2024 Abstract Award Winners

1st Place: Paola Villamarin

Potential of essential oils against the two-spotted spider mite, *Tetranychus urticae* Koch (Acari: Tetranychidae)

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The two-spotted spider mite (TSSM), *Tetranychus urticae* poses a significant threat to various crops, including ornamental plants. The presence of TSSM reduces plant quality due to direct feeding, leaf drop, and eventual plant death. Traditional control in ornamental plants relies heavily on synthetic acaricides, but due to pest biology, resistance often develops rapidly. Worldwide, 526 cases of TSSM resistance to 96 active ingredients have been reported. Therefore, there is a need to identify new active ingredients with more environmentally friendly properties. We hypothesized that using essential oils from plants known for their insecticidal properties might be an alternative method to control TSSM effectively. This study aimed to (a) evaluate the impact of various concentrations of essential oils on mortality, oviposition, and egg viability, (b) establish the lethal dose (LD50) and lethal concentration (LC50) for these essential oils, and (c) conduct an analysis of their potential phytotoxicity. Five essential oils, including manuka, copaiba, ginger, pepper tree, and tea tree were identified as potential options against TSSM, and each oil was tested at four different concentrations: 0.01%, 0.1%, 1%, and 10%. The control treatment consisted of absolute ethanol as oils were diluted in it. The treatments were applied using a potter spray tower. The experimental units consisted of 5 cm diameter plastic petri dishes filled with water-soaked cotton wool and a 2.4 cm leaf disk placed with its adaxial side up. One TSSM female was released on each arena and sprayed with 1 mL of solution of the assigned treatment. The mortality and the number of eggs were recorded 24 and 48 hours after treatment application. At 48 hours the females were removed, and the eggs were left to conduct the viability assessment. The number of larvae emerging from the eggs was recorded six days after the treatment application. The experiment was conducted in three blocks, with each block including 30 replicates, totaling 90 replicates per treatment. The arenas were maintained at 25 ± 1 °C, RH 60 ± 5 %, and 12:12 h (L:D). For mortality and egg viability, a Generalized Lineal Mixed- effects Model (GLMM) was conducted using binomial distribution. The number of eggs laid per female was analyzed using the same model but with negative binomial distribution. The fixed factors were oil, concentration, and time. Block was the random factor. Manuka oil at 10% concentration resulted in the highest mortality in comparison to the other treatments (GLMM: $\chi 2 = 78.23$, df = 15, P = < 0.001; Fig. 1). Oviposition varied with oil and concentrations (GLMM: $\chi 2 = 382.05$, df = 15, P = < 0.001). The lowest oviposition was recorded for manuka oil at 1% and 10% (Fig. 2). No significant differences were observed for the proportion of hatched eggs or egg viability (Fig. 3). Further analysis is underway to determine LD50, LC50, and phytotoxicity effects. Preliminary findings suggest that manuka oil has potential for TSSM control, with

mortality observed within 24 hours, followed by copaiba and pepper tree oils at higher concentrations

2nd Place: Sofía Gonzalez Salazar

A survey of soil oribatid diversity and community structure in a Madrean sky island in Southeastern Arizona, US

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The Madrean archipelago is a group of 55 mountain ranges in southern Arizona and northern Sonora. Known as the Madrean Sky Islands, these mountains support diverse plant and animal communities which are isolated from similar communities on neighboring mountain ranges by the surrounding desert. Beginning with Forrest Shreve's 1915 study of the flora of the Santa Catalina Mountains, many studies have documented the diversity of above-ground communities in this region; however, below-ground diversity remains poorly known. Oribatid mites are a key constituent of soil communities, particularly in forest ecosystems where they are often the most taxonomically diverse and abundant group of soil microarthropods. As part of a larger study of the diversity and community structure of soil mites in the Madrean Sky Islands, we carried out extensive surveys of soil oribatids and other microarthropods in the Santa Rita Mountains south of Tucson, Arizona between 2018 and 2021. Litter and soil samples were collected from 207 sites spanning an elevational range from 1000 to 2800 m, and soil microarthropods were extracted using Berlese-Tullgren funnels. As expected, mites were the most abundant component of these communities, accounting for approximately 78% of the 60,320 invertebrates recovered from these samples. Oribatids were somewhat less abundant (43%) overall than Prostigmata (54%), with Mesostigmata accounting for the remaining 3% of the sampled mites. Investigation of the adult oribatids in these samples using light microscopy and genetic barcoding revealed a total of 104 morphospecies, most of which represent new records for Arizona. Brachypyline oribatids are particularly abundant and account for a majority (79/104) of the morphospecies and approximately 90% of the adults. The most abundant taxa belong to the families Tectocepheidae, Gymnodamaeidae, Scheloribatidae, Phenopelopidae and Oppiidae. However, species accumulation curves suggest that additional oribatid species remain to be discovered even in this relatively small portion of the Sonoran Desert. This is the first study to investigate how the composition of a below-ground ground community varies with elevation in a Madrean sky island. It will also produce a catalog of soil oribatid species in the Madrean archipelago, as well it contributes new genetic barcode data to public databases for most oribatid species obtained. Similarly, this study will help to investigate further how the composition of a below-ground community varies across the Madrean sky islands.

3rd Place: Marielle Berto

Phoretic mites associated with ambrosia beetles in Florida avocados and their potential use in IPM

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Ambrosia beetles (Coleoptera: Curculionidae) are wood-boring insects that carry and farm symbiotic fungi using the xylem of the host tree as a substrate. Fungi carried by these insects usually pose no threat to plants. However, *Harringtonia lauricola* (Ophiostomales: Ophiostomataceae) is the causal agent of laurel wilt, a deadly vascular disease that affects lauraceous plants in native forest ecosystems, and avocado trees (*Persea americana*) in commercial plantings in Florida. The cryptic living habits of these beetles make their management challenging. A few organisms inhabit their galleries, including phoretic mites. Little is known about the ecology of phoretic mites and their potential application in pest management. A survey of phoretic mites on ambrosia beetles was conducted in eight avocado orchards and a swampbay (*Persea palustris*) in South Florida. Ambrosia beetles were captured in flight using (1) modified Lindgren traps, (2) as they emerged from infested logs placed in emergence chambers, and were also (3) physically excavated from infested avocado logs. Eleven mite species in six families were collected from nine beetle hosts, including *Asca* sp. and *Lasioseius safroi* (Ascidae), *Proctolaelaps bickleyi* and *Proctolaelaps* sp. (Melicharidae), *Dendrolaelaps* sp. (Digamasellidae), *Acarothorectes curculionium*, *Elattoma* sp., *Brazilopsis floridensis*, and *Pediculaster* sp. (Pygmephoridae), *Tarsonemus* sp. (Tarsonemidae), and *Histiogaster arborsignis* (Acaridae). The mite family Pygmephoridae was the most abundant group associated with ambrosia beetles. *Acarothorectes curculionium* and *Elattoma* sp. were the most common phoretic mite species. Four new species were found in this study, namely *B. floridensi, Pediculaster* sp., *Dendrolaelaps* sp. and *Proctolaelaps* sp. The phoretic associations were not specific to a particular ambrosia beetle species. *Histiogaster arborsignis* is a cosmopolitan phoretic mite commonly associated with wood-boring insects. This fungivorous mite can be easily mass-reared and could potentially transport fungal spores into the beetle galleries. The fungal feeding plasticity of *H. arborsignis* was assessed through no-choice assays offering *H. lauricola*, *Fusarium* sp., six non-pathogenic ambrosia beetle fungal symbionts, and two commercially available beneficial fungi. The ability of *H. arborsignis* to carry and inoculate *Beauveria bassiana* and *Trichoderma harzianum* into ambrosia beetle colonies was also assessed. The potential predation by *H. arborsignis* on *Xyleborus bispinatus* was also assessed. *H. arborsignis* developed and reproduced for two generations on all beetle symbionts, particularly more on *Graphium* sp. No reproduction on *T. harzianum* or *B. bassiana*, and no predation on *X. bispinatus* were observed. *H. arborsignis* only fed on dead individuals. The mites transferred beneficial fungi to *X. bispinatus* galleries in avocado sawdust rearing media, affecting the beetles' survivability and reproduction. *Histiogaster arborsignis* showed a close association with the beetle fungal symbionts and the potential to be incorporated into innovative IPM practices for managing wood boring pests. This research is the first step towards understanding complex symbiotic associations between phoretic mites, ambrosia beetles and ambrosia fungi. While this research focuses on the laurel wilt-ambrosia beetle complex, IPM tacticts using phoretic mites could potentially be implemented in other wood-boring insect pest systems.

4th Place: Daysi López-Baltazar

Diversity and ecology of intertidal soil mites on the coast of Sonora, Mexico

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Intertidal regions often support distinctive assemblages of animals and plants that are adapted to the harsh conditions that arise due to fluctuating water levels. Organisms that live in the intertidal zone must be able to cope with frequent changes in moisture, salinity and temperature. One strategy for coping with these challenges is to live underground, where conditions may be more stable due to the retention of interstitial water and reduced exposure to the sun and wind. In Mexico, most studies of intertidal soil arthropods have been conducted in the tropical regions of Quintana Roo. These surveys have documented high levels of species richness of soil mites and other micro-arthropods in litter and soil associated with mangrove forests. In contrast, little is known about soil mites in intertidal zones along the western coast of Mexico bordering the Pacific Ocean and the Gulf of California. For this reason, we surveyed soil arthropods over a 16 month period in salt marsh and mangrove-associated habitats in the Estero Santa Cruz of Bahía de Kino on the Gulf Coast of central Sonora, Mexico. Here the intertidal zone is bordered by desert habitats which experience extended periods of high temperature and limited precipitation. Mites accounted for approximately 59% of the 6,618 invertebrates collected in our samples, with Endeostigmatid mites being most abundant (51% of all mites), followed by Oribatids (38%), Prostigmata (9%) and Mesostigmata (4%). In contrast to the diverse intertidal soil mite communities documented in Quintana Roo, our samples contained only two Endeostigmatid species and 14 Oribatid species, with the three most abundant species belonging to the genera *Nanorchestes*, *Speleorchestes* and *Scheloribates* together accounting for 78% of all mites in our samples. On the other hand, we report the first records of the families Selenoribatidae and Fortuyniidae for Mexico, as well as two new species in the family Lohmaniidae. Although we observed only limited zonation of mite communities along spatial transects extending through the salt marsh, we found significant spatial variation in the density and composition of soil mite communities across the estuary. This variation was more strongly associated with soil characteristics such as pH, organic matter content and soil moisture than with local plant community composition, but collectively these factors explained slightly less than 50% of the total variation. Although this is the first survey of intertidal mites in northwestern Mexico, the threats faced by saltmarsh and mangroves due to human encroachment and global warming highlight the need for additional studies of intertidal mites throughout this large and ecologically diverse region.