virginicus* & *R. hageni* 3 sequential months. Three species were collected in March, May and June and four species during April. These alate collections will be discussed with reference to future research directions.

Efficacy of Chitin Synthesis Inhibitors Against the Western Drywood Termite *Incisitermes minor* (Blattodea: Kalotermitidae)

Nicholas Poulos, Michael K. Rust, Chow-Yang Lee & Dong-Hwan Choe

Department of Entomology, University of California, Riverside, CA 92521, USA

Abstract

The western drywood termite, *Incisitermes minor* (Hagen), causes significant economic damage in its native range and other areas where they have been introduced by human activity. Baits containing chitin synthesis inhibitors (CSIs) have been an effective tool for subterranean termite control due to their dose-independent lethal time, delayed toxicity and nonrepellency. However, such an option is not available for drywood termite control. Three CSIs, noviflumuron, bistrifluron and chlorfluazuron, were evaluated for their efficacy against *I. minor* over 60 days in no-choice and choice experiments. Transfer experiments were also carried out to evaluate the movement of ingested CSIs within groups of *I. minor*. This study serves as a first step towards utilizing CSIs for drywood termite control.

Overview of Trials to Evaluate an Experimental Caulk-Like Bait Containing Noviflumuron when Applied to Trees for Elimination of *Coptotermes formosanus* Shiraki

Joe DeMark[1] & Barry Yokum[2]

[1]Corteva Agriscience
[2]City of New Orleans Mosquito, Termite & Rodent Control Board

Abstract

Trials were conducted 2018-2022 in New Orleans, Louisiana to determine the consumption and efficacy of an experimental caulk-like cellulose bait containing noviflumuron applied to trees infested with *Coptotermes formosanus* Shiraki. Noviflumuron rates of 0.1 and 0.2% wet weight were tested and differing amounts of the caulk-like bait were applied. Mean consumption of the bait was estimated to be >90% for all trials based on the initial amount applied. Results showed that when 125 g+ of the caulk-like bait was applied at both the 0.1% and 0.2% noviflumuron rates, elimination of all colonies was achieved in a range of 71.5 to 82.4 days. These time to elimination results for the experimental caulk bait were similar to previous Recruit® HD in-ground baiting trials around trees (mean = 80.78 d) and Recruit® AG FlexPack structure trials (mean = 80.1 d).

Trelona® Trusted by Pest Management Professionals

Freder Medina[1], Robert W. Davis[1], Stephanie N. Granda[1], Kyle Gilder[2] & Edward L. Vargo[2]

[1]BASF Professional & Specialty Solutions
[2]Center for Urban & Structural Entomology Texas A&M University

Abstract

Each year, termites cause more than $6.8 billion in property damage in the U.S., thus innovations play a significant role as they provide Pest Management Professionals (PMPs) with the most advanced termite treatment products and tools. One example is Trelona ® ATBS Annual Bait Stations and since its market introduction in 2018 it has undergone rigorous testing to demonstrate its efficacy against subterranean termites. This presentation provides results from two different field studies, one evaluates the longevity of the Trelona Termite Bait Cartridges (TBC), and another demonstrates termite colony elimination. To determine the efficacy of aged Trelona TBC under field conditions on *Reticulitermes* spp., it required recording termite mortality over time (days) after exposure (DAE). Mortality results showed no statistical differences between 1, 3, and 5-years aged (90-100% @ 90 DAE & 95% (mean) @ 120 DAE) versus unaged TBCs. A second study consisted of two grid (1 UTC & 1 Trelona) sites in an area of known termite pressure (*R. flavipes* & *R. virginicus*) in central Texas. Each termite colony was genotyped and identified (Vargo, TAMU), delineated, and tracked over time. The Trelona treated site showed a significant reduction of termite active stations compared to the UTC site with the elimination of twelve genotypically identified colonies. This year we are also launching our latest innovation, RFID and StationSeeker, two new tools to help PMPs locate Trelona ATBS stations. Our termiticide portfolio, results, and innovations confirm our commitment in helping PMPs implement a successful Integrated Termite Management program.

Product Integrity Lab Testing for Sentricon®

Eva Chin, Garima Kakkar, Joe DeMark & Mary Rushton

Corteva Agriscience

Abstract

Product Integrity testing for the Sentricon ® System including Recruit ® HD in-ground bait and Recruit above-ground bait materials (Recruit AG FlexPack) are routinely conducted in the Urban Pest Management lab at Corteva Agriscience in Indianapolis, Indiana. Samples from lots of newly manufactured product are received monthly from the manufacturing plant and a series of laboratory tests are run to ensure the quality of the termite bait prior to release to customers. Types of tests conducted include acute toxicity, preference vs. wood, blank material and previous lots, efficacy, and tensile strength. The lab also runs acceptance testing for new lots of AI and for any changes proposed for the station materials. This includes for example the station material plastic, inks, colorants, labels, and protective sleeves/shrink wrap for the bait. Lab testing of degraded baits from the field are also done to understand bait longevity and performance from different environments overtime.

Encircle™ Remote Termite Detection System: An Innovative Approach Enabling Integrated Management by BASF

James Austin[1], Kenneth Brown[1], Carrie Cottone[2] & Cheryl Leichter[1]

[1]BASF Professional & Specialty Solutions, Research Triangle Park, NC, USA

[2] City of New Orleans Mosquito, Termite & Rodent Control Board

SYMPOSIUM

Invasive Ants in North America in the Year 2024. Can We Stop Them?

Marina Ascunce[1] & Doug Booher[2]

[1]USDA-ARS Center for Medical, Agricultural & Veterinary Entomology
[2]USDA Forest Service

Abstract

Ants (Hymenoptera: Formicidae) are a very diverse group of organisms with more than 14,000 valid species. They live on all the continents except Antarctica. Non-native ants are frequently found at port of entrance in plant materials and currently more than 320 ant species have been transported outside of their native range and established into new areas. Some of the key features that allow ants to be easily transported by humans are their small size and their ability to survive in ephemeral nest sites such as in root masses, leaf litter, logs and debris, which are enough for the colony to survive their trip to the new geographic area.

In the new geographic areas, non-native ants can have a wide range of negative impacts affecting three main dimensions: 1) ecological, 2) human health and activities, and 3) agriculture and livestock. Non-native ants are some of the most widespread and challenging invasive species in the world as they are very difficult or impossible to eradicate once established.

While only 19 ant species are currently listed in the IUCN Global Invasive Species Database (GISD) (ISSG, 2015), many more ants should be included in the list of invasive species due to their negative impacts in some or all the three dimensions listed above. In the US alone there are 192 non-native ants. Two regions in the US seem to have become host spots for non-native ants which are Hawaii with 60 non-natives ants and Florida with almost 80 non-native ants.

In this symposium, we invited researchers that study non-native ants in different geographic areas and from different perspectives to share their work and jointly discuss the current needs to improve early detection, management, and prevention, if that is possible. We will discuss initiatives to create standardized systems for data submission and expedite reports of new invasives as well geographic expansions, universal metabarcoding system, and the need to more collaborations to tackle these challenges.

Ant Invaders of the Northeast: Trends and Threats

Kaloyan Ivanov[1] & Chin-Cheng "Scotty" Yang[2]

[1]Department of Recent Invertebrates, Virginia Museum of Natural History
[2]Department of Entomology, Virginia Tech

Abstract

Ants dominate terrestrial environments in terms of abundance, biomass, and ecological importance, and also include some of the world's most damaging invasive species. We compiled non-native ant distributions for 19 US states, plus Washington DC, and 6 Canadian provinces based on published records, specimen databases (Antweb, GABI, iDigBio, SCAN), museum collections, and new data. A total of 53 non-native taxa are recorded from the area, including 14 dubious records, which could not be verified. Of the remaining 39 species, 19 are currently confined to man-made structures, 17 are confirmed as established, and 3 have been collected outdoors only a single time and their establishment in the area could not be substantiated. Similarly to other areas across the globe, the majority of the introduced taxa in the region remain confined to human-modified habitats, and many of the records came from the large urban centers of the Northeast. Not surprisingly, the number of naturalized taxa is dominated by Palearctic species; while indoors records are largely represented by widespread tramp species, all of which have become established across the southern reaches of the Nearctic. While most of the taxa that have naturalized in the region have minimal, or unknown, impacts, 6 notorious ant invaders (*Linepithema humile*, *Myrmica rubra*, *Solenopsis invicta*, *Solenopsis richteri*, *Tetramorium tsushimae*, and *Brachyponera chinensis*) have been shown to expand their ranges and exert pressure on native biota, human health, and the economy. We also generated preliminary data to characterize three notorious ant invasives, with a particular focus on Virginia populations. *Solenopsis invicta*, the red imported fire ant, has expanded its state range northward and westward, infesting a total of 27 Virginia counties by 2024. Virus surveys conducted across Virginia's range indicate a decrease in prevalence and diversity of fire ant viruses (*Solenopsis invicta* virus 1, -2, and -3) in recently established populations. Hybrid fire ants (*Solenopsis invicta* x *S. richteri*) were also recently detected in southwestern Virginia, where they are currently restricted to Lee County. In Virginia, *Linepithema humile*, the Argentine ant, is an indoor pest and all records have been associated with household potted plants or greenhouses. Recently, our long-term monitoring has identified a persistent Argentine ant infestation in Virginia Beach which has expanded into adjacent residential areas over 2.5 years, making it the northernmost permanent infestation in the eastern United States. *Brachyponera chinensis*, the Asian needle ant, is widespread throughout the East occupying various habitats from intact forests and forest edges to suburban and urban areas. Mitochondrial DNA sequencing has revealed a common haplotype shared by the majority of *B. chinensis* specimens in the East, consistent with previous findings indicating low genetic diversity across the ant's rapidly expanding invasive range in the United States. We are currently exploring multiple biorational, innovative strategies to enhance the efficiency of managing these invasive ant species.

Disruption of Florida's Native Ant Community by Global Invaders

Doug Booher
USDA Forest Service

Cuticular Hydrocarbons and Body Size Influence Desiccation Resistance of Argentine Ant Supercolonies in California

Elizabeth Cash
University of Florida

Using Interception Records to Build a Predictive Framework for Ant Introductions

Andrew V. Suarez

University of Illinois, Department of Entomology, Urbana, IL 61801

Abstract

A goal of invasion biology is to predict and prevent future invasive species. I discuss the role of using interception records to develop a predictive framework for ant introductions. Using data from Australia and the United States, I examine taxonomic and biogeographic patterns of ant movement. I also discuss how trade and transport data influence interception rates, the identity of species being transported, and the commerce most associated with the transport of ants. Intercepted ants include species not known to be established, yet have characteristics shared with known introduced species. These species should be priorities for detection efforts. I also briefly discuss the growing role of the global ant pet trade in the movement of ant species.

Updates on Alien and Invasive Ants in Mississippi

Joe A. MacGown & JoVonn G. Hill

Mississippi Entomological Museum, Mississippi State University, Mississippi State, MS 39762

Abstract

Since 2001, the Mississippi Entomological Museum (MEM) has conducted extensive surveys of ants in the southeastern region of the United States, especially in Mississippi. Earlier surveys predating 2001 in Mississippi by Marion Smith and others resulted in eight alien ant species being reported from Mississippi. Since 2001, MEM surveys have added an additional 22 species of alien ants to the known fauna of the state. During this time, many of these species have significantly expanded their range in the state and a subset of them are considered invasive. The alien ants reported from Mississippi are native to many regions including Central and South America, Europe, Africa, Australia, and Asia. Here, we report the alien ant species currently known to occur in Mississippi.

For more information about southeastern ants, visit:
https://mem.org.msstate.edu/Researchtaxapages/Formicidaehome.html

Alien Ant Species in Mississippi (Figures 1 and 2)

This list of species is arranged alphabetically. Alien or invasive species and pest status, generalized distribution in Mississippi, and native range are provided.

Brachymyrmex obscurior Forel. Invasive; nuisance pest; isolated records in southern MS, common in southern FL; native to Neotropics.

Brachymyrmex patagonicus Mayr. Invasive; nuisance pest; well established throughout MS and the Southeast; native to Argentina.

Brachyponera chinensis Emery. Invasive; stinging pest; not well established in MS but widespread in central Atlantic coastal region; native to China, Japan.

Camponotus planatus Roger. Possibly invasive; potential structural pest; uncommon in MS, confined to coastal region, common in southern FL; native to Central America.

Camponotus tortuganus Emery. Possibly invasive; potential structural pest; isolated record in coastal MS, common in southern FL; native to Caribbean region.

Cardiocondyla wroughtonii (Forel). Alien tramp species; not considered to be a pest, but can sting; isolated records from southern MS, uncommon; possibly native to Asia.

Cyphomyrmex rimosus (Spinola). Possibly invasive; may out compete native species; well established in MS from coast through central regions, expanding range throughout the Coastal Plain; native to Neotropics.

Hypoponera opaciceps (Mayr). Alien, non-invasive; may out compete native species, not considered a pest but can sting; scattered throughout the state and southeastern region; native to Brazil.

Hypoponera punctatissima (Roger). Invasive; stinging pest; isolated record on coast, common in Florida; native to Europe.

Linepithema humile (Mayr). Invasive; large super colonies, nuisance pest; well established in MS, southern USA, and CA; native to Argentina.

Monomorium floricola Jerdon. Invasive tramp species; nuisance pest; not well established in MS, isolated coastal records, common in FL; native to Old World Tropics, India, Southeast Asia.

Monomorium pharaonis (Linnaeus). Invasive tramp species; nuisance pest, stings; scattered indoor records in MS and USA; thought to be native to Africa.

Nylanderia fulva (Mayr). Invasive; large super colonies, serious nuisance pest, outcompetes native species; well established on MS coast and Gulf Coast to TX; native to South America.

Odontomachus haematodus (Linnaeus). Invasive; stinging pest, may outcompete native species; established in southern MS and spreading along Gulf Coast; native to South America.

Paratrechina longicornis (Latreille). Invasive; large super colonies, serious nuisance pest, outcompetes native species; well established on MS coast and spreading along Gulf Coast; native to Old World Tropics.

Pheidole navigans Forel. Potential invasive; not considered a pest but may out compete native species; well established in MS from coast through central regions of the state, coastal plain; thought to be native to Greater Antilles, Puerto Rico.

Pheidole obscurithorax Naves. Potential invasive; not considered a pest but may out compete native species; well established in southern MS and gulf coastal states; native to Argentina.

Ponerocantha triangularis (Mayr). Alien; not currently considered a pest, may sting; established in southern MS, spreading northward in the state and found in other southeastern states; native to Neotropics.

Pseudomyrmex gracilis (Fabricius). Invasive; stinging pest; well established in coastal areas and spreading northward in the state and throughout coastal plain to NC; native to Mexico or Central America.

Solenopsis invicta Buren. Invasive; serious stinging pest; well established in the southern half of the state and along the Mississippi River north to TN, common throughout the Southeast; native to South America.

Solenopsis richteri Forel. Invasive; serious stinging pest; well established in the northern portion of the state into TN and KY; native to South America.

Strumigenys epinotalis Weber. Alien; not considered a pest, impact on other species unknown; only known from isolated records in coastal MS, FL, and LA; native to Central & South America.

Strumigenys hexamera (Brown). Alien; not considered a pest, impact on other species unknown; well established in scattered localities throughout MS and the Southeast; native to Japan.

Strumigenys margaritae Forel. Alien, tramp species; not considered a pest, impact on other species unknown; only known from isolated records in central MS and the Southeast; native to Neotropics.

Strumigenys membranifera Emery. Alien, tramp species; not considered a pest, impact on other species unknown; well established in scattered localities throughout MS and the Southeast; native to Old World Tropics-Europe.

Strumigenys silvestrii Emery. Alien; not considered a pest, impact on other species unknown; well established in scattered localities throughout MS and the Southeast; native to South America.

*Tapinoma melanoce*phalum (Fabricius). Invasive; nuisance pest; populations in coastal MS, coastal AL, and southern FL; native to Indo-Pacific area.

Tetramorium bicarinatum (Nylander). Alien; not considered a pest, can sting; populations in southern MS, spreading through Coastal Plain; native to Old World Tropics-SE Asia.

Tetramorium immigrans Santschi. Invasive; nuisance pest, can sting; isolated records in central MS, common in states north of MS; native to Europe.

Tetramorium lanuginosum Mayr. Alien; not considered a pest, can sting; populations in coastal MS; native to Old World Tropics-SE Asia.

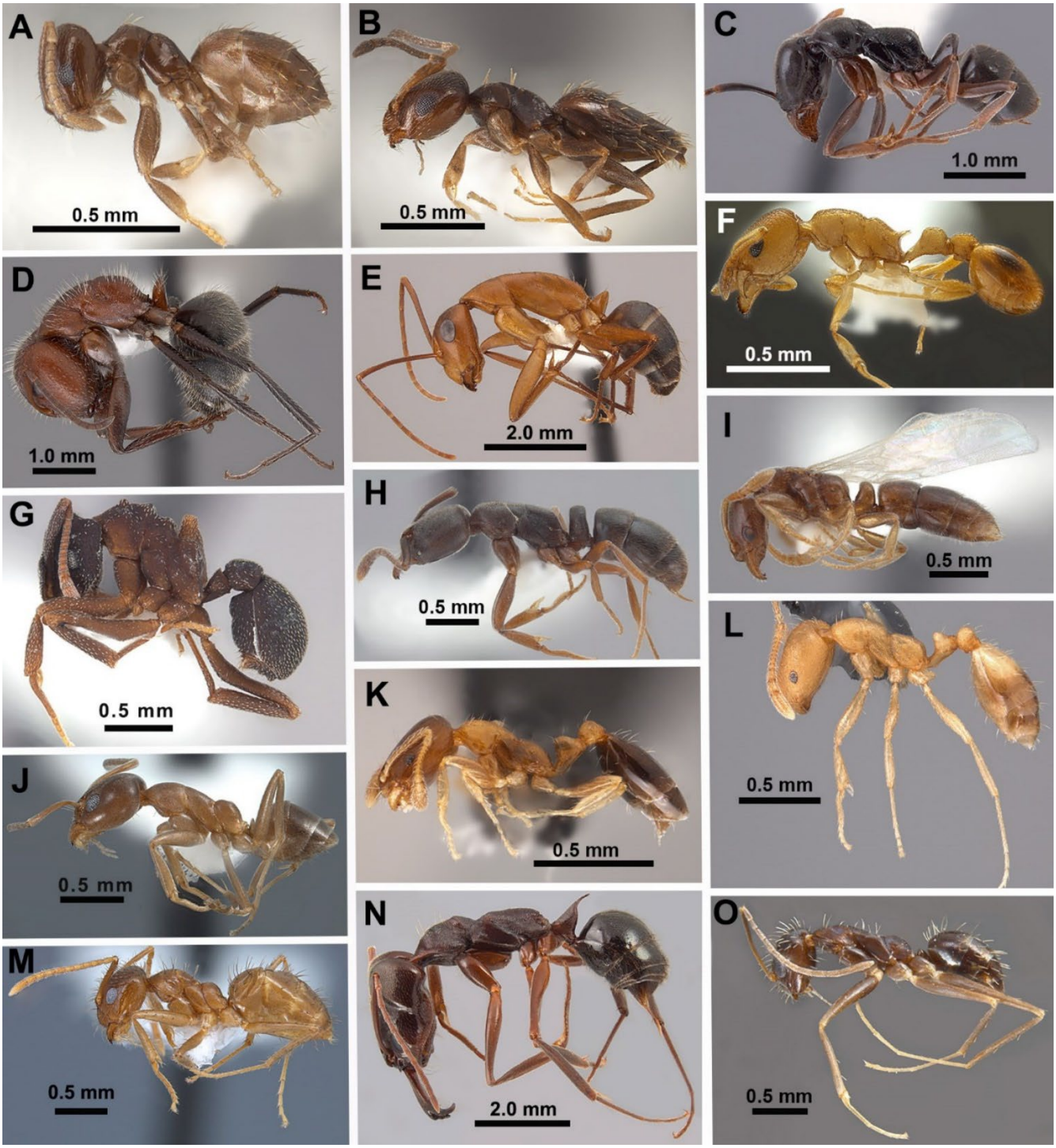

Figure 1. Lateral views of (A) *Brachymyrmex patagonicus*, (B) *B. obscurior*, (C) *Brachyponera chinensis*, (D) *Camponotus planatus*, (E) *C. tortuganus*, (F) *Cardiocondyla wroughtonii*, (G) *Cyphomyrmex rimosus*, (H) *Hypoponera opaciceps*, (I) *H. punctatissima*, (J) *Linepithema humile*, (K) *Monomorium floricola*, (L) *M. pharaonis*, (M) *Nylanderia fulva*, (N) *Odontomachus haematodus*, and (O) *Paratrechina longicornis*.

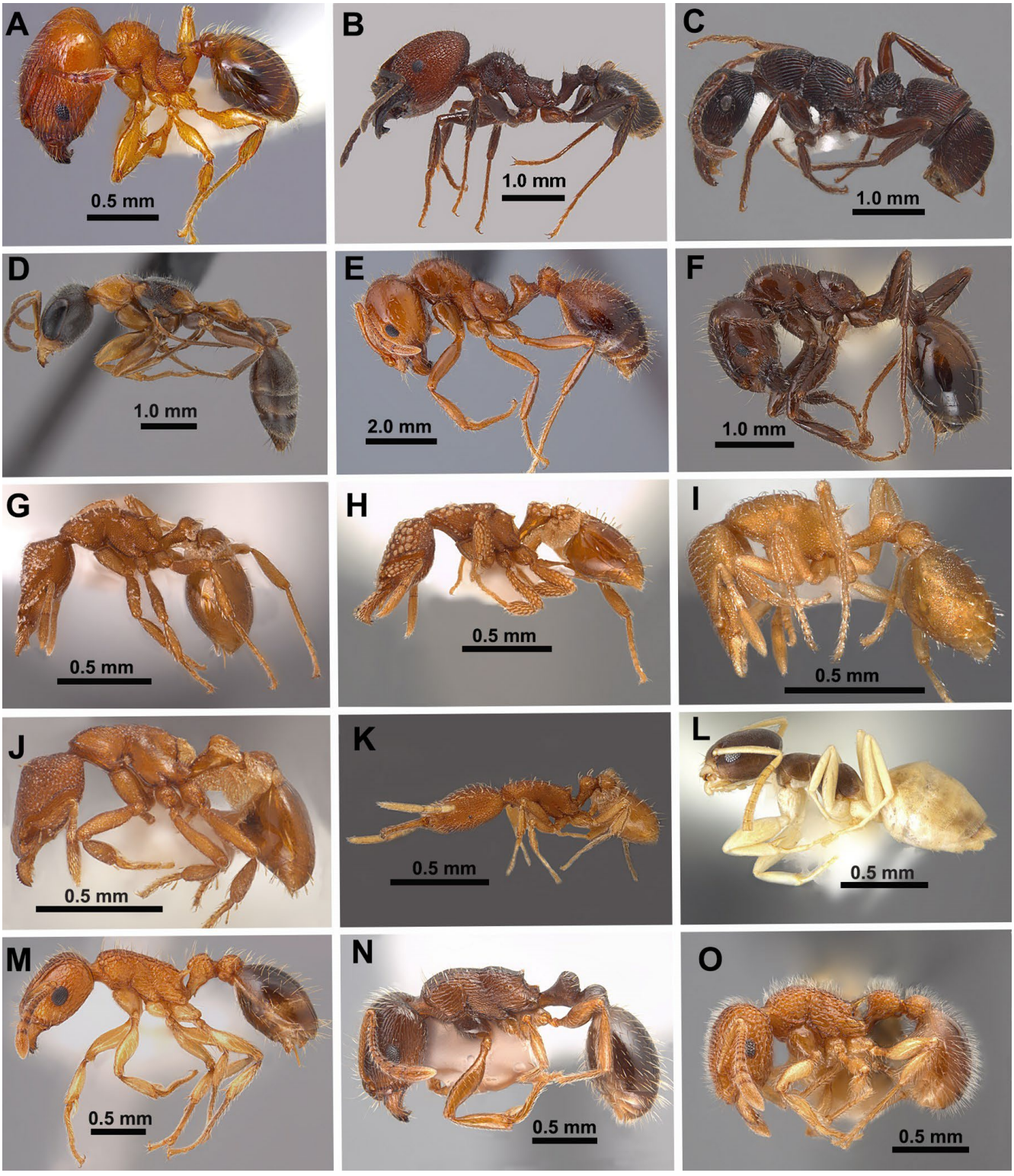

Figure 2. Lateral views of (A) *Pheidole navigans*, (B) *P. obscurithorax* (C) *Ponerocantha triangularis*, (D) *Pseudomyrmex gracilis*, (E) *Solenopsis invicta*, (F) *S. richteri* (G) *Strumigenys epinotalis*, (H) *S. hexamera*, (I) *S. margaritae*, (J) *S. membranifera*, (K) *S. silvestrii*, (L) *Tapinoma melanocephalum*, (M) *Tetramorium bicarinatum*, (N) *T. immigrans*, and (O) *T. lanuginosum*.

SYMPOSIUM

Product and Equipment Innovations in Urban Pest Management

Chris Keefer & Tim Husen

Syngenta Professional Pest Management

Abstract

Symposium will focus on recent and upcoming product and equipment innovations targeted towards urban or structural pest management. Session will incorporate speakers from Academia, Industry, and Operational Pest Management.

Plinazolin Technology – Innovation for Professional Pest Management

Chris Keefer & Tim Husen

Syngenta Professional Pest Management

Abstract

Syngenta will soon introduce a novel mode of action and new active ingredient, *isocycloseram*, under the trade name Plinazolin ® technology into the urban pest management market. This chemistry functions as a GABA antagonist that impacts nerve and muscle function and is designated as Group 30 by the Insecticide Resistance Action Committee (IRAC). It is a non-repellent active ingredient with dual-action activity on most urban pests by contact and ingestion and has no known cross resistance to existing active ingredients in formulated professional pest management products. Plinazolin technology has been formulated into a cockroach gel bait with a highly attractive bait matrix and is effective against German cockroaches and peridomestic cockroaches.

Trial data shows that *isocycloseram* is horizontally transferred in German cockroaches at the secondary and tertiary level through necrophagy, coprophagy and emetophagy. The formulated cockroach gel bait at 1.0% *isocycloseram* has received reduced-risk pesticide status and will have no signal word on the label.

Toxicity of Isocycloseram (Plinazolin) Against Insecticide-Susceptible and -Resistant German Cockroaches (Blattodea: Ectobiidae)

Shao-Hung Lee

University of California, Riverside

Abstract

Isocycloseram is a new insecticide in the isoxazoline class that targets insect GABA-gated chloride channels. In this study, we evaluated a cockroach gel bait formulation containing 1% isocycloseram against a susceptible strain (UCR) and five field-collected strains (WM, RG386, Ryan, CDR, and SY) of the German cockroach, *Blattella germanica* (L.) and compared it with several commercial insecticide baits in the laboratory. Using the Ebeling choice-box method, we also tested a residual deposit of an SC formulation of isocycloseram against the UCR, RG386, and Ryan strains. The isocycloseram bait was amongst the fastest-performing treatments against adult males (mean survival time: 0.9–2.7 d) and mixed stages and sexes (mean survival time: 1.4–5.4 d) across all strains. Physiological resistance was not detected in the WM, CDR, and RG386 strains with topical treatment of a diagnostic dose (3 x LD 95) of isocycloseram developed using the UCR strain. However, topical assays revealed resistance ratios (RR 50) of 1.5 and 3.0X less sensitivity in the Ryan and SY strains, respectively. The performance of a 0.05% isocycloseram residual application against the Ryan strain was improved with the addition of piperonyl butoxide (PBO).

Innovation at Rentokil US

Cassie Krejci

Rentokil Terminix

Innovation Culture at BASF for Urban Pest Management: Ridesco™ WG Insecticide, a New Dual Insecticide Formulation for Mosquito Control

Robert Davis[1] & Matthew Lee[2]

[1]BASF Professional and Specialty Solutions, Blanco, TX
[2]Entomology Consultants, LLC., El Paso, TX

Abstract

BASF Professional & Specialty Solutions Research & Development has developed a new, dual active insecticide formulation - Ridesco™ WG Insecticide. The Ridesco™ WG Insecticide formulation includes dinotefuran (neonicotinoid chemistry, classified as a Reduced Risk Active Ingredient for Public Health Pests) and alpha-Cypermethrin (a type II pyrethroid that is 4X more active than Cypermethrin). The Ridesco™ WG Insecticide label lists >49 pests or pest groups including mosquitoes. Mosquitoes are important public health pests, for which Pest Professionals can struggle offering services that provide adequate control. Fresh and residual leaf treatment efficacy of Ridesco™ WG Insecticide on 3 species of mosquitoes (*Aedes aegypti*, *Culex quinquefasciatus* and *Anopheles quadrimaculatus*) was evaluated and compared with 2 other products. Simulated rain events were provided to the treated leaves (0.25 inches per week, through 60 days).

Dried, 1-day old hibiscus leaf treatments of Ridesco™ WG Insecticide (0.15%), Temprid® FX Insecticide (0.075%) and Suspend® Polyzone® Insecticide (0.03%) provided knockdown within 15 minutes after a 1-hour exposure and 100% mortality at 24 HAE. All three insecticide products provided 100% mortality of the three mosquito species after a 1-hour exposure to 1-day and 7-day aged leaf treatments. The three insecticide treatments provided 89-97% mortality after a 24-hour exposure to 21-day aged leaf treatments and 18-51% mortality after a 24-hour exposure to 60-day aged leaf treatments. In general, 60 DAT residual efficacy was greater vs. *A. quadrimaculatus* than the other two species. This data supports use of Ridesco™ WG Insecticide for control of multiple species of mosquitoes.

Novel Bed Bug Detection: TruDetx

Alexander Ko
Envu

New Strategies and Innovations to Address Challenging German Cockroach Infestations in Subsidized Multifamily Housing (Advion ® Trio and Advion ® MicroFlow)

Timothy J. Husen[1] & Ameya D. Gondhalekar[2]

[1]Technical Services Manager, Midwest & Northeast US, Syngenta Professional Pest Management, Manhattan, IL, USA
[2]Center for Urban & Industrial Pest Management, Department of Entomology, Purdue University, West Lafayette, IN, USA

Introduction: Achieving satisfactory control of German cockroach (*Blattella germanica* L.) infestations in subsidized multifamily housing is challenging due to several factors such as unaddressed plumbing and structural issues, cockroach movement between apartments, poor sanitation and low pest control budgets (Fardisi et al. 2019). Because of these issues, subsidized public housing facilities experience perpetual infestations of German cockroaches (Gondhalekar et al. 2021). Therefore, new strategies and insecticide formulations are needed to combat these perpetual and tough cockroach infestations. The overall objective of this study was to test two new cockroach insecticide bait formulations for effective and long-term suppression of German cockroach infestations in multifamily housing.

Advion ® Trio and Advion ® Microflow were the newest bait formulations evaluated in this study. Advion Trio is a new cockroach gel bait formulation introduced to the market by Syngenta Professional Pest Management. In addition to 0.6% indoxacarb, it contains 0.1% pyriproxyfen (a juvenile hormone mimic) and 0.1% novaluron (a chitin synthesis inhibitor) as insecticide active ingredients. Advion Microflow is a new dry flowable insect bait formulation developed by Syngenta that contains 0.22% indoxacarb. Since rotations between active ingredients from different insecticide mode of action (MOA) categories is important for German cockroach insecticide resistance management (Scharf and Gondhalekar 2021), Optigard ® cockroach gel bait (Syngenta) with 0.1% emamectin benzoate was used in rotation with the Advion Trio gel bait.

Field evaluation procedures: This field-based study was conducted in U.S. HUD (U.S. Housing and Urban Development)-subsidized multifamily housing in Southern Indiana. Study site included German cockroach infested apartments in high-rise (7-story) and low-rise (1-2 story) buildings. Infested apartments were initially identified by surveying approximately 110 apartments for cockroach population numbers using Catchmaster ® glue traps. A total of 6 glue traps were placed per apartment in the following locations: below the kitchen sink, on the kitchen counter, behind refrigerator, next to the stove, in the utility room and in the bathroom. Glue traps were left in the apartment for approximately 24 hours, after which the number of trapped cockroaches were counted. Apartments with pre-treatment trap counts of 10 or more cockroaches were selected for inclusion in the study with resident permission. A total of 23 apartments (distributed in low- or high-rise buildings) qualified for the study based on pre-treatment trap counts of 10 or more cockroaches. These 23 apartments were assigned to one of the two treatment groups. The first treatment group (Advion Trio and Optigard cockroach gel baits) consisted of 11 apartments with cockroach

population numbers ranging from 10 to 458. The second treatment group that received gel bait treatments along with Advion Microflow dry flowable bait placement in void areas, had a total of 12 apartments with population levels ranging from 11 to 436. The starting cockroach population numbers were not significantly different between the two treatment groups: average of 122 for the gel bait only group and 87 for the gel bait + Advion Microflow group ($P>0.05$; t-test).

This study lasted for approximately 10 months. Bait was applied during the first 5 months of the study at weeks 0, 1, 2, 4 (first month), and then at months 2, 3, 4 and 5. With respect to gel bait application, the Advion Trio bait was used at weeks 0, 1, 2 and 4 (first month). For the remaining bait application intervals (months 2, 3, 4 and 5), Optigard cockroach gel bait was utilized. In apartments that received Advion Microflow treatment in addition to gel baits, an Exacticide Power Duster (Technicide, Herber City, UT, USA) was used for placement of dry flowable bait in void spaces (e.g., behind and under the refrigerator and stove and in the wall void behind the kitchen sink) at all application intervals from week 0 to month 5. Prior to each bait application interval, data on cockroach population numbers was collected using 6 Catchmaster glue traps per apartment as explained above for pre-treatment monitoring. During the remaining 5 months of the study (months 6, 8 and 10) no bait was applied but population monitoring was performed using glue traps. As shown in Table 1, average bait application amounts varied based on (i) the cockroach population counts for each apartment as well as (ii) the size or the total square footage of each apartment. High-rise apartments had a living area of approximately 500 sq. ft. and the area of low-rise apartments ranged from 700–1000 sq. ft.

Table 1. Gel and dry flowable bait application amounts based on cockroach infestation levels and apartment square footage.

Cockroach population counts	**Average application amounts at each treatment interval**	
	Gel baits (30 g bait per syringe)	**Dust or dry flowable bait**
Less than 20	0.25–1.5 syringes per apartment	0.2–1.0 oz./ 100 sq. ft. of void space
More than 20	1.5–2.5 syringes per apartment	1.0–1.8 oz./ 100 sq. ft of void space

Results and Discussion: In the Advion Trio treatment group, cockroach trap count reduced by 88% at month 2, whereas in the Advion Trio + Advion Microflow treatment, the trap count declined by >90% at the same time interval (Fig. 1). This decline in populations in both treatment groups at 2 months was statistically significant compared to week 0 trap counts (Repeated Measures ANOVA; $P< 0.05$). However, the trap count reduction was not significantly different between the two treatments. At the 5-month population monitoring interval, trap counts had declined by 98.3 and 99.3% in the gel bait only and gel bait + Advion Microflow treatment groups, respectively (Fig. 1). In congruence with the cockroach trap count decline, Advion Microflow, Advion Trio and Optigard cockroach gel bait application amounts also declined in both treatments from week 0 to month 5 (data not shown).

Additionally, because satisfactory (>90%) German cockroach population reduction was achieved in both treatments, bait applications were stopped after month 5.

When application of Advion Microflow and/or Advion Trio and Optigard cockroach gel baits was stopped after the first 5-months of the study, >90% cockroach trap count reduction relative to week 0 was still observed at months 6, 8 and 10 (Fig. 1). These results suggest that both Advion Trio (rotated with Optigard cockroach gel bait) and Advion Mircroflow + Advion Trio (rotated with Optigard cockroach gel bait), provided sustained control of cockroach infestations or did not allow population spikes for 5 months after bait applications were paused. However, in apartments that received Advion Microflow applications in addition to the Advion Trio and Optigard cockroach gel bait treatments, decline in cockroach trap counts was slightly higher (98–99%) in comparison to apartments receiving gel bait only treatments (92–95% decline). Nonetheless, this difference in control efficiency was not statistically significant ($P > 0.05$). Based on these results, it is plausible to conclude that the placement of Advion Microflow dry flowable bait in void spaces provided a slightly higher and more sustained suppression of German cockroaches. Based on preliminary data, Advion Microflow is known to maintain its efficacy against German cockroaches for more than 1 year (Dr. Alvaro Romero, *unpublished data*).

The effective and sustained control of German cockroaches in both treatments can also be attributed to the presence of a juvenile hormone mimic and a chitin synthesis inhibitor in the Advion Trio cockroach gel bait (in addition to indoxacarb), which may have disrupted normal growth and development of cockroach nymphs by causing molting and cuticular deformations and preventing formation of fertile adults (Gondhalekar et al. 2021). In this regard, at 1- and 2-months after the initiation of this study, malformed nymphs and adultoids were trapped on glue boards in all apartments.

Conclusions: Although it is difficult to achieve satisfactory control of German cockroach infestations in subsidized multifamily housing, a step-wise and comprehensive approach that incorporates (i) identification of population hotspots in the entire building using glue traps, (ii) application of adequate bait amounts depending upon cockroach population numbers and apartment square footage and (iii) utilization of new dust bait formulations (e.g., Advion Microflow) and gel baits containing multiple active ingredients (e.g., Advion Trio) can lead to effective and long lasting suppression of German cockroach populations. The placement of Advion Microflow dry flowable bait in hard-to-reach void spaces can further improve the efficiency and longevity of cockroach control programs. The use of new mixture gel bait, Advion Trio, with three active ingredients: indoxacarb (MOA group 22), pyriproxyfen (MOA group 7C) and novaluron (MOA group 15) is also equally important for long-term suppression of German cockroach infestations particularly due to the negative impacts of insect growth regulators on development and reproduction of German cockroaches. Lastly, rotation of the gel bait component in this study i.e., rotating Advion Trio with Optigard cockroach gel bait (active ingredient: emamectin benzoate; MOA group 6), may have also contributed to the satisfactory and sustained control of German cockroach infestations in this field-based study.

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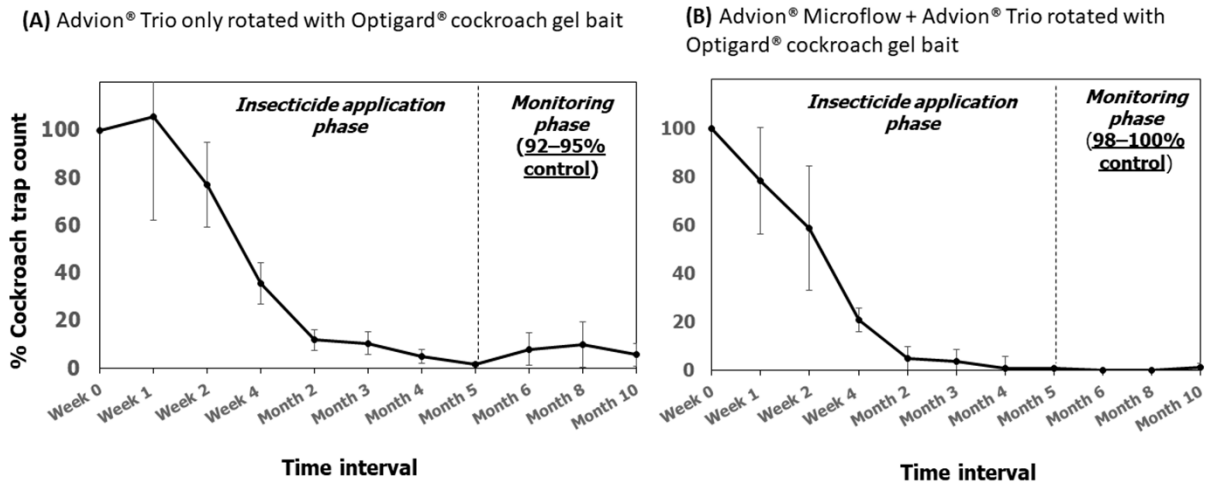

Figure 1. Changes in German cockroach trap counts over 10 months relative to week 0 counts in two different bait treatments: (A) Shows data for gel bait only treatment (Advion Trio rotated with Optigard cockroach gel bait) and (B) Shows data for Advion Microflow + Advion Trio rotated with Optigard cockroach gel bait. For gel baits, Advion Trio was applied in both treatments from week 0 to 4 and then Optigard cockroach gel bait was applied from month 2 to 5. Advion Microflow was utilized in one of the two treatments (i.e., B graph) and its application was limited to void areas in an apartment. Both treatments lead to >90% cockroach population decline ($P<0.05$; Repeated Measures ANOVA) even after the bait application was paused at month 5.

SYMPOSIUM

Coordinated Training and Evaluation of Pest Management, Vector Control District, Public Health, Sanitary, Animal Health Professionals and Pre-Service Students in These Fields to Achieve an Integrated Workforce to Mitigate Community Vector-Borne Disease Risk in the Gulf Coast Region

Claudia Riegel

City of New Orleans Mosquito, Termite & Rodent Control Board

Abstract

Vector-borne diseases have increased in the past two decades at rates beyond what current infrastructure can manage. In order to protect public health, we must increase and strengthen our frontline defenses, which are mosquito abatement districts and public health workers. This is particularly important in the Gulf South because of its intersection of health and economic disparities with a climate that is susceptible to vectors and pathogens. Our proposal, entitled "Coordinated training and evaluation of pest management, vector control districts, public health, sanitary, and animal health professionals in these fields to achieve an integrated workforce to mitigate community vector-borne disease risk in the Gulf Coast region," will address critical gaps in information exchange, resources, infrastructure, evaluation methods, and training standards. The strategies outlined will address these gaps by creating education, evaluation, and partnership sustainability tools that will last beyond the scope and timeline of this proposal.

Specifically, we will **TRAIN** students and professionals. We will create and test educational content that highlights procedural best practices. The core curriculum will be standardized and replicated across the region, and will be offered to students, working professionals, and trainees across audiences with diverse backgrounds. Educational programming can be evaluated using standardized measurement tools. We will implement a training system with four tiers: Awareness, Beginner, Intermediate, and Expert. The training will be centered around regional hubs that offer in-person and virtual modules to increase reach. The educational offerings will be translated into Spanish and other major languages to reach the full extent of the population in the Gulf Coast. We will also create a career exploration program to target college-level students, and our academic partners will incorporate material and guest lecturers into existing public health courses and seminar classes. We will then **EVALUATE** the impact and effectiveness of VBD programs. We will form a working group to compile a collection of relevant information that defines current VBD preparedness, monitoring, and response capacity. The group will regularly meet to share ideas, information, relevant resources, and training materials. The group will construct a needs assessment model built on previous national and regional assessments to better understand vector control activities, knowledge gaps, and challenges to implementation in the Gulf South. We will determine best practices for our region as guided by needs assessment and survey results. Finally, we will build a network of relevant stakeholders and **PARTNERS** to achieve these goals. This working group will

hold regular meetings to share ideas and work to improve vector control practices. We will create mechanisms for sustainability of partnerships and infrastructure to ensure continued cooperation and information sharing among stakeholders and partners. All materials and other relevant products generated by the actions in this proposal will be housed in a centralized online platform with continued access beyond the project timeline.

Strengthening Vector Control by Conducting Evaluations to Determine Gaps, Train Students and Professionals and Partner Across Sectors to Strengthen Vector Control Preparedness

Claudia Riegel
City of New Orleans Mosquito, Termite & Rodent Control Board

Educational Opportunities for Vector Control Training in the Gulf South States

Janet Hurley
Texas A&M University

Evaluation Methods Used to Better Understand the Infrastructure of Vector Control Across Sectors

Imelda Moise
University of Miami

Needs Assessment Objectives and Results That Will Provide the Framework for Education Programs to Strengthen Vector Control Preparedness

Susanne Straif-Bourgois
Louisiana State University

SUBMITTED PAPERS
INSECTICIDES

Flupyradifurone: A Novel Small Molecule Insecticide for Urban Pest Control

Arunas Damijonaitis, Alexander Ko & Byron Reid

Envu

Abstract

Urban pest management faces evolving challenges, necessitating innovative solutions. In this context, new small molecule insecticides play a pivotal role. Our presentation focuses on Flupyradifurone, a promising compound with a proven track record in agriculture and mosquito management. Flupyradifurone belongs to the novel chemical class of butenolides (IRAC group 4D) and can exhibit strong insecticidal effects and circumvent resistance mechanisms due to its unique chemical structure and receptor binding properties.

With the introduction of this new chemical class, we ensure continued efficacy in the face of volving pests while aiming at a well-established neuromuscular insecticide target – the insect nicotinic acetylcholine receptor. Because this molecule is quickly metabolized to less or non-toxic metabolites in bees, it allows for effective pest control while safeguarding delicate ecosystems. Finally, Flupyradifurone's versatility spans through controlling ants, bed bugs, cockroaches, flies, and mosquitoes, addressing critical imperatives in urban pest control and public health.

A New Insecticidal Dust for Pest Management in 2024, Temprid Dust

Alexander Ko

Envu

Abstract

While a variety of formulations are used for pest mitigation, insecticidal dusts remain one of the most effective tools for pest control. Effective as long as they remain dry and undisturbed, insecticidal dusts are a critical component of any pest management program. I present data on a new insecticidal dust for the pest management market, Temprid dust. Containing a pyrethroid (beta-cyfluthrin) and a butenolide (flupyradifurone), this silica-aerogel dust has shown be extremely effective against pests, including bed bugs. I discuss the new active ingredient flupyradifurone and review the efficacy of Temprid dust against susceptible and resistant strains of insects.

Formulation Technology to Improve the Weather Resistance of Residual Insecticides

Jamora Hamilton-Brown, Byron Reid & Deborah Koufas

Envu

Abstract

The structure of outdoor environments can greatly impact outdoor insecticide use. Exposure to conditions such as UV light, wind, or water can degrade or cause movement of the active ingredient in the environment to off-target sites. This can also decrease performance of the insecticide by removing it from the surface and decreasing its bioavailability in the area being protected. Suspend PolyZone is an insecticide with a unique formulation that contains a proprietary polymer that allows it to protect the active ingredient from weather, water runoff, and mechanical abrasion. This allows the product to leave behind residues that stay where they are applied and remain active in the environment for longer periods of time. To examine the residual longevity of Suspend PolyZone and other insecticides exposed to aging in outdoor environments, we introduced groups of either cockroaches or mosquitoes to different treated substrates and compared the mortality resulting from the insecticide residues. Suspend PolyZone was found to have the greatest residual activity and exhibited residual effects for the longest amount of time compared to the other insecticides, indicating that the properties of this formulation were effective in improving insecticide performance in outdoor environments.

Ridesco™ WG, Efficacy and the Unique Value Proposition (UVP) When Using Dual Active Ingredients on Bed Bugs, Spiders and Other Pests

Desiree Straubinger, Sylvia Kenmuir, Bob Davis & Freder Medina

BASF Professional & Specialty Solutions

Abstract

Ridesco™ WG is a new wettable granule combining dinotefuran with alpha-cypermethrin providing a dual mode of action combination against many pests. Dinotefuran is a member of IRAC Group 4A which is a nicotinic receptor agonist interfering with sodium ion flow. Alpha-Cypermethrin is a member of IRAC Group 3A which act as sodium channel modulators causing sodium leakage. Both modes of action disrupt the insect nervous system through contact and ingestion. This combination of active ingredients aids in resistance management, effectively eliminating some pest strains that are resistant to other products. Ridesco™ WG has a broad label including food handling, turf, ornamentals, and livestock housing. Increased labeled sites and pests combined with quick knockdown and long-lasting residual control make it an ideal product with increased value to the field.

Efficacy of Fendona® CS II Controlled Release Insecticide: Now with Food Additive Tolerance!

Kyle Jordan & Chuck Klein

BASF Professional & Specialty Solutions, Research Triangle Park, NC, USA

Introduction & Product Overview

Fendona® CS controlled release insecticide is a microencapsulated dilutable insecticide that has been on the market for several years in the United States. The updated formulation (Fendona CS II) improves on several features of the product and adds food additive tolerance (FAT) to the label (product can be applied in food handling areas).

Every company that manufactures microcaps has their own unique (often patented) production method but each generally possesses the following traits: protection from UV degradation, keeping the active ingredient bioavailable by preventing washing away from treated surfaces, and increasing adhesion to the exoskeleton, resulting in dermal uptake by the target. The updated Fendona CS II formulation has microcaps that are an average of 2 microns in diameter, resulting in approximately 29 billion microcaps per milliliter. These caps are 6-14 times smaller than other microencapsulated products on the market, resulting in better coverage and better residual activity. Active ingredients usually have multiple isomers and the isomers have different levels of activity. The two isomers of α-cypermethrin in Fendona CS II are the two most biologically active isomers, making the formulation four times more active than regular cypermethrin. This, combined with the microencapsulated formulation makes for a highly effective product.

Acquiring FAT is a complicated process but one that greatly expands the use options for a product – opening up its sites to residential and commercial kitchens and food storage areas. This testing involves exposing different categories of food to a chemical application in various states (on counter, on shelves, in drawers, etc.) and exposure intervals. This particular Fendona formulation had not undergone this testing before, so it was performed in order to add FAT to the label and therefore increase its marketability.

Results

Efficacy data must be provided upon registration to add pests to labels, and updating the formulation required running direct efficacy and residual trials on a variety of species. To add 'WASPS' to the label, baldfaced hornets (*Dolicovespula maculata*), yellowjackets (*Vespula* sp.), and paper wasps (*Polistes* sp.) were tested. Mortality for all three species exceeded 90% by 72 hours when applied as a direct spray (**Figure 1**). To add 'TICKS' to the label, deer ticks (*Ixodes scapularis*), lone star ticks (*Amblyomma americanum*), and dog ticks (*Dermacentor variabilis*) were tested. Mortality for all three species exceeded 90% by 48 hours when applied as a direct spray (**Figure 2**).

To add residual control for mosquitoes to the label three species of mosquitoes from three genera (*Aedes aegypti*, *Anopheles quadrimaculatus*, *Culex quinquefasciatus*) were tested by exposing them to treated leaf surfaces at various intervals. Cast iron plants (*Aspidistra* sp.) were sprayed with 0.025% Fendona CS II and were aged outdoors. Adult mosquitoes were exposed to portions of the leaves at intervals up to 122 days. All three species of mosquito exhibited mortality higher than 90% within 24 hours (**Figure 3**). Fendona CS II was tested against the striped bark scorpion (*Centuroides vittatus*) as a residual application on two types of surfaces (wood – porous, and tile – non-porous). The surfaces were aged either indoors or outdoors and scorpions were exposed to the surfaces for four hours at either one day or fourteen days after treatment. The mortality exceeded 90% for all combinations of surface and age (**Figures 4a**, **4b**).

Conclusion

Fendona CS II is efficacious against a variety of pests, including three wasp species and three tick species. While it does not provide instant knockdown, mortality exceeded 90% for all six species tested. It also provided effective residual control of mosquitoes and scorpions. Fendona CS II provided 90+% efficacy at 122 days for the three mosquito species and at 14 days for the striped bark scorpion on both wood and tile. This product will be a useful addition to the pest control portfolio of any pest management professional.

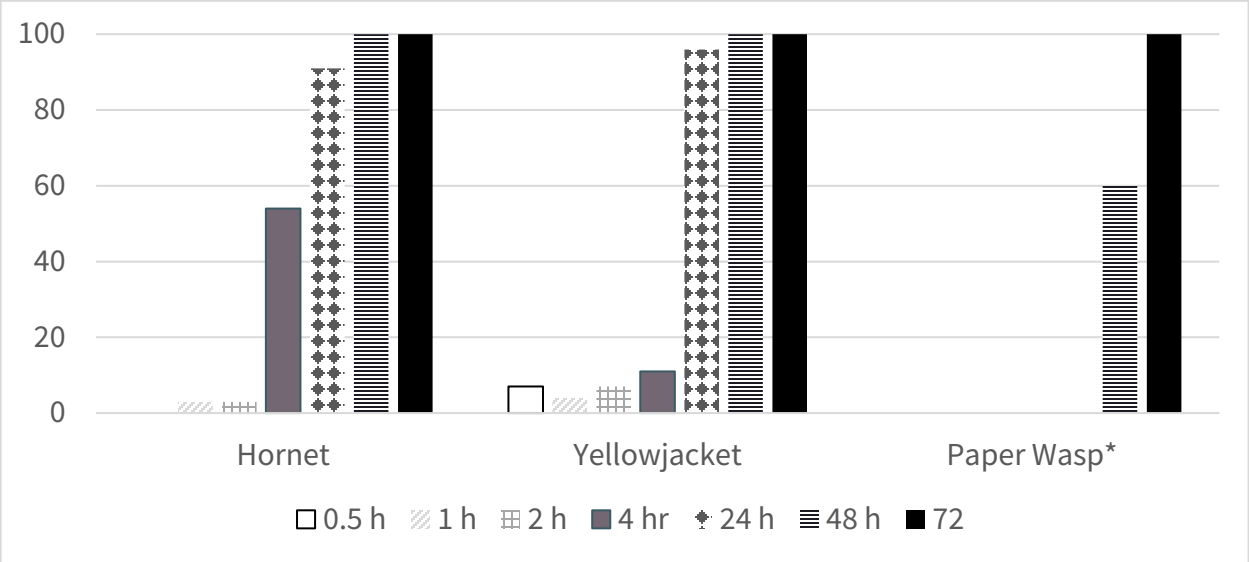

Figure 1. Mortality of wasp species (*Dolicovespula maculata*, *Vespula* sp., *Polistes* sp.) when 0.025% Fendona CS II was applied as a direct spray.
*Paper wasps were tested individually caged instead of 15 per replicate due to availability.

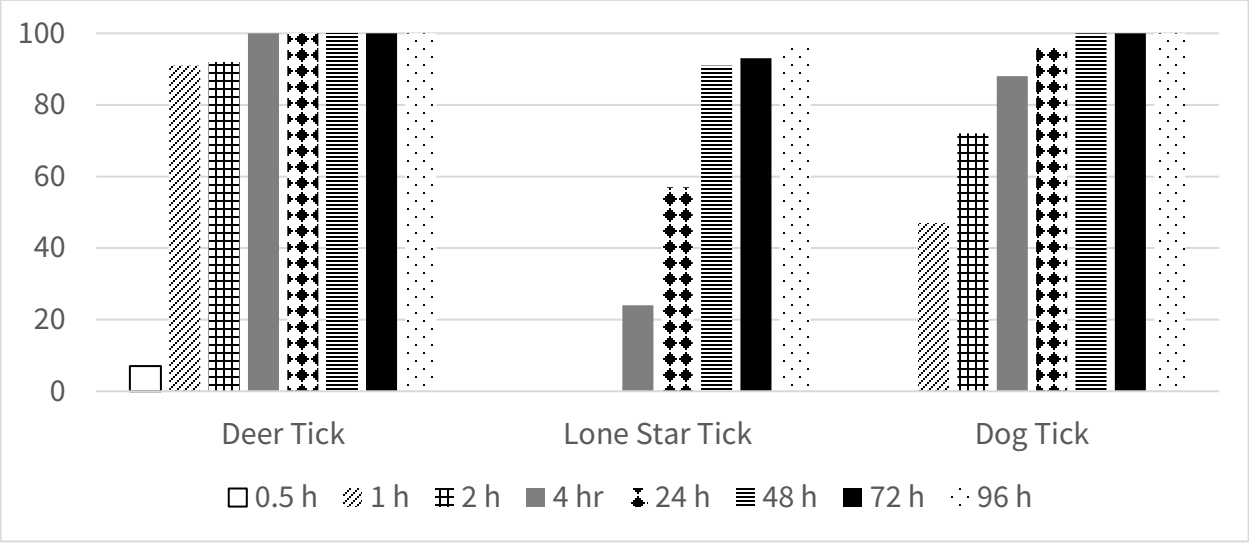

Figure 2. Mortality of 0.025% Fendona CS II when as a direct spray application to three tick species (*Ixodes scapularis*, *Amblyomma americanum*, *Dermacentor variabilis*).

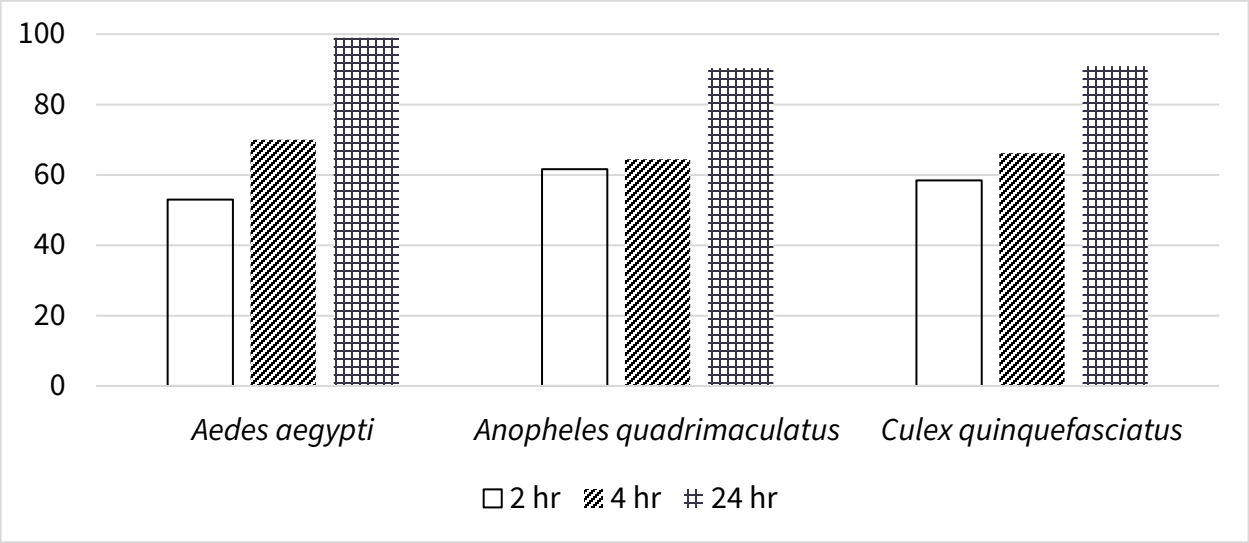

Figure 3. Mortality of three mosquito species when exposed to residual (122 d) applications of 0.025% Fendona CS II on *Aspidistra* sp. leaves.

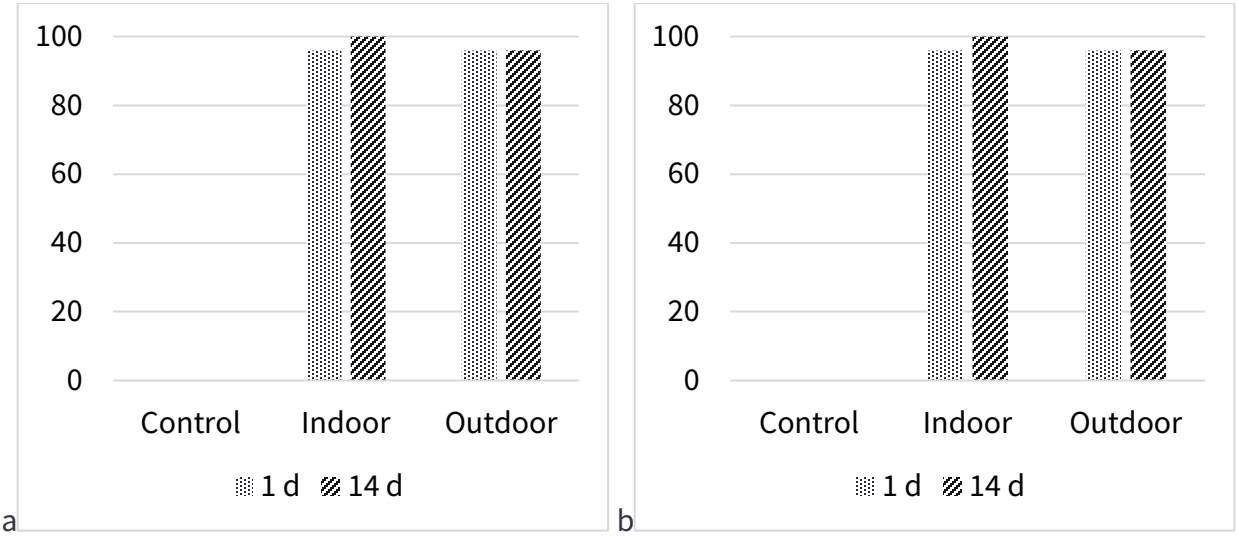

Figure 4. Mortality of striped bark scorpion (*Centuroides vittatus*) on (a) porous (wood) (b) and non-porous (tile) surfaces that were treated with 0.05% Fendona CS II and aged for one day or fourteen days. Surface exposure time = 4 hours.

Termidor® Termite Transfer and Associated Behavior

Jason Meyers

BASF Professional & Specialty Solutions

Abstract: Termidor® SC Termiticide/Insecticide and Termidor® 80 WG Termiticide/Insecticide attained US-EPA approval in 1999 as termiticides. Since that time, multiple formulations have been successfully used against many different arthropod structural pests. Over a 25-year period, numerous tests have been performed, none being more captivating than the transfer mortality results. From radio-labeled fipronil to field tests with Termidor, we review the history of Termidor product transfer tests. Here-in, this paper discusses the results of various lab and field transfer tests of termite and ant interactions with Termidor. Given the wide breadth of laboratory and field testing, combined with field observations, these tests indicate a platform for logical conclusions from linear to planar (flat) to 3D transfer investigations based on real-world insect behavior.

Manuscript: There are basic goals of a termiticide. To stop ongoing damage from the current termite colony attacking the structure. To prevent future damage from that termite colony. To prevent future damage from new/other termite colonies. To prevent future damage for a long period of time. And finally, to create acceptable profit from the previously mentioned achievements.

The seminal laboratory assays demonstrating transfer of Termidor among termite nestmates was conducted (Bagneres et al. 2009). This study conducted contact and feeding intoxication bioassays. Contact intoxication contained significantly lower fipronil ppm than ingestion ppm levels. Direct transfer results were tested using [^{14}C] fipronil and measured on their cuticle and in their bodies. Transfer was observed through donors to recipients. Donors transferred ~46% of the toxicant to recipients and occurred within 24 hours of exposure with maximum uptake occurring through cuticular exposures.

The Concrete Slab and Ground Board tests for Termidor (Kard 2000; Kard 2001; Peterson et al. 2007), conducted by USDA-FS (USDA-Forrest Service), indicated that transfer of Termidor to previously non-treated termites in the field may be occurring. Additionally, the lack of activity in Termidor control plots compared to other treatment control plots indicated a unique reaction to the treatment was occurring, relative to previous testing of repellent and non-repellent liquid termiticides.

Laboratory studies investigating transfer among termites have often limited termite foraging abilities and ultimately, behavior and potential mortality (Ladley and Bullock 2005). There are four foraging arena types that have been used in various studies. Those types include linear (often in thin tube form to simulate distance), planar (often through thin plates of plastic or glass), larger spaces (allow limited 3-dimensional foraging), and field (allows natural foraging space and behavior).

Gahlhoff, 1999 (M.S. Thesis) investigated soil penetration by Eastern subterranean termites and mortality associated with liquid termiticide soil exposures in large tubes (3-D space). This study found termites penetrated label rate Termidor treatments (Fig. 1) at nearly the same rate as those treatments that were 1/10th the label rate (Fig. 2). Termite mortalities associated with those treatments were high for both Termidor soils treated at the label rate (Fig. 3) and 1/10th label rate (Fig. 4), respectively.

Vargo and Parman 2012 demonstrated 100% colony elimination from Termidor SC treatments to field structures. The study followed termite station activity for a 3-year period and no activity was found from the colonies attacking the structure and no new termite colonies were found infesting the structure during the study. Termite activity distance from the house and treatment zones in one of the structures ranged from 6 to 13.5 m.

A previous Termidor callback study (Potter and Hillery 2003) indicated less than 1% retreatment rates for Termidor during the initial years when Termidor SC and Termidor WG were on the market. An internal study (BASF 2020-2024, unpublished) indicated the long-term retreatment rate (of Termidor SC, Termidor WG, Termidor® HE High-Efficiency Termiticide, and Termidor® HP II High Precision Termiticide) was less than 0.1% out of 179,000 structures identified throughout the Eastern and Southeastern U.S.

In addition to the references cited above, there are additional laboratory and field studies on Termidor transfer of peer-reviewed papers and articles that may be helpful to the reader. These are listed in a separate reference section under Appendix A.

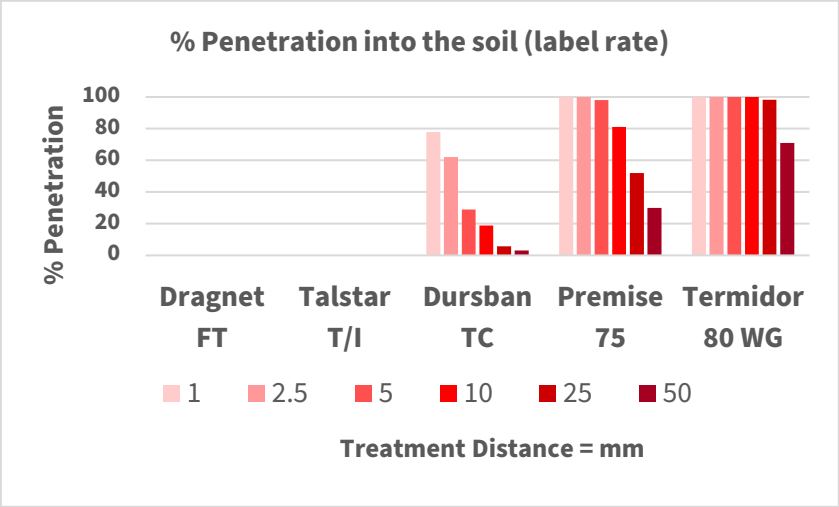

Figure 1. Penetration (%) (max = 50 mm) by eastern subterranean termites exposed to selected treatment thicknesses into soils treated with label rates of liquid termiticides.

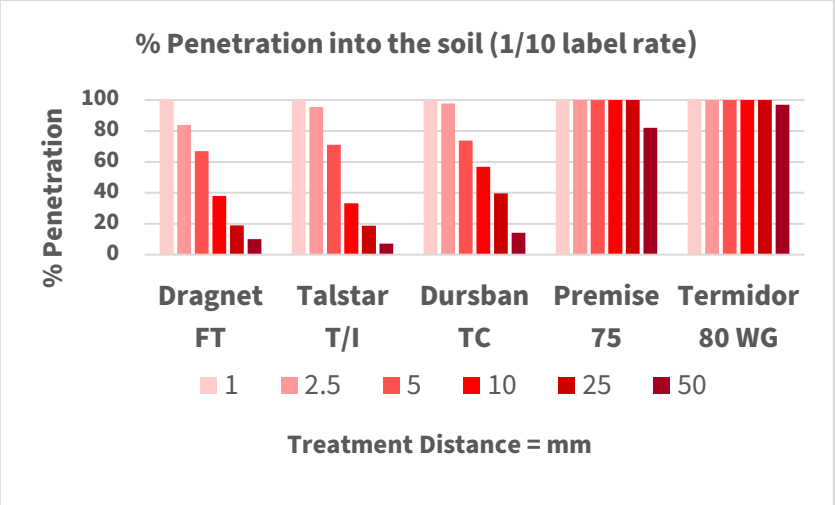

Figure 2. Penetration (%), (Max = 50 mm) of Eastern subterranean termites exposed to selected treatment thicknesses into soils treated with 1/10th label rates of liquid termiticides.

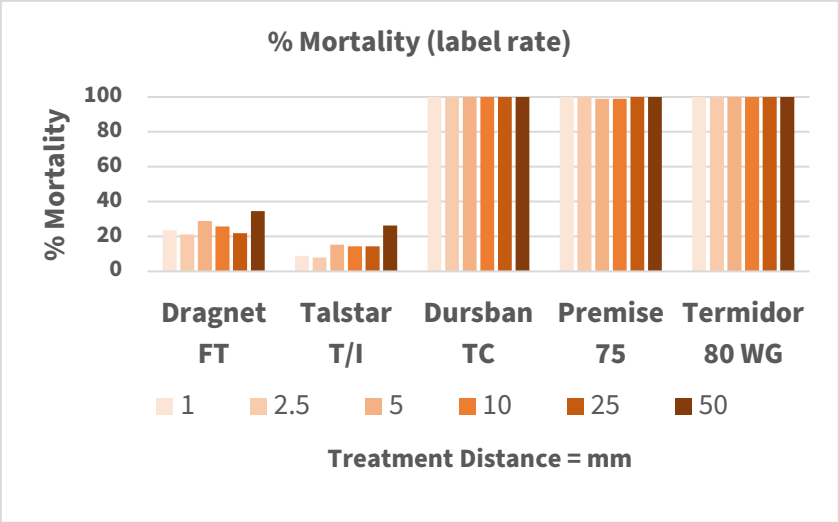

Figure 3. Percent mortality of Eastern subterranean termites when exposed to selected treatment thicknesses in soils treated with label rates of liquid termiticides.

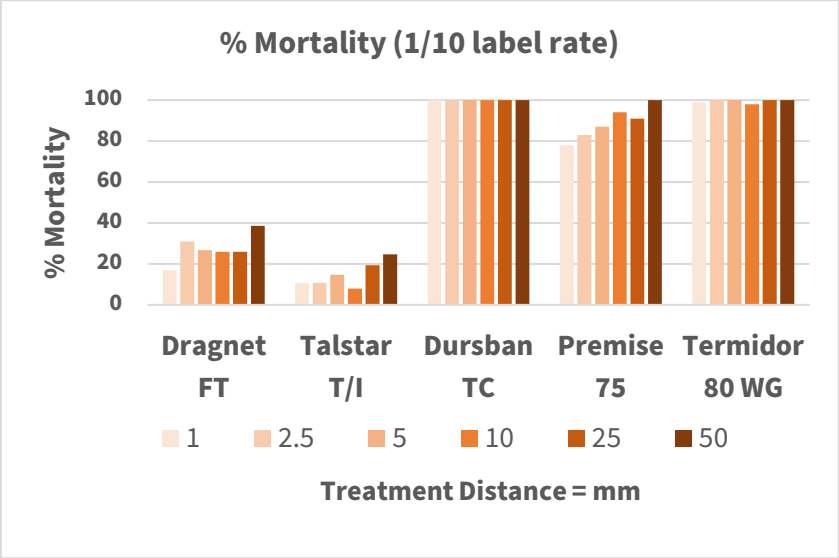

Figure 4. Percent mortality of Eastern subterranean termites when exposed to selected treatment thicknesses in soils treated with 1/10th label rates of liquid termiticides.

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Appendix A

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SYMPOSIUM

A Community-Based Rodent Surveillance Collaborative for Greater Public Health

Claudia Riegel

City of New Orleans Mosquito, Termite & Rodent Control Board

Abstract

Public and private rodent management programs vary greatly across the United States. Relatively few cities in the United States provide comprehensive rodent management programs and they vary greatly in size, funding and function. Understanding the data available, resource limitations, and the needs of rodent management stakeholders are critical for establishing sustainable and effective programs. This session details the establishment of a Community-Based Rodent Surveillance Collaborative (CBRSC) program. The broad and long-term goals of the Collaborative is to foster interagency and cross-sector rodent data sharing and cross-sector dialogue between rodent data producers, custodians and users, first in New Orleans and then across partner cities in the United States. A workgroup was created to better understand the knowledge and needs of stakeholders working in rodent control. In addition, a rodent control survey was conducted to better understand the knowledge and needs of the residents of New Orleans. Listening and providing the resources needed by stakeholders is essential to ensure advancement rodent management. Expanding the availability of available resources will begin to change rodent management procedures in urban areas and dramatically expand the ability of stakeholders in affected cities to detect and respond to new rodent threats as well as greatly improve population health outcomes.

Working Outside of Silos to Maximize Rodent Management

Claudia Riegel

City of New Orleans Mosquito, Termite & Rodent Control Board

Educational Resources for Rodent Management

Janet Hurley

Texas A&M University

Views of Local Health Departments of the State of US Rodent Control Programs

Imelda Moise

University of Miami

SYMPOSIUM

Professional Credentialing in Structural Pest Control

Willet Hossfeld

Entomological Society of America Certification Programs

Abstract

This talk will provide valuable insights into the various types of credentials available and the benefits they infer on their holders. We will cover the difference between certifications, licenses, and degrees. Specific attention will be paid to the benefits of adding credentials earlier in your career and how credentials can help with employee development, growth, and retention.

We will provide background on the landscape of various types of credentials that exist in structural pest control. Then move on to discuss the educational landscape for all levels within the structural pest control industry and how credentials fit into it, covering the perspective of trainers as well as trainees. Doctor Jordan will discuss how earning a credential has benefitted him in his career. We will then discuss the importance of earning credentials, even if you hold an advanced degree as a means to demonstrate professionalism and a commitment to continuing education and understanding of a constantly adapting landscape. Lastly, we will discuss credentials from the perspective of employers, and how they benefit from having certified individuals on staff; credential holders have been demonstrated to have higher job satisfaction.

ESA Certifications and Other Credentials in the Pest Control Industry

Willet Hossfeld

Entomological Society of America Certification Programs

Benefits of Credential Programs for Teaching and Training in the Pest Control Industry

Faith Oi

University of Florida

Personal Benefit of Earning a Credential

Kyle Jordan

BASF Professional & Specialty Solutions

Why Earning a Credential, Beyond Your Degree, Can Be More Advantageous Earlier in Your Career

Benefits of Credentials for Employee Development

SUBMITTED PAPERS
RODENTS

Using Non-Toxic Monitoring Bait, Prelontra, as Part of a Rodent IPM Program

Jeffrey A. Weier

Jeffrey Weier Consulting

Abstract

Non-toxic rodent monitoring baits have existed for many years with little use in the Pest Management industry. Regulatory pressures on rodenticide's active ingredients will require new approaches to rodent control programs. Prelontra is a new product, and this trial investigated weatherability and acceptance of this product to wild rodents over a six-month period. Prelontra was readily accepted and resistant to mold and non-target consumption. When Prelontra showed evidence of being consumed it was switched to Selontra in the same station. The result was Selontra being immediately accepted. Cholecalciferol, the active in Selontra, has historically had some aversion issues in the field. These results imply that pre-baiting with monitoring blocks may enhance the subsequent acceptance of rodenticides. The implications of this observation are that the use of non-toxic monitoring baits can reduce the amount of rodenticides used, reducing potential non-target exposure. Also, monitoring baits like Prelontra may accelerate and enhance the acceptance of rodenticides, increasing efficacy and possibly overcoming some aversion issues.

Prelontra™ Rodent Monitoring Bait: New Product for Monitoring Rodent Infestations and Pre-Baiting Prior to Selontra® Rodent Bait Use

Joseph A. Argentine, William E. Barton, Sharon Hughes, Sylvia J. Kenmuir & Zach Mundy

BASF Professional & Specialty Solutions

Abstract

Rodent monitoring bait has been used to detect rodent activity and overcome neophobia but is increasingly being used due to regulatory pressure. Prelontra Rodent Monitoring Bait is a non-toxic, soft block formulation based on the Selontra Rodent Bait matrix but without the active ingredient cholecalciferol. It contains none of the Nine Big Food Allergens and no dye, so it is easy to distinguish from Selontra blocks. It also has the same patented polyolefin film (POF) that helps protect the bait from both weather and non-target invertebrate consumption, yet allows odors to escape and be detected by rodents. Prelontra is ideal for pre-baiting prior to using Selontra, allowing rodents to become accustomed to the smell and presence of this formulation of soft block. In laboratory choice feeding studies Prelontra was highly palatable and quickly accepted by both rats and mice, with both consuming 6.5 and 2.8 times more Prelontra than the standard laboratory diet, respectively[1,2]. Also, in a field trial on a rat infestation at a UK zoo Prelontra was readily accepted by Norway rats. Following the pre-baiting stage Selontra was administered and controlled the infestation of over 100 rats at the site[3]. Additional studies in the US have also shown Prelontra to be readily accepted by rodents. The fit of monitoring bait as part of an Integrated Rodent Management program is discussed.

[1]Richter, D. ‘‘Choice feeding (palatability) test on BASF Rodent Monitoring Block (Without active ingredient) against male *Rattus norvegicus*. Report ASF-21-004. 2021.

[2]Richter, D. ‘‘Choice feeding (palatability) test on BASF Rodent Monitoring Block (Without active ingredient) against male *Rattus norvegicus*. Report ASF-21-004. 2021.

[3]Hughes, C. S. ‘‘Field trial study on the use of Monitoring Paste from BASF, followed by Selontra for the control of Norway rats, *Rattus norvegicus*, at a zoo in the UK.“ Report LR23-004. 2003.

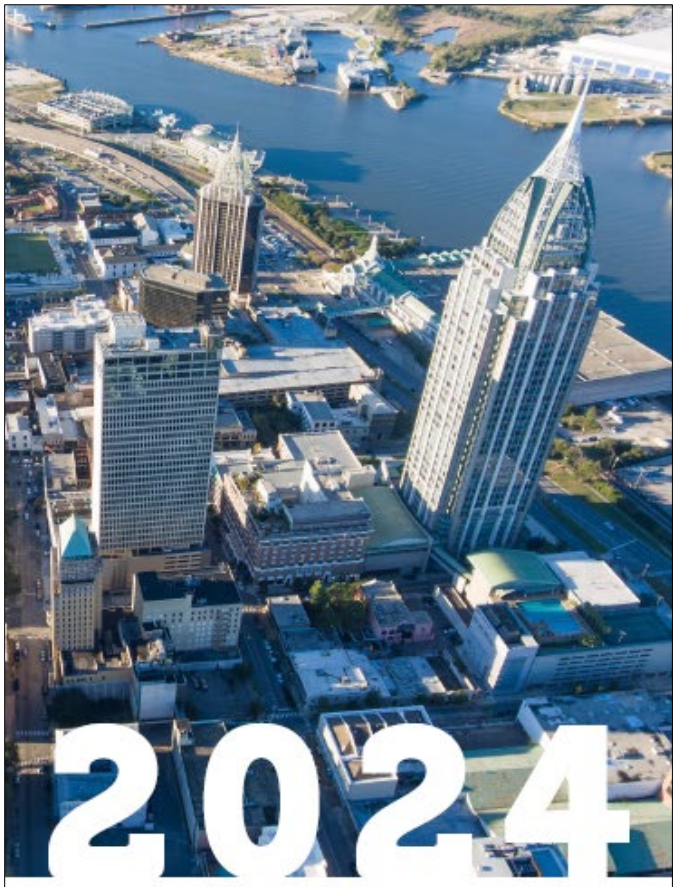
Unveiling the Stop-feed Phenomenon of Cholecalciferol in Rodent Control: Mechanisms and Implications

Sylvia Kenmuir[1], Joseph Argentine[1] & Niamh Quinn[2]

[1]BASF Professional & Specialty Solutions
[2]University of California Agriculture & Natural Resources, Irvine

Abstract

As concerns over the secondary toxicity of anticoagulants rise and regulatory scrutiny intensifies, exploring alternative rodenticide modes of action becomes imperative for effective commensal rodent management. Cholecalciferol possesses properties, including its distinctive stop-feed effect, which refers to its ability to stop animals from feeding after ingestion. This characteristic is particularly important in rodent control, where cholecalciferol is used as a rodenticide. Understanding the stop-feed effect is crucial for applicators because it affects dosing and consumption pattern analysis. This paper delves into cholecalciferol's general mode of action, histopathological manifestations such as organ calcification, and strategies for interpreting baiting success when employing this unique active compound.



National Conference on Urban Entomology & Invasive Pest Ant Conference

May 19-22 | Mobile, Alabama

Renaissance Mobile Riverview Plaza Hotel

NCUE
National Conference on Urban Entomology

INVASIVE & PEST ANT CONFERENCE

Schedule at a Glance

SUNDAY, MAY 19

6:00-8:00p	Welcome Reception

MONDAY, MAY 20

6:30-7:45a	Breakfast on your own
8:00-9:30a	Mallis Award
9:30-10:15a	Student Award Papers
10:15-10:30a	Break
10:30a-12:30p	Concurrent Sessions MASTER'S Student Paper Competition DOCTORAL Student Paper Competition
12:30-1:30p	Lunch on your own
1:30-4:30p	Concurrent Sessions SYMPOSIUM Biology and Management of Blood-Feeding Arthropods SYMPOSIUM Training in Urban Pest Management
3:00-3:30p	Break
3:30-4:30p	Symposia continued

TUESDAY, MAY 21

6:30-8:00a	Breakfast on your own
8:00-10:00a	Concurrent Sessions SYMPOSIUM Formosan Subterranean Termites SYMPOSIUM Advances in Invasive and Pest Ant Management SYMPOSIUM The Southern Region DI Working Group
10:00-10:30a	Break
10:30-11:30a	Concurrent Sessions SYMPOSIUM Formosan Subterranean Termites, continued SUBMITTED PAPERS Ants SUMITTED PAPERS IPM & Industry
11:30a-1:00p	Awards Luncheon
1:00-3:00p	Concurrent Sessions SUBMITTED PAPERS WDO/Termites SYMPOSIUM Invasive Ants in North America in the year 2024 SYMPOSIUM Product and Equipment Innovations in Urban Pest Management
3:00-3:30p	Break
3:30-5:15p	Concurrent Session SYMPOSIUM Achieve an Integrated Workforce to Mitigate Vector-Borne Diseases in the Gulf Coast Region SUBMITTED PAPERS Insecticides
6:00-9:00p	Explorium

REGISTRATION HOURS:
Sun 2:30-5:00p, Mon & Tues 7:00a-5:00p, Wed 7:00-10:00a

Upload your presentation during breaks at the table by registration. Please be courteous and upload your talk at least one session prior to when you are speaking.

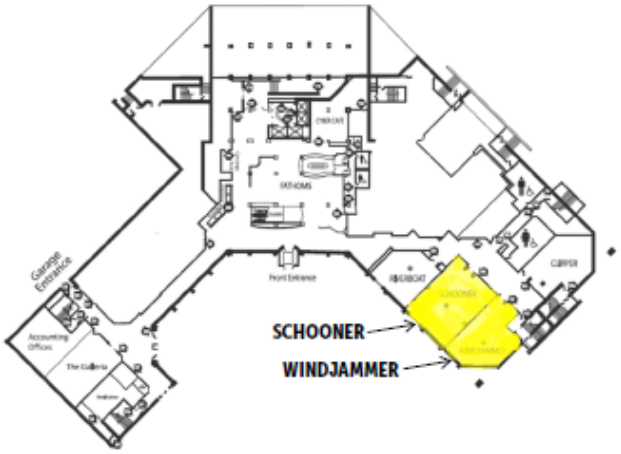
Schedule at a Glance

WEDNESDAY, MAY 22

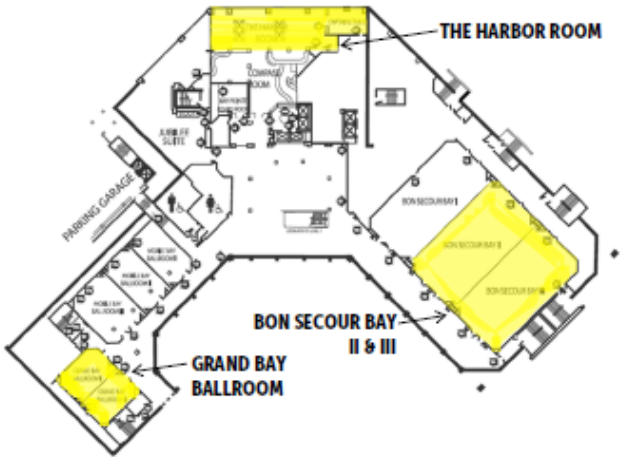
6:30-8:00a	Breakfast on your own
7:30-10:30a	Surveying Termites of the Southern US Working Group (Private Meeting)
8:00-9:30a	Concurrent Sessions SYMPOSIUM A Community-Based Rodent Surveillance Collaborative for Greater Public Health SYMPOSIUM Professional Credentialing in Structural Pest Control
9:30-10:15a	SUBMITTED PAPERS Rodents
10:15-10:30a	Checkout
10:30-11:30a	Final Business Meeting
11:30a-12:30p	Executive Committee Business Meeting

Hotel Map

Deck One



Deck Two



SUNDAY, MAY 19

2:30-5:00p	**Registration** Preconvene 2
6:00-8:00p	**Welcome Reception** The Harbor Room

MONDAY, MAY 20

6:30-7:45a **Breakfast on your own**

AWARDS PRESENTATIONS
BON SECOUR BAY II & III

7:45-8:00a **WELCOME**

8:00-9:30a **Distinguished Achievement in Urban Entomology, The Arnold Mallis Memorial Award Lecture**
Learning the Language and Foraging Cues of Urban Arthropods...and How to Talk Back
GERHARD GRIES
SIMON FRASIER UNIVERSITY

9:30-9:45a **Doctoral Award**
A Systemic Review on the Impacts of Indoor Vector Control on Domiciliary Pest: Good Intentions Challenged by Harsh Realities
CHRISTOPHER C. HAYES & Colby Schal
NORTH CAROLINA STATE UNIVERSITY

9:45-10:00a **Master's Award**
Ant Alarm Pheromones Deter Blacklegged Ticks, *Ixodes scapularis*
CLAIRE GOODING, Charlotte Pinard, Regine Gries & Gerhard Gries
SIMON FRASER UNIVERSITY

10:00-10:15a **Bachelor's Award**
Efficacy of Essential Oils in German Cockroach Control
DANIELA JACKSON, Angela Sierras & Zachary DeVries
UNIVERSITY OF KENTUCKY

10:15-10:30a **BREAK**

10:30-11:20a **CONCURRENT SESSIONS**

MASTER'S STUDENT PAPER COMPETITION
GRAND BAY BALLROOM

***Moderator:** Judy Black, Rollins*

10:30-10:40a **Utilizing +ssRNA Viruses Within Alginate Hydrogel to Combat the Invasive Big-Headed Ant, *Pheidole megacephala***
JOEY YIN XIN CHANG, John Lawrence, Chin-Cheng "Scotty" Yang & Jia-Wei Tay
UNIVERSITY OF HAWAI'I AT MĀNOA

10:40-10:50a **Bait Acceptance and Seasonal Activity of the Asian Needle Ant, *Brachyponera* (=*Pachycondyla*) *chinensis* (Emery), an Emerging Medically Important Species, in Central Georgia**
KAREN CORSETTI & Daniel R. Suiter
UNIVERSITY OF GEORGIA

10:50-11:00a **Evaluation of Menadione Toxicity in Various Food Sources on German Cockroaches (*Blattella germanica* L.)**
MOHAMED SADIQ SHAIK, Qian Sun, James Ottea & Aaron R. Ashbrook
LOUISIANA STATE UNIVERSITY

11:00-11:10a **Optimizing Comfort of CNC Knitted Micro-Resolution Mosquito Bite Blocking Textiles**
KYLE OSWALT & John Beckmann
AUBURN UNIVERSITY

11:10-11:20a **Assessing the Efficacy of Multiple Insecticidal Classes Against the Common Bed Bug (*Cimex lectularius*)**
BANDANA SHRESTHA, James A. Ottea, Qian Sun & Aaron R. Ashbrook
LOUISIANA STATE UNIVERSITY

DOCTORAL STUDENT PAPER COMPETITION
BON SECOUR BAY II & III

Moderator: Hao Yu, Rentokil Terminix

10:30-10:40a **Termite Damage and Area-Wide Management of Korean Wooden Heritages**
SIHYUN KIM, Changwook Jo & Suji Kim
NATIONAL RESEARCH INSTITUTE OF CULTURAL HERITAGE

10:40-10:50a **Morphology of *Coptotermes formosanus* on O'ahu**
JOEL MELIA, Reina Tong & Jia-Wei Tay
UNIVERSITY OF HAWAI'I AT MĀNOA

10:50-11:00a **SINV-Infected Fire Ants Are Less Responsive to Baiting**
FANG-LING LIU & Chin-Cheng "Scotty" Yang
VIRGINIA TECH

11:00-11:10a **Common Consumer Residual Insecticides Lack Efficacy Against Insecticide-Susceptible and Resistant Populations of the German Cockroach (Blattodea: Ectobiidae)**
JOHNALYN GORDON[1], Marla Eva[2], Sudip Gaire[1], Arthur Appel[2] & Zachary DeVries[1]
[1]UNIVERSITY OF KENTUCKY, [2]Auburn University

11:10-11:20a **The Prevalence and Abundance of Mite Ectoparasites on House Mice in Residential Buildings and a Farm**
JIN-JIA YU & Changlu Wang
RUTGERS UNIVERSITY

11:20-11:30a **Insecticide Dusts Evaluated Against Arizona Bark Scorpions, *Centruroides sculpturatus*, Exhibited a Limited Effect on Mortality After Four-Hour Forced Exposures**
JOHN AGNEW & Alvaro Romero
NEW MEXICO STATE UNIVERSITY

11:30-11:40a **An Entomological Perspective: Detailed Review of 150 Delusional Parasitosis Case Reports**
GRACE KOLB, Timothy Gibb & Ameya Gondhalekar
PURDUE UNIVERSITY
NORTH CAROLINA STATE UNIVERSITY

11:40-11:50a ***Wolbachia*-Free Bed Bugs Help Us to Understand Their Nutritional Requirements**
ELIZABETH WILES, Madhavi Kakumanu & Coby Schal
NORTH CAROLINA STATE UNIVERSITY

11:50a-12:00p **Repellency of DEET During Host-Seeking Behavior of Bed Bugs (Hemiptera: Cimicidae) in Binary Choice Olfactometer Assays**
CHRISTOPHER C. HAYES & Coby Schal
NORTH CAROLINA STATE UNIVERSITY

12:00-12:10p **Bed Bug Repellency to Common Control Products**
BENJAMIN GRADY & Zachary DeVries
UNIVERSITY OF KENTUCKY

12:10-12:20p **Effects of Surface Type and Distance Traveled on the Efficacy of a *Beauveria bassiana*-Based Biopesticide (Aprehend®) for Bed Bug (Hemiptera: Cimicidae) Control**
SIMONA PRINCIPATO & Zachary DeVries
UNIVERSITY OF KENTUCKY

12:30-1:30p **Lunch on your own**

1:30-4:30p **CONCURRENT SESSIONS**

SYMPOSIUM: BIOLOGY & MANAGEMENT OF BLOOD-FEEDING ARTHROPODS
SCHOONER

Organizers: Alvaro Romero, New Mexico State University & Sudip Gaire, Rentokil Initial

1:30-1:45p **Emerging Bed Bug Biocontaminants**
ZACHARY C. DeVRIES[1], Johnalyn Gordon[1], Coby Schal[2], Simona Principato[1] & Sudip Gaire[3]
[1]UNIVERSITY OF KENTUCKY, [2]North Carolina State University, [3]Rentokil Initial

1:45-2:00p **Insecticide Studies on Bed Bugs**
ALVARO ROMERO
NEW MEXICO STATE UNIVERSITY

2:00-2:15p **Effectiveness of Various Monitoring Methods for Detecting Bed Bugs in Apartments**
CHANGLU WANG
RUTGERS UNIVERSITY

2:15-2:30p **Evaluation of Vikane Fumigation for Efficient Bed Bug (*Cimex lectularius*) Elimination**
MORGAN M. WILSON[1], Dakota B. Todd[1], Dini Miller[1] & Jennifer R. Gordon[2]
[1]VIRGINIA TECH, [2]Douglas Products and Packaging Company

2:30-2:45p **Spatio-Temporal Genetic Structure of the Bed Bug, *Cimex lectularius*, in the United States**
WARREN BOOTH[1], Cari D. Lewis[2], Coby Schal[3] & Edward L. Vargo[4]
[1]VIRGINIA TECH, [2]The University of Tulsa, [3]North Carolina State University, [4]Texas A&M University

2:45-3:00p **Understanding and Mitigating Emerging Health Impacts of Bed Bugs**
JOSE PIETRI
UNIVERSITY OF SOUTH DAKOTA

3:00-3:30p **BREAK**

3:30-3:45p **Bed Bug (Hemiptera: Cimicidae) Response to Wet Surfaces**
JORGE BUSTAMANTE & Dong-Hwan Choe
UNIVERSITY OF CALIFORNIA, RIVERSIDE

3:45-4:00p **New Entrapment Material Captures More Bed Bugs Than Selected Commercial Monitoring Devices**
CATHERINE LOUDON[1], Jorge Bustamante[2], Dong-Hwan Choe[2], Kathleen Campbell[2], Patrick Liu[1] & Andrew Sutherland[3]
[1]UNIVERSITY OF CALIFORNIA, IRVINE, [2]University of California, Riverside, [3]University of California (UC ANR, UC IPM)

4:00-4:15p **Identifying and Monitoring for Rat Mites and Bird Mites (Macronyssidae: *Ornithonyssus* spp.) Within Structures**
ANDREW SUTHERLAND
UNIVERSITY OF CALIFORNIA (UC ANR, UC IPM)

4:15-4:30p Discussion

SYMPOSIUM: TRAINING IN URBAN PEST MANAGEMENT
WINDJAMMER

Organizer: *Nancy Troyano, Rentokil Terminix*

1:30-2:00p **The Importance of On-the-Job Training**
NANCY TROYANO
RENTOKIL TERMINIX

2:00-2:30p **Study Preparation for State Licensing Exams**
GLEN RAMSEY
ORKIN

2:30-3:00p **Best Practices in Pest Technician New Hire Training**
MORGAN MANDERFIELD
ECOLAB

3:00-3:30p **BREAK**

3:30-4:00p **Vendor Training Resources**
TIM HUSEN
SYGENTA PROFESSIONAL PEST MANAGEMENT

4:00-4:30p **The Use of Technology in Pest Management Training**
WYATT WEST
ARROW EXTERMINATORS

5:30-7:30p **Rentokil Terminix Training & Service Innovation Tour**

TUESDAY, MAY 21

6:30-8:00a **Breakfast on your own**

8:00-10:00a **CONCURRENT SESSIONS**

SYMPOSIUM: FORMOSAN SUBTERRANEAN TERMITES: FROM THEIR INEVITABLE SPREAD TO LOCAL SOLUTIONS
WINDJAMMER

Organizer: *Mark Janowiecki, City of New Orleans Mosquito, Termite & Rodent Control Board*

8:00-8:15a **Deciphering the Invasion History of the Formosan Subterranean Termite in the U.S.**
ED VARGO[1], Pierre-André Eyer[1], Claudia Husseneder[2], Kenneth Grace[3] & Jianchu Mo[4]
[1]TEXAS A&M UNIVERSITY, [2]Louisiana State University, [3]University of Hawaii, [4]Zhejiang University

8:15-8:30a **Present Status of Formosan Subterranean Termite Infestations in California**
CHOW-YANG LEE[1], Shu-Ping Tsen[2], Siavash Taravati[3], Dong-Hwan Choe[1] & Michael K. Rust[1]
[1]UNIVERSITY OF CALIFORNIA, RIVERSIDE, [2]National Taiwan University, [3]University of California Cooperative Extension, Riverside County

8:30-8:45a **Disparate Morphology of *Coptotermes formosanus* Colonies on O'ahu**
JOEL MELIA, Reina Tong & Jia-Wei Tay
UNIVERSITY OF HAWAI'I AT MĀNOA

8:45-9:00a **A Prediction of *Coptotermes* Termites Distribution Using a Species Distribution Model**
SANG-BIN LEE, Thomas Chouvenc & Nan-Yao Su
UNIVERSITY OF FLORIDA

9:00-9:15a **Trapping Methods and Distribution of FST in Louisiana**
MARK JANOWIECKI, Eric Guidry, Carrie Cottone, Barry Yokum, Kenneth Brown, Edward Freytag & Claudia Reigel
CITY OF NEW ORLEANS MOSQUITO, TERMITE & RODENT CONTROL BOARD

9:15-9:30a **Decades of Industry-Academia Partnership Toward Monitoring Invasive Termites in Florida**
THOMAS CHOUVENC
UNIVERSITY OF FLORIDA

9:30-9:45a **Surveying Termite Diversity in SUS Working Group**
AARON ASHBROOK[1], Santos J. Portugal[2] & Anamika Sharma[3]
[1]LOUISIANA STATE UNIVERSITY, [2]Mississippi State University, [3]Florida A&M University

9:45-10:00a **Sustainable Formosan Subterranean Termite Control Efforts**
CARRIE COTTONE
CITY OF NEW ORLEANS MOSQUITO, TERMITE & RODENT CONTROL BOARD

SYMPOSIUM: ADVANCES IN INVASIVE & PEST ANT MANAGEMENT
SCHOONER

Organizer: *David Oi, USDA-ARS Center for Medical, Agricultural & Veterinary Entomology*

8:00-8:15a **Prevalence of Microsporidium *Kneallhazia solenopsae* Among Invasive Fire Ant Populations in Tennessee and Its Relationship with Monogyne and Polygyne Social Forms**
MARINA S. ASCUNCE[1], Jason Oliver[2], Steve Valles[1], Karla Addesso[2], Nadeer Youssef[2], Rachel Atchison[1] & David Oi[1]
[1]USDA-ARS CENTER FOR MEDICAL, AGRICULTURAL & VETERINARY ENTOMOLOGY, [2]Tennessee State University

8:15-8:30a **Efforts to Develop Pre- and Post-Harvest Imported Fire Ant Quarantine Soil Treatments for Field-Grown Nursery Trees**
JASON OLIVER[1], Karla Addesso[1],Anthony Witcher[1], Nadeer Youssef[1], Paul O'Neal[1], David Oi[2], Ronald Weeks[3] & Lisa Alexander[4]
[1]TENNESSEE STATE UNIVERSITY, [2]USDA-ARS Center for Medical, Agricultural & Veterinary Entomology, [3]USDA-APHIS-PPQ, [4]USDA-ARS, U.S. National Arboretum

8:30-8:45a **Insecticidal Effects of Receptor-Interference Isolated Bioactive Peptides on Fire Ant Colonies**
ROBERT K. VANDER MEER[1], Satya P. Chinta[2] & Man-Yeon Choi[3]
[1]USDA-ARS CENTER FOR MEDICAL, AGRICULTURAL & VETERINARY ENTOMOLOGY, [2]Foresight Science and Technology, [3]USDA-ARS, Horticulture Crops Research Unit

8:45-9:00a **A New Approach for Enhancing Ant Bait Specificity**
JIAN CHEN
USDA-ARS, National Biological Control Laboratory

9:00-9:15a **Regulating Ant Populations in either Direction Using Biodegradable Hydrogel Baits**
JIA-WEI TAY
UNIVERSITY OF HAWAI'I AT MĀNOA

9:15-9:30a **Invader at the Gate: Current Status and Research Update of the Yellow Crazy Ant**
CHIN-CHENG "SCOTTY" YANG
VIRGINA TECH

9:30-9:45a **Past, Present, and Future: Little Fire Ant Management in Hawaii and Beyond**
MICHELLE MONTGOMERY
HAWAI'I ANT LAB, UNIVERSITY OF HAWAI'I

9:45-10:00a **Developing a Baiting Strategy for the Control of Tawny Crazy Ants**
DAVID OI & Rachel Atchison
USDA-ARS CENTER FOR MEDICAL, AGRICULTURAL & VETERINARY ENTOMOLOGY

SYMPOSIUM: THE SOUTHERN REGION DELUSIONAL INFESTATION WORKING GROUP AND DI OUTPUTS
GRAND BAY BALLROOM

Organizers: *Karen Vail, University of Tennessee & Nancy Hinkle, University of Georgia*

8:00-8:12a **Delusional Infestation Has No Temporal or Spatial Limits, and Its Ripples Have a Wide Impact**
NANCY HINKLE[1], Mike Waldvogel[2], Rich Pollack[3] & Mike Merchant[4]
[1]UNIVERSITY OF GEORGIA, [2]North Carolina State University, [3]Harvard University, [4]Texas A&M AgriLife Extension Service

8:12-8:24a **A Needs Assessment of Extension Agents and Pest Management Professionals and the Formation of DI Working Groups**
KAREN VAIL, Sandra Peña & Rebecca Trout Fryxell
UNIVERSITY OF TENNESSEE

8:24-8:36a **A Factsheet Explaining DI to the Public**
JONATHAN LARSON[1], Robert Puckett[2], Sydney Crawley[3], Zach DeVries[4], Steve Murphree[5], Abelardo Moncayo[6], Karen Vail[7], Faith Oi[8], Jeffery Stovall[9], Macy Kosinski[7] & Emma Lamb[7]
[1]UNIVERSITY OF KENTUCKY, [2]Texas A&M AgriLife Extension Service, [3]Rentokil-Terminix, [4]University of Kentucky, [5]Belmont University, [6]Tennessee Department of Health, [7]University of Tennessee, [8]University of Florida, [9]Vanderbilt University

8:36-8:48a **What Could Be Bugging You? Arthropods Associated with True Infestations and Those Submitted as Suspects in Potential DI Cases**
MATT BERTONE[1], Molly Keck[2], Lyle Buss[3] & Macy Kosinski[4]
[1]NORTH CAROLINA STATE UNIVERSITY, [2]Texas A&M AgriLife Extension Service, [3]University of Florida, [4]University of Tennessee

8:48-9:00a **A Step-By-Step Protocol for Interacting with Suspected DI Individuals**
ERIC BENSON[1], Nancy Hinkle[2], Aaron Ashbrook[3], Xing Ping Hu[4], Meredith Shrader[4], Molly Deinhart[5], Karen Vail[5] & Faith Oi[6]
[1]CLEMSON UNIVERSITY, [2]University of Georgia, [3]Louisiana State University, [4]Auburn University, [5]University of Tennessee, [6]University of Florida

9:00-9:12a **The DI Manual for Extension Agents**
WIZZIE BROWN[1], Bryant A. McDowell[1], Karen Vail[2], Jon Zawislak[3], Leticia Flores[4], Rebecca Trout Fryxell[2] & Francesca Size[2]
[1]TEXAS A&M AGRILIFE EXTENSION SERVICE, [2]University of Tennessee, [3]University of Arkansas, [4]University of Tennessee Psychology Clinic

9:12-9:24a **A Training for Professionals Working with Suspected DI**
BRYANT A. MCDOWELL[1], Jon Zawislak[2], Matt Bertone[3], Sydney Crawley[4], Theresa Dellinger[5] & Francesca Size[6]
[1]TEXAS A&M AGRILIFE EXTENSION SERVICE, [2]University of Arkansas, [3]North Carolina State University, [4]Rentokil Terminix, [5]Virginia Tech, [6]University of Tennessee

9:24-9:36a **Additional Concerns from the PMP Perspective**
SANTOS PORTUGAL[1], Sydney Crawley[2] & Wally Holden[2]
[1]MISSISSIPPI STATE UNIVERSITY, [2]Rentokil Terminix

9:36-10:00a Discussion

10:00-10:30a **BREAK**

10:30-11:30a **CONCURRENT SESSIONS**

SYMPOSIUM: FORMOSAN SUBTERRANEAN TERMITES, cont'd
WINDJAMMER

10:30-10:45a **Possible Behavioral Changes During US Invasion in *Coptotermes formosanus***
NOBUAKI MIZUMOTO
AUBURN UNIVERSITY

10:45-11:00a **To Bait or Not to Bait? Why Is It Still a Question 30 Years Later?**
NAN-YAO SU
UNIVERSITY OF FLORIDA

11:00-11:15a **The Impact of Extension Programs in the Management and Control of Subterranean Termites**
FAITH OI
UNIVERSITY OF FLORIDA

11:15-11:30a Discussion

SUBMITTED PAPERS: ANTS
SCHOONER

***Moderator:** Fudd Graham, Auburn University*

10:30-10:45a **Fire Ant Males Prevent Multiple Mating of Conspecific Females Through Male Produced Tyramides**
SATYA P. CHINTA[1], Robert K. Vander Meer[2] & Tappey H. Jones[3]
[1]Foresight Science and Technology, [2]USDA-ARS Center for Medical, Agricultural & Veterinary Entomology, [3]Virginia Military Institute

10:45-11:00a **The Relationship Between Fire Ants and the Nitrogen-Fixing Bacteria of Legumes**
ASHLEY MORRIS[1], Robert K. Vander Meer[1] & Roberto Pereira[2]
[1]USDA-ARS CENTER FOR MEDICAL, AGRICULTURAL & VETERINARY ENTOMOLOGY, [2]University of Florida

11:00-11:15a **The ManhattAnt: Tracking the Spread of a New Pest Ant in New York City**
CLINT PENICK[1], Samantha Kennett[2], Todd Pierson[3], Bernard Seifert[4] & Robert Dunn[5]
[1]AUBURN UNIVERSITY, [2]Clemson University, [3]Kennesaw State University, [4]Senckenberg Museum of Natural History, [5]North Carolina State University

SUBMITTED PAPERS: IPM & INDUSTRY
GRAND BAY BALLROOM

***Moderator:** Erin Monteagudo, Veseris*

10:30-10:45a **IPM in Urban Agriculture and Landscape**
ANAMIKA SHARMA
FLORIDA A&M UNIVERSITY

10:45-11:00a **Pulling Back the Curtain: Open Records and Federal Data Bases Reveal Objective, Verifiable Revenue and Employment Estimates for Professional Pest Management Services**
JACOB L. WINKLES & Brian T. Forschler
UNIVERSITY OF GEORGIA

11:30a-1:00p **AWARDS LUNCHEON**
Bon Secour Bay II & III

1:00-3:00p **CONCURRENT SESSIONS**

SUBMITTED PAPERS: WDO/TERMITES
WINDJAMMER

***Moderator:** Carrie Cottone, City of New Orleans Mosquito, Termite & Rodent Control Board*

1:00-1:15p **Distribution Survey of Termites on Oahu, HI**
REINA L. TONG & Jia-Wei Tay
UNIVERSITY OF HAWAI'I AT MĀNOA

1:15-1:30p **Architects of Apoidea: A Study of the Eastern Carpenter Bee, *Xylocopa virginica*, and Its Role in Constructing New Environments**
ANDERS STEVENSON & Brian T. Forschler
UNIVERSITY OF GEORGIA

1:30-1:45p **Flight Times for Five *Reticulitermes* Species (Blattodea: Rhinotermitidae) Collected Over 30 Years from the Southeastern United States**
CONOR G. FAIR & Brian T. Forschler
UNIVERSITY OF GEORGIA

1:45-2:00p **Efficacy of Chitin Synthesis Inhibitors Against the Western Drywood Termite *Incisitermes minor* (Blattodea: Kalotermitidae)**
NICHOLAS POULOS, Michael K. Rust, Chow-Yang Lee & Dong-Hwan Choe
UNIVERSITY OF CALIFORNIA, RIVERSIDE

2:00-2:15p **Overview of Trials to Evaluate an Experimental Caulk-Like Bait Containing Noviflumuron when Applied to Trees for Elimination of *Coptotermes formosanus* Shiraki**
JOE DEMARK[1] & Barry Yokum[2]
[1]CORTEVA AGRISCIENCE, [2]City of New Orleans Mosquito, Termite & Rodent Control Board

2:15-2:30p **Trelona® Trusted by Pest Management Professionals**
FREDER MEDINA[1], Robert W. Davis[1], Stephanie N. Granda[1], Kyle Gilder[2] & Edward L. Vargo[2]
[1]BASF PROFESSIONAL & SPECIALTY SOLUTIONS, [2]Texas A&M University

2:30-2:45p **Product Integrity Lab Testing for Sentricon® Recruit HD**
EVA CHIN, Garima Kakkar, Joe DeMark & Mary Rushton
CORTEVA AGRISCIENCE

2:45-3:00p **Encircle™ Remote Termite Detection System: An Innovative Approach Enabling Integrated Management by BASF**
JAMES AUSTIN[1], Kenneth Brown[1], Carrie Cottone[2] & Cheryl Leichter[1]
[1]BASF PROFESSIONAL & SPECIALTY SOLUTIONS, [2]City of New Orleans Mosquito, Termite & Rodent Control Board

SYMPOSIUM: INVASIVE ANTS IN NORTH AMERICA IN THE YEAR 2024. CAN WE STOP THEM?

SCHOONER

Organizers: *Marina Ascunce & Doug Booher, USDA-ARS Center for Medical, Agricultural & Veterinary Entomology*

1:00-1:24p **Ant Invaders of the Northeast: Trends and Threats**
KAL IVANOV
VIRGINIA MUSEUM OF NATURAL HISTORY

1:24-1:48p **Disruption of Florida's Native Ant Community by Global Invaders**
DOUG BOOHER
USDA FOREST SERVICE

1:48-2:12p **Cuticular Hydrocarbons and Body Size Influence Desiccation Resistance of Argentine Ant Supercolonies in California**
ELIZABETH CASH
UNIVERSITY OF FLORIDA

2:12-2:36p **Using Interception Records to Predict Future Invaders**
ANDREW SUAREZ
UNIVERSITY OF ILLINOIS

2:36-3:00p **Updates on Alien and Invasive Ants in Mississippi**
JOE MACGOWN
MISSISSIPPI ENTOMOLOGICAL MUSEUM

SYMPOSIUM: PRODUCT EQUIPMENT INNOVATIONS IN URBAN PEST MANAGEMENT

GRAND BAY BALLROOM

Organizers: *Chris Keefer & Tim Husen, Syngenta Professional Pest Management*

1:00-1:20p **Plinazolin Technology – Innovation for Professional Pest Management**
CHRIS KEEFER
SYNGENTA PROFESSIONAL PEST MANAGEMENT

1:20-1:40p **Toxicity of Isocycloseram (Plinazolin) Against Insecticide-Susceptible and -Resistant German Cockroaches (Blattodea: Ectobiidae)**
SHAO-HUNG LEE
UNIVERSITY OF CALIFORNIA, RIVERSIDE

1:40-2:00p **Innovation at Rentokil US**
CASSIE KREJCI
RENTOKIL TERMINIX

2:00-2:20p **Innovation Culture at BASF for Urban Pest Management: Ridesco™ WG Insecticide a New Dual Insecticide Formulation for Mosquito Control**
ROBERT W. DAVIS
BASF PROFESSIONAL & SPECIALTY SOLUTIONS

2:20-2:40p **Novel Bed Bug Detection: TruDetx**
ALEXANDER KO
ENVU

2:40-3:00p **New Strategies and Innovation Against Challenging Cockroach Infestations (Advion Trio and Advion MicroFlow in HUD housing)**
AMEYA GOHNDAHLAKER
PURDUE UNIVERSITY

3:00-3:30p **BREAK**

3:30-5:15p **CONCURRENT SESSIONS**

SYMPOSIUM: COORDINATED TRAINING AND EVALUATION TO ACHIEVE AN INTEGRATED WORKFORCE TO MITIGATE COMMUNITY VECTOR-BORNE DISEASE RISK IN THE GULF COAST REGION

WINDJAMMER

Organizer: *Claudia Riegel, City of New Orleans Mosquito, Termite & Rodent Control Board*

3:30-4:00p **Strengthening Vector Control by Conducting Evaluations to Determine Gaps, Train Students and Professionals, and Partner Across Sectors to Strengthen Vector Control Preparedness**
CLAUDIA RIEGEL
CITY OF NEW ORLEANS MOSQUITO, TERMITE & RODENT CONTROL BOARD

4:00-4:30p **Educational Opportunities for Vector Control Training in the Gulf South States**
JANET HURLEY
TEXAS A&M UNIVERSITY

4:30-4:52p **Evaluation Methods Used to Better Understand the Infrastructure of Vector Control Across Sectors**
IMELDA MOISE
UNIVERSITY OF MIAMI

4:52-5:15p **Needs Assessment Objectives and Results That Will Provide the Framework for Education Programs to Strengthen Vector Control Preparedness**
SUSANNE STRAIF-BOURGOIS
LOUISIANA STATE UNIVERSITY

SUBMITTED PAPERS: INSECTICIDES

SCHOONER

Moderator: *Aaron Ashbrook, Louisiana State University*

3:30-3:45p **Flupyradifurone: A Novel Small Molecule Insecticide for Urban Pest Control**
ARUNAS DAMIJONAITIS, Alexander Ko & Byron Reid
ENVU

3:45-4:00p **A New Insecticidal Dust for Pest Management in 2024, Temprid Dust**
ALEXANDER KO
ENVU

4:00-4:15p **Formulation Technology to Improve the Weather Resistance of Residual Insecticides**
JAMORA HAMILTON-BROWN, Byron Reid & Deborah Koufas
ENVU

4:15-4:30p **Ridesco™ WG, Efficacy and the Unique Value Proposition (UVP) When Using Dual Active Ingredients on Bed Bugs, Spiders and Other Pests**
DESIREE STRAUBINGER, Sylvia Kenmuir, Robert W. Davis & Freder Medina
BASF PROFESSIONAL & SPECIALTY SOLUTIONS

4:30-4:45p **Efficacy of Fendona CS II**
KYLE JORDAN & Chuck Klein
BASF PROFESSIONAL & SPECIALTY SOLUTIONS

4:45-5:00p **Termidor® Insect Mortality Transfer and Associated Behavior**
JASON MEYERS
BASF PROFESSIONAL & SPECIALTY SOLUTIONS

6:00-9:00p **Exploreum**

BASF We create chemistry

WEDNESDAY, MAY 22

6:30-8:00a **Breakfast on your own**

7:30-10:30a **Surveying Termites of the Southern US Working Group (Private Meeting)**
Grand Bay Ballroom

8:00-9:30a **CONCURRENT SESSIONS**

SYMPOSIUM: A COMMUNITY-BASED RODENT SURVEILLANCE COLLABORATIVE FOR GREATER PUBLIC HEALTH

SCHOONER

Organizer: *Claudia Riegel, City of New Orleans Mosquito, Termite & Rodent Control Board*

8:00-8:30a **Working Outside of Silos to Maximize Rodent Management**
CLAUDIA RIEGEL
CITY OF NEW ORLEANS MOSQUITO, TERMITE & RODENT CONTROL BOARD

8:30-9:00a **Educational Resources for Rodent Management**
JANET HURLEY
TEXAS A&M UNIVERSITY

9:00-9:30a **Views of Local Health Departments of the State of US Rodent Control Programs**
IMELDA MOISE
UNIVERSITY OF MIAMI

SYMPOSIUM: PROFESSIONAL CREDENTIALING IN STRUCTURAL PEST CONTROL

WINDJAMMER

Organizer: *Willet Hossfeld, Entomological Society of America*

8:00-8:15a **ESA Certifications and Other Credentials in the Pest Control Industry**
WILLET HOSSFELD
ENTOMOLOGICAL SOCIETY OF AMERICA

8:15-8:30a **Benefits Credential Programs for Teaching and Training in the Pest Control Industry**
FAITH OI
UNIVERSITY OF FLORIDA

8:30-8:45a **Personal Benefit of Earning a Credential**
KYLE JORDAN
BASF PROFESSIONAL & SPECIALTY SOLUTIONS

8:45-9:00a **Why Earning a Credential, Beyond Your Degree, Can Be More Advantageous Earlier in Your Career**
ALL

9:00-9:15a **Benefits of Credentials for Employee Development**
ALL

9:15-9:30a Discussion

SUBMITTED PAPERS: RODENTS
SCHOONER

Moderator: *Patricia Hottel, Rentokil Terminix*

9:30-9:45a **Using Non-Toxic Monitoring Bait, Prelontra, as Part of a Rodent IPM Program**
JEFFREY A. WEIER
JEFFREY WEIER CONSULTING

9:45-10:00a **Prelontra™ Rodent Monitoring Bait: New Product for Monitoring Rodent Infestations and Pre-Baiting Prior to Selontra® Rodent Bait Use**
JOSEPH A. ARGENTINE, William E. Barton, Sharon Hughes, Sylvia J. Kenmuir & Zach Mundy
BASF PROFESSIONAL & SPECIALTY SOLUTIONS

10:00-10:15a **Unveiling the Stop-Feed Phenomenon of Cholecalciferol in Rodent Control: Mechanisms and Implications**
SYLVIA KENMUIR, Joseph A. Argentine & Niamh Quinn
BASF PROFESSIONAL & SPECIALTY SOLUTIONS

10:15-10:30a **CHECKOUT**

10:30-11:30a **FINAL BUSINESS MEETING**
Grand Bay Ballroom

11:30a-12:30p **EXECUTIVE COMMITTEE BUSINESS MEETING**
Grand Bay Ballroom

PAST CONFERENCE CHAIRS

1986	Patricia A. Zungoli – Clemson University
1988	William H. Robinson – Virginia Polytechnic Institute & State University
1990	Michael K. Rust – University of California, Riverside
1992	Gary W. Bennett – Purdue University
1994	Roger E. Gold – Texas A&M University Judy K. Bertholf – DowElanco
1996	Donald A. Reierson – University of California, Riverside
1998	Brian T. Forschler – University of Georgia Shripat Kamble – University of Nebraska-Lincoln
2000	Shripat Kamble
2004	Daniel R. Suiter – University of Georgia
2006	Dini Miller – Virginia Polytechnic Institute & State University Robert Kopanic – SC Johnson
2008	Richard Houseman – University of Missouri Bob Cartwright – Syngenta
2010	Karen Vail – University of Tennessee
2012	Faith Oi – University of Florida
2012	Faith Oi Grzesiek Buczkowski – Purdue University
2016	Kyle Jordan – BASF
2018	Kyle Jordan
2021	Allie Allen – National Pest Management Association
2022	Molly Keck – Texas A&M AgriLife Extension

2024 NCUE PLANNING COMMITTEE

CONFERENCE CHAIR: Carrie Cottone, City of New Orleans Mosquito, Termite & Rodent Control Board

PROGRAM CHAIR: Erin Monteagudo, Veseris

AWARDS CHAIR: Molly Keck, Texas A&M AgriLife Extension

TREASURER: Carrie Cottone

SECRETARY: Changlu Wang, Rutgers University

LOCAL ARRANGEMENTS: Carrie Cottone & Fudd Graham, Auburn University

SPONSORSHIP CHAIR: Stewart Clark, Pest Control Product Development Labs

SPONSORSHIP COMMITTEE: Fudd Graham & Hao Yu, Rentokil Terminix

2026 NCUE PLANNING COMMITTEE

CONFERENCE CHAIR: Erin Monteagudo, Veseris

PROGRAM CHAIR: Changlu Wang, Rutgers University

AWARDS CHAIR: Carrie Cottone, City of New Orleans Mosquito, Termite & Rodent Control Board

TREASURER: Carrie Cottone

SECRETARY: Hope Bowman, Waltham Pest Services

LOCAL ARRANGEMENTS: Glen Ramsey, Rollins

SPONSORSHIP CHAIR: Stewart Clark, Pest Control Product Development Labs

SPONSORSHIP COMMITTEE: Fudd Graham, Auburn University

2024 NCUE ATTENDEE LIST

A

ABBAR, Salehe
Envu
sally.abbar@envu.com

AFFUL, Edwin
FMC
edwin.afful@fmc.com

AGNEW, John
New Mexico State University
agnewj@nmsu.edu

ALI, Abbas
University of Mississippi
aali@olemiss.edu

AMES, Lisa
University of Georgia
lames@uga.edu

APPEL, Arthur
Auburn University
aappelag@auburn.edu

ARGENTINE, Joseph
BASF
joseph.argentine@basf.com

ASCUNCE, Marina
USDA-ARS
marina.ascunce@usda.gov

ASHBROOK, Aaron
Louisiana State University AgCenter
aashbrook@agcenter.lsu.edu

AUSTIN, James
BASF
james.austin@basf.com

B

BACORN, Barry
OPC Pest Services
bbacorn@opcpest.com

BALDWIN, Daniel
Hawx
dan.baldwin@hawxservices.com

BALDWIN, Rebecca
University of Florida
baldwinr@ufl.edu

BENSON, Eric
Clemson University
ebenson@clemson.edu

BENTLEY, Michael
National Pest Management Association
mbentley@pestworld.org

BERGBOWER, Hunter
Rentokil Terminix
hunter.bergbower@rentokil-terminix.com

BERTONE, Matt
North Carolina State University
maberto2@ncsu.edu

BLACK, Judy
Rollins, Inc.
jblack@rollins.com

BLAKELY, Brittny
Syngenta
brittny.blakely@syngenta.com

BOOHER, Douglas
USDA Forest Service
douglas.booher@usda.gov

BOOTH, Warren
Virginia Teach
warrenbooth@vt.edu

BOWMAN, Hope
Waltham Pest Services
hbowman@walthamservices.com

BREWER, Jack
Cook's Pest Control
jack.brewer@cookspest.com

BROWN, Richard
Rentokil-Terminix
rbrown4@rentolkil-terminix.com

BROWN, Wizzie
Texas A&M AgriLife Extension Service
ebrown@ag.tamu.edu

BRUMFIELD, Jennifer
Western Pest Services
jbrumfield@rollins.com

BUSTAMANTE, Jorge
University of California, Riverside
jorgeb@ucr.edu

BUTLER, James
Public Health Command - East
james.j.butler72.civ@health.mil

C

CAIN, Danny
ACES
caindan@aces.edu

CAMPBELL, Brittany
Control Solutions, Inc.
brittany.campbell@controlsolutionsinc.com

CARTWRIGHT, Bob
Syngenta
bob.cartwright@syngenta.com

CASH, Elizabeth
University of Florida
e.cash@ufl.edu

CHANG, Joey Yin Xin
University of Hawaii
joey21@hawaii.edu

CHEN, Jian
USDA-ARS
jian.chen@usda.gov

CHIN, Eva
Corteva Agriscience
eva.chinheady@corteva.com

CHINTA, Satya
Foresight Science & Technology, USDA-ARS
satya.chinta@usda.gov

CHOUDHURY, Anjali
University of Miami
amc920@miami.edu

CHOUVENC, Thomas
University of Florida
tomchouv@ufl.edu

CLARK, Stewart
Pest Control Product Development Labs
w.stewart.clark@gmail.com

CLOHERTY, Erin
New Orleans Mosquito, Termite & Rodent Control Board
ercloherty@nola.gov

COFFELT, Mark
Syngenta
mark.coffelt@syngenta.com

COOKINGHAM, Colson
Syngenta
colson.cookingham@syngenta.com

COOPER, Richard
R Cooper Consulting
rick.cooper5518@gmail.com

CORSETTI, Karen
University of Georgia
corsettikaren@gmail.com

COTTONE, Carrie
New Orleans Mosquito, Termite & Rodent Control Board
cbcottone@nola.gov

CRAWLEY, Sydney
Rentokil-Terminix
sydney.crawley@rentokil-terminix.com

D

DAMIJONAITIS, Arunas
Envu
arunas.damijonaitis@envu.com

DARBY, Nefertiti
Corteva Agriscience
nefertiti.darby@corteva.com

DAVIS, Bob
BASF
robert.davis@basf.com

DAVITT, Andrew
Cook's Pest Control
andrew.davitt@cookspest.com

DE LUCA, Michael
Syngenta
mike.deluca@syngenta.com

DeMARK, Joe
Corteva Agriscience
joe.demark@corteva.com

DENNY, Rachel
New Orleans Mosquito, Termite & Rodent Control Board
rdenny@nola.gov

DeVRIES, Zachary
University of Kentucky
zdevries@uky.edu

DiGIOVANNI, Frank
New Orleans Mosquito, Termite & Rodent Control Board
fjdigiovanni@nola.gov

DOLSHUN, Ed
AP&G
edolshun@catchmaster.com

DONAHUE, Michael
Sierra Research Laboratories
michael@sierraresearchlaboratories.com

DONATELLI, Sheila
Rentokil-Terminix
sheila.donatelli@rentokil.com

DUNN, Lori
Rentokil-Terminix
ldunn@rentokil-terminix.com

E

ELLIS, Nicolas
Western Pest Services
nellis@westernpest.com

EPPLER, Lisa
Syngenta
lisa.eppler@syngenta.com

F

FAIR, Conor
University of Georgia
cfair13@uga.edu

FORSCHLER, Brian
University of Georgia
bfor@uga.edu

G

GAIRE, Sudip
Rentokil-Terminix
sudip.gaire@rentokil-terminix.com

GALLAGHER, Nicola
Syngenta
nicky.gallagher@syngenta.com

GALLE, Glenn
Syngenta
glenn.galle@syngenta.com

GASTER, Marshall
Syngenta
marshall.gaster@syngenta.com

GONZALES-MORALES, Maria
Defense Health Agency
maria.a.gonzalesmorales.civ@health.mil

GOODING, Claire
Simon Fraser University
claire_gooding@sfu.ca

GORDON, Johnalyn
University of Kentucky
jmgo230@uky.edu

GORE, Chad
Rentokil
chad.gore@rentokil.com

GRADY, Benjamin
University of Kentucky
bengrady@uky.edu

GRAHAM, Fudd
Auburn University
grahalc@auburn.edu

GRIES, Gerhard
Simon Fraser University
gries@sfu.ca

H

HAMILTON-BROWN, Jamora
Envu
jamorahbrown@gmail.com

HAMRICK, Rob
Metro
rob.hamrick@gmail.com

HATHORNE, Kevin
Terminix Service, Inc.
khathorne@trustterminix.com

HAVERTY, Michael
Retired
mike.haverty@comcast.net

HAYES, Christopher
North Carolina State University
cchayes@ncsu.edu

HINKLE, Nancy
University of Georgia
nhinkle@uga.edu

HOLDEN, James “Wally”
Rentokil-Terminix
wholden@rentokil-terminix.com

HOLMES, Steven
Naval Facilities (NAVFAC)
melanie.l.decker.civ@us.navy.mil

HOSSFELD, Willet
Entomological Society of America
whossfeld@entsoc.org

HOTTEL, Benjamin
Rollins
benjamin.hottel@rollins.com

HOTTEL, Patricia
Rentokil-Terminix
phottel@terminix.com

HOXWORTH Jr, Stephen
Rentokil-Terminix
shoxworth@rentokil-terminix.com

HURLEY, Janet
Texas A&M AgriLife Extension Service
ja-hurley@tamu.edu

HUSEN, Timothy
Syngenta
timhusen52@gmail.com

I

IVANOV, Kal
Virginia Museum of Natural History
kal.ivanov@virginia.gov

J

JACKSON, Daniela
University of Kentucky
daniela.jackson@uky.edu

JAMES, Noreen
Massey Services, Inc.
njames@masseyservices.com

JANOWIECKI, Mark
New Orleans Mosquito, Termite & Rodent Control Board
mark.janowiecki@nola.gov

JENKINS, Nina
Aprehend/ConidioTec
nina.jenkins24@gmail.com

JOHNSON, Joel
University of Hawaii
joelmj@hawaii.edu

JORDAN, Kyle
BASF
kyle.jordan@basf.com

K

KATZ, Olivia
University of Kentucky
Olivia.katz@uky.edu

KECK, Molly
Texas A&M
molly.keck@ag.tamu.edu

KEEFER, Chris
Syngenta
chris.keefer@syngenta.com

KELLEY-TUNIS, Kimberly
Nisus Corporation
kimkt@nisuscorp.com

KENMUIR, Sylvia
BASF
sylvia.kenmuir@basf.com

KIM, Sihyun
National Research Institute of Cultural Heritage
shkim1242@korea.kr

KIM, SooJi
National Research Institute of Cultural Heritage

KO, Alex
Envu
alexander.ko@envu.com

KOEHLER, Philip
University of Florida
pgk@ufl.edu

KOLB, Grace
Purdue University
gwinhove@purdue.edu

KREJCI, Cassie
Rentokil-Terminix
cassie.krejci@rentokil-terminix.com

L

LaFOREST, Joe
University of Georgia
laforest@uga.edu

LARSON, Jonathan
University of Kentucky
jonathan.larson@uky.edu

LEE, Chow Yang
University of California, Riverside
chowyang.lee@ucr.edu

LEE, Jeungmin
National Research Institute of Cultural Heritage

LEE, Sang-Bin
University of Florida
lsb5162@gmail.com

LEE, Shao-Hung
University of California, Riverside
slee228@ucr.edu

LEWIS, Vernard
University of California, Berkeley
urbanpests@berkeley.edu

LIANG, Dangsheng
Apex Bait Technologies, Inc.
dliang@apexbait.com

LIU, Fang-Ling
Virginia Tech
fanling@vt.edu

LOGUE, Debra
BASF
debra.logue@basf.com

LONG, Catherine
Syngenta
catherine.long@syngenta.com

LOPINA, Allison
University of Kentucky
allo247@uky.edu

LOUDON, Catherine
University of California, Irvine
cloudon@uci.edu

M

MacGOWN, Joe
Mississippi State University
jmacgown@entomology.msstate.edu

MADERE, Timmy
New Orleans Mosquito, Termite & Rodent Control Board
thmadere@nola.gov

MAIER, Ben
SC Johnson
bjmaier@scj.com

MANDERFIELD, Morgan
Ecolab
morgan.manderfield@ecolab.com

MARTIN, Chris
Naval Facilities (NAVFAC)
melanie.l.decker.civ@us.navy.mil

MARTIN, Jaclyn
New Orleans Mosquito, Termite & Rodent Control Board
jaclyn.martin@nola.gov

MASON, Makena
Naval Facilities (NAVFAC)
kristina.s.johnson5.civ@us.navy.mil

McALLISTER, Tara
Alabama Department of Agriculture & Industries
tara.mcallister@agi.alabama.gov

McDOWELL, Bryant
Texas A&M
Bryant.mcdowell@ag.tamu.edu

MEDINA, Freder
BASF
freder.medina@basf.com

MEEK, Frank
Rollins
fmeek@rollins.com

MELIA, Joel
University of Hawaii at Manoa
joelmj@hawaii.edu

MEYERS, Jason
BASF
jason.meyers@basf.com

MIZUMOTO, Nobuaki
Auburn University
nzm0095@auburn.edu

MOISE, Imelda
University of Miami
ikm11@miami.edu

MONTEAGUDO, Erin
Veseris
erin.monteagudo@veseris.com

MONTGOMERY, Michelle
Hawaii Ant Lab
michelle.montgomery@littlefireants.com

MOORE, David
Dodson Brothers Pest Control
dmoore@dodsonbros.com

MORRIS, Ashley
USDA
ashleymarin1234@gmail.com

MOTES, Larry
Trécé, Inc.
lmotes@trece.com

MOUNT, Brian
FMC
brian.mount@fmc.com

O

OI, David
USDA-ARS
david.oi@usda.gov

OI, Faith
University of Florida
foi@ufl.edu

OLIVER, Jason
Tennessee State University
joliver@tnstate.edu

OLIVER, Tracy
Alabama Department of Agriculture & Industries
tracy.oliver@agi.alabama.gov

OSWALT, Kyle
Auburn University
kbo0005@auburn.edu

OSWALT, Donald
Docs, LLC
docozconsulting@gmail.com

P

PACHAMUTHU, Pari
Massey Services, Inc.
ppachamuthu@masseyservices.com

PAVLAKIS, Alex
New Orleans Mosquito, Termite & Rodent Control Board
alexandros.pavlakis@nola.gov

PELLITTIERI, Mark
Veseris
mark.pellittieri@veseris.com

PENICK, Clint
Auburn University
clintpenick@gmail.com

PEREIRA, Roberto
University of Florida
rpereira@ufl.edu

PHAN, Christine
National Association of County & City Health Officials (NACCHO)
cphan@naccho.org

PIETRI, Jose
University of South Dakota
jose.pietri@usd.edu

PORTER, Sanford
USDA-ARS (Retired)
sdporter22@gmail.com

PORTUGAL, Santos
Mississippi State University
sportugal@entomology.msstate.edu

POULOS, Nick
University of California, Riverside
npoul004@ucr.edu

PRINCIPATO, Simona
University of Kentucky
s.principato@uky.edu

PUCKETT, Robert
Texas A&M
robert.puckett@ag.tamu.edu

R

RAMSEY, Glen
Rollins, Inc.
gramsey1@rollins.com

RASCH, Aaron
US Air Force
jason.frigon.2@us.af.mil

RASOAMANANA, Nicole
Mississippi State University
nr733@msstate.edu

REID, Byron
Envu
byron.reid@envu.com

RICHMAN, Dina
SC Johnson
drichman@scj.com

RIEGEL, Claudia
New Orleans Mosquito, Termite & Rodent Control Board
criegel@nola.gov

RIGGS, Laurie
Syngenta
laurie.riggs@syngenta.com

ROMERO, Alvaro
New Mexico State University
aromero2@nmsu.edu

ROSENWALD, Laura
National Pest Management Association
lrosenwald@pestworld.org

RUST, Michael
University of California, Riverside
michael.rust@ucr.edu

S

SARAN, Raj
Syngenta
raj.saran@syngenta.com

SCHAL, Coby
North Carolina State University
coby@ncsu.edu

SCHARF, Mike
University of Florida (Retired)
mikescharf.100@gmail.com

SCHUH, Joe
BASF
joseph.schuh@basf.com

SCOTT, Derrick
Mobile County Health Department
dscott@mchd.org

SHAIK, Mohamed Sadiq
Louisiana State University AgCenter
mshaik@agcenter.lsu.edu

SHARMA, Anamika
Florida A&M University
anamika.sharma@famu.edu

SHELTON, Thomas
USDA Forest Service
thomas.g.shelton@usda.gov

SHRADER, Meredith
Auburn University
mes0241@auburn.edu

SHRESTHA, Bandana
Louisiana State University AgCenter
bandanashrestha@agcenter.lsu.edu

SIERRAS, Angela
Syngenta
angela.sierras@syngenta.com

SKED, Shannon
Western Fumigation
ssked@westernpest.com

SLAATS, Brigitte
Syngenta
brigitte.slaats@syngenta.com

STEVENSON, Anders
University of Georgia
ajs90635@uga.edu

STRAIF-BOURGEOIS, Susanne
Louisiana State University
sstra1@lsuhsc.edu

STRANGE-GEORGE, Jessica
MGK
jessica.strange-george@mgk.com

STRAUBINGER, Desiree
BASF
desiree.straubinger@basf.com

STRICKLAND, Freder
Anticimex North America
fred.strickland@anticimex.com

SU, Nan-Yao
University of Florida
nysu@ufl.edu

SUAREZ, Andrew
University of Illinois
suarez2@illinois.edu

SUITER, Dan
University of Georgia
dsuiter@uga.edu

SURANYI, Robert
MGK
robert.suranyi@mgk.com

SUTHERLAND, Andrew
University of California
amsutherland@ucanr.edu

T

TAN, Yen Sheng
MGK
yensheng.tan@mgk.com

TANG, Kit Lam
University of Illinois Urbana-Champaign
kitlam2@illinois.edu

TAY, Jia Wei
University of Hawaii
jwtay@hawaii.edu

THORN, Kevin
Thorn Pest Solutions
kevin@thornservices.com

TONG, Reina
University of Hawaii at Manoa
renat@hawaii.edu

TROYANO, Nancy
Rentokil-Terminix
nancy.troyano@rentokil.com

V

VAIL, Karen
University of Tennessee
kvail@utk.edu

VAN DEN MEIRACKER, Kristen
Terminix Service, Inc.
kristen@trustterminix.com

VANDER MEER, Bob
USDA-ARS, IFAHI
bob.vandermeer@usda.gov

VanderWERP, Mark
Rose Pest Solutions
mvande@rosepest.com

VARGO, Edward
Texas A&M University
ed.vargo@tamu.edu

VOGT, James
USDA Forest Service
james.t.vogt@usda.gov

W

WAGEMANS, Bert
Syngenta
bert.wagemans@syngenta.com

WALKER, Christopher
National Environmental Health Association
cwalker@neha.org

WANG, Changlu
Rutgers University
changluw@yahoo.com

WEIER, Jeffrey
Jeffrey Weier Consulting
jweier52@gmail.com

WEISS, Dennis
Saela Pest Control
dennis.weiss@saelapest.com

WELCH, Johanna
Florida Department of Agriculture
johanna.welch@fdacs.com

WEST, Wyatt
Arrow Exterminators
wwest@arrowexterminators.com

WILES, Elizabeth
North Carolina State University
elwiles@ncsu.edu

WILLIAMS, Ian
Rollins, Inc.
iwilliams@rollins.com

WILLIAMS, Kirk
Naval Facilities (NAVFAC)
melanie.l.decker.civ@us.navy.mil

WILSON, Morgan
Virginia Tech
morganw92@vt.edu

WINKLES, Jacob
University of Georgia
jacob.winkles@uga.edu

WONG, Colin
MGK
colin.wong@mgk.com

WOODLAND, Kimberly
ABC Home & Commercial Services
kwoodland@goanteater.com

Y

YANG, Chin-Cheng "Scotty"
Virginia Tech
scottyyang@vt.edu

YU, Jin-Jia
Rutgers University
jy767@sebs.rutgers.edu

YU, Hao
Rentokil-Terminix
hao.yu@rentokil.com

BYLAWS

ARTICLE I – NAME

The name of this organization is the National Conference on Urban Entomology.

ARTICLE II – BACKGROUND

In the spring of 1985, individuals representing urban entomology and the pest control industry came together to organize a national conference to be held biennial. The mission of these conferences was to open channels of communication and information between scientists in industry, academia, and government, and to foster interest and research in the general area of urban and structural entomology. The primary scope of the National Conference is to emphasize innovations and research on household and structural insect pests. It is the intent; however, to provide flexibility to include peripheral topics that pertain to the general discipline of urban entomology. It is anticipated that the scope of the conference could change through time, but the emphasis would be to provide an opportunity for urban entomologist to meet on a regular basis. It is not anticipated that any specific memberships would be required or expected, but that the cost associated with the conference would be met through registration fees and contributions. In the event that funds become available through donations or from the sale of conference proceedings, that these resources will be spent to meet expenses, to pay the expenses for invited speakers, and to provide scholarships to qualified students working in urban entomology. It is the intent of this organization to be non-profit, with financial resources provided to the Conference to be used entirely in support of quality programming and the support of scholarships.

ARTICLE III – OBJECTIVES

The objectives of this organization are:

(1) To promote the interest of urban and structural entomology.
(2) To provide a forum for the presentation of research, teaching and extension programs related to urban and structural entomology.
(3) To prepare a written/electronic proceedings of all invited and accepted papers given or prepared at the biennial meeting.
(4) To promote scholarship and the exchange of ideas among urban entomologists.
(5) As funds are available, scholarships will be awarded to students pursuing scholastic degrees in urban entomology. Three levels of scholarships will be offered: the first level is for Bachelor students; the second level is for Masters students; and the third level is for Ph.D. candidates. These students must register for, and attend, the conference and present the paper in order to receive funding. These scholarships will be awarded based solely on the merits of the candidates, and the progress that they have made towards completion of their research and scholastic degrees. The student will receive funding only if they are currently enrolled in a university at the time that the conference is held.

(6) There may also be first, second, and third place recipients of an onsite student competition for students who are currently involved in their undergraduate or graduate programs. These students can compete for scholarship funds; however, if any student has already been awarded a scholarship for the current meeting, and wishes to participate in this onsite competition, their presentation must be completely separate, and they must be properly registered in advance for this competition.

ARTICLE IV – JURISDICTION

The jurisdiction of this conference is limited to events held within the United States of America; however, we will be supportive of international urban entomology conferences as they are organized and held.

ARTICLE V – MEMBERSHIP

There are no membership requirements associated with this organization except for the payment of registration fees which go to offset the cost of holding the conference, preparation/printing of proceedings and the offering of scholarships. All persons with an interest in urban entomology are invited to attend the conferences and associated events.

ARTICLE VI – OFFICERS

Leadership for the Conference will be provided by the Chair of the Conference Committee. The Executive committee will be composed primarily of representatives from academia, industry and government. There will be seven officers of the Executive Committee and will include the following:

- Chair of the Conference Committee
- Chair of the Program Committee
- Chair of the Awards Committee
- Secretary to the Conference
- Treasurer to the Conference
- Chair of the Sponsorship Committee
- Chair of the Local Arrangements Committee

The Chair of the Conference Committee will preside at all Committee meetings, and will be the Executive Officer for the organization, and will preside at meetings. In the absence of the Chair of the Conference Committee, the Chair of the Program Committee may preside. The voting members for executive decisions for the conference will be by a majority vote of a quorum which is here defined as at least five officers.

The duties of the officers are as follows:

Chair of the Conference Committee: To provide overall leadership for the Conference, to establish ad hoc committees as needed, and to solicit nominations for new officers as needed.

Chair of the Program Committee: To coordinate the conference in terms of arranging for invited speakers and scientific presentations as well as oversee the printing of announcements, programs and proceedings.

Chair For Awards: To oversee and administer the Mallis Award, scholarships and other honors or awards as approved by the executive committee.

Secretary: To take notes and provide minutes of meetings.

Treasurer: Provide documentation of expenditures, and the collection and disbursement of funds. To act on behalf of the executive committee in making arrangements with hotels, convention centers and other facilities in which conferences are held.

Chair For Sponsorship: This committee will be involved in fund raising and in seeking sponsorship for various aspects of the conference. It will also contact contributors and potential contributors to seek donations and support for the conference and associated events. It is anticipated that the committee will be composed of at least one member representing academia, and one member representing industry.

Chair For Local Arrangements: To gather information on behalf of the executive committee for hotels, convention centers and other facilities in which the conference is to be held. To arrange for audio/visual equipment, and to oversee the general physical arrangements for the conference.

ARTICLE VII – TERMS OF OFFICE & SUCCESSION OF OFFICERS:

Officers may serve for a maximum of four conference terms (8 years); however, if no new nominations are received, the officers may continue until such time as replacements are identified and installed.

The Awards Chair is the last position to be served and may be relieved from NCUE officer duties unless asked or willing to serve NCUE in another capacity.

The Conference Chair may serve for one conference, after which time they will become the Chair of the Awards Committee.

The Program Chair may serve for one conference term after which time they will become the Conference Chair.

The Secretary may serve for one conference term, after which time they will become the Program Chair.

The Chair for Local Arrangements should change with each conference unless the meetings are held in the same location.

The Chair of the Sponsorship Committee (to include both an academic and industry representative) will serve for two conferences.

The Treasurer will serve for two conference cycles, unless reappointed by the Executive Committee.

ARTICLE VIII – NOMINATION OF OFFICERS

Nominations for any of the chair positions may come from any individual, committee, or subcommittee, but must be forwarded to the Chair of the Conference before the final business meeting of each conference. It is further anticipated that individuals may be asked to have their names put into nomination by the Chair of the Conference. In the event that there are no nominations, the existing Chair may remain in office with a majority vote of the Executive Committee for the conference. It is clearly the intent of these provisions that as many new people be included as officers of this organization as is possible, and no one shall be excluded from consideration.

ARTICLE IX – MEETINGS

Conferences of the National Conference on Urban Entomology will be held every two years. Meetings of the officers of this organization will meet at least annually either in direct meetings or by conference calls in order to plan the upcoming conference, and to conduct the business of the organization.

ARTICLE X – FINANCIAL RESPONSIBILITIES

All financial resources of the Conference will be held in a bank under an account named, “National Conference on Urban Entomology", and may be subjected to annual audits. Expenditures may be made in support of the conference, for scholarships and other reasonable costs; however, funds may not be used to pay officers’, or their staff’s salaries, or for officers’ travel expenses. In the event that this organization is disbanded, all remaining funds are to be donated to the Endowment Fund of the Entomological Society of America.

ARTICLE XI – FISCAL YEAR

The fiscal year will run from January 1 through December 31 of each year.

ARTICLE XII – AMENDMENTS

The bylaws for this organization may be amended by a two-thirds affirmative vote of the attendees at the business meeting, provided that the proposed amendments are available for review at least 48 hours in advance of the voting.

ARTICLE XIII – INDEMNIFICATION

The National Conference on Urban Entomology shall indemnify any person who is or was a party, or is or was threatened to be made a party to any threatened, pending or completed action, suit or proceeding, whether civil, criminal, administrative or investigative by reason of the fact that such person is or was an officer of the Committee, or a member of any subcommittee or task force, against expenses, judgments, awards, fines, penalties, and amount paid in settlement actually and

reasonably incurred by such persons in connection with such action, suit or proceeding: (I) except with respect to matters as to which it is adjudged in any such suit, action or proceeding that such person is liable to the organization by reason of the fact that such person has been found guilty of the commission of a crime or of gross negligence in the performance of their duties, it being understood that termination of any action, suit or proceeding by judgment, order, settlement, conviction or upon a plea of nolo contendere or its equivalent (whether or not after trial) shall not, of itself, create a presumption or be deemed an adjudication that such person is liable to the organization by reason of the commission of a crime or gross negligence in the performance of their duties; and (II) provided that such person shall have given the organization prompt notice of the threatening or commencement (as appropriate) of any such action, suit or proceeding. Upon notice from any such indemnified person that there is threatened or has been commenced any such action, suit or proceeding, the organization: (a) shall defend such indemnified person through counsel selected by and paid for by the organization and reasonably acceptable to such indemnified person which counsel shall assume control of the defense; and (b) shall reimburse such indemnity in advance of the final disposition of any such action, suit or proceeding, provided that the indemnified person shall agree to repay the organization all amounts so reimbursed, if a court of competent jurisdiction finally determines that such indemnified persons liable to the organization by reason of the fact that such indemnified person has been found guilty of the commission of a crime or of gross negligence in the performance of their duties. The foregoing provision shall be in addition to any and all rights which the persons specified above may otherwise have at any time to indemnification from and/or reimbursement by the organization.

Modified: 5/19/10-passed