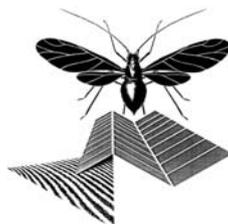


28e
Nederlandse
Entomologendag

16 december 2016
De Reehorst
Ede

Programma
Abstracts



Sectie Experimentele en Toegepaste Entomologie
van de Nederlandse Entomologische Vereniging

ALGEMENE INFORMATIE

GENERAL INFORMATION

Locatie

De 28e Entomologendag wordt gehouden in congrescentrum De Reehorst, Bennekomseweg 24, 6717 LM Ede. De Reehorst is zeer goed met openbaar vervoer te bereiken. Het ligt op 3 min. loopafstand van het treinstation Ede-Wageningen. Automobilisten kunnen in Ede de routeborden 'De Reehorst' volgen. De Reehorst ligt ten zuiden van het station, aan het begin van de Bennekomseweg. Er is ruime parkeergelegenheid.

The 28th Entomologendag will be held in De Reehorst, Bennekomseweg 24, 6717 LM Ede. De Reehorst is most easily reached by public transport: it is located about 3 min. walking from train station Ede-Wageningen. By car: after reaching Ede, follow the signs 'De Reehorst'. De Reehorst is situated just south of the train station, at the beginning of the Bennekomseweg.

Inschrijf- en informatiebalie / Registration and Information desk

De balie in de Beethovenfoyer is open vanaf 08:30 uur. Hier kunt u terecht voor inschrijven, algemene informatie en het ophalen van uw naambadge. Als u zich wel aangemeld hebt, maar nog niet betaald, dan kunt u dat ook aan de balie doen.

The desk will be open at 08:30 hrs. Here you can register, get information throughout the day, and obtain your badge. If you registered before but have not as yet paid, you can also do this at the desk.

Dagindeling / Timetable

- 08:30 Aanmelden/inschrijven bij de balie en ontvangst met koffie of thee. Posters ophangen. Voorbereiden presentatie. / *Registration, welcome with coffee or tea, mounting of posters. Prepare for presentation.*
- 10:00 Opening en plenaire lezing door Paul Vantomme (Italy / Belgium) / *Plenary lecture*
- 11:00 Koffie, thee, postersessie / *Coffee, tea, posters*
- 11:30 Start parallelle sessies
- 12:50 Lunch
- 14:00 NEV Dissertatieprijs en lezing / *NEV Dissertation award and lecture*
- 14:40 Vervolg parallelle sessies
- 15:20 Koffie, thee, postersessie / *Coffee, tea, posters*
- 15:40 Vervolg parallelle sessies
- 16:40 Borrel, postersessie / *Refreshments, posters*

Organisatie / Organization

NEV, Sectie Experimentele en Toegepaste Entomologie / *Netherlands Entomological Society, Section Experimental and Applied Entomology.*

Programmaboekje / *Abstracts:*

Jan Bruin (janbruin@bred.nl)

Gaarne uw badge inleveren bij vertrek

Please, return your badge before leaving

**Opportunities and constraints of insects
for food, feed and health care**

PAUL VANTOMME

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Trends towards 2050 predict a steady population increase to 9 billion people. Particularly the demand for animal proteins is exploding. 'New' plant and animal species as sources of proteins are being investigated such as: algae (Spirula), Moringa, medusae and jelly fish or even laboratory-made artificial meat. However, farming 'insects' appears the most promising. Insects are part of the traditional diets already of approximately 2 billion people worldwide. Insects can contribute to food security given their high nutritional value, low emissions of greenhouse gases (GHG), low requirements for land and water, and the high efficiency at which they can convert feed into food. The majority of insects consumed in developing countries today is harvested in nature. In western countries, the disgust factor to consider insects as food, combined currently with their limited availability on the market and a lack of regulations governing insects as food and feed are major barriers for their further expansion. The overall contribution of edible insects to livelihoods is difficult to estimate by lack of reliable statistics. However, the biggest opportunity may well lay in the production of insect biomass as feedstock for animals as it can be combined with the bioprocessing of organic waste. Considering the immense quantities of insect biomass needed to supplement current protein-rich feed ingredients, automated mass rearing facilities that produce stable, reliable and safe products need to be developed. For this to occur, significant technological innovations, changes in consumer food preferences, insect-encompassing food and feed legislation, and progress towards more sustainable food production systems are needed.

THEATRE AZURE**BACH (1+2)****11:30 1.1 Sustainability of insect production**DENNIS OONINCX
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Prosperity in developing countries and population growth increase the demand for animal protein. Insects are suggested as a sustainable source of protein. However, sustainability depends on several variables amongst which life cycle duration and the number of offspring produced. Moreover, the type and amount of feed used is of particular relevance. Insect production systems with a species that efficiently uses underutilized substrates can form a sustainable source of animal protein.

2.1 Impact of an exotic biocontrol agent of ragweed in EuropeSUZANNE LOMMEN, BENNO AUGUSTINUS,
CASPAR HALLMANN, URS SCHAFFNER, EELKE
JONGEJANS & HEINZ MÜLLER-SCHÄRER
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The North American leaf beetle *Ophraella communa* is an accidentally introduced candidate biocontrol agent of its favourite and highly invasive host plant, common ragweed, in Europe. During 3 years, we experimentally assessed beetle impact on Italian ragweed field populations. Using these data in demographical models, we find spatiotemporal variation in the success of the beetle in suppressing ragweed population growth. We discuss under which conditions the beetle achieves long-term control.

3.1 Kevers en archeologie: onderzoek naar middeleeuwse mestkuilen

SANDER AERTS

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Resten van kevers blijven vaak goed geconserveerd in archeologische contexten, maar worden helaas niet altijd opgemerkt. Voor een onderzoek naar vreemde mestkuilen op middeleeuwse erven zijn monsters uit Den Bosch, Dordrecht en Leiden behandeld om de overblijfselen van kevers eruit te halen. Ecologische kennis van deze beestjes moet ons vertellen of deze archeologische sporen gebruikt zouden kunnen zijn als kweekbedden, broeibedden, of misschien iets anders.

4.1 Endosymbiotic control of sex determination in haplodiploid wasps

ELZEMIEK GEUVERINK, MARLOES VAN LEUSSEN, LOUIS VAN DE ZANDE & LEO W. BEUKEBOOM

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Sex determination mechanisms are highly variable and can turnover rapidly. In haplodiploid systems fertilized diploid eggs develop as females, whereas unfertilized haploid eggs become males. Many haplodiploid insects are infected with endosymbionts that manipulate the sex determination instruction, leading to asexual development of diploid females from unfertilized eggs. *Wolbachia* bacteria appear to change the maternal provision of key sex determination genes to the eggs of two wasp species.

11:50

1.2 Insects for food: protein fractionation

C.M.M. LAKEMON, L. YI & M.A.J.S. VAN
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Tenebrio molitor protein was fractionated into a soluble and insoluble fraction in view of food applications. Digestibility was higher for the soluble fraction. The soluble fraction contained hemolymph protein (~12 kDa) and putative allergens (e.g., arginine kinase, ~30 kDa), the insoluble one mainly muscle proteins (e.g., actin, 30-50 kDa). Upon investigating the effect of pH and NaCl during extraction, we found minimum solubility at pH 4-6 and maximum solubility at pH 11.

2.2 Improving pest control efficiency: a modelling approach

WOUTER PLOUVIER & ERIC WAJNBERG
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One method of improving the cost-efficiency of biological control is by breeding selection programmes. Therefore, we first need a better understanding of the life-history traits of natural enemies and their effects on population dynamics and the level of pest suppression. To this end, we constructed an optimality model, based on principles in behavioural and population ecology, that allows for the identification of the key life-history traits that lead to the highest economic returns.

12:10

1.3 Influence of enzymatic browning on protein characteristics from insects

R.H. JANSSEN, C.M.M. LAKEMON, V.
FOGLIANO & J.-P. VINCKEN
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Insects are more acceptable as alternative protein source for Western consumers when not recognized as such. During protein extraction enzymatic browning occurs, caused by endogenous tyrosinase. The influence of tyrosinase on protein extraction from larvae of *T. molitor*, *A. diaperinus* and *H. illucens* was investigated. Soluble protein yield and purity decreased using heating for tyrosinase inhibition, while sulphite inhibition was similar to the protein extract without tyrosinase inhibition.

2.3 Polyploidy in *Nasonia* parasitoid wasps and biocontrol

KELLEY LEUNG, LEO W. BEUKEBOOM, LOUIS
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Nasonia vitripennis is a wasp that parasitizes blowflies. Polyploids are organisms that have more than the normal number of chromosome sets. *Nasonia* polyploids can be used to study how additional copies of certain genes can improve biocontrol agent performance, but not much is known about their basic biology. In my study I found that polyploids are larger than non-polyploids and are just as fertile. Male polyploids also live longer, but female polyploids do not live as long as normal females.

3.2 Circannual rhythm in diapause induction of *Nasonia vitripennis*

JELENA PRODIC
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Circannual rhythm in photoperiodically induced diapause has been detected in the jewel wasp *Nasonia vitripennis*. Potential differences in yearly periodicity also seem to be present between populations from different latitudes in Europe. The nature of the observed rhythmicity was investigated to see if it persisted due to endogenous or exogenous factors, and its possible association with circadian time-keeping system was examined as well.

4.2 *Doublesex* regulates sex specific pigmentation in the parasitic wasp, *Nasonia*

EVELINE C.VERHULST
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The conserved transcription factor *doublesex* (*dsx*) sets the switch to male or female development in all insects, but little is known of the downstream target genes that *dsx* regulates to shape sex-specific traits on a species-to-species basis. In *N. vitripennis*, *dsx* has been identified but functional analyses showing its role in regulating sex-specific traits were lacking. In this presentation I show our preliminary results of *dsx* RNAi knockdown resulting in the loss of a dimorphic trait.

3.3 Seasonal patterns of infestation by carob moth in pomegranate cultivars

SEYED ALI HOSSEINI, SEYED HOSSEIN
GOLDANSAZ, SEYEDEH MASOUMEH
FOTOUKKIAII & ASTRID T. GROOT
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Cracked pomegranate and cracking susceptible cultivars were infested by carob moth the most. However, this pattern changed during field seasons. At the start of season almost all cracked fruits were infested, while at the end of season infestation in uncracked fruits and cracking resistant cultivars increased. Since under simulated overwintering conditions survival of larvae in uncracked fruits was >3-fold higher than in cracked fruits, uncracked fruits appear to be chosen as overwintering site.

4.3 Persistence of lifespan variation in selected strains of *Drosophila melanogaster*

MARTIJN SCHENKEL
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Strains of *Drosophila melanogaster* were selected for either increased or decreased lifespan in studies on the evolution of aging. Since then, these strains have been maintained in the laboratory without selection. This relaxation period has lasted for between 15 and 25 years depending on the strain. These strains were tested to check whether between-strain differences in longevity were still present. Here, I report on my findings on the persistence of divergence in this life history trait.

12:30

1.4 Consumer acceptance of insects as food in The Netherlands

JONAS HOUSE

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This presentation outlines research with consumers of insect-based foods in The Netherlands. Three key arguments are made: (1) insect-based foods are evaluated by the same criteria as other foods (e.g., price, taste); (2) unless Western insect foods can fulfil these criteria, they will meet with limited success; and (3) consumer acceptance is not just a demand-side issue (i.e., trying to educate and convince consumers) but also a supply-side issue (i.e., tasty, accessible products needed).

2.4 Selective breeding of predatory mites: a challenge for biological control

SOPHIE LE HESRAN, MARCEL DICKE, TOM GROOT & MARKUS KNAPP

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The efficacy of biological control can be limited for many reasons, as unfavorable abiotic conditions for the natural enemy. The case of the predatory mite *Phytoseiulus persimilis* and its prey *Tetranychus urticae* is an example of adaptation to different climates between the pest and its predator. *T. urticae*, unlike *P. persimilis*, thrives in hot and dry conditions. The first aim of this study is to develop a more drought resistant strain of *P. persimilis*, by using selective breeding methods.

14:00

NEV Dissertatieprijs en lezing / NEV Dissertation award and lecture

*Invited Plenary Lecture***14:00****THEATRE AZURE**

3.4 Temperature-dependent phenology of *Campaea margaritaria* (Lepidoptera) derived from field data

HARRIE A.J. GOVERS
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A degree day model is presented for the calculation of flightpeak days of *C. margaritaria* (L.), widespread in The Netherlands. Observed peak days (1986-2015) were derived from the Noctua database, temperatures from KNMI weather station De Bilt and thermal requirements from mean year data. Accounting for deviations from the mean year the latter were used for the calculation of annual peak days with inaccuracies of 3-5 days on the average. Trends correspond to the observed ones.

4.4 Illuminating sexual trait decay under asexuality

A.A. KAMPFRAATH, T. DUDINK, K.
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After switching from sexual to asexual reproduction, males become redundant and therefore their sexual traits are predicted to decay by the consequences of genetic drift. The amounts of genetic material in spermatophores and their attractiveness to sexual females from males of two parthenogenetic and a sexual line of the springtail *Folsomia candida* were measured. Trait decay was detected in both asexual lines, although the degree to which they were deteriorated differed between the two.

NEV Dissertatieprijs en lezing / NEV Dissertation award and lecture

Invited Plenary Lecture

14:00

THEATRE AZURE

| 4:40

1.5 Cadmium, lead and arsenic uptake by insects

H.J. VAN DER FELS-KLERX, L. CAMENZULI, M.K. VAN DER LEE & D.G.A.B. OONINCX
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We studied the possible uptake of toxic elements by larvae of two insects species. Substrates were spiked with each of the three elements to three different levels each. Larvae were grown on the contaminated substrates. Lead and cadmium accumulated in black soldier fly larvae, and arsenic accumulated in yellow mealworm larvae. If insects are used as feed materials, attention should be paid to contamination of the substrates used for certain toxic elements.

| 5:00

1.6 Insects in pet foods?

GUIDO BOSCH
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Insects are considered to be a valuable protein source for the future. In this contribution, the application of insects in foods for pet dogs and cats is considered. These pets are valued family members and this anthropomorphism is an important concept for potential application of insect in pet foods. Safety, palatability and nutritional value are fundamental for all pet foods whereas therapeutic functionalities, naturalness and sustainability link to niche markets.

2.5 Using omnivorous predators for biological control of thrips and aphids

GERBEN J. MESSELINK, CHANTAL, M.J. BLOEMHARD, HANS HOOGERBRUGGE, JEROEN VAN SCHELT & ARNE JANSSEN
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A major benefit of omnivorous predators in biological control is their ability to establish in crops prior to pest invasions by feeding on plant-provided food sources. Our studies showed that combined inoculative releases of the omnivorous predators *Macrolophus pygmaeus* and *Orius laevigatus* are a good solution for controlling both aphids and thrips. They co-exist in one crop and complement each other in the control of both pests, but their behaviour in complex food webs needs further studies.

2.6 Promising new mirids for control of tomato pests, but safe?

VANDA H.P. BUENO & JOOP C. VAN LENTEREN
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During the past 20 years polyphagous mirid predators became popular biological control agents. This may seem surprising as they are also zoophytophagous. Two important European mirids used in bio-control can seriously damage plants and fruits. We are now evaluating three South American mirid predators which prey on a range of important tomato pests. Although all three mirids caused feeding rings on tomato fruits and leaves, and stung fruit, the injury did not affect fruit quality or quantity.

5.1 Light at a fixed time period after infection is needed for *Spodoptera exigua* MNPV-induced tree-top disease

YUE HAN, STINEKE VAN HOUTE, MONIQUE M. VAN OERS & VERA I.D. ROS
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Baculoviruses induce hypermobility and tree-top disease in their caterpillar hosts to enhance their transmission. Previously, we showed that the baculovirus SeMNPV induced tree-top disease at 3 dpi in *Spodoptera exigua* larvae and that light from above plays a key role in triggering this behaviour. Here we found that light was needed between 43-50 h post infection to induce tree-top disease. We also showed that light before this period did not affect the final positions where the larvae died.

5.2 Innate immunity in *Oncopeltus* eggs

REMY VAN DER HULST, CHRIS G.C. JACOBS, SOTIRIS MOUDOURIS, SIEGFRIED ROTH & MAURIJN VAN DER ZEE
 Biology, Leiden University / Entomology, Max Planck Institute for Chemical Ecology, Jena, Germany / Developmental Biology, University of Cologne, Germany, remydna@hotmail.com

An evolutionary novelty in insect eggs, the serosa, protects the embryo of the holometabolous beetle *Tribolium castaneum* against infection. The serosa is a unique insect extraembryonic zygotic epithelium, present during early egg development. To investigate whether the serosa has a protective role in other insects too, we studied the hemimetabolous bug *Oncopeltus fasciatus*. We show that the serosa provides the egg with an innate immune response until the embryo proper becomes immune competent.

6.1 Parasitoids can count: sensory basis of host discrimination in hymenopterans

JOOP C. VAN LENTEREN, JOOP J.A. VAN LOON, HANS SMID & SARA RUSCHIONI
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We know since 45 years that *Leptopilina heterotoma* uses its ovipositor to discriminate between parasitized and healthy *Drosophila* larvae, but how does it choose the 'best' host available. We made electrophysiological recordings of responses from a sensillum on the tip of the ovipositor by stimulating it with haemolymph of unparasitized, once and twice-parasitized *Drosophila* larvae and demonstrate for the first time that neural responses to these haemolymph samples differed significantly.

6.2 Consequences of extreme brain scaling in *Nasonia* parasitic wasps

JITTE GROOTHUIS, EMMA VAN DER WOUDE & HANS M. SMID
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The small parasitoid *Nasonia vitripennis* may vary 10-fold in body size. This leads to extreme scaling of its brain. In general, small animals have relatively larger brains than larger animals. However, small *Nasonia* wasps have smaller brains than expected, resulting in a brain of 0.01 mm³. Volumetric analyses revealed brain adaptations related to wasp size. In addition, small wasps showed worse memory performance. We discuss these neural and cognitive consequences in an ecological context.

15:40

1.7 Biotic and abiotic factors affecting Black Soldier Fly larvae

KAROL B. BARRAGAN-FONSECA, MARCEL DICKE & JOOP J.A. VAN LOON
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The Black Soldier fly (BSF) has been studied for its capability to convert organic waste to high-quality protein. Factors including quantity and quality of food, temperature, substrate moisture and/or larval crowding can affect BSF performance. This presentation provides information on biotic and abiotic conditions that affect the BSF body composition and performance, and identifies which knowledge is required to ensure more dependable yields of BSF-mass rearing.

16:00

1.8 From labscale to large scale rearing of Black Soldier Fly larvae

ARJAN BORGHUIS
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Research at HAS University of applied sciences shows how to rear and harvest Black Soldier Fly larvae efficiently on various diets. Using 4- to 5-day-old larvae, we determined growth, protein and fat content of larvae reared on various diets. Next we determined the selfharvesting efficiency of full-grown Black Soldier Fly larvae under elevated temperature, CO₂ and light intensity. Finally we determined growth and harvesting for large scale rearing.

7.1 Root beneficial endosymbionts impact plant-herbivore dynamics in tomato

TERESA QUIJANO, AXEL TOUW, ALEXANDER WEINHOLD, NICOLE VAN DAM & AINHOA MARTINEZ-MEDINA
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Root colonization by selected endophytic fungi might influence plant responses against attackers. Here we study the effect of two endophytic fungi *Rhizophagus irregularis* (an arbuscular mycorrhizal fungi) and *Trichoderma harzianum* on tomato plant defenses against the specialist herbivore *Manduca sexta*. The performance of the herbivore and the analysis of genes markers show advantageous partnership with these fungi for attacked plants via the enhanced of plant defenses.

7.2 Increased thrips resistance by coronatine-producing bacteria *Pseudomonas syringae* in tomato

GANG CHEN, ROCIO ESCOBAR-BRAVO, PETER KLINKHAMER & KIRSTEN LEISS
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Coronatine (COR) mimics jasmonic acid (JA) in activating the JA signaling pathway in plants. Therefore, COR-producing bacteria such as *Pseudomonas syringae* may enhance plant insect resistance. Inoculation of tomato plants with *P. syringae* or COR significantly reduced thrips feeding damage. While glandular trichome density was not affected by the treatments, the defensive enzymes PPO and WIP-II were significantly increased and metabolomic changes observed.

8.1 Flower morphology and abundance determine the structure of a generalized pollination network

SASKIA KLUMPERS

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Generalized species form the core of pollination networks and play a key role, determining their structure and stability. Understanding plant-pollinator interactions is crucial for the conservation of these communities. We analyzed the influence of flower morphology and abundance on pollinator choice and pollination community structure among a group of generalized plant species (Asteraceae). Our results indicate that pollinators forage more selective than expected by chance or morphological constraints.

9.1 Latitudinal diversity of *Culex pipiens* biotypes in different habitats in Europe

CHANTAL B.F. VOGELS, TIM W.R. MÖHLMANN, DIEDE MELSEN, GUIDO FAVIA, UNO WENNERGREN & CONSTANTIANUS J.M. KOENRAADT

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In this study we aimed to elucidate the relative abundance of *Cx. pipiens* biotypes and hybrids in three habitat types at three latitudes across Europe, using two different surveillance traps. From northern to southern latitudes there was a remarkable decrease of biotype *pipiens* and an increase of biotype *molestus*. Hybrids were found in all countries, but highest proportions were recorded in The Netherlands.

8.2 Modelling how competition between parasitoid species is shaped by herbivores

LIA HEMERIK, ASTRID POTIEK, TIBOR BUKOVINSZKY & ERIK H. POELMAN

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Competition among parasitoid species can be driven by indirect species interactions. We show in a data-based simulation study that the parasitoid *C. glomerata*, is better adapted than *C. rubecula* to locate its host in heterogeneous environments where non-hosts are present. In addition, non-host presence resulted in a reduced occurrence of multiparasitism and elimination of *C. glomerata*. Thus presence of trophically neutral species in communities may indirectly stabilize competitive interactions.

9.2 Vector competence of European mosquito populations for West Nile virus

CHANTAL B.F. VOGELS, GIEL P. GÖERTZ, GORBEN P. PIJLMAN & CONSTANTIANUS J.M. KOENRAADT

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Outbreaks of West Nile virus (WNV) have been limited to southern and central Europe. Lowered vector competence of mosquito populations, driven by lower temperatures, may explain the absence of outbreaks in northern Europe. Vector competence of northern and southern European *Culex pipiens* populations was compared at different temperatures. Both mosquito populations had similar vector competence, which increased with higher temperatures. Temperature is a key limiting factor for WNV transmission.

UES MSc Thesisprijs 2016

I.9 Exploration of the *Spodoptera exigua* larval brain

HANNEKE SUIJKERBUIJK

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In order to unravel the mechanisms underlying parasitic manipulation of *Spodoptera exigua* by *Autographa californica* multiple nucleopolyhedrovirus (AcMNPV) I studied the anatomy of the neuropils and serotonergic neurons in the 3rd instar (L3) *S. exigua* brain. A 3D model was created by using immunocytochemistry and image reconstruction software. I was able to describe neuropils, the serotonergic neurons, landmark fiber bundles and serotonin-innervated brain areas.

7.3 Flowering plants under attack: consequences for flower visitors

QUINT RUSMAN, DANI LUCAS-BARBOSA, MARCEL DICKE & ERIK H. POELMAN
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Flowering plants under attack by herbivores might change flower traits, leading to plant-mediated herbivore-flower visitor interactions. In this study, we tested whether a broad range of herbivores feeding on *Brassica nigra* affect interactions with flower visitors. We show that herbivore induction affects pollinator community composition (differently for above- and belowground herbivores), but not colonization, oviposition preference and performance of our floral antagonist, *Meligethes aeneus*.

posters

Neem: Mode of action on rose aphids (*Macrosiphum rosae*)

IMKE BARTELSMEIER

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Insecticides based on neem tree extracts do not provide a strong knock-down effect and their efficacy has to be evaluated in more detail. A summary of studies about the effect of a neem product on rose aphids (*Macrosiphum rosae*) is presented. NeemAzal®-T/S inhibited the population growth, led to delayed development and to higher mortality of young nymphs. Further, reproduction was reduced, if females grew up on treated plants. No effect was found on host plant choice, on feeding and on adult aphids.

Predictability of species performance under thermal stress

OSCAR FRANKEN, SUSANA FERREIRA, MILOU HUIZINGA, JACINTHA ELLERS & MATTY P. BERG

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Extreme climatic events, like heat waves, can have severe impacts on species and their interactions in a community if they differ in their ability to cope with heat. We used a trait-based approach to investigate the thermal sensitivity of species within a community, by measuring the thermal tolerance of individuals. We found that this trait was linked to performance and there were clear differences in tolerance between soil arthropod families, which can lead to altered species interactions.

Does bacterial diversity matter in plant-insect interactions?

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Soil bacterial diversity plays an important role for many ecosystem functions. However, its effects on plant performance and defence induction are poorly investigated. Here we present a study testing the influence of bacterial diversity on the induction of systemic resistance in *Arabidopsis thaliana* against the aphid herbivore *Myzus persicae*.

8.3 Combining empirical data and a model to study nematode-aphid interactions

W.H.G. HOL, C.E. RAAIJMAKERS, I. MONS, K.M. MEYER & N.M. VAN DAM
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Root-feeding herbivores can affect the performance of shoot herbivores, but the life-history parameters underlying the effects remain underexplored. Data from empirical experiments are used together with a model to investigate how two nematode species affected population growth of the aphid *Brevicoryne brassicae* on *Brassica nigra*. Relatively small differences in reproduction rate per female can yield a similar difference in aphid populations as found in the empirical experiments.

9.3 Bridge-vectors of primate diseases and the effect of mosquito host preference

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Mosquitoes are able to transmit a variety of diseases yet the vectors of cross-species disease transmission are unidentified. Whether the host preference of mosquitoes is influencing this cross-species transmission is largely unknown. We show, using samples collected from a field study in the Republic of Congo, that different mosquito genera have a diversity in host preference. Moreover, opportunistic mosquitoes are important candidate vectors in cross-species transmission of malaria species.

posters

Optimizing the yield of cricket farms in developing countries

G. VAN DUIJVENDIJK, J. CORNIELJE, J. VAN GINKEL, R. KIRSCHBAUM & W. VAN RAVENHORST
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Protein malnutrition is an important issue in developing countries. Insects are currently part of the human diet in Uganda during the rainy seasons. Cricket farms, however, could offer animal proteins year-through. The Flying Food Project has introduced cricket farms to Uganda. This study aimed to optimize the yield of cricket farms. Different experiments were conducted to optimize development rate, egg production, feed intake and mortality, with the use of locally abundant resources.

Host-foraging behaviour of 4th trophic level insects

LUCIA SALIS, T. COSTAZ, P. HOLLANDER, L. VAN HEUMEN, M. KOS & L.E.M. VET
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Hyperparasitoids play a major role in insect-plant community as they determine populations dynamics of their host species as well as the lower trophic levels. Yet, little is known on their life-histories and host-foraging behaviour. Here we present a study aimed to identify which odour cues hyperparasitoids use to locate their hosts and the role of learning in using this cues. Acquiring fundamental knowledge on their behaviour is the first step to develop a sustainable biocontrol program.

Does experience alter parasitism rate in *Trichogramma* parasitoid wasps?

S. CHATTINGTON & A. THIEL
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Despite being one of the most released biocontrol agents, the egg parasitoid *Trichogramma* remains to have varied success in the field. Laboratory strains reared exclusively on factitious hosts are often no longer as well suited or attracted to the native hosts in the field. *Trichogramma* display a certain capacity for learning, and in this study, lab-reared populations will be tested to determine if a single previous encounter of naturally occurring pest species increases parasitism efficiency.

Male nutrition affects female fecundity in a male-dimorphic mite

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In many species, males develop into either of two discrete morphs: majors or minors. Majors use physical weaponry to monopolize females. Minors, depending on their species, use a wider variety of methods to mate with females. We here tested for a difference in a male-dimorphic mite in the number of offspring produced by females when mated to either morph. We showed that female fecundity was not affected by male morph, but females mated to fed males did lay more eggs.

BINGO: Breeding Invertebrates for Next Generation BioControl

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BINGO is an Innovative Training Network that develops innovative research training to improve the production and performance of natural enemies in biological control by the use of genetic variation for rearing, monitoring and performance. BINGO's approach is multidisciplinary, encompassing a broad range of scientific disciplines, including the application of state-of-the-art genomic techniques in the field of biological control.

Oh brother, where art thou? – Kin recognition in parasitic wasps

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In biological pest management, parasitoid wasps of the genus *Bracon brevicornis* are used as natural antagonists against several crop pests. Different inbreeding avoidance strategies prevent inbreeding effects, which can lead to a serious loss of offspring. We found that female *B. brevicornis* are able to distinguish age-dependent between strangers and closely related males. As responsible detection mechanism we assume recognition of specific odour components or other olfactory interactions.

Effect of low temperature storage *Tenebrio molitor* on progeny number

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To assure the availability of sufficient number of beetles for mass rearing of the mealworm, adult beetles are stored at low temperatures (7 °C). The effects of low temperature storage on production is poorly described. By measuring mother survival, progeny number and progeny weight, it was shown that low temperature storage resulted in a decrease in production, because of increased mother mortality and reduced number of progeny. Weight of progeny was not affected.

Immune response in the embryo of milkweed bug *Oncopeltus fasciatus*

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The milkweed bug *Oncopeltus fasciatus* representing a basally branching insect was used to test whether Toll was recruited for dorsoventral patterning from an ancestral role in immunity. To characterize the immune response in *Oncopeltus* embryos, we plan to knockdown key components of Toll and Imd signaling and test by qPCR for embryonic expressions of antimicrobial peptides (AMPs), which were upregulated upon infection. Inhibition zone assays will be performed for maternal deposition of AMPs.

Programma 28e Nederlandse Entomologendag 16 dec 2016			
08:30	Registratie en koffie in ontvangstruimte		
10:00	Theatre Azure: Opening door voorzitter SETE, Plenaire lezing Dr. Paul Vantomme: <i>Opportunities and constraints of insects for food, feed and health care</i>		
11:00	KOFFIEPAUZE / POSTERSSESSIE IN ONTVANGSTRUIJTE		
ZAAL	Theatre Azure		
	Bach 1+2	Bach 3+4	Strauss I
	3. Ecology + Timing		
11:30	1.1 Oninck	2.1 Lommen	4.1 Geuvenik
11:50	1.2 Lakemond	2.2 Plouvier	4.2 Verhulst
12:10	1.3 Janssen	2.3 Leung	4.3 Schenkel
12:30	1.4 House	2.4 le Hesran	4.4 Kampfraath
12:50	LUNCHPAUZE		
14:00	Theatre Azure: Uitreiking NEV Dissertatieprijs + plenaire lezing door winnaar		
	5. Host-pathogen interactions		
14:40	5.1 Han	6.1 van Lenteren	9.1 Wöhlmann
15:00	5.2 v.d. Huls	6.2 Groothuis	9.2 Vogels
15:20	KOFFIEPAUZE / POSTERSSESSIE IN ONTVANGSTRUIJTE		
	8. Ecological species interactions		
15:40	8.1 Klumpers	9.1 Wöhlmann	9.1 Wöhlmann
16:00	8.2 Hemerik	9.2 Vogels	9.2 Vogels
16:20	8.3 Hol	9.3 Bakker	9.3 Bakker
16:40	BORREL / POSTERSSESSIE IN ONTVANGSTRUIJTE		

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11:00 KOFFIEPAUZE / POSTERSSESSIE IN ONTVANGSTRUIJTE

ZAAL Theatre Azure

1. Insects for food and feed

1.1 Oninck Sustainability of insect production

1.2 Lakemond Insects for food: protein fractionation

1.3 Janssen Enzymatic browning and insect proteins

1.4 House Consumer acceptance of insects as food

12:50 LUNCHPAUZE

14:00 Theatre Azure: Uitreiking NEV Dissertatieprijs + plenaire lezing door winnaar

Insects for food and feed - cont.

1.5 v.d. Fels Cd, Pb and As uptake by insects

1.6 Bosch Insects in pet foods?

15:20 KOFFIEPAUZE / POSTERSSESSIE IN ONTVANGSTRUIJTE

Insects for food and feed - cont.

1.7 Barragan Black Soldier Fly larvae performance

1.8 Borghuis Scales of rearing of Black Soldier Fly

1.9 UES-MSc Thesis Price Suijkerbuijk - *Spodoptera* larval brain

16:40 BORREL / POSTERSSESSIE IN ONTVANGSTRUIJTE

Bach 3+4

3. Ecology + Timing

3.1 Aerts

3.2 Prodic

3.3 Hosseini

3.4 Govers

Strauss I

4. Development + Life history

4.1 Geuvenik Endosymbiotic control of wasp sex determination

4.2 Verhulst *Drosophila* regulates sex specific pigmentation

4.3 Schenkel Persistence of life span variation in strains

4.4 Kampfraath Illuminating sexual trait decay under asexuality

6. Neurobiology

6.1 van Lenteren Sensory basis of host discrimination in parasitoids

6.2 Groothuis Consequences of extreme brain scaling in *Masonia*

9. Medical entomology

9.1 Wöhlmann Latitudinal diversity of *Culex pipiens* in Europe

9.2 Vogels WNV vector competence of European mosquitoes

9.3 Bakker Bridge-vectors of primate diseases

5. Host-pathogen interactions

5.1 Han Light and MNPV-induced tree-top disease

5.2 v.d. Huls Innate immunity in *Oncopeltus* eggs

8. Ecological species interactions

8.1 Klumpers Flower morphology and pollination network

8.2 Hemerik Modeling competition between parasitoids

8.3 Hol Modelling nematode-aphid interactions + data