Poster Presentation Competition

P1

Comparative Analysis of Blowfly (Diptera: Calliphoridae) Succession and Carcass Weight Loss Between Exposed and Suitcase-Enclosed Remains

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Blowflies (Diptera: Calliphoridae) are among the earliest colonizers of animal remains and serve as crucial indicators for postmortem interval (PMI) estimation in forensic investigations. In practice, however, corpses are often discovered within enclosed containers such as suitcases, where colonization and decomposition may differ from those of exposed carcasses. To address this gap, we performed a comparative field experiment in Asan, Korea (May 8–June 5, 2025), comparing blowfly succession and carcass weight loss between an exposed carcass and one enclosed in a suitcase under identical environmental conditions. In the exposed carcass, *Lucilia sericata* first appeared approximately one day after deposition (May 9), followed by *Chrysomya megacephala*, *Lucilia illustris*, and *Calliphora lata*. Until the carcass reached the dry stage, *L. sericata* accounted for 7EA (out of 585) of all calliphorids collected, while *Ch. megacephala* represented 121EA. and *C. lata* and *L. illustris* each comprised 3 and 97 individuals. The carcass weight decreased from 30.0 kg at deposition to 9.5 kg after 26 days (June 3), representing a 68.3% reduction. In contrast, in the carcass enclosed in a suitcase, the first colonization occurred three days after deposition (May 11) by *L. sericata* and *Ch. megacephala*. Until the carcass reached the dry stage, *Ch. megacephala* reached 43EA (out of 246) of the total calliphorids, while *L. sericata* and *L. illustris* represented 6 and 63EA, respectively. The carcass weight decreased from 38.5 kg at deposition to 23.1 kg after 26 days, corresponding to a 40.0% reduction. These results clearly demonstrate that suitcase enclosure delayed the onset of blowfly colonization, reduced relative abundance, and slowed decomposition, even under identical conditions. The findings underscore the importance of systematically accumulating succession data from concealed or container-associated remains to refine PMI estimation and improve the reliability of forensic entomological applications.

Key words: Medico-legal Entomology, Postmortem interval (PMI), Blowfly, Carrier-encolosed remains

P2

Evaluation of natural products as attractants against *plautia stali* Scott (Hemiptera: Pentatomidae): electrophysiological responses and field tests

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Plautia stali causes damage to a wide range of crops, reducing their commercial value. *P. stali* has a highly developed olfactory system, which makes it suitable for semiochemical-based pest management strategies. In this study, we focused on natural compounds as potential semiochemicals, and evaluated their effects using electroantennogram (EAG) recordings and field experiments. In EAG screening of fifteen natural compounds, four compounds (*A*, *B*, *K*, and *M*) exhibited significant EAG responses at a 1 mg dose in both male and female adults of *P. stali*. In the field experiments, the behavioral responses of nymphs and adults of *P. stali* to the EAG-active compounds (500 mg dose) were evaluated in combination with the aggregation pheromone methyl (2*E*,4*E*,6*Z*)-decatrienoate (MDT), and compared with MDT alone (positive control) and a blank control (negative control). Compound *A* increased trap catches of *P. stali* adults and nymphs by 55.1% and 141.7%, respectively, compared to the positive control, while compound *K* increased nymph catches by 208.3%. These results demonstrate the potential of specific natural compounds to serve as eco-friendly and commercially viable repellents or attractants, supporting the development of a push–pull strategy for the sustainable management of *P. stali.*

Key words: olfactory, semiochemical, methyl (2*E*,4*E*,6*Z*)-decatrienoate, eco-friendly

P3

Comparison of non-bee pollinator assemblages between pan traps and blue vane traps

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Non-bee pollinators defined as pollinators except on honeybees (*Apis* spp.) and other bees beloning to Anthophila. They play a crucial role in crop production and ecosystem stability, providing an insurance effect against land-use changes and honeybee declines. Despite their importance, sampling methods for non-bee pollinating insects remains limited both domestically and internationally. Therefore, this study aimed to investigate effective sampling methods for non-bee pollinators. From April to May 2025, we sampled non-bee pollinators using three colored pan traps and blue vane traps in four different habitat types with various exposure periods, and found that the use of both trap types will be essential to monitoring non-bee pollinating insects effectively.

Key words: insect diversity, sampling protocol, monitoring, conservation

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P4

The beetle fauna of Bito Island (Sacheon-si, Gyeongsangnam-do)

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An insect fauna survey of the order Coleoptera was performed in Bito Island (Sacheon-si, Gyeongsangnam-do) The sampling carried out three times from May 28 to August 8, 2025 by using netting, manual collecting, sweeping, sifting, flight interception trap, and pit-fall trap methods. A total of 4,445 individuals representing 357 species within 55 families were collected. The family Staphylinidae showed the highest species diversity with 124 species, followed by Curculionidae (35 species), Chrysomelidae (26 species), and Carabidae (19 species). The families with high abundance of individuals were Staphylinidae (1,460 individuals), Carabidae (950 individuals), and Corylophidae (397 individuals). The flight interception trap collected the greatest species diversity (227), and sifting yielded the highest number of individuals (2,150).

Key words: Coleoptera, beetle fauna, insect collecting

P5

Molecular Approach to the Taxonomic Resolution of *Chrysoperla nipponensis*

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Family Chrysopidae (green lacewings) is one of the representative groups of natural enemies and is also a highly useful group as a biological control agent. However, despite this ecological importance, this family includes complex groups that are extremely difficult at the species identification. Among them, *Chrysoperla nipponensis* is one of the most prevalent species of fhe family in eastern Asia. It belongs to the *Chrysoperla carnea*-group, a highly cryptic species complex that can only be reliably distinguished by substrate-borne courtship songs. Previous attempts to construct haplotype trees using mitochondrial genes of *Chrysoperla nipponensis* have resulted in paraphyletic groupings with other species, suggesting that mitochondrial genes alone are not an reliable molecular marker for this taxon.

In this study, we conducted a comparative analysis of the COI gene—well-known for its high utility in species identification—and the CAD gene, a single copy nuclear protein coding gene which showed potential for identifying certain taxonomic groups within Coleoptera, a closely related taxa to Neuropterida to enable more accurate and rapid species identification for the species.

Key words: Chrysopidae, Cryptic species, *Chrysoperla nipponensis*, CO1, haplotype, CAD

P6

First Record of *Cinara tujafilina* (Hemiptera: Aphididae: Lachninae) in Myanmar

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The genus *Cinara* Curtis, 1835 (Hemiptera: Aphididae: Lachninae) is a large, conifer-associated lineage comprising 256 described species worldwide, primarily on hosts in the Cupressaceae and Pinaceae. In this study we report *Cinara* (*Cupressobium*) *tujafilina* (Del Guercio, 1909) from Myanmar for the first time. In addition to this new country record, we provide: (1) a morphological diagnosis of the apterous viviparous female, (2) COI-based DNA barcoding to confirm species identity, and (3) population-genetic analyses.

Key words: Aphids, exotic species, COI, distribution

P7

New distribution record of the genus *Stethynium* (Hymenoptera: Mymaridae) from Korea associated with tea green leafhopper *Empoasca onukii* (Hemiptera: Cicadellidae)

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The genus *Stethynium* (Hymenoptera: Mymaridae) comprises of approximately 50 species worldwide, with two species recorded from the Palearctic region. In this study, we report *Stethynium empoascae* as the first record of the genus from Korea, collected from tea fields in the southern region of the country. During the survey, the green tea leafhopper, *Empoasca onukii* (Hemiptera: Cicadellidae), a major pest of tea plants throughout the major tea-producing regions of East Asia, was also observed at the collection sites. The tea plants were brought to the lab and maintained until the adults of *S. empoascae* were eclosed. Based on previous studies and known host associations, we infer the parasitoids from the tea field eclosed from *E. onukii* individuals. This poster presents general information on *S. empoascae* along with brief biological and distributional data, contributing to a better understanding of its distribution and potential host associations in Korea.

Key words: Biodiversity, Host-parasitoid association, Potential biological control, Natural enemy

P8

Taxonomic corrections on the genus *Plautia* (Hemiptera: Pentatomidae) from Korea, with discussion on its morphological variation and parasitoid

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The pentatomine bug genus *Plautia* Stål, comprises 28 species reported worldwide, primarily across the Palearctic region (mostly East and Southeast Asia) and Australia. Among them, several species are significant agricultural pests. Our recent survey recognized two *Plautia* species, *P. stali* and *P. himechabane*. *Plautia splendens* was excluded from the Korean list based a the review of previous references and examination of the Korean population. Images of dorsal habitus and genitalic structures of both sexes are presented for two Korean *Plautia*, with figures for observable variation in coloration and genital structure. We also describe two newly recognized associated mites of *Plautia*, with detailed figures and discussion.

Key words: Pentatomidae, *Plautia*, variation, parasitoid

* This work was supported by NIBR, NRF and SNUR&D grant

P9

A newly recorded species of the genus *Roeslerstammia* Zeller, 1839 (Lepidoptera: Roeslerstammiidae) from the Koreabased on Morphological and Molecular analysis

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The genus *Roeslerstammia* Zeller, 1839, is the type genus of the family Roeslerstammiidae, which currently includes four species distributed globally. In this study, we report a newly recorded species of this genus from Korea. In addition, we review the taxonomic history of the family Roeslerstammiidae and *Roeslerstammia.* A taxonomic key and molecular analysis based on the COI gene are also conducted.

Key words: Taxonomic review, Gracillarioidea, distribution map, Korean fauna, COI.

P10

First record of the genus *Burmophora* (Diptera: Phoridae) from Korea

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The genus *Burmophora* is a small group within subfamily Phorinae consisting of six species, characterized by male both surstyli separated from epandrium and female proboscis greatly elongated. In this study, specimens of *Burmophora* collected in South Korea are morphologically examined and *B. angustifrons* and *B. multiseta* are newly described from Korea, which are previously recorded from Japan and Russian Far East. Also, *B. multiseta* is seemed to be associated with ants, based on the observation of the adults hanging around the nest of *Lasius spathepus*. Photographs of the Korean *Burmophora* species and a revised key to world species are provided.

Key words: *Burmophora*, Korea, new record, scuttle fly, taxonomy

* This work was supported by a grant from the National Institute of Biological Resources (NIBR), funded by the Ministry of Environment (MOE) of the Republic of Korea (NIBR202502202).

P11

Three *Psychoda* species (Diptera: Psychodidae) new to science from Jeju Gotjawal Provincial Park

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Psychoda, the type genus of the family Psychodidae, is one of the largest genera within the family, exhibiting remarkable morphological homogeneity that makes their identification rather challenging. In this study, three species new to science were discovered from Jeju Gotjawal Provincial Park in Jeju Is., *viz*., *Psychoda epaulettifera* sp. nov., *P. gotjawalensis* sp. nov., *P. ochani* sp. nov. These species can be easily recognized by unique male genitalic character, especially in aedeagal structures and/or unique wing ornament. The type localities are well-protected areas in Jeju Is. possessing unique fauna and flora, exhibiting quite dissimilar habitats comparing ones in Korean Peninsula. This discovery highlights the necessity of exploring a broader spectrum of habitats for a better understanding of this taxon.

Key words: *Psychoda*, moth fly, new species, gotjawal, taxonomy.

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P12

New family records of spiders (Arachnida: Araneae) from Korea

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During nearly 120 years of Korean Arachnological history, currently more than 970 species belonging to 45 families have been recorded in Korea. As a result of new discovery from several field surveys and nomenclatural changes made by recent phylogenetic studies in family-level, seven spider families, *viz*, Argyronetidae, Cicurinidae, Desidae, Dolomedidae, Lathyidae, Pimoidae, and Synotaxidae, have been recorded for the first time in Korea, and species belonging to two genera, *viz*, *Argenna* (Argyronetidae) and *Tekellina* (Synotaxidae) were newly discovered in the country. Brief introductions for these newly recorded families and species are provided, with lists of included species in Korea and a remark on new combinations of pimoid species.

Key words: Argyronetidae, Cicurinidae, Desidae, Dolomedidae, Lathyidae, Pimoidae, Synotaxidae, Korea

P13

Redescription of *Belisana amabilis* (Araneae: Pholcidae) from Korea

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The genus *Belisana* is the second most diverse group of cellar spiders (Araneae: Pholcidae), containing 171 species mainly distributed in Indo-Malayan and Australasian regions. Currently only a single species, *Belisana amabilis* (Paik, 1978), has been known in Korea, described using only female specimens from Seogwipo and Mt. Hallasan, Jeju Island and Gimcheon, and no additional study on this species has ever been conducted after the original description. In this study, *B. amabilis* is redescribed based on type series and recently collected materials from Gotjawal Provincial Park, with the first description of male and notes on its identity and distribution.

Key words: Araneae, *Belisana*, cellar spider, Gotjawal, redescription, taxonomy

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P14

Discovery of a new species of *Chilobrachys* (Araneae: Theraphosidae) from Phang Nga Province, Thailand

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Chilobrachys is a genus of spiders belonging to the family Theraphosidae, distributed mainly in Oriental region. These spiders are widely sold in the pet trade under the common name “tarantulas” and are very popular among hobbyists. Through detailed morphological examination using specimens collected from Phang Nga Province in southern Thailand, we discovered the species being sold under the name *Chilobrachys* sp. “Southern Thailand Blue” which was found to be an undescribed species. Currently, only three species of *Chilbrachys* are recorded from Thailand which are clearly separated by ecological niche (habitat) from this new species. In this study, we provide a detailed description and habitat information as well as an identification key to *Chilobrachys* from Thailand.

Key words: *Chilobrachys,* tarantula, Theraphosidae, new species, Thailand, taxonomy.

P15

Newly recorded species of *Antispila* Hubner, 1825 (Lepidoptera: Heliozelidae) from Korea

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Heliozelidae are small monotrysian moths with a near global distribution, currently comprising fewer than 150 described species in 13 genera, motst of which are concentrated in North America and Australia. The larvae are generally considered leaf miners, cutting an elliptical case from the host plant's leaf in which they pupate. This characteristic has earned them the common name "shield-bearing moths". In this study, we firstly reported the *Antispila* species in Korea. Illustrations of adult and genitalia are also provided.

Key words: Leaf miner, New record, Heliozelidae, Korea, Taxonomy.

P16

A little known genus *Pseudopostega* Kozlov, 1985 (Lepidoptera: Nepticuloidea) from Korea

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Opostegidae is one of the microlepidopteran family (Lepidoptera: Nepticuloidea) including 200 species belonging to 7 genera worldwide. Among them, the genus *Pseudopostega* is distributed worldwide and is the most species rich, comprising about 120 of the 200 described species of Opostegidae. However, it has not yet been recorded from Korea and its diversity in Northeast Asia is relatively low with only two species known from China and two from Japan. In this study, we firstly reported the genus *Pseudopostega* based on two new species. Illustrations of adults and genitalia are also provided.

Key words: Leaf miner, New record, Opostegidae, Korea, Taxonomy.

P17

Genetic diversity of *Pterotopteryx spilodesma* (Lepidoptera: Alucitidae) in Korea

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The family Alucitidae, comprising approximately 280 species in 20 genera worldwide, is a rare group of moths with a distinctive plume-like wing morphology. However, their ecology and genetic characteristics remain poorly understood, and studies on this family remain scarce. *Pterotopteryx spilodesma* is the most widespread Alucitidae species in Korea, yet molecular and ecological studies on this species remain scarce. In this study, we aim to investigate the genetic divergence within the species, *P. spilodesma* based on COI analysis.

Key words: Lepidoptera, Alucitidae, Many-plumed moths, Haplotype, Genetic diversity

P18

First record of myrmecophilous clown beetle, *Eucurtiopsis ohtanii* (Histeridae: Chlamydopsinae) from Korea

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A new record of a myrmecophilous histerid species is recognized from Korea: *Eucurtiopsis ohtanii* (Sawada, 1994). A single specimen was collected by sifting the mass of a *Pheidole fervida* colony from Jeju Island. Herein, we present the morphological diagnosis, photographs of the adult, and ecological information.

Key words: Taxonomy, Histeridae, *Eucurtiopsis*, first record, Korea

P19

Molecular Identification and Morphology of Immature Stages of *Monochamus* (Coleoptera: Cerambycidae)

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The genus *Monochamus* Dejean, 1821 includes major vectors of the pine wilt nematode, such as *M. alternatus* and *M. salturarius*. Their larval and pupal morphology provides critical insights into taxonomy, evolution, and pest management. However, accurate identification of their immature stages remains challenging and often results in misidentification, making molecular approaches essential. In this study, we applied COI-based molecular identification to immature stages of *Monochamus*. Based on molecularly identified specimens, we present high-resolution photographs of larvae and pupae of all five *Monochamus* species occurring in Korea. We also provide a preliminary key to species, and biological information including host plants and larval feeding habits.

Key words: *Monochamus,* molecular identification, DNA barcoding, larvae, pupae, Cerambycidae

P20

Taxonomic review of *Oxyscelio* Kieffer, 1907 (Hymenoptera: Scelionidae) in Korea, with two new records

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The genus *Oxyscelio* Kieffer belongs to the subfamily Scelioninae, with c.a. 200 valid species known worldwide, 97 species from the Palearctic and Indo-Malayan region, but only one species, *Oxyscelio mollitia* Burks, 2013 recorded in Korea. This genus is clearly differentiated from other genera by pronounced frontal depression on the head, posteriorly rounded vertex, fore wing submarginal vein being distant from wing margin, very short marginal vein, virtually absent postmarginal vein, and distinct metascutellum.

In this study, two species, *Oxyscelio arvi* Burks, 2013 and *Oxyscelio aureamediacritas* Burks, 2013, are newly recognized in Korea. Key to Korean species, diagnoses and photos of diagnostic characteristics are provided.

Key words: *Oxyscelio*, new record, *Oxyscelio arvi*, *Oxyscelio aureamediacritas*, Scelioninae, Korea

P21

DNA barcoding of 41 species of the subfamily Boletobiinae and allied taxa (Lepidoptera, Erebidae) in Korea

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The subfamily Boletobiinae comprises moths of various sizes, with a wingspan ranging from 5 to 30 mm. This group has undergone considerable taxonomic changes in its systematic placement. Leaves, deciduous trees, and lichens are known as host plants, although the hosts of most species remain unknown. Additionally, the distribution patterns of different Boletobiinae species vary between Europe and Asia. Therefore, it is necessary to establish DNA barcodes and conduct phylogenetic studies of this group in Korea.

In this study, we obtained and analyzed the DNA barcodes from 126 specimens of 41 species in the subfamilies Boletobiinae and Hypenodinae. Among them, we obtained 105 specimens of 33 species belonging to Boletobiinae and 21 specimens of 8 species belonging to Hypenodinae, respectively. Based on these results, we constructed Neighbor-Joining (NJ) trees for these two subfamilies and analyzed their taxonomic positions at both the genus and species levels. We further provide a comprehensive dataset, including the barcoding species list, photographs, and other research outputs obtained in this study.

Key words: Lepidoptera, Boletobiinae, DNA barcode, Identification

* This work was supported by the Korea National Arboretum (Project No. KNA1-1-20-16-1).

P22

A new species and one newly recorded species of the genus *Bucculatrix* Zeller, 1839 (Lepidoptera: Bucculatricidae) from Korea

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The genus *Bucculatrix* Zeller, 1839 of the family Bucculatricidae is known to comprise over 300 species worldwide. Among them, more than 30 species are recognized in the Palearctic region. In Korea, only five species have been reported to date.

In this study, we report a new species and one newly recorded species of the genus *Bucculatrix* for the first time in Korea: *Bucculatrix* sp. nov.1, *B. comporabile* Seksjaeva, 1989. All available information, host plants, DNA barcode and images of adults and genitalic structures for species is provided.

Key words: Bucculatricidae, Bucculatrix, leafminer, taxonomy, Korea

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P23

Revised Taxonomic Keys for Stored Grain Pests in Plant Quarantine Inspection

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Since the inception of plant quarantine in South Korea, a total of 39,793 cases of stored grains have been reported. From 2010 to 2025, 11,627 cases of stored grain pests interceptions were recorded, but only 9,740 cases were identified to the species level, representing 9 orders, 78 families, and 259 species, indicating that about 17% remained unidentified at the species level.

While international references provide comprehensive descriptions of all developmental stages and systematic management strategies, domestic protocols still rely on pre-2017 documents and offer identification keys only at the genus and species levels. To address this gap, we presents species level identification keys organized by order, including Coleoptera, Acaridae, Lepidoptera, and supplemented with higher level diagnostic keys.

Key words: stored grain pests, identification, quarantine

P24

Application of genetic analysis of red imported fire ants (*Solenopsis invicta* Buren) collected in Taiwan

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In 2025, ants (n = 92) were collected from two sites in northern Taiwan. DNA was extracted, and species identification using cytochrome c oxidase subunit I (*COI*) sequences confirmed them as *Solenopsis invicta*. *COI* amplification for matrilineal haplotype analysis identified Haplotype 22. Analysis of colony social organization using *Gp-9* genotypes provides essential ecological information for elucidating the species' dispersal and establishment strategies. Since 2017, we have conducted microsatellite-based analyses of the genetic structure of domestic and foreign specimens and have sought to obtain populations from diverse source regions to secure reliable data. The northern Taiwan samples obtained here provided an important opportunity to compare genetic differences with samples collected in 2020 through international collaboration. These efforts are expected to expand the genetic reference for future studies on the invasion pathways and spread of the red imported fire ant.

Key words: *Solenopsis invicta*, red imported fire ant, *COI* barcode, haplotype analysis, *Gp-9*, Taiwan, molecular epidemiology

P25

A newly recorded species of genus *Apodesmia* (Hymenoptera: Braconidae: Opiinae) from South Korea

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The subfamily Opiinae comprises approximately 2,000 species distributed worldwide. Members of this subfamily are koinobiont endoparasitoids, with parasitism typically culminating in the eventual mortality of the host. Due to this biological characteristic, members of Opiinae have been utilized species as resources for the biological control of agricultural pests in some countries. The genus *Apodesmia* was regarded as a subgenus of *Opius*, but was raised to genus level based on differences in the form of the occipital carina. We report the first occurrence of *Apodesmia incisula* Fischer, 1963 in South Korea. In addition, descriptions, diagnoses and photographs of the diagnostic characters are provided.

Key words: faunistic record; natural enemy; parasitoid wasps; species distribution; systematics; taxonomy

P26

First report of the genus *Coleolaelaps* (Acari: Laelapidae) on the endangered *Polyphylla laticollis manchurica* (Coleoptera: Scarabaeidae) in Korea

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The genus *Polyphylla* comprises relatively large-sized beetles, comprising 85 species worldwide, with a record of *P. laticollis manchurica* in Korea. According to the collection records, this beetle was widely distributed across the Korean Peninsula. However, they have been designated as a highly endangered species (class I) in Korea in 1993, since their specific habitat, riverbanks, were disturbed by urbanization and pollution. Many terrestrial beetles serve as carriers for mites, which usually live either on the hosts' bodies or within their nests. These mites are generally known as scavengers of the nests, but sometimes, they can feed directly on the hosts' eggs. In the case of *Polyphylla* beetles, the genus *Coleolaelaps* is known to be associated with them, however, only their host–phoretic relationship has been reported, with no information on their ecological behavior. In this study, we report a new mite species and their behavior that may be a threat to the conservation of the endangered *Polyphylla* beetle.

Key words: Acari, endangered species, Mesostigmata, new record, phoresis

P27

The first record of *Falsomordellina luteoloides* (Coleoptera: Mordellidae) in Korea

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The tribe Mordellistenini (Coleoptera: Mordellidae) is the largest group in the family Mordellidae, comprising more than 1,200 species within 40 genera worldwide, including over 450 species in 20 genera from the palaearctic region. Members of this tribe are characterized by a long pygidium and well-developed long hind legs with plural lined spines on tibiae and tarsi. In Korea, four genera (*Falsomordellistena*, *Gilpostenoda*, *Mordellina*, and *Mordellistena*) and 14 species have been recorded to date. During a taxonomic study of Korean Mordellistenini, *Falsomordellina luteoloides* (Nomura, 1961) was discovered. This represents the first Korean record of the genus *Falsomordellina*. We provide illustrations of the habitus and diagnostic characters of this species to facilitate identification.

Key words: Coleoptera, Mordellidae, Mordellistenini

P28

Review on the *lewisii*-group (Coleoptera: Ptiliidae: *Acrotrichis*), with redescription of Korean *Acrotrichis lewisii* and descriptions of two new species from Taiwan

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The genus *Acrotrichis* is divided into four subgenera; however, the subgeneric classification remains ambiguous. The '*lewisii*-group' is one of five species groups proposed in 2002 for Japanese *Acrotrichis*. This group includes three species previously placed in the subgenus *Flachiana*. In Korea, a single species, *A. lewisii* is known to be distributed on Jejudo Island. In this study, we examined species of *lewisii*-group from Korea, Taiwan and Japan. We report *A. latipedes* as new to Korea, and discribe two additional new species from Taiwan. A redescription of the *A. lewisii* and *lewisii*-group, along with illustrations of their habitus and diagnostic characters, a distribution map, and a key to the species of the *lewisii*-group, are also provided.

Key words: featherwing beetles, Korea, East Asia, taxonomy

P29

Taxonomic review of the family Corylophidae (Coleoptera: Cucujoidea) from Korea

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The family Corylophidae LeConte (Coleoptera: Cucujoidea) is a cosmopolitan group, comprising 28 genera and approximately 300 species. In Korea, three genera and six species have been recorded to date. Here, we provide redescriptions of six previously known species, describe three new species, *Arthrolips* sp. 1, *A.* sp. 2, and *Clypastraea* sp. 1, and report *Sericoderus brevicornis* Matthews, 1890 as a new record for Korea. Illustrations of habitus and genitalia, diagnostic characters, and a distribution map are provided.

Key words: minute hooded beetles, new species, new record, Korea, taxonomy

P30

Revision of the New Zealand genus *Plectomorphus* Rafrray (Coleoptera: Staphylinidae: Pselaphinae: Euplectitae)

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The genus *Plectomorphus* Raffray is endemic to New Zealand. This genus previously comprises 11 species: *P. insignis* Broun, *P. trisulcicollis* (Broun), *P. spinifer* (Broun), *P. munroi* (Broun), *P. laminifer* Broun, *P. optandus* Broun, *P. anguliferus* Broun, *P. scitiventris* Broun, *P. collinus* (Broun), *P. brevicornis* Broun, and *P. egenus* Broun. In this study, four species, *P. laminifer* Broun, *P. optandus* Broun, *P. anguliferus* Broun, and *P. collinus* (Broun), are transferred as new combinations and five species, *P. spinifer* (Broun), *P. munroi* (Broun), *P. scitiventris* Broun, *P. brevicornis* Broun, and *P. egenus* Broun, are synonymized. As a result, this genus is currently consisted of two species: *P. insignis* Broun and *P. trisulcicollis* (Broun).

Key words: new combination, synonym, taxonomy, New Zealand

P31

Using the Lucid Program to Develop Skills in Generating and Utilizing Taxonomic Keys in an Insect Systematics Class

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곤충분류학 실험 및 실습에서 중요한 부분이 검색표를 활용할 줄 알고, 내게 주어진 곤충들로 객관적 지표에 의해 배타적 분류 키를 만들 줄 아는 능력을 키우는 것이다. 오랫동안 사용해 오던 책에 나오는 검색표를 이용하는 수준의 수동적 접근에서 벗어나 멀티미디어를 이용하는 보다 최신의 방법을 활용하고 스스로 검색표를 제작하고 활용할 줄 알게 하기 위하여 이미 오래 전 개발된 Lucid 프로그램을 활용하였다. 이의 효과적 활용을 위해 영어로 된 프로그램 내 용어 및 설명을 모두 한글화하는 작업을 해두었으며, 최근 몇 년간의 활용을 통해서 나타난 교육적 성과는 기대 이상이었다. 한글패치 파일은 개인적으로 Lucid 본사에 제공해 주었기에 요청 시 추가하여 이용할 수 있다(개인적 이익관계 전무함). 비록 약간의 구매 비용이 들지만 팀플로 운영 시 큰 무리 없이 활용할 수 있기에 추천하고자 한다.

Key words: Lucid, taxonomic key, insect systematics

P32

Insect Dobble Game for teaching insect orders using the gamification method

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곤충의 다양한 목에 대한 교육용으로 게임을 적용하는 방식(gamification)을 도블 게임에 적용하여 프로그램을 만들었다. 도블 게임은 일종의 보드게임인데, 원래는 곤충을 대상으로 제작되었다가, 이후 정식 판매용 도블게임은 카드 당 8개의 간단한 이미지를 활용하였다. 도블게임은 나름 고도의 수학적 원리가 적용되는데, 약 30가지 곤충 목의 다양한 형태적 특징을 여기에 적용하여 실제로 하나의 카드에 6개 서로 다른 이미지를 넣되 모든 임의의 두 장의 카드에는 단 한 가지의 동일한 이미지만 나오도록 하였다. 카드는 곤충 30개 목용 카드와 비곤충 절지동물 1개 카드이다. 실물을 떠나 컴퓨터용으로 구축하기 위해 MIT에서 개발된 스크래치 프로그램을 활용하였다. 그리고 누구나 이용할 수 있도록 충북대 식물의학과 홈페이지 내 연구 > 조수원_곤충계통생물정보학실험실 페이지에 embedding해 두었다.

Key words: insect dobble game, gamification, Scratch

P33

Comparative analysis of insect antennae types suggested by various LLMs

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곤충의 더듬이 종류를 구분함에 있어 곤충학 관련 교재 및 주요 LLM (large language model) 챗봇들로부터의 정보들을 비교, 분석하였다. 이 과정에서 최근 몇 년간 주목받고 있는 대표적인 거대언어모델들(ChatGPT , Claude, Copilot, Gemini, Grok)을 통해 곤충의 더듬이 종류에 대한 정보를 요청하였고, 이를 통해 얻어진 답변을 비교하면서 제시되는 문제점과 오류를 확인하였다. 추가적인 더듬이 유형에 대한 정보도 비교하였으나 공통적으로 적용할 만한 유형은 한두 가지 외에는 보이지 않았다. 이번 분석을 통해 더듬이의 유형을 일차적으로 제시한다.

Key words: Insect antennae, LLM, ChatGPT , Claude, Copilot, Gemini, Grok

P34

Provision of the latest classification systems for some orders through an open knowledge platform

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개방형 지식 플랫폼(open knowledge platform)을 분류체계 업데이트에 활용하는 것은 전문가는 물론, 대중과의 공유폭이 넓어짐과 함께, 분류군별 전문가의 견해가 수시로 반영, 조정될 수 있다는 장점이 있다. 학계에서 명칭의 확정 등이 이루어지기 전에 활발한 논의가 가능하고, 확정 이후에는 바로 수정도 가능하기 때문이다. 이에 최근 곤충 및 관련 절지동물의 분류체계 중 특히 분류체계 정리의 필요성을 느끼는 곤충전체, 나비목, 파리목, 거미목, 및 응애아강에 대하여 최신 또는 최선의 분류체계를 반영한 정보를 개방형 지식 플랫폼인 위키백과에 제시하였다. 이를 통해, 변화하는 분류체계와 분류군의 명칭 등이 정리 또는 안정화되는 계기를 만들고, 이와 함께 미정 상태의 명칭에 대해 비전문가적 신칭이 인터넷 상에 난립되는 문제가 어느 정도 정리될 수 있을 것으로 기대한다.

검색어: 위키백과, 곤충분류체계, 나비목 분류 체계, 파리목 분류 체계, 거미목 분류 체계, 응애아강 분류 체계

P35

The genus *Acylomus* Sharp (Coleoptera: Phalacridae) new to Korea

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The family Phalacridae Leach (Coleoptera: Cucujoidea) includes 52 genera and nearly 650 species within two subfamilies distributed worldwide. Most phalacrids are fungivores, but some species feed on flower heads. A total of 16 genera and 104 species of Phalacridae have been recorded in the Palaearctic region. The genus *Acylomus* Sharp includes 94 species worldwide, but it has not previously been recorded in Korea. In this study, the genus *Acylomus* and two unrecorde species, *Acylomus orientalis* and *Acylomus* sp.1, are documented for the first time from Korea. Illustrations of their habitus, diagnostic characters and male genitalia, distribution maps, and an identification key to the Korean *Acylomus* species are provided.

Key words: *Acylomus*, new record, Palaearctic, Phalacridae, shining flower beetles

P36

Additions, corrections, and bibliographic issues on the Heteroptera fauna of Korea (Insecta: Hemiptera)

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We address issues on faunistic studies on Korean true bugs (Hemiptera: Heteroptera) and critically revise the literature records on recently (2011–2024) reported species. Furthermore, 17 species in 10 families are newly reported from Korea, of which five species are recorded based on photographic evidence. Eleven species are excluded from the Korean fauna based on revision of literature records. Three species are reconfirmed from Korea.

Key words: new records, true bugs, the Korean Peninsula, Palaearctic Region

P37

Temporal analysis of COI gene variations in *Spodoptera litura* populations from Gyeongnam Province in 2025: a comparison with the 2024 nationwide survey

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The tobacco cutworm (*Spodoptera litura*) is a major agricultural pest whose occurrence has increased under recent climate change. In 2024, we conducted the first nationwide survey in Korea to analyze spatial genetic variation based on *cytochrome C oxidase I* (*COI*) sequences. This study focused on temporal variation of *COI* sequences of *S. litura* adults, which are collected in Gyeongnam Province during 2024-2025. The analysis showed no major differences in haplotype distribution or single nucleotide polymorphism (SNP) patterns between the two years. Most individuals exhibited a C→T substitution at position 406, while a subset carried a substitution at position 407, consistent with the previous survey. These results indicate that *S. litura* populations in Gyeongnam maintain a stable genetic structure despite short-term environmental changes. Such stability provides valuable baseline data for population genetics and supports long-term predictions of pest occurrence and the development of effective management strategies.

Key words: *Spodoptera litura, cytochrome C oxidase I*, Single nucleotide polymorphism, haplotype, climate change

P38

The origin and invasive pathways of the oriental fruit fly, *Bactrocera dorsalis*, using mitochondrial COI

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The oriental fruit fly (*Bactrocera dorsalis*) is a significant agricultural pest infesting more than 400 plant species, including crops and fruits. Native to Southeast Asia and Taiwan, it has recently expanded its geographical range to Japan and China, prompting concerns regarding its potential invasion into new regions. The mitochondrial cytochrome c oxidase subunit I (COI) gene was utilized to examine the genetic diversity and dispersal patterns of *B. dorsalis*. Flies were collected from multiple Southeast Asian countries, including Thailand, Taiwan, Vietnam, Cambodia, and the Philippines. Additionally, mitochondrial COI sequences in GenBank database were incorporated to understand the regional characteristics of *B. dorsalis* in Asia. The results revealed substantial haplotype diversity both within and among populations, with distinct genetic patterns identified in certain island populations, including Philippines, Papua New Guinea, Indonesia, and Malaysia. Notably, the major haplotypes were commonly shared among all sampled populations, except for the Philippines and Papua New Guinea. These findings provide mitochondrial COI-based insights into the genetic structure of *B. dorsalis* in Southeast Asia, highlighting both the geographical differentiation of Island populations and the extensive sharing of genetic variation across continental populations.

Key words: *Bactrocera dorsalis*, population genetics, mitochondrial gene, Southeast Asia

P39

Phylogeny and biogeography of the two subfamilies, Alysiinae and Opiinae (Hymenoptera: Braconidae)

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Alysiinae and Opiinae are species-rich in Braconidae but their phylogeny remains largely unexamined in an integrative framework. We analyzed five markers (*COI, COII, Cyt b, ND1, 28SD2*; total 1,865 bp) for 175 taxa using maximum-likelihood and Bayesian inference. Phylogeny with the preferred topology recovers Opiinae as a strongly supported lineage nested within Alysiinae, rendering Alysiinae paraphyletic, which does not support the monophyly of the traditional tribes Alysiini and Dacnusini. In light of these results, we refine subtribal limits within Alysiini by recognizing Aspilotina and proposing Asobarina subtrib. nov. Relaxed-clock molecular dating places the origin of the combined Alysiinae–Opiinae clade in the Late Cretaceous (~112 Ma), with accelerated diversification across the Paleocene–Eocene transition. Biogeographic reconstruction supports a Western Palearctic origin followed by subsequent dispersal. Collectively, these findings motivate targeted taxonomic revision and clarify the evolutionary history of these economically important parasitoid wasps.

Key words: Biogeography, new subtribe, new to science, parasitoid wasp, taxonomy

P40

Establishing a Genetic Resource Database of Intercepted pests during Plant Quarantine Inspection (2021-2025)

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With the increase in climate change and agricultural trade, international quarantine negotiations have become more frequent, emphasizing the need for greater expertise and accuracy in the quarantine process. In this study, conducted from 2021 to 2025, DNA barcode sequences of major quarantine pests—including insects, arthropods, and mollusks were analyzed to obtain genetic information, using specimens collected from quarantine inspection(via aircraft, vessels, and passenger baggage) and from domestic and international sources. A total of 25 orders, 179 families, and 2,300 specimens were analyzed, with Lepidoptera accounting for the largest proportion (32 families, 888 specimens), followed by Hemiptera (36 families, 426 specimens). To improve species identification accuracy, a comprehensive database was established, incorporating images, country of origin and associated commodities, primers, and DNA sequences. The results of this study are expected to serve as foundational data for developing precise diagnostic systems and advancing molecular identification techniques for quarantine pests.

Key words: plant quarantine, DNA barcode, invasive pests, molecular biological identification

P41

Phylogeographic relationships of the wild silkmoth, *Bombyx mandarina* (Lepidoptera: Bombycidae), using mitochondrial genomes

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The wild silkmoth, *Bombyx mandarina* (Lepidoptera: Bombycidae), the presumed ancestor of *B. mori*, has long been studied to understand genetic relationships among geographic populations. In this study, we sequenced 100 mitochondrial genomes of *B. mandarina* collected from 13 regions in South Korea and four regions in Japan. Our results showed that *B. mandarina* from South Korea is genetically closest to those from northern China and southern China, while the Japanese population formed the most distinct group. We discovered one individual from Inje in northeastern South Korea to have a lengthy A+T-rich region sequence and structure that is highly similar to those observed in all Japanese individuals. Moreover, all individuals sampled from Jeju Island formed a separate genetic group from the South Korean inland populations, reflecting the biogeographic history that separated the island after the last glacial maximum. These findings reveal interaction of *B. mandarina* among eastern China, South Korea, and Japan during its range expansion.

Key words: *Bombyx mandarina*, mitochondrial genome, phylogeny, population structure, biogeographic

P42

Multigene-based phylogenetic study of Aphidiinae (Hymenoptera: Ichneumonoidea: Braconidae) from South Korea

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The subfamily Aphidiinae consist of 52 genera and 702 species worldwide excluding fossil, with 19 genera and 71 species being recorded in South Korea. In this study, we used 20 genera and 81 species including collections from other countries, and analyzed using three nulcear regions (*28SD2*, *EF-1α*, *wingless*) with four mitochondrial fragments (*COI*, *COII*, *Cytb*, *ND1*). We inferred partitioned maximum-likelihood (ML) and Bayesian (BI) phylogenies from seven loci, and applied these trees to test monophyly as well as to resolve relationships within Aphidiinae. We then performed divergence-time estimation on a time-calibrated tree, and compared diveregence times of the parasitoids with published dating/fossil times of major aphid lineages. Finally, we reconstructed ancestral host associations (multi-states characterized by aphid subfamily) from extant host-use records to evaluate host-switching patterns and their co-evolutionary implications.

Key words: natural enemy, parasitoid wasps, taxonomy, systematics

P43

Complete mitochondrial genome of *Meganola major* (Hampson, 1891) (Lepidoptera: Nolidae)

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The complete mitogenome of *Meganola major* is reported and its phylogenetic placement within the family is evaluated. The circular genome is 15,237 bp and comprises 37 genes, including 13 PCGs, 22 tRNAs, and 2 rRNAs, together with an A+T rich region. Most PCGs begin with ATN, whereas *cox1* begins with CGA and *cox2* with GTG. Gene order matches the typical lepidopteran arrangement without rearrangements, and base composition falls within the range observed in other nolids. Phylogenetic analyses of *M. major* and 20 Nolidae species recovered the following relationships: Nolinae as sister to Risobinae, *Blenina* as an independent lineage consistent with recognition of Bleninae, and *Meganola* and *Nola* as reciprocally monophyletic with strong support, clearly separating *M. major* from *Nola* species. The mitogenome presented here extends the reference set for Nolidae and provides a molecular framework for generic delimitation within Nolinae, as well as a resource for species identification and monitoring in applied contexts such as pest management.

Key words: tuft moth, Nolidae, *Meganola*, phylogeny, crepe myrtle pest

P44

STEP buffer: a rapid method for gDNA release and molecular diagnostics of minute arthropods

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Obtaining sufficient quality gDNA is essential for downstream molecular analyses. Due to their simplicity and speed, gDNA release methods are sometimes preferred over conventional extraction procedures. In this study, we developed a newly formulated buffer, named STEP, for rapid gDNA release from minute arthropod specimens. We tested specimens with limited gDNA, including whole bodies of *Dermatophagoides pteronyssinus*, first-instar nymphs and exuviae of *Cimex lectularius*, and a single leg of *Aedes albopictus*. The performance of STEP was compared with water and the alkaline-based DAPE buffer, yielding greater gDNA release efficiency than water and comparable or higher amount than DAPE. Furthermore, unlike DAPE, which markedly alters reaction pH, STEP was suitable for colorimetric loop-mediated isothermal amplification (LAMP) as well as PCR and conventional LAMP. This makes STEP particularly useful for on-site diagnostics.

Key words: gDNA release, PCR, LAMP, qPCR, molecular diagnostics, on-site diagnostics

P45

Characterization of Digestive Alpha-Amylase Isoforms in *Spodoptera*

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Insects cause a significant impact on global food security, so characterizing their digestive enzymes is crucial for understanding feeding efficiency and identifying molecular targets for pest control. Alpha-amylases, key enzymes in carbohydrate metabolism, occur in multiple isoforms that may contribute to dietary adaptation and developmental processes in lepidopteran pests. In this study, three alpha-amylase isoforms of *Spodoptera frugiperda* mined from NGS analysis and each isoform was investigated through molecular and evolutionary analyses with a focus on their activation patterns and expression across larval tissues and developmental stages. Our findings highlight potential isoform specialization and emphasize their relevance as prospective targets for sustainable pest management strategies.

Key words: *Spodoptera frugiperda*, digestive enzymes, alpha-amylase, isoforms, pest management

P46

Metabolite changes induced by carbonyl sulfide treatment in *Tribolium castaneum* (Coleoptera: Tenebrionidae)

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Tribolium castaneum, a major stored-grain pest, contributes to substantial global food losses and degrades product quality. Fumigants are currently the primary means of controlling stored-grain pests. However, ozone depletion caused by methyl bromide and the spread of phosphine resistance have increased the need to develop alternative fumigants. Carbonyl sulfide (COS) has drawn attention as a promising alternative fumigant due to its high insecticidal activity and broad efficacy. Prior work has shown that COS exposure impairs mitochondrial function in *T. castaneum*. Nevertheless, the metabolite-level changes induced by COS remain insufficiently characterized. In this study, we conducted comparative metabolomic profiling of *T. castaneum* following COS exposure to define metabolite-level changes and to elucidate the associated toxic mechanisms and physiological responses. LC–MS/MS analysis detected a total of 284 metabolites in positive-ion mode and 321 in negative-ion mode across COS-treated and control samples (raw union). Based on the detected metabolites, enrichment analysis revealed pronounced class-level shifts, particularly in carboxylic acids and derivatives, organonitrogen compounds, and keto acids and derivatives. Subsequently, pathway analysis indicated pronounced changes in alanine, aspartate and glutamate metabolism as well as glycerophospholipid metabolism, valine, leucine and isoleucine biosynthesis, and nicotinate and nicotinamide metabolism. Notably, metabolites associated with mitochondrial function, including 2-oxoglutaramic acid and nicotinamide, showed significant changes in the COS-treated group relative to controls. These results suggest that COS may disrupt mitochondria-associated metabolic processes in *T. castaneum*. This study provides a metabolomic framework for understanding COS toxicity and supports its evaluation within integrated strategies for stored-grain pest control.

Key words: Carbonyl sulfide (COS), *Tribolium castaneum,* Comparative metabolomics, Mitochondria-associated pathways, Stored-grain pest control

P47

Within- and between-generation effects of temperature on life-history traits in two coexisting species of *Drosophila*

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Comparative studies of within-generation responses have suggested that *D. melanogaster* and *D. simulans* differ in thermal sensitivity, which leads them to occupy distinct thermal niches and thus facilitates their coexistence. However, the role of trans-generational effects in shaping coexistence remains unexplored. We conducted two experiments to test how temperature influences life-history traits within and between generations in these two sibling species. In the first experiment, offspring from parents reared at 23°C were raised at three developmental temperatures (17, 23, 29°C) to investigate within-generation plasticity. In the second experiment, parental flies were reared at three temperatures (17, 23, 29°C), and their offspring were raised at 23°C to examine trans-generational effects. In both experiments, we measured larval life-history traits and found significant species × temperature interactions, mainly driven by reduced performance of *D. simulans* at 29°C. Taken together, our results demonstrate that both within- and between-generation effects shape species-specific thermal responses, possibly faciliating niche differentiation and coexistence in nature.

Key words: coexistence, *Drosophila*, life-history traits, temperature, transgenerational effects

P48

Transcriptomic profiling of the brain in *Spodoptera frugiperda* under cold stress

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Cold stress is a critical environmental factor affecting the physiology and survival of insects. To investigate the molecular mechanisms underlying cold tolerance in *Spodoptera frugiperda*, we performed transcriptomic analysis of brain tissue following exposure to 4 °C. A total of 266,051 unigenes were assembled, and 6,917 genes were identified as differentially expressed under cold stress. Overall, down-regulated genes outnumbered up-regulated genes. Functional annotation revealed cold-responsive genes related to protein stabilization and structural protection (*HSPs*), membrane stability (*PEDS1*), water transport (*AQP*), energy metabolism (*Tret1*), circadian rhythm (*DYW*), and transcriptional regulation (*RN7SK*). Among these, *HSP*s and *PGPEP1* were strongly induced (>50-fold), whereas *RN7SK* exhibited a marked 175-fold down-regulation. These findings provide new insights into the molecular basis of cold adaptation in insects and highlight potential molecular markers for studying cold resistance and developing pest management strategies.

Key words: Brain, Cold stress, DEG, Transcriptome, *Spodoptera frugiperda*

P49

Scent of a Fig: Host Volatiles Driving Fig Weevil Antennal Responses

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The fig weevil (*Aclees taiwanensis* Kôno) is an invasive pest that causes severe damage to fig cultivation in Korea. To explore potential chemical cues involved in its host association, we collected volatile compounds from different parts of the fig tree (*Ficus carica*) and evaluated their electrophysiological activity on adult antennae. Headspace volatiles were obtained from leaves, fruits, young shoots, and whole plants, and analyzed by GC–MS. Selected compounds were further tested in electroantennography (EAG) assays with both sexes across multiple concentrations. Some compounds elicited clear antennal responses, with sex-related differences observed only at specific concentrations. These findings suggest that host volatiles play an important role in the chemosensory ecology of *A. taiwanensis*. The identified candidates provide a basis for behavioral assays and semiochemical-based monitoring tools, and may also serve as synergists to enhance pheromone-based trapping once the aggregation pheromone of this species is identified.

Key words: *Aclees taiwanensis,* fig tree volatiles, electroantennography, semiochemical, invasive pest

P50

Mapping the Sensory Landscape: Antennal Morphology and Sensilla of the Fig Weevil Revealed by SEM and TEM

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The fig weevil (*Aclees taiwanensis* Kôno) is an invasive pest causing substantial damage to fig cultivation in Korea. Antennae are essential sensory organs that house a variety of sensilla responsible for chemical, mechanical, and other environmental cues. This study investigated the morphology and ultrastructure of antennal sensilla in *A. taiwanensis* using scanning and transmission electron microscopy. Both male and female antennae were examined, revealing multiple types of sensilla with distinct morphologies and distributions. Subtle sexual differences were noted, and cross-sectional views provided insights into their potential sensory roles. These results offer the first comprehensive overview of antennal sensilla in *A. taiwanensis*, establishing a structural foundation for linking antennal morphology with chemosensory function. This morphological framework complements electrophysiological studies on host volatiles and supports ongoing efforts to elucidate the chemical ecology of this invasive pest.

Key words: *Aclees taiwanensis*, antennal sensilla, SEM, TEM, sensory morphology

P51

Impact of elevated developmental temperatures on gut microbial communities in bumblebee (*Bombus terrestris*) workers

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Bumblebees are essential pollinators in agriculture and ecosystems, but climate change is contributing to their decline. While previous studies have shown ecological and physiological changes due to climate stress, the effects of elevated developmental temperatures on gut microbiota remain poorly understood. In this study, we analyzed the gut microbial communities of bumblebee workers reared at optimal (27 °C), moderately high (32 °C), and high (35 °C) temperatures. Alpha and beta diversity analyses revealed significant shifts in microbial composition. At the phylum level, elevated temperatures reduced Firmicutes and increased Proteobacteria. At the genus level, higher temperatures significantly decreased *Bombilactobacillus* and increased *Gilliamella* (at 32 °C) and *Snodgrassella* (at 35 °C), likely due to enhanced intestinal colonization. These results suggest that elevated developmental temperatures, such as those driven by climate change, alter the gut microbiome and may lead to dysbiosis, potentially affecting bumblebee health.

Key words: *Bombus terrestris*; bumblebee workers; developmental temperature; gut microbiome

P52

Effects of field-realistic doses of thiamethoxam and flupyradifurone on *Apis mellifera* (Hymenoptera: Apidae) foraging behavior as determined by RFID

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Despite efforts to minimize off-target effects, pesticide residues in pollen, nectar, and wax continue to pose potential risks to the western honey bee, *Apis mellifera*. Thiamethoxam (Thmx), a widely used neonicotinoid, and flupyradifurone (FPF), a newer butenolide insecticide, are highly systemic and can be translocated into pollen and nectar following crop treatment. This study examined the effects of field-realistic doses of these two systemic insecticides on honey bee foraging behavior. Colonies were provisioned with pollen bread and sugar syrup containing field-realistic doses, based on previous researches, while access to external pollen sources was restricted. Newly emerged, pesticide-exposed workers were attached with radio frequency identification (RFID) tags, and their foraging activity was monitored from 12 days after emergence. The pesticide significantly reduced the age of first foraging (Control: 21.5±5.7 days; Thmx: 19.0±4.0 days; FPF: 18.7±3.6 days), but had no effect on the total average foraging time (Control: 50.1±33.1 min; Thmx: 48.5±31.4 min; FPF: 49.6±30.1 min).

Key words: *Apis mellifera*, Foraging behavior, pesticide, field-realistic dose, RFID system

P53

Identification of salivary miRNAs in the parasitic mite *Varroa destructor* (Mesotigmata: Varroidae)

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Varroa mite, *Varroa destructor,* is the major ectoparasite of Western honey bees. This host–parasite association has developed within the past century following the mite's host shift from the Asian honey bee to *A. mellifera*, making it a valuable model for studying recently established interactions. During such interactions, hosts and parasites exchange diverse molecules, including microRNAs (miRNAs), which may alter each other's physiology to gain adaptive advantages. In this study, we investigated miRNAs potentially transferred through direct fluid exchange between the host and parasite. A total of 161 miRNAs were detected in each of the whole-body and salivary gland (SG) samples of *Varroa* mites. Among these, six SG-specific miRNAs were identified, each showing more than 1,000 reads per million (RPM) in SG samples, at least 4-fold higher RPM than in whole-body samples, and linked to host-parasite interaction-related GO/KEGG pathways. Some of candidates were also detected in the saliva of *V. destructor*. This study examined the potential involvement of miRNA in host-parasite interactions and identified varroa-derived candidate miRNAs. Further studies will focus on screening host-derived miRNAs, and elucidating the functional roles of these candidates.

Key words: miRNA, *Apis mellifera*, *Varroa destructor*, Host-parasite interaction

P54

Cross-Species microRNA Exchange Between Humans and Body lice

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Host–parasite interactions are increasingly recognized to involve cross-species molecular communication, including transfer of microRNAs (miRNAs). The body louse, an obligate ectoparasite of humans, provides a unique model for investigating these processes. In this study, time-course analyses of louse tissues following blood feeding revealed persistence of 125 human-derived miRNAs. In parallel, we identified 98 salivary gland-specific and 66 saliva-specific louse miRNAs potentially transferable to the human host. Based on the structural features of human blood- and louse saliva-derived miRNAs, we selected candidates most likely to remain stable after interspecies transfer. Subsequent pathway analyses revealed their potential involvement in major physiological processes. Taken together, these results provide the first integrative view of miRNA exchange with potential functional implications in the human-insect ectoparasite system.

Key words: body louse, miRNA, cross-species interactions, parasite

P55

16S rRNA metagenomic analysis of blood from wild rodents in Jeonbuk, Korea

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Wild rodents are recognized as natural reservoirs and vectors of various pathogens, including *Leptospira* spp., due to their frequent contact with ticks and mites. However, most studies on rodent-borne pathogens have focused on human-pathogenic agents, and 16S rRNA metagenomics has been applied mainly to fecal samples. In this study, we analyzed the bacterial composition of blood from 24 rodents collected in Jinan, Jeonbuk, during 2024 and the first half of 2025, using 16S rRNA metagenomics based on next-generation sequencing(NGS). The results showed that Haemotropic *Mycoplasma* spp. and *Bartonella* spp. constituted a significant proportion of the bacterial communities. In addition, leukocyte-associated pathogens such as *Anaplasma phagocytophilum* and *Ehrlichia chaffeensis* were detected. Although the pathogens have not been designated as legal communicable disease in Korea, our findings provide important baseline data to inform preparedness for potential transmission risks in the wild.

Key words: wild rodents, blood microbiome, 16S rRNA metagenomics, next-generation sequencing(NGS)

P56

Acaricidal efficacy of Korean native *Sophora flavescens* root extracts against the two-spotted spider mite (*Tetranychus urticae*)

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Sophora flavescens is a potential source of natural pesticides, but its application in Korea is limited by the lack of established extraction methods and efficacy data. This study aimed to optimize the extraction of insecticidal alkaloids from the roots of Korean native *S. flavescens* and evaluate the extract's efficacy against major agricultural pests. Ethanol extractions were conducted at 25°C and 65°C, and the primary alkaloids, matrine and oxymatrine, were quantified using LC-MS. The insecticidal and acaricidal activities were tested against the green peach aphid (*Myzus persicae*), diamondback moth (*Plutella xylostella*), and two-spotted spider mite (*Tetranychus urticae*). The results showed that extraction temperature significantly influenced alkaloid composition. Extraction at 25°C yielded approximately 4,600 ppm of total matrine alkaloids, with oxymatrine comprising over 95% of the total. In contrast, extraction at 65°C yielded about 2,000 ppm, with matrine being the predominant form (>95%). In bioassays, the extract exhibited low mortality (<40%) against *M. persicae* and *P. xylostella* at a 50-fold dilution. However, it demonstrated high acaricidal activity, causing approximately 90% mortality in *T. urticae* when applied at a 200-fold dilution (40 ppm total matrine). Interestingly, this potent acaricidal effect was not significantly different between the 25°C and 65°C extracts. These findings indicate that Korean native *S. flavescens* extract is a promising candidate for developing a natural acaricide for the control of *T. urticae*.

Key words: *Sophora flavescens*, Matrine, Oxymatrine, Extraction temperature, *Tetranychus urticae*, Natural acaricide

P57

First Report of *Sarcoptes scabiei kdr* mutations Conferring Permethrin Resistance in Korea

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Scabies is a contagious skin disease caused by infestation with the mite, *Sarcoptes scabiei.* Recently, an increasing number of patients have exhibited poor therapeutic response to repeated topical applications of permethrin, which has been the standard first-line treatment for scabies in Korea. To investigate the underlying cause, we elucidated the gDNA sequence of the mite *voltage-sensitive sodium channel* and subsequently identified *kdr* mutations associated with resistance from 30 patient-derived skin scrapings. To our knowledge, this is the first report of permethrin-resistant scabies mite in Korea. These findings highlight the urgent need to introduce alternative therapeutic agents for scabies, including oral ivermectin and topical spinosad.

Key words: *Sarcoptes scabiei*, permethrin, kdr-mutaion, resistance, Neglected tropical disease

P58

Development of new efficacy testing methods for metofluthrin-based mosquito coils under semi- and outdoor conditions

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According to Consumer Chemical Products and Biocides Safety Control Act, biocidal products must demonstrate acceptable levels of efficacy and safety before being distributed in consumer markets. Mosquito coils are commonly used in outdoor conditions due to smoke generation; however, previous tests were conducted in a closed indoor environments. In the first test, we examined insecticidal activity of metofluthrin-based mosquito coils against laboratory-susceptible strains of *Aedes* and *Culex* mosquitoes in a semi-open chambers (18 and 33 m^3) with one side open. Mortality showed wide variety based on the position of mosquitoes in the chamber. In the second test, repellency was examined using a two-choice design, where two small tents (>10 m apart) were equipped with BG-Sentinel traps as attractants. Repellency ranged 68–87%, with an average of 53 mosquitoes collected in the untreated control tents. The newly designed repellency testing methods may serve as standardized approaches for evaluating the efficacy of mosquito coils.

Key words: mosquito coil, *Aedes albopictus*, *Culex pipiens*, repellency

P59

Risk of Biodegraded Mulch Film-Insecticide Mixtures: Synergistic Toxicity and Sublethal Effects in Non-Target Species, *Folsomia candida* and *Stratiolaelaps scimitus*

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Biodegradable mulch films such as PBAT (polybutylene adipate-co-terephthalate) blended with PLA (polylactic acid) are increasingly used as sustainable alternatives to conventional plastics, yet the impacts of their degradation products on soil-dwelling invertebrates remain poorly understood. Importantly, these byproducts are rarely encountered in isolation; instead, they often co-occur with soil-applied insecticides such as abamectin, cyantraniliprole, sulfoxaflor, and thiamethoxam, raising the potential for synergistic interactions that enhances the risks. Here, we investigated the biodegradation profile of PBAT-PLA films under ISO-17556 standard soil, assessing physicochemical changes (degradation rate, film thickness, soil pH) and the ecotoxicological effects of the resulting degradation products. We tested their mixture toxicity with the above insecticides on two non-target arthropods, the springtail, *Folsomia candida* and the predatory mite, *Stratiolaelaps scimitus*, in soils subjected to up to 8 weeks of film degradation. Degradation products alone were not toxic. However, when combined with LC_{20} of insecticides, synergistic toxicity was identified in *F. candida* with abamectin (2- and 7-day exposures) and with sulfoxaflor and thiamethoxam (7-day exposure only), while cyantraniliprole showed no synergy. No synergistic effects were detected in *S. scimitus*. Predation assays on western flower thrips, Frankliniella occidentalis, revealed that both degradation products and sublethal insecticide concentrations (except cyantraniliprole) impaired predation rates, but without synergistic interaction under the Bliss independence criterion. These results highlight the need to consider mixture exposures and sublethal endpoints when assessing risks of biodegradable mulching films, and demonstrate species-specific patterns of synergistic toxicity in soil invertebrates.

Key words: biodegradable mulch film; environmental risk assessment; mixture toxicity; springtail; predatory mite

P60

Development of Field-Deployable Molecular Diagnostic Kit for *Monochamus saltuarius* (Coleoptera: Cerambycidae) using Recombinant Polymerase Amplification

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Effective management of pine wilt disease requires rapid and accurate identification of its vector insects, yet no field diagnostic kits currently exist—especially for immature stages like larvae and pupae, which are difficult to distinguish visually. This study developed a high-sensitivity molecular diagnostic kit for *Monochamus saltuarius*, a major vector, using Recombinant Polymerase Amplification (RPA) and Lateral Flow Detection (LFD). Primers and probes targeting Cytochrome c oxidase subunit I (COI) genes showed 100% specificity and detected as low as 0.01 pg and 1 copy of target DNA. Field tests demonstrated 97.14% sensitivity and 95.24% specificity. This is the first kit for vector detection and is expected to aid in preventing disease spread.

Key words: *Monochamus saltuarius*, Molecular Diagnostic Kit, Recombinant Polymerase Amplification – Lateral Flow Detection, Cytochrome c oxidase subunit I gene, Pine Wilt Disease

P61

Dietary effects on the development and survival of *Spodoptera exigua* (Hübner) under laboratory conditions

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Spodoptera exigua (Lepidoptera: Noctuidae) is a polyphagous pest causing significant economic damage to vegetable and field crops worldwide. Understanding its nutritional ecology is essential for designing cost-effective mass-rearing systems and improving pest management strategies. We evaluated the biological attributes of *S. exigua* when reared on different diets: cabbage leaf (CL), artificial diet (AD), artificial diet supplemented with cabbage extract (ADC). Larval development significantly differed across treatments, with the longest on AD 25.1 days) compared to CL (15.5 days). Female pupae were heavier than males, with the highest mean pupal weight on CL (90.1 mg) and the lowest on ADC (67.1 mg). Larval mortality was lowest on ADC. These findings suggest that adding cabbage extract in artificial diet can enhance larval survival. The underlying cause will be assessed in future studies.

Key words: artificial diet, cabbage extract, survival, pupal weight, life table

P62

Evaluation of the effectiveness of seven registered pesticides against *Tetranychus urticae* using leaf dip and foliar spray methods

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The two-spotted spider mite (*Tetranychus urticae*) is a major pest that rapidly develops resistance owing to its short life cycle and high reproductive capacity. This study evaluated the efficacy of seven pesticides registered in Korea—amitraz (IRAC 19), bifenazate (20d), chlorfenapyr (13), cyflumetofen (25a), fenazaquin (21a), fluxametamide (30), and propargite (12c)—using two bioassay methods, leaf-dip and foliar spray. After 72 hours, all pesticides achieved more than 90% control at the recommended concentrations, but LC_{50} values varied between the two methods. These results demonstrate that the choice of bioassay can influence efficacy interpretation and underscore the need for selection criteria tailored to pesticide characteristics and research objectives. The LC_{50} values obtained provide essential baseline data for resistance monitoring, the development of new pesticides, and the implementation of resistance management strategies.

Key words: *Tetranychus urticae*, Pesticides, Efficacy, Leaf-dip, Foliar spray

P63

Control of the pine wilt nematode, *Bursaphelenchus xylophilus*, with dsRNA specific to *vATPase-B*

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The pine wilt nematode, *Bursaphelenchus xylophilus*, is native to North America and has spread to Asia and Europe through infested timber and human activity. It causes a serious damage to pine trees causing rapid wilting, browning of needles, reduced resin flow, and eventual tree death. The nematode is transmitted by pine sawyer beetles (*Monochamus* spp.), which carry it from infected trees to healthy ones during feeding or egg-laying. Management strategies include removing infected trees, applying chemical treatments, and monitoring timber movement to prevent further spread. This study aims to develop an effective dsRNA insecticide against *B. xylophilus*. Three candidate genes were selected from potent dsRNAs with high mortalities against plant parasitic nematodes from previous studies: arginine kinase, pectate lyase, and vATPase-B. Their orthologous genes were determined from *B. xylophilus* genome. Expressions of these genes were confirmed by RT-PCR. Bioassay used a bacterial growth plate by treating dsRNA along with the diet bacteria. All three dsRNAs gave significant mortalities to the nematode. Notably, dsRNA specific to *vATPase-B* was highly potent. Using FISH, the expression of *vATPase-B* was observed in the control but its expression was markedly decreased in the dsRNA treatment. These results suggest an application of the dsRNA specific to *vATPase-B* to control *B. xylophilus*.

Key words: dsRNA, nematicide, vATPase-B, FISH, *Bursaphelenchus xylophilus*

P64

Effect of host plant on the insecticidal effect of the *Metcalfa pruinosa*

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The *Metcalfa pruinosa* is an invasive pest introduced into Korea in the mid-2000s. In Korea, it is a polyphagous pest that feeds on 345 plant species, and insecticides are registered against it for various crops. However, registered insecticides for trees in forests and residential areas are insufficient. Therefore, this study conducted a field test to evaluate the efficacy of flonicamid, cypermethrin, sulfoxaflor, pyrifluquinazone, and thiacloprid, which are registered crop insecticides for the control of the *M. pruinosa,* on trees that are vulnerable to the *M. pruinosa* but for which no registered insecticides exist. The results showed that efficacy varied depending on the pesticide species and test site. Cypermethrin and sulfoxaflor showed mortality rates of 83.2 to 100% on the third day and over 90% on the seventh day, but pyrifluquinazone showed a relatively low mortality rate, and thiacloprid showed a mortality rate of 79.9 to 92.8% on the seventh day after insecticide treatment.

Key words: Efficacy, host plant, insecticide, *Metcalfa pruinosa*

P65

Drug response to acetamiprid in local populations of the *Hyphantria cunea* in Korea

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The *Hyphantria cunea*, an invasive pest, is a representative polyphagous pest that occurs in groups not only in agricultural fields but also in street trees, landscape trees, and forests, causing serious damage to various host plants. This study was conducted to determine differences in efficacy of acetamiprid, registered for the control of the *H. cunea*, among regional strains of the *H. cunea*. In the first-year experiment targeting third instars, there were differences in efficacy among regional strains of the *H. cunea*. In the second-year experiment targeting second and fourth instars, there were also differences in efficacy among regional strains. The mortality for all regional populations of the *H. cunea* were 8.3-48.3% for third instars, 35.7-80.0% for second instars, and 3.3-85.0% for fourth instars, showing an overall mortality rate of less than 90%.Further research is needed to determine whether the differences in insecticide responses among regional populations are due to the development of resistance or low efficacy.

Key words: acetamiprid, efficacy, *Hyphantria cunea*, living area trees, resistance

P66

Study on the effects of chitin synthesis inhibitors and formulation preferences of *Reticulitermes speratus* for application of termite baiting systems

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The subterranean termite, *Reticulitermes speratus*, causes extensive damage to wooden structures and cultural heritage sites in Korea, with the threat expected to intensify under climate change. Conventional fumigation, chemical treatment, and trapping methods are limited in effectiveness and persistence, making baiting systems a promising alternative. This study evaluated the insecticidal effects of four chitin synthesis inhibitors (CSIs) and the feeding preferences of *R. speratus* among different formulations to optimize an effective baiting system in Korea. Three CSIs (CSI I, II, III) achieved 94.5–98.7% mortality at 10 weeks, while CSI IV reached only 55.3%. In feeding tests, termites consumed the least from formulation A and more from formulations B, D, and E. These findings provide useful information to develop CSI-based baiting systems, contributing to environmentally friendly and cost-effective termite management strategies to safeguard wooden structures and cultural heritage in Korea.

Key words: baiting system, chitin synthesis inhibitor, feeding preference, mortality, termite control

P67

Evaluation of *Beauveria bassiana* ARP14 against *Halyomorpha halys* (Stål) (Hemiptera: Pentatomidae)

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The brown marmorated stink bug, *Halyomorpha halys* (Stål), native to East Asia, has become an important polyphagous pest of fruit crops worldwide. As a potential mycoinsecticide, we compared the virulence of a native entomopathogenic fungus, *Beauveria bassiana* (Balsamo) Vuillemin ARP14 with a commercial GHA strain against *H. halys*. Topical application method was used in the laboratory with a concentration of 1×10^8 conidia/ml. The median survival time (ST_{50}) value of the ARP14 strain was not statistically different from that of the GHA strain for either the nymphal or adult stages. However, Mycosis rates in 3rd and 5th instar nymphs were not different between the ARP14 (up to 52 and 50%, respectively) and GHA (up to 36 and 16%, respectively). In adults of *H. halys*, a higher mycosis rate was found in ARP14 strain (up to 90%) than in GHA strain (up to 58%) during the period of 12 to 14 days after treatment. These findings indicate that the native *B. bassiana* ARP14 strain is a promising candidate for development as a mycoinsecticide for managing *H. halys*.

Key words: biological control, entomopathogenic fungus, mycoinsecticide, mortality, mycosis rate.

P68

Integrating Soil-drenching and Foliar Applications of Neem Oil: A Strategy for Managing *Tuta absoluta* (Lepidoptera: Gelechiidae)

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Tomato (*Solanum lycopersicum* L.) is a globally significant vegetable crop that suffers substantial economic losses due to insect pests, notably the tomato leafminer *Tuta absoluta* (Lepidoptera: Gelechiidae). *T. absoluta* has become a significant pest worldwide, impacting greenhouse and open-field tomato production. Due to the resistance development of synthetic pesticides, neem oil, a plant-derived natural pesticide as an alternative option, has been widely used for sustainable pest management. This study evaluated the effects of neem oil at 0 to 20 ppm concentration on plant growth and damage per plant, number of larvae per plant, eclosion rate, and damage reduction (%) compared to the control. Results indicated that the neem oil soil-drenching treatment has no adverse effects on plant growth. Compared to the control, the combined application method significantly decreased the number of larvae, damage caused by larvae, and eclosion rate on treated plants. The results of this study may lead to an easier and more effective neem oil treatment method to maximize the control of *T. absoluta.*

Key words: azadirachtin, neem, tomato leaf miner, invasive species, tomato, biopesticides

P69

Efficacy and Safety Assessment of Sulfuryl fluoride and Ethyl formate Fumigation in Scale-up Trials against *Rhyzopertha dominica*

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In Korea, methyl bromide(MB) has long been used for wood quarantine fumigation, but its ozone-depleting properties, and reported neurological effects on workers have led to increasing restrictions. This study evaluated sulfuryl fluoride(SF) and ethyl formate(EF) as alternative fumigants through scale-up tests($0.5m^3$), focusing on efficacy against *Rhyzopertha dominica* and worker safety during aeration. Experiments were conducted at 23°C using SF at a dose targeting eggs and EF at doses against larvae, pupae, and adults. Scale-up tests achieved complete mortality of all developmental stages of *R. dominica*. After fumigation, concentrations of both fumigants dropped below their TLV within 30 minutes, and below the limit of detection within 1 hour. These results provides data for establising phytosanitary treatment standards to replace MB.

Key words: combined treatment, sulfuryl fluoride, ethyl formate, *Rhyzopetha dominica*

P70

Evaluation of synergistic efficacy of Sulfuryl fluoride and Ethyl formate against egg and pupal stage of *Sitophilus zeamais*

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Wood pellets are widely traded biofuels, but they are frequently exposed to infestation during international transport. In Korea, methyl bromide and phosphine have been applied as standard fumigants; however, MB is being phased out due to its ozone-depleting property and toxicity. Thus, alternative fumigation strategies are urgently needed. In this study, the synergistic effect of combination treatment with sulfuryl fluoride and ethyl formate against *Sitophilus zeamais* was evaluated, based on the results of single-fumigant treatment from previously studied. According to earlier findings, eggs are most tolerant stage to sulfuryl fluoride, whereas pupae are most tolerant stage to ethyl formate. Therefore, this study focused on evaluating synergistic efficacy at egg and pupal stage. However, no significant synergistic effects was observed at either stage. Nevertheless, effective concentrations for controlling all developmental stages were determined through the combination treatment.

Key words: wood pellets, stored product insect, fumigation, maize weevil

P71

Comparative Analysis of Predation Rates of Four Predatory Mite Species on *Frankliniella occidentalis* and Their Susceptibility to Insecticides

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The western flower thrips, *Frankliniella occidentalis*, causes severe economic damage to pepper production through direct feeding and by transmitting tomato spotted wilt virus (TSWV). Chemical control has become less effective due to insecticide resistance, highlighting the need for alternative management strategies within IPM. We evaluated four predatory mite species (*Gaeolaelaps aculeifer*, *Stratiolaelaps scimitus*, *Neoseiulus barkeri*, and *N. californicus*) for their predation rates on *F. occidentalis*. In addition, we assessed the compatibility of five insecticides (neem oil, clothianidin, spinetoram, bifenthrin, and broflanilide) by testing their lethal effects on the predatory mites. Soil-dwelling predatory mites (*G. aculeifer* and *S. scimitus*) exhibited 2–5 times higher predation rates than foliar-dwelling species (*N. barkeri* and *N. californicus*) in a plastic cup assay. In terms of side effects, the relative toxicity ranking of insecticides to predatory mites was: neem oil < clothianidin (IRAC group 4A) < spinetoram (5) < bifenthrin (3A) < broflanilide (30). Neem oil had little effect on predatory mites, whereas broflanilide caused 100% mortality. These findings suggest that combining predatory mites with selective insecticides such as neem oil or 4A compounds could enhance the efficacy of thrips management while maintaining natural enemy populations, thereby supporting sustainable IPM programs in pepper cultivation.

Key words: Biologyical control, Resistance management, Predeatory mite, Eco–friendly pesticide, IPM

P72

Monitoring of honey bee pathogens and evalutaion of potential miticide toxicity to *Aethina tumida* in South Korea

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Aethina tumida, the small hive beetle (SHB), is an invasive pest that infests honey bee colonies, transmits various pathogens, and causes serious damage to apicultural activities. In 2016, SHB was first detected in Miryang, Gyeongsangnam-do, South Korea. Nevertheless, public awareness and scientific research on SHB remain limited in Korea. This study aimed to investigate the presence of 14 honey bee pathogens in SHB specimens collected from Miryang and Jinju during 2024 and 2025. PCR analysis confirmed the presence of Acute bee paralysis virus and *Aspergillus flavus* in Jinju, whereas none of the 14 screened pathogens were detected in Miryang. Pathogen screening revealed that SHB primarily carried honey bee pathogens. The study also evaluated the toxicity of three chemicals commonly used to control *Varroa destructor* (Amitraz, Coumaphos, and Fluvalinate) against both adult and larval stages of SHB. Toxicity assays demonstrated that adult SHBs were more sensitive to the insecticides than larvae. This study presents baseline information on the prevalence of honey bee pathogens and the insecticide sensitivity of SHB in South Korea, offering insights for improved pest control and honey bee health protection.

Key words: honey bee; small hive beetle; invasive pest; honey bee virus; insecticides

P73

Research on dsRNA-Based Pest Control and Stability Enhancers for Managing Diamondback Moth(*Plutella xylostella*)

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dsRNA 기반 작물보호제는 RNA 간섭(RNAi) 기술을 활용하여 특정 해충의 유전자 발현을 차단함으로써, 해충의 생리적 기능을 방해하는 혁신적인 방법이다. dsRNA를 활용한 작물보호제는 화학농약에 비해 환경에 미치는 영향이 적고, 기존 화학농약에 대한 교차저항성이 없다는 장점이 있다. 또한, 방제를 하고자 하는 해충에만 선택적으로 작용하기 때문에 유용곤충 및 미생물에 대하여 안전하다는 점에서 농업 분야에서의 시장 가능성이 높다.

본 연구는 십자화과 작물에 피해를 주는 주요 해충인 배추좀나방(*Plutella xylostella*)을 RNA 간섭을 이용하여 방제하는 목표로 수행되었다. 시험을 위한 공시충은 서울대학교로부터 분양받아 실내 사육조건(온도 24℃, 상대습도 60%, 광주기 16L:8D)하에 계대 사육하였고, 방제활성 평가는 배추좀나방 유충을 이용하여 leaf disc 방식으로 진행하였다. 시험결과 dsRNA를 단독으로 처리하였을 때에는 배추좀나방의 중장에 dsRNA를 분해시키는 dsRNAase와 강염기성 구조로 인해 dsRNA의 충분한 방제 효과를 얻기 어려운 문제점을 확인할 수 있었다. 따라서 dsRNA의 안정성 확보를 목적으로 문헌조사를 통해 보조제(A, B, C)를 선발할 수 있었고, 보조제 혼합 조건에 따른 방제효과를 평가하였다. 평가결과 dsRNA와 각 보조제를 이중 또는 삼중 혼용 처리하였을 때, 기대이하의 살충활성을 나타낸 반면, dsRNA와 각 보조제를 모두 혼합한 사중 혼용 처리 군에서는 96.6%의 우수한 방제가를 나타내어 dsRNA의 적용가능성을 확인할 수 있었다.

이러한 결과를 통해 나비목 해충에 대한 dsRNA와 보조제 혼용을 통해 효과적인 방제가 가능함을 시사 하였다. 향후 연구에서는 dsRNA의 안정성에 대한 추가적인 연구와 제형화에 대한 실험이 필요하다.

검색어: RNAi, dsRNA, *Plutella xylostella*

P74

Regional insecticide susceptibility and detection of target-site mutations in *Tuta absoluta* population from South Korea

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The tomato leafminer, *Tuta absoluta*, a major pest of tomato production worldwide, was first reported in South Korea in 2023 and has since spread rapidly. Its management largely depends on chemical insecticides, raising concerns about resistance development, yet studies on resistance monitoring in South Korea remain limited. We evaluated six registered insecticides (metaflumizone, cyantraniliprole, spinetoram, emamectin benzoate, fluxametamide, and pyridalyl) through bioassays on the Gwangju population collected in 2025 and analyzed mutations at six insecticide target sites from ten regional strains. In bioassay results, Fluxametamide, spinetoram and cyantraniliprole showed the highest performance, causing complete mortality (100%) at the recommended concentrations, whereas pyridalyl, metaflumizone and emamectin benzoate exhibited reduced performance at the recommended concentrations, with mortality rates of 63.3%, 74.4% and 86.7%, respectively, in the Gwangju population. Mutation screening from ten regional strains detected known mutations in Ace1 (A201S), VGSC (M918T, T929I, L1014F), and RDL (A301S), whereas no mutations were detected in RyR, nAChR, and GluCl. These results provide the first baseline of insecticide susceptibility and target site mutations in *T. absoluta* throughout South Korea and will support the development of resistance management strategies. Further insecticide bioassays and mutation screening throughout regions are being conducted.

Key words: Tomato leafminer, Insecticide resistance, Bioassay, Target-site mutation

P75

Mitochondrial Dysfunction and Redox Imbalance Induced by Carbonyl Sulfide in *Tribolium castaneum*

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Carbonyl sulfide (COS) has emerged as a promising alternative to phosphine for controlling stored-product pests, yet its toxicological mechanism remains unclear. We investigated COS action in *Tribolium castaneum* using bioassays, transcriptomic profiling, RNA interference, ultrastructural analysis, and biochemical assays. COS exhibited comparable toxicity against both phosphine-susceptible and resistant strains, and functional assays confirmed that carbonic anhydrase 3 is essential for COS activity. Transcriptomic analysis revealed broad changes in detoxification and mitochondrial genes. Transmission electron microscopy showed mitochondrial damage, including matrix rarefaction and vacuolization. Biochemical assays demonstrated complex III inhibition, compensatory increases in complexes II and IV, ATP depletion, elevated ROS, and increased NAD^+ levels without significant changes in the NAD^+/NADH ratio. Antioxidant assays further indicated impaired hydrogen peroxide detoxification due to suppressed catalase activity. These findings suggest that COS disrupts mitochondrial energy metabolism and redox homeostasis, leading to oxidative stress and cellular dysfunction, and highlight its potential as an effective fumigant.

Key words: Carbonyl sulfide, Carbonic anhydrase, Mitochondrial dysfunction, Oxidative stress, *Tribolium castaneum*

P76

Development of a forecasting model and decision-making system for *Chilo suppressalis* at farm level

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Unpredictable and rapid changes in local weather caused by continuous climatic change increase the variability of crop pest occurrence. Therefore, it is required that a pest decision-making system can reflect real-time weather conditions at each farm level. Even though one of major pests, *Chillo suppressalis*, has caused serious economic damage in rices, its forecasting models has been shunned by Korean farmers due to its low prediction accuracy. Thus, this study was conducted to develop a forecasting model of *Chillo suppressalis* by applying AI techniques, and suggest optimal management timings based on the developed model. The forecasting model was developed with its occurrence data at 167 observation points from 2016 to 2022 and its corresponding weather data by using machine learning techniques. From the developed local model, the information of its occurrence and optimal management timings for *Chillo suppressalis* will be provided to farmers at each farm level by using installed automatic weather system and weather forecasting system of Korean Meteorological Administration. For this system, an integrated system was constructed to control the quality and missing data of automatic weather systems, auto-update the forecasting system, and reflect real-time weather data. This system would increase the management efficiency for *Chillo suppressalis*, and ultimately contribute to stable production of rices in Korea.

Key words: *Chillo suppressalis*, forecasting model, AI-model, rice, optimal management timing

P77

Analysis of Achievements in the Field of Insect and Phytosanitary Treatment of the Plant Quarantine Technology R&D Project by APQA

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To improve the efficiency of the Plant Quarantine Technology R&D Project by APQA, we analyzed achievements from 2020~2024. Average annual budget was 5.1 billion KRW; contract research (55%) exceeded APQA own research (45%). Universities accounted for the largest share (42%). Among four fields, insect & phytosanitary treatment received the highest budget (7.887 billion KRW, 31%). Achievements included 50 papers, 154 presentations, 9 patents, 15 policy proposals, and 10 books. Patent applications and registrations per 100 million KRW were 0.08 and 0.04, below national R&D project. Publications per 100 million KRW were 0.53, 3.1 times higher, with mrnIF 64.03, indicating comparable quality to national R&D project (67.04). To strengthen both scientific and technical outcomes, long-term, large-scale projects should be expanded to promote industrialization and practical application.

Key words: Plant Quarantine Technology R&D Project, achievement, efficiency, insect & phytosanitary treatment

P78

Selection for insecticides in *Riptortus pedestris* with low toxicity for honey bees (*Apis mellifera*)

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Insect growth regulators (IGRs) are chemicals that inhibit the growth of larva during their molting process and lead to their death with less toxic for adult honey bees (*Apis mellifera*) than other insecticides. This study was conducted to evaluate the susceptibility of *Riptortus pedestris* nymphs to six IGRs (3 benzoylureas, buprofezin, 2 diacylhydrazines), as well as the spray toxicity and leaf residual toxicity of 6 insecticides against *A. mellifera* adults. Among all the tested insecticides against *R. pedestris* nymphs, benzoylureas (lufenuron, novaluron, flufenoxuron) showed 100% mortality at 12 day after treatment (DAT). However, the toxicities of buprofezin, methoxyfenozide, tebufenozide were not observed until 30 DAT. Additionally, No significant differences in acute and residual toxicity tests on *A. mellifera* adults were found between the experimental and control groups.

Key words: insect growth regulators, *Riptortus pedestris*, honey bee, *Apis mellifera*

P79

Regional Assessment of Imidacloprid Resistance in *Nilaparvata lugens* (Korea, 2024)

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벼멸구(*Nilaparvata lugens* Stål, 1854)는 해마다 열대 및 아열대 지역에서 저기압 기류를 타고 국내로 유입되어 벼에 피해를 준다. 벼멸구 방제를 위해 농약의 반복 사용으로 약제 저항성이 세계적으로 심화되고 있으며, 특히 이미다클로프리드에 대한 저항성이 확대되고 있다. 본 연구는 2024년 충남 태안, 서천, 전남 진도, 고흥, 경남 고성 등 5개 지역에서 채집한 야외계통과 감수성계통(국립농업과학원 분양)을 대상으로 이미다클로프리드에 대한 저항성 수준을 평가하였다. 농도별 처리 후 사충률을 확인하고 프로빗 분석으로 반수치사농도(LC_{50}, mg/L)를 추정한 결과, 감수성계통은 1.11 mg/L, 야외계통은 46.4~74.6 mg/L였으며, 감수성계통 대비 저항성비(RR)는 41.8~67.2로 나타났다. 이는 이미다클로프리드 저항성을 지닌 집단이 국내로 유입되고 있으며 지역 또는 연도에 따라 이미다클로프리드 저항성 수준에 차이가 있을 가능성을 시사한다. 효과적인 벼멸구 방제를 위해 지역별 저항성 감시를 기반으로 한 맞춤 방제 전략과 지속적인 저항성 관리가 필요하다.

검색어: 벼멸구, 약제 저항성, 이미다클로프리드, 방제, 저항성관리

P80

Insecticide susceptibility of *Myzus persicae* (Hemiptera: Aphididae) populations collected from kimchi cabbage fields in South Korea

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Myzus persicae (Hemiptera: Aphididae) is a destructive pest for agricultural crops worldwide. In this study, we assessed the susceptibility of *M. persicae* to eight insecticides using aphids collected from kimchi cabbage fields in 15 regions in South Korea from 2022 to 2024; a laboratory population was used as a reference strain. For this, lethality at the recommended concentration (RC) of each insecticide and resistance ratio (RR; LC_{50} ratio beween field and laboratory populations) were evaluated. At RC, deltamethrin was the least effective, showing <35% lethality in all field populations. In contrast, sulfoxaflor, spirotetramat, and thiacloprid achieved high lethality (>85%) at RC. However, sulfoxaflor showed an average RR of 7.7, with four populations having >10 of RR, suggesting on-going resistance development despite the high efficacy. Imidacloprid and flonicamid showed the largest variability in lethality at RC, varying by >50% among populations. These results highlight the need for continuous monitoring of insecticide resistance to develop effective management strategies for *M. persicae*.

Key words: insecticide resistance, green peach aphid, pesticide, resistance monitoring, pest management

P81

Monitoring and Proteomic Analysis of Acaricide-Resistant Field Populations of a Two-Spotted Spider Mite, *Tetranychus urticae* (Acari: Tetranychidae), in Korea

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The two-spotted spider mite, *Tetranychus urticae* Koch, is a serious agricultural pest that has developed resistance to many pesticides. In this study, we evaluated the levels of pesticide resistance by comparing the susceptibility of *T. urticae* eggs and adults collected from seven fields (CG, GJ, HS, SJ, OC, PT1, and PT2) with that of a laboratory-susceptible (S) strain. Substantial variation of acaricide resistance were observed among eggs and adults. A proteomic approach combining 2D-PAGE with MALDI-TOF/TOF was used to analyze protein synthesis profiles in *T. urticae*. Forty-five differentially expressed protein spots were identified between the S strain and field populations. In conclusion, our findings provide new insights into the molecular mechanisms underlying acaricide resistance in the two-spotted spider mite.

Key words: *Tetranychus urticae*, acaricide, resistance, proteomics

P82

Investigation of phosphine resistance in *Tribolium castaneum* collected by rice processing complex in South Korea, 2021-2025

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Aluminum phosphide is a common pesticide used to control grain pests in rice processing complex(RPC). However, increasing use of aluminum phosphide caused the occurrence of phosphine-resistant pests globally. In this study, we investigated the occurrence of phosphine-resistance by conducting FAO No. 16 test and Dihydrolipomaide dehydrogenase (DLD) test on *Tribolium castaneum* collected from RPC at 2021 to 2025. Tested pests were collected from 52 regions in South Korea, and phosphine-resistance was confirmed in Eumseong and Jincheon by FAO No. 16 test. As a result of DLD test, 4 regions showed strong resistance (5~87.5%), with Eumseong being the most resistant at 87.5%. These results indicate that continuous inspection of grain storage is required to inhibit the widespread of resistant pest.

Key words: Phosphine, Resistance, Rice processing complex, FAO test, DLD test

P83

Evaluating the Efficacy of RNAi-Mediated Knockdown for Controlling the Pine Wood Nematode

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The pine wood nematode (PWN), *Bursaphelenchus xylophilus*, is the causative agent of pine wilt disease, which inflicts severe ecological and economic damage on global forest ecosystems. Consequently, the development of eco-friendly control agents is a critical priority. This study investigates RNA interference (RNAi) as a sustainable method for PWN control. We conducted a large-scale screening by synthesizing double-stranded RNA (dsRNA) molecules targeting approximately 200 genes. These dsRNAs were delivered to second-stage juvenile PWNs via a soaking method, for which we optimized buffer conditions to maximize uptake efficiency. The nematicidal activity screening successfully identified a significant number of candidate genes. These findings validate that dsRNA-mediated RNAi is a highly effective strategy for precisely targeting PWN, underscoring its potential as a next-generation, environmentally safe alternative to conventional nematicides.

Key words: Pine wilt disease, Pine wood nematode, RNA interference, Gene silencing, Double stranded RNA

P84

Isolation and Purification of a Nematicidal Compound from *Burkholderia*

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Plant-parasitic nematodes pose a significant threat to global food security, creating an urgent need for novel, eco-friendly control agents. This study investigated the nematicidal properties of *Burkholderia* sp. JB-2, whose culture filtrate exhibited high mortality (>80%) against the root-knot nematode *Meloidogyne* sp.. Through a bioassay-guided fractionation strategy, the primary active compound was isolated. Its chemical structure was determined using LC-MS and subsequently confirmed unequivocally by HPLC co-analysis with a commercial standard. The purified compound demonstrated significant, dose-dependent nematicidal activity against *M. incognita*, with notable efficacy observed at a concentration of 1 mM. This research identifies a specific natural product responsible for the potent nematicidal activity of *Burkholderia* sp. JB-2, highlighting its considerable potential as a lead compound for developing next-generation bio-nematicides.

Key words: Plant parasitic nematode, Root-knot nematode, Nematicidal activity, Biological control, *Burkholderia*

P85

Analysis of Invasive ants (Hymenoptera: Formicidae) in Imported Lumber and Plants from Southeast Asia and Central America

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We analyzed ants collected from specific regions in several countries in Southeast Asia and Central America, where imports of plants and lumber are increasing during plant quarantine inspection. There are 52 species (6 subfamilies, 28 genera) including genus *Carebara*, *Dolichoderus*, *Oecophylla*, *Solenopsis* in Thailand and Vietnam, and 26 species (7 Subfamilies, 23 genera) including genus *Lepisiota*, *Platythyrea*, *Solenopsis*, *Wasmannia* in Panama, making a total of 75 species (7 subfamilies, 40 genera). In the present study, we provide a rapid key to the subfamilies of high-potentional invasive ant species collected in the above countries for use in plant quarantine inspection.

Key words: invasive species, identification manual, pest, quarantine

P86

Camelliasaponin A1 and A2 extracted from camellia (*Camellia japonica* var. *japonica*) seeds are key antifeedant compounds against the larvae of diamondback moth (*Plutella xylostella* L.)

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Plutella xylostella (diamondback moth) is a major pest of cruciferous crops, causing substantial global economic losses. Therefore, this study aims to isolate natural antifeedant compounds from *Camellia japonica* seeds and evaluate their bioactivity against third-instar larvae of *P. xylostella*. The ethanolic extract of *C. japonica* seeds exhibited strong antifeedant activity, with a 50% antifeedant concentration (AFC_{50}) of 128 ppm. LC-MS/MS analysis of the extract identified major constituents, including disaccharides (17%), kaempferol glycosides (12%), camelliasaponin A1 (10%), camelliasaponin A2 (11%), and other triterpenoid glycosides. Subsequent medium-pressure liquid chromatography (MPLC) fractionation of the extract produced five fractions, one of which showed antifeedant activity at 125.0 ppm. This active fraction contained high levels of camelliasaponins A1 (5,031 ± 286 ppm) and A2 (6,053 ± 185 ppm). Authentic camelliasaponin A1 and A2 also showed potent antifeedant activity against *P. xylostella* larvae, with AFC_{50} values of 5.4 ppm and 3.6 ppm, respectively, both lower than that of neem-derived Azadirachtin (AFC_{50} = 12.4 ppm). These findings confirm that camelliasaponin A1 and A2 are the principal active antifeedant constituents in *C. japonica* seed extracts. Overall, the findings highlight the potential of camellia seed extracts for development into environmentally friendly formulations for integrated pest management targeting lepidopteran larvae.

Key words: Antifeedant activity, *Camellia japonica*, Camelliasaponin, *Plutella xylostella*

P87

Seasonal Surveillance of Tick-Borne Pathogens in Yeongam and Gunsan, Republic of Korea (May to July 2025)

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Ticks (Ixodidae) are important hematophagous vectors of pathogens including severe fever with thrombocytopenia syndrome virus (SFTSV), *Rickettsia*, *Borrelia*, and *Bartonella*. This surveillance was from May to July 2025, during which adult ticks were collected once a month from four environments (grassland, mountain road, copes, grave) at Yeongam and Gunsan, Republic of Korea (ROK). The collected ticks were morphologically identified, pooled (≤ 5 ticks per pool), extraction to nucleic acid for pathogen detection using real-time polymerase chain reaction (PCR) and calculated for minimum infection rate (MIR). A total of 431 ticks were collected, of which 106 pools contained *Haemaphysalis longicornis* (376 ticks, 87.24%), the dominant species. The highest number of ticks was collected in May from grassland in Gunsan (*H. longicornis*, 75 ticks, 15 pools). All samples were negative for SFTSV, *Borrelia*, and *Bartonella*; however, *Rickettsia* was detected in 39 pools. The overall MIR for *Rickettsia* was 9.05%, with a maximum MIR of 46.15% observed in May at Yeongam. This study provides baseline data on regional and environmental differences in tick populations as well as their associated pathogens. This information is expected to inform future tick surveillance and vector control strategies in ROK.

Key words: tick, minimum infection rate, pathogen, rickettsia, seasonal surveillance

P88

First report of parasitism of *Orthaga olivacea* (Lepidoptera: Pyralidae) by *Phanerotoma flava* (Hymenoptera: Braconidae)

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Orthaga olivacea (Warren, 1891) (Lepidoptera: Pyralidae) is a major pest of *Machilus thunbergii* and *Cinnamomum camphora* (Laurales: Lauraceae). Its shelter-building behavior reduces the efficacy of insecticides, making management difficult. Accordingly, alternative control methods are needed to overcome the limitations of chemical control. This study identified a newly discovered parasitoid from *O. olivacea* and investigated the emergence rate of the host moth, the parasitism rate of the parasitoid, and its emergence patterns.

The parasitoid was identified as *Phanerotoma flava* Ashmead, 1906 (Hymenoptera: Braconidae) based on morphological characteristics and COI DNA barcode analysis. In 2024, the emergence rate and the parasitism rate were 47.2% and 18.7%, respectively, whereas in 2025 the rates decreased to 16.9% and 2.4%. Adult host moths emerged from mid-June to early August in both years, with peak abundance observed in early to mid-July. The parasitoid emerged about 3-10 days later than the host, occurring from late June to early August. These findings suggest that *P. flava* has potential as a biological control agent against *O. olivacea* and provide fundamental information for establishing pest management strategies for *M. thunbergii*.

Key words: *Machilus thunbergii*, *Orthaga olivacea*, *Phanerotoma flava*, parasitoid, DNA barcode

P89

Survey of flying insect diversity in vineyard under organic conversion

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Organic grapes in South Korea are expected to have increasing economic value in the future, as the organic market continues to grow annually and grapes are one of representative export agricultural products of South Korea. In organic farming, pest management relies on ecosystem services derived from on-farm vegetation management, which increase biodiversity of the farm. Although pest management through biodiversity is important, related studies remain limited. We surveyed flying insects in three vineyards undergoing conversion to organic farming. Insects captured using sticky traps were identified and counted, and comparisons were made according to the environmental conditions and cultivation practices of each vineyard. The diversity of flying insects differed among the three vineyards, which was likely influenced by differences in cultivation practices and the varying potential for external insect influx between greenhouse and field cultivation.

Key words: organic vine, biodiversity of organic farming, flying insect fauna

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P90

Effects of organic cultivation environment of floury rice fields on the community structure and ecological function of benthic macroinvertebrates

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Benthic macroinvertebrates play ecologically important roles in rice paddy ecosystems. This study aimed to evaluate how the cultivation environment of organically grown floury rice affects the community structure and ecological function of benthic macroinvertebrates. Field surveys were conducted twice in July 2024 at the experimental rice paddies of the National Institute of Agricultural Sciences using a D-frame net. We analyzed the community characteristics and functional traits of benthic macroinvertebrates collected from these sites. In the community analysis, the diversity index was significantly higher in plot A4 during the first survey. However, the lowest richness and evenness indices were recorded in plot A1 during the second survey. Functional group analysis revealed distinct distributions of ecological functions depending on the cultivation environment. These results indicate that the organic cultivation environment for floury rice significantly influences the composition and ecological function of benthic macroinvertebrate communities.

Key words: benthic macroinvertebrate, ecological function, floury rice, organic farming, rice field

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P91

A Trade-off Between Beetle & Weed Diversity and Management Costs in Agricultural Land

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Agricultural expansion and chemical inputs have degraded air, soil, and water, driving biodiversity loss. To mitigate these impacts, eco-friendly farming has been promoted as an alternative to conventional systems. We examined beetle and non-crop weed communities on Jeju Island across two farming systems (eco-friendly vs. conventional) and land-use types (arable fields vs. orchards). Eco-friendly farming supported higher beetle richness (+50%) and abundance (+78%), along with greater weed richness (+54%) and coverage (+94%). Both farming system and land use significantly shaped species richness, abundance, and community composition. However, increased weed cover and the presence of certain pest species suggest higher management costs. These results underscore trade-offs in eco-friendly farming, where biodiversity gains must be balanced against economic sustainability.

Key words: agriculture, beetle, eco-friendly, trade-off, weed

P92

Temperature-Dependent Development Model and Seasonal Occurrence of *Spodoptera litura* (Lepidoptera : Notuidae)

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Spodoptera litura (Fabricius, 1775) (Lepidoptera: Noctuidae) is a representative polyphagous pest widely distributed in temperate and subtropical regions of Asia and Australia, causing serious damage to various crops, vegetables, and ornamental plants. Damage has been reported on more than 140 plant species, and its high resistance to insecticides makes it one of the most difficult pests to control. In this study, developmental experiments of *S. litura* were conducted under five constant temperature conditions (15, 20, 25, 30, 35 ± 1°C; 60 ± 5% RH; 16L : 8D), and seasonal adult occurrence was monitored using sex pheromone traps. The results showed that the lower developmental threshold was 11.7°C, and the effective accumulated temperature was 625.0 degree-days (DD). Field monitoring in Wanju, Jeonbuk Province, revealed that the first occurrence of adults was on May 7 in 2023 and on May 6 in 2024, while peak occurrences were observed on September 2 and August 29, respectively.

Key words: *Spodoptera litura*, Lepidoptera, Lower developmental threshold, Degree day

P93

Volatile organic compounds of four Lamiaceae species and oviposition host preference of *Pyrausta panopealis* Walker(Lepidoptera: Crambidae)

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In this study, four representative Lamiaceae plants commonly cultivated or used as ornamentals in Korea-perilla, basil, rosemary, and lavender-were selected to investigate factors influencing host selection of Pyrausta panopealis. Volatile organic compounds(VOCs) emitted from each plant were analyzed using GC–MS to identify chemical cues associated with oviposition preference. Host suitability was further evaluated through no-choice tests with single-plant treatments, while dual-choice assays were conducted to classify plants as primary hosts, secondary hosts, or non-hosts. The results provide insights into the role of plant-emitted VOCs in oviposition site selection by female P. panopealis and offer a basis for developing effective pest management strategies.

Key words: volatile organic compounds, oviposition host preference, *Pyrausta panopealis*

P94

A Novel Data-Driven Phenology Modeling for an Invasive Longhorn Beetle Using Citizen-Science Records

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Accurate timing of insect emergence, especially for invasive pests, is critical for surveillance and timely interventions. Yet, many species lack experimental developmental data required for traditional phenology models. Here, we present an empirical, binary logistic regression model that predicts the first adult emergence of the invasive beetle *Anoplophora horsfieldii* using citizen-science occurrence data (iNaturalist) and degree-day accumulation. To balance sensitivity to early emergence and biological realism, we developed a dual-binning strategy: 10 DD bins for emergence onset and 20 DD bins to estimate saturation thresholds, with full emergence scores beyond identified saturation points. The estimated logistic model of slope = 0.0146 and intercept = -14.471 yielded a 50% emergence probability at 990.0 DD and demonstrated robust fit (Likelihood Ratio = 214.2 with $P < 0.0001$, c-statistic (AUC) = 0.994). The model was validated using independent field observations from Jeju Island (2024 and 2025), which fell within the early transition zone (21.8 % emergence probability). In validation using independent 2025 citizen-science data, ROC analysis yielded an AUC (Area Under the Curve) of 0.990, indicating excellent discriminatory ability of the model. Our results highlight that meaningful emergence predictions can be achieved from fragmented, presence–absence data, offering a data-driven tool for early detection and biofix estimation of non-native pests. This framework is applicable across taxa and geographies, enabling scalable, real-time phenology forecasting in data-limited contexts.

Key words: *Anoplophora horsfieldii*, Phenology model, degree-days, early detection, dual-bin strategy

P95

Molecular identification of *Inostemma seoulis* and *Platygaster matsutama*, parasitoid wasps of the pine needle gall midge (*Thecodiplosis japonensis*)

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Thecodiplosis japonensis (pine needle gall midge, PNGM) is a major forest pest in Korea, causing severe damage to pine trees through larval feeding, which leads to wilting and death. Although parasitoid wasps have been utilized for the biological control of PNGM, their extremely small size makes morphological identification challenging. In this study, we developed a molecular identification method for two dominant parasitoid species, *Inostemma seoulis* and *Platygaster matsutama.* Species-specific primer sets were designed based on *COI* sequences. Molecular detection revealed parasitism of *I. seoulis* in 23% and *P. matsutama* in 6.9% of PNGM larvae that exhibited no visible signs of infection, while no cases of multiparasitism were observed. These results provide a molecular framework for rapid and accurate species-level identification of parasitoid wasps associated with PNGM.

Key words: *Thecodiplosis japonensis*, *Inostemma seoulis*, *Platygaster matsutama*, molecular identification, *COI*

P96

A Short Review on the Species and Damage of Bark and Ambrosia Beetles (Coleoptera: Scolytinae) Distributed in Korea

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Since the first record of 51 species in 1929, about 171 species of Scolytine beetles have been documented in Korea. In the past, these beetles were mainly recognized as pests of stone fruit trees and received little attention in forests compared to lepidopteran pests. A review of published studies (1980–2024) shows that out of the 169 species historically recorded in Korea, 49 species have been consistently observed in the field, indicating their continuous presence. Frequently recorded species include Hylastes plumbeus, Hypothenemus eruditus, Ambrosiodmus rubricollis, Ambrosiophilus atratus, Xyleborinus saxeseni, and Xylosandrus germanus, while species with high trap abundance include X. saxeseni, Cnestus mutilatus, X. germanus, X. crassiusculus, Cyclorhipidion bodoanum, and Euwallacea validus.

Field monitoring was conducted in Jeju Island forests using ethanol- and pheromone-baited traps from April to August 2024. The dominant species observed were Scolytoplatypus mikado, Amasa amputatus, and Xylosandrus crassiusculus. Recently, concerns have grown over potential outbreaks due to climate change. In 2024, a severe outbreak occurred in the protected forest of Mt. Sanbangsan, Jeju Island, where about 380 Castanopsis sieboldii trees were killed. This highlights the urgent need for proactive monitoring and integrated management strategies to prevent large-scale forest damage.

Key words: Scolytine, monitoring, Bark and ambrosia beetles

P97

Seasonal and Habitat Dynamics of Blowfly Assemblages (Diptera: Calliphoridae) in Southern South Korea

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Blowflies (Diptera: Calliphoridae) are among the earliest insects to colonize cadavers and provide critical evidence for estimating the postmortem interval (PMI) in medicolegal investigations. This study investigated seasonal and habitat-related variations in blowfly assemblages across 14 regions of southern South Korea. Field surveys were conducted twice monthly from June 2022 to December 2024 using mouse cadavers as bait. A total of 17,087 adult blowflies, representing 15 species from six genera, were collected. The SOM analysis showed that community composition varied seasonally, with species-level relative abundance also showing seasonal shifts. In spring, *Lucilia illustris* (43.0%) dominated in urban areas, whereas *Lucilia porphyrina* (28.0%) was most abundant in forested habitats. During summer, *Chrysomya megacephala* (32.9%) predominated in urban sites, while *Chrysomya pinguis* (45.1%) dominated in forests. In autumn, *Ch. megacephala* was the leading species in both urban (44.1%) and forested (47.3%) areas. Notably, the occurrence of *Ch. megacephala* showed no significant difference between habitat types ($p = 0.632$) but exhibited pronounced seasonal variation ($p < 0.000$). In winter, *Ch. megacephala* was recorded exclusively on Jeju Island, a pattern potentially associated with ongoing climate warming and its influence on species persistence. These findings provide foundational insights into the ecological distribution of blowflies and highlight the importance of incorporating both seasonal and habitat factors into PMI estimation in forensic entomology.

Key words: Medico-legal entomology, Calliphoridae, Seasonal variation, Habitat, Self-Organizing Map

P98

The Role of Predatory Insects in Early Carcass Decomposition and Its Implications for Post-Mortem Interval Estimation

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In medico-legal entomology, post-mortem interval (PMI) estimation primarily relies on the development of early-arriving insect communities, particularly necrophagous flies. Yet, under natural conditions, predatory insects can profoundly disrupt fly colonization and reshape decomposition dynamics. This study evaluated the impact of predatory interference on early carcass decomposition in a Korean forest using frozen–thawed mice (*Mus musculus*), assigned to either predator-excluded or predator-exposed groups. The two treatments produced distinctly different decomposition outcomes. In the predator-excluded group (initial weight: 23.5 g), necrophagous flies (*Lucilia papuensis*) established typical maggot masses, with mass loss remaining below 4.3% (1.0 g) after 24 hours. By contrast, in the predator-exposed group (initial weight: 21.0 g), intensive feeding by the invasive Asian hornet (*Vespa velutina*) resulted in the removal of 42.9% (9.0 g) of carcass mass within 24 hours. The residual carcass was subsequently dominated by ant colonies, which actively preyed upon and removed first-instar fly larvae, thereby severely limiting further colonization. These findings reveal a critical ecological shift from biochemical decomposition to physical biomass removal under predator pressure, together with a pronounced suppression of primary decomposers. Consequently, PMI estimates based solely on fly larval development risk underestimating the actual time since death if early predator interference is overlooked.

Key words: Medico-legal Entomology, Predatory insects, Carcass decomposition, PMI, *Vespa velutina*

P99

Application of environmental DNA as a screening tool for soil toxicity test using Collembola

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As the number of emerging chemicals grows, alternative approaches are needed to complement traditional toxicity tests that require considerable labor and cost. The application of environmental DNA (eDNA), genetic material shed by organisms into the environment, in toxicity test holds promise for rapid and cost-effective evaluation of pollutant effects. This study established a soil toxicity test using eDNA of *Allonychiurus kimi* and assessed its feasibility. Conventional and eDNA-based toxicity tests conducted for four heavy metals (As, Pb, Cd, and Cu) exhibited dose-dependent responses. EC_{50} values were comparable between the tests for As, Pb, and Cd, whereas Cu showed a lower EC_{50} in the eDNA-based test. These results demonstrate that the eDNA-based toxicity test exhibits sensitivity similar to that of conventional approaches. This supports its applicability as a screening tool for soil toxicity testing.

Key words: eDNA, soil toxicity test, Collembola, screening tool, pollutant

P100

Survey of Insects in the Andong Area Using Light Traps

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As part of the 2025 National Ecosystem Survey, nocturnal insect surveys were conducted in the Andong region of Gyeongsangbuk-do, Korea. To collect nocturnal insects, light traps were installed at selected sites with well-preserved vegetation. As a result, Lepidoptera and Coleoptera were the predominant groups collected. The result of this study are expected to provide basic data on the nocturnal insect fauna of the Andong region and to be utilized in related applied fields.

Key words: Andong, insect, light trap, taxonomy, Korea

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P101

Development of an occurrence prediction model and suggestion of optimal pesticide application timing for *Riptorus clavatus*

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Continuous climatic change affected outbreak of *Riptortus clavatus* in soybeans, which caused economic damages and excessive pesticide uses for soybean production. Thus, a forecasting model of *R. clavatus* was developed using machine learning techniques. A total of 67 data sets of bean bug catches by pheromone traps and daily average temperature at corresponding locations were obtained from the Rural Development Administration and the Korea Meteorological Administration, respectively. Of the 67 data sets, 57 sets from 2016-2023 were used for model training, and 10 sets from 2024 for model validation. The developed model showed high prediction accuracy resulting in average 3.6-day difference between predicted and actual occurrences of *R. clavatus* adults. The degree-days required for development of the first instar stage from the adult occurrence which was estimated from the developed model was calculated using a population dynamics model previously published in the literature. The optimal timings for insecticide applications were determined based on the predicted timings for the first instar stage development. To prevent unnecessary pesticide application, the model also considered the potential damage period. This approach would reduce unnecessary pesticide applications and increase efficiency for *R. clavatus* management, and ultimately contribute stable productions of soybeans in Korea.

Key words: Soybean, *Riptortus clavatus*, machine learning, degree-day model, optimal management timing

P102

Hatchability of *Allonychiurus kimi* (Collembola: Onychiuridae) according to the microbial food sources

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In a previous experiment, *Allonychiurus kimi* (Collembola: Onychiuridae) exhibited dispersal movement away from feeding sites after having consumed food sufficiently. This post-feeding movement is hypothesized to represent a precautionary behavior to reduce the risks associated with egg-laying in high-density microbial environments. As microbivores, collembolans are drawn to nutrient-rich areas that may also harbor opportunistic pathogens or harmful defensive compounds. Building on this, the present experiment was conducted to test hatchability under different food conditions. Egg hatchability was compared across five conditions: no food treatment (baseline), yeast, and three different cyanobacteria species. The results showed a severe reduction in hatchability on the yeast substrate (1.7% of baseline). Unlike yeast, hatching rates on the cyanobacteria substrates varied, ranging from neutral (100% of baseline) to significantly reduced (43% of baseline). These results indicate that the observed post-feeding movement is not solely a mitigation of crowding stress or predator-avoidance behavior for adult survival. Instead, it could function as a precautionary reproductive strategy that potentially enhances offspring survival by allowing females to lay eggs in a microbially safer environment, away from potential hazards.

Key words: Collembola, *Allonychiurus kimi*, Hatchability, precautionary behavior

P103

Assessment of pathogenicity of *Metarhizium phasmatodea* against *Ramulus mikado* and non-target insects

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Recent outbreaks of the stick insect, *Ramulus mikado* in the Seoul metropolitan area continue to damage forests. Conventional controls, including sticky traps and chemical insecticides, has problems in use over large areas and resulted in environmental concerns. Eco-friendly alternatives are needed and we tested the pathogenicity of entomopathogenic fungi, *Metarhizium phasmatodea* isolated from dead *R. mikado* in Mt. Cheonggyesan in 2022. Susceptibility and survival rate of *R. mikado* eggs, 3rd instars, and adults were tested at 1×10^4–10^8 conidia mL^{-1}. For non-target insects, the same treatments were applied to cockroaches, *Blattella nipponica* and crickets, *Gryllus bimaculatus*. Stick insects showed dose-dependent mortalities, while no difference was found in the non-target insects.

Key words: stick insect, entomopathogenic fungi, virulence, *Blattella nipponica, Gryllus bimaculatus*

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P104

Relationship between water stress of *Prunus* × *yedoensis* and occurrence of *Aromia bungii* (Coleooptera: Cerambycidae)

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Prunus × *yedoensis* is an abundant roadside tree species in South Korea, but infestation by *Aromia bungii*, which resulted in tree death, has recently increased. This study examined the indice of tree water status, such as electric resistance on stem and water potential on tree crown, either beetle-infested and not infested trees. From late June to late July 2025 as the beetles' activity season, the monitoring of the water stress of *P. yedoensis* was conducted. Stem water stress was measured by a Jun's meter, while crown water potential was measured by a PMS 600 pressure chamber. Crown water potential was significantly lower in infested trees compared to non-infested trees ($p < 0.001$), while stem electrical resistance was significantly higher in infested trees ($p < 0.01$). These results indicate that *A. bungii* infestation appeared to be associated with tree water stress, and crown water potential may be more sensitive to beetles' infestation.

Key words: longhorn beetle, tree borers, urban tree, water stress, tree condition

P105

Occurrence of stored-product insects in Rice Processing Complex(RPC) in South Korea, 2021-2025

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Stored-product insect pests, which can degrade grain quality and negatively impact international trade, are a persistent problem in grain storages. This study aimed to investigate the occurrence of grain pests in rice processing complex(RPC). Identification of stored-product insect pests belonging to the orders Coleoptera and Lepidoptera, collected from RPC in 51 regions across South Korea between 2021 and 2025, has been performed through morphological classification and COI barcoding. The survey revealed 26 species from 10 families of Coleoptera, with *Tribolium castaneum*, *Attagenus unicolor japonicus*, and *Alphitobius diaperinus* being the most frequently observed. For Lepidoptera, 7 species from 4 families were identified, with *Cadra cautella, Plodia interpunctella,* and *Nemapogon granellus* being the most common. Continuous and systematic monitoring is required to track changes in the occurrence of stored-product insect pests in South Korea.

Key words: Rice processing complex, Stored-product insects, Coleoptera, Lepidoptera

P106

Development of system dynamics model for exploring relationships between *Bursaphelenchus xylophilus* and various factors in forest ecosystem

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Pine wilt disease is a fatal forest pest that kills pine and larch trees. It is caused by *Bursaphelenchus xylophilus*, which invades trees through its vector, *Monochamus alternatus*. This invasion disrupts the transport of water and nutrients, ultimately killing the tree. The disease poses a severe threat to pine forests on the Korean Peninsula, causing significant ecological disruption and devastating losses to the forestry and related economies. This study noted that the spread of pine wilt disease is a complex process influenced by a mix of biological, environmental, economic, and human factors, which are often accelerated by unpredictable events like wildfires and landslides. To understand the relationships among these components, a system dynamics model was used based on the dynamics of pests and diseases within the forest ecosystem. This computer-aided approach is designed to help people make better decisions when confronted with complex, dynamic systems. By selecting key factors associated with pine wilt disease, this study established a quantitative model and, through simulation, analyzed how the dynamics of the pests and diseases change over time.

Key words: system dynamics model, simulation, pine tree, *Monochamus alternatus*, *Bursaphelenchus xylophilus*

P107

Assessment of the Probiotic Suitability of Native *Lactiplantibacillus* Strains for their Honey Bee Host (*Apis mellifera*)

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Honey bees (*Apis mellifera*), vital agricultural pollinators, face population declines from numerous stressors. While their gut microbiota, especially lactic acid bacteria (LAB), is integral to bee health, novel strains remain underexplored. This study addresses this gap by isolating *Lactiplantibacillus* sp. IBT15 from honey bee guts and systematically assessing its probiotic potential. The isolate demonstrated robust growth under bee-relevant conditions (pH, temperature, and sucrose concentration) and was evaluated for a comprehensive suite of probiotic traits, including aggregation, antioxidant activity, and organic acid production. Safety was confirmed through hemolytic activity and antibiotic susceptibility assays. Overall, the strong probiotic characteristics and safety profile of IBT15 establish it as a potential candidate for the development of bee-specific probiotics.

Key words: Honeybee, Gut microbes, Lactic acid bacteria, Probiotics, *Lactiplantibacillus*

P108

Isolating Polyurethane-Degrading Bacteria from the Red-veined Darter, *Sympetrum fonscolombii*

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Insect gut microbiota are essential for host nutrient acquisition and environmental adaptation. In this study, we isolated intestinal strain from the Red-veined Darter (*Sympetrum fonscolombii*), *Pseudomonas* sp. IBT50, capable of degrading polyurethane. This strain effectively degraded various PU types, including polyester-, polyether-, and polyacrylic urethane. Biodegradation was validated through weight loss, scanning electron microscopy, Fourier transform infrared spectroscopy, and metabolite analyses. Notably, extracellular esterases were found to exhibit polyurethane-degrading activity. Furthermore, transcriptome analysis revealed that the strain employed distinct survival strategies under PU exposure. These results suggest that insect gut microbes contribute to host ecological resilience through their metabolic diversity and provide novel insights into the biodegradation of persistent environmental substrates.

Key words: Red-veined Darter, Polyurethane, Biodegradation, Insect gut symbionts, Plastic waste management

P109

Thermal Buffering Effect of Honey Storage Cells in Honeybee Comb

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The thermal role of stored honey in combs was investigated using 64 sensors embedded within colonies. From August 1–12, 2025, outdoor air temperatures in Jeonju fluctuated widely (21–36 °C), far outside the brood-rearing optimum (34–35 °C). Comparison between an empty comb cell and a honey-filled cell revealed striking differences. The honey-filled comb maintained a higher mean temperature (34.3 °C) with minimal fluctuation (±0.5 °C), consistently aligned with brood-compatible conditions. In contrast, the empty comb exhibited lower mean temperatures (31.5 °C) and larger daily oscillations (~6.5 °C), reflecting external variation. These findings demonstrate that stored honey provides a strong thermal buffering effect, stabilizing the comb microclimate against external fluctuations and supporting brood development. This insulating function of honey storage highlights an adaptive advantage in colony thermoregulation and offers a potential reference for smart hive design.

Key words: Honeybee comb thermoregulation, Thermal buffering, Honey storage cells, Smart hive design

P110

Development of the elite strain "An-Sim-Ae" of the edible insect *Tenebrio molitor* Linnaeus through selective breeding

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The yellow mealworm (*Tenebrio molitor*) must be harvested at the larval stage, but frequent pupation at shipping stage increases labor costs and reduces product quality. To address this issue, we performed individual-based selective breeding emphasizing delayed pupation and enhanced larval growth, resulting in the Go110 line (variety name: "An-Sim-Ae"). Under controlled conditions, Go110 outperformed other strains across three generations, with maximum advantages of +83 mg in larval weight, +108 mg in pupal weight, and +85 mg in adult weight compared with the control. The larval duration was extended by up to 24 days, and at the shipping stage (10–13 weeks) Go110 exhibited more than 70% lower pupation rates. These traits allow larvae to remain marketable until delivery, improving shipment uniformity while reducing pupation-related losses and labor costs. Future breeding programs will build on Go110 to develop additional lines with improved productivity and efficiency for industrial applications.

Key words: *Tenebrio molitor*, selective breeding, delayed pupation, larval body weight, productivity

P111

Experimental evaluation of pathogenicity and transmission routes of *Gryllus bimaculatus* Densovirus in South Korea

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Gryllus bimaculatus densovirus (GbDV) has recently emerged as a major pathogen in South Korean cricket farms. We conducted injection, ingestion, airborne exposure, and proportion-dependent assays to evaluate pathogenicity and transmission. Injection resulted in rapid mortality, with extremely high viral loads detected prior to death. Oral ingestion, even at 1:1000 dilution, significantly reduced survival, whereas airborne exposure had no significant effect under laboratory conditions. In proportion-dependent assays, higher proportions of infected individuals accelerated colony mortality, confirming the strong transmissibility of GbDV. These findings demonstrate the high patogenicity and transmissibility of GbDV and underscore the urgent need for effective disease management strategies in cricket farming.

Key words: disease management, *Gryllus bimaculatus* densovirus, pathogenecity, transmission

P112

Effects of an Insect-Based After-School Program on Children

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As of 2024, Neulbom School is operating in 6,185 elementary schools and 178 special education schools nationwide. Insect resources can be integrated with the "Animal Life Cycle" curriculum in third-grade science, making them highly curricularly appropriate and a preferred educational resource for both children and teachers. This study aimed to explore the impact of insect-based programs within the Neulbom School system on lower elementary school children. Pre- and post-test questionnaires analyzed through field application revealed improvements in emotional regulation, school adaptability, and agricultural sensitivity ($p<0.05$). Future efforts should include developing integrated insect programs that consider child developmental stages and curriculum alignment, training insect specialist instructors, and developing operational manuals.

Key words: neulbom school, insect experience, school adaptability

P113

Healing Effects with Insects in Elderly Care

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There is evidence that insect-based healing programs have a positive effect on the health of elderly people. Insedct are diverse, relatively inexpensive, and do not require much space. This study aims to examine the effect of insect-based healing programs for the health of the elderly. Elderly people raised crickets (*Teleogryllus emma*) by themselves for 8 weeks after pre-training and participated in various experintial activities. Rusults showed that for the group of healthy elderly people aged 65 years or older, the activity in the brain area of the Quality of Life and Geriatric Depression Scale (GDS) was increased as assessed using a questionnaire and fMRI. And the group of choronically ill people aged 70 years or older who wsed nursing facilities, the Insomnia Index (ISI) and average sleep time were significantly Improved. Pet insects are effective resources to apply to AAT. It is also showed that elderly people have a positive effect on improving the mental health and sleep function of the elderly.

Key words: insects, healing program, aged people

P114

Effect of an Insect-Based Therapeutic Program on Multiculturea Adolescents

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A visual-focused insect therapy program was developed and implemented for youth from multicultural families. The program ran for four sessions from June to July 2025. A color art therapist collaborated with the program, incorporating art activities combined with physical movement to encourage emotional engagement and expression. Pre- and post-test questionnaires showed increases in participants' life satisfaction and happiness ($p<0.05$). These results suggest the positive potential of an integrated insect therapy program for emotional support for youth from multicultural families, and we anticipate its active use in therapeutic agriculture and educational settings.

Key words: insect therapy, therapeutic agriculture, sensory stimulation