Entomologie fonctionnelle et évolutive
Gembloux Agro-Bio Tech
Université de Liège

Des odeurs pour contrôler les insectes indésirables : Du laboratoire au terrain

Prof François VERHEGGEN
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Quatre projets de recherche pour quatre indésirables
Quatre « happy end » ?

La confusion sexuelle pour lutter contre la mouche du brou du noyer *Rhagoletis completa*

SENURA

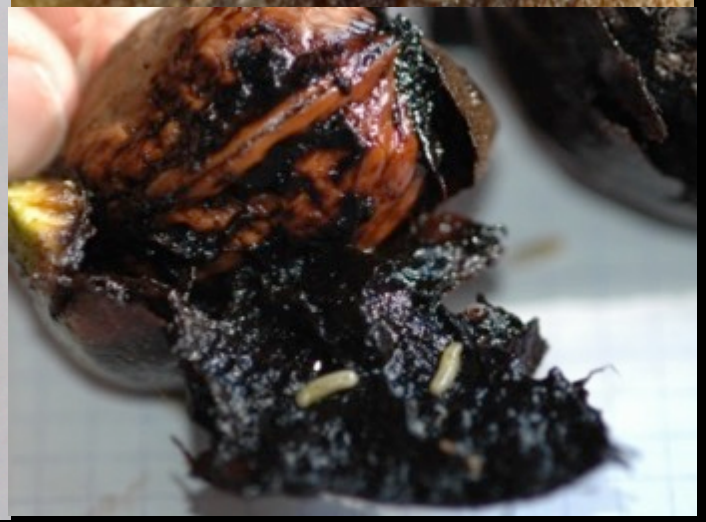
M2 Life Sciences

Mouche du noyer

Taupins

Coccinelles asiatiques

Pucerons



Mouche du noyer | Taupins | Coccinelles asiatiques | Pucerons

Research Article

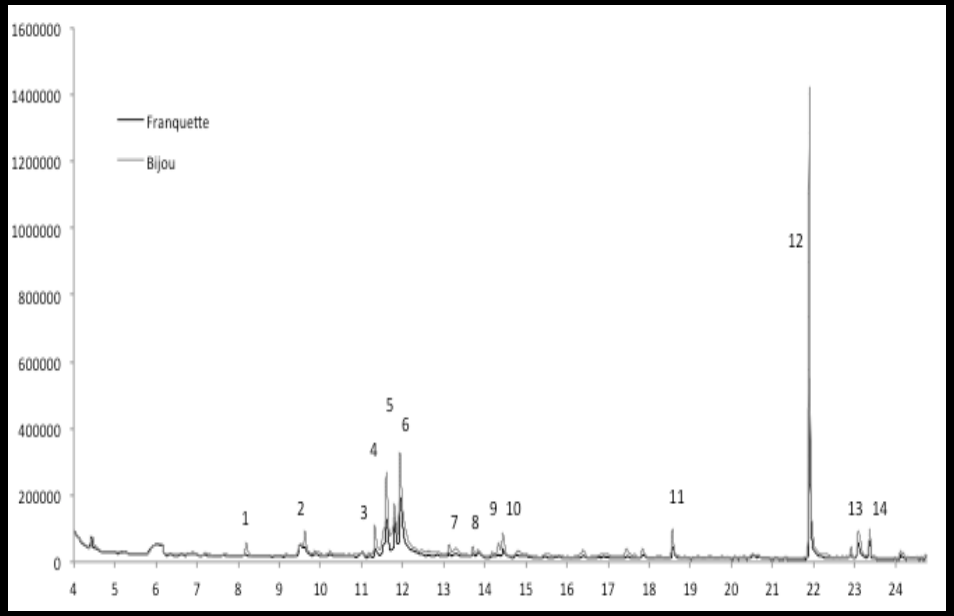
SCI

Received: 28 November 2016 Revised: 21 March 2017 Accepted article published: 3 April 2017 Published online in Wiley Online Library:

(wileyonlinelibrary.com) DOI 10.1002/ps.4584

Identification of walnut husk (*Juglans regia* L.) volatiles and the behavioural response of the invasive Walnut Husk Fly, *Rhagoletis completa* Cresson

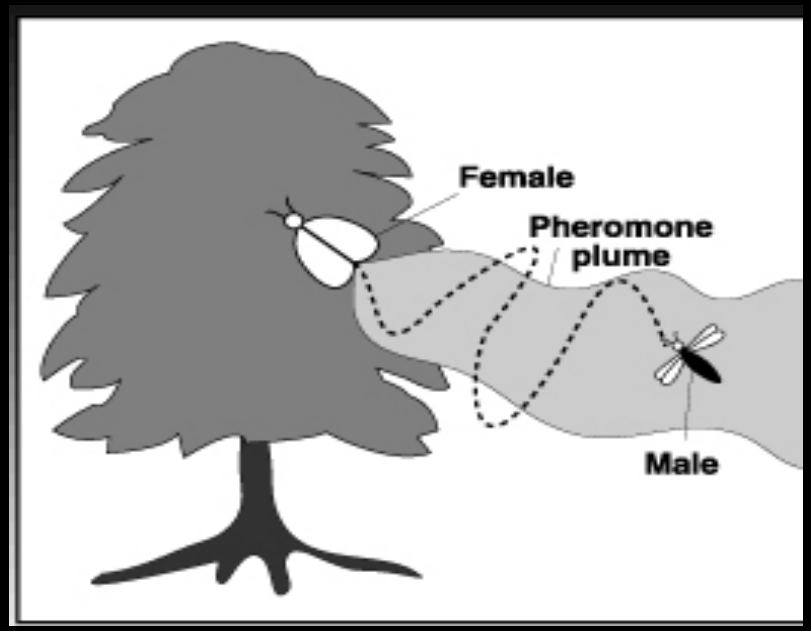
Landry Sarles,[a] Antoine Boullis,[a] Bérénice Fassotte,[a] Georges Lognay,[b] Agnès Verhaeghe,[c] Frédéric Francis[a] and François J Verheggen[a]*

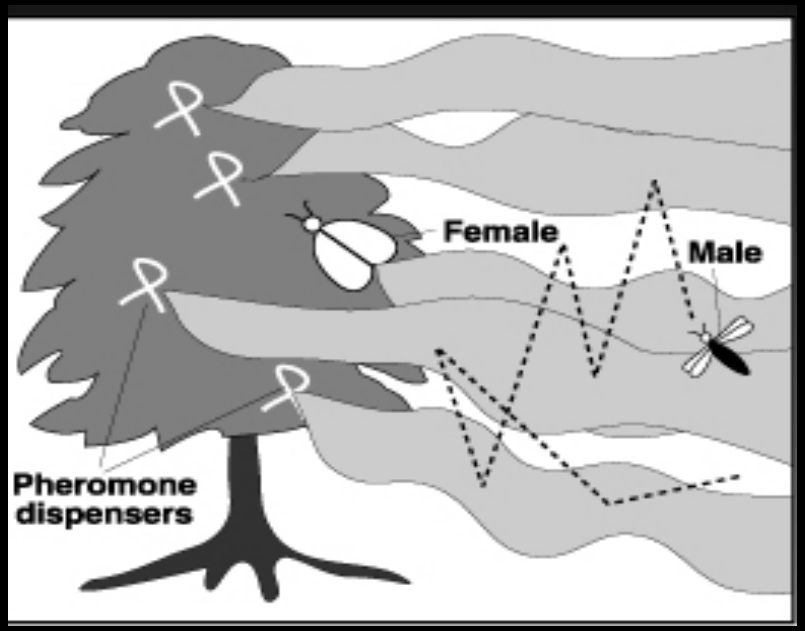


Mouche du noyer | Taupins | Coccinelles asiatiques | Pucerons

Mouche du noyer | Taupins | Coccinelles asiatiques | Pucerons

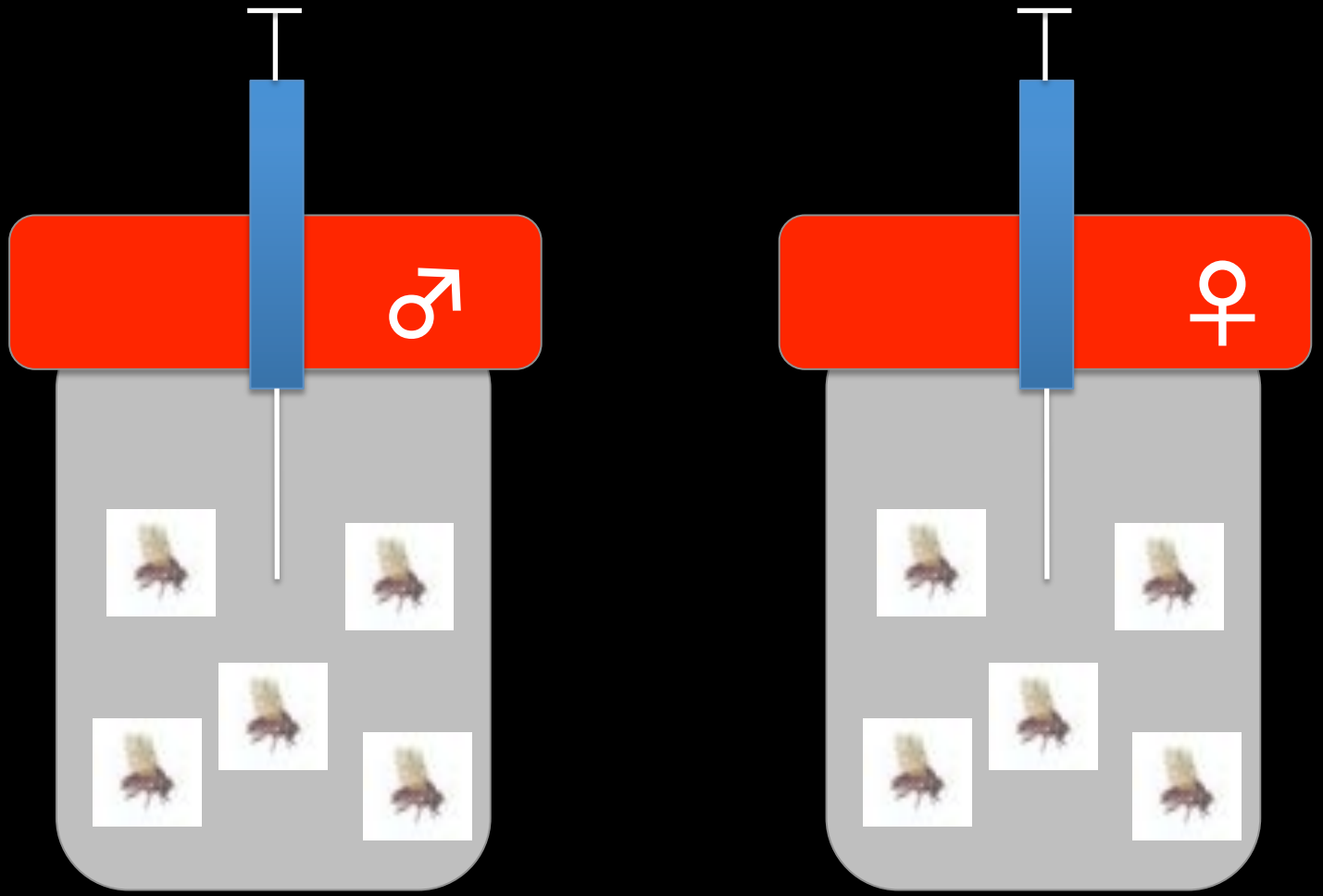
De la confusion sexuelle?





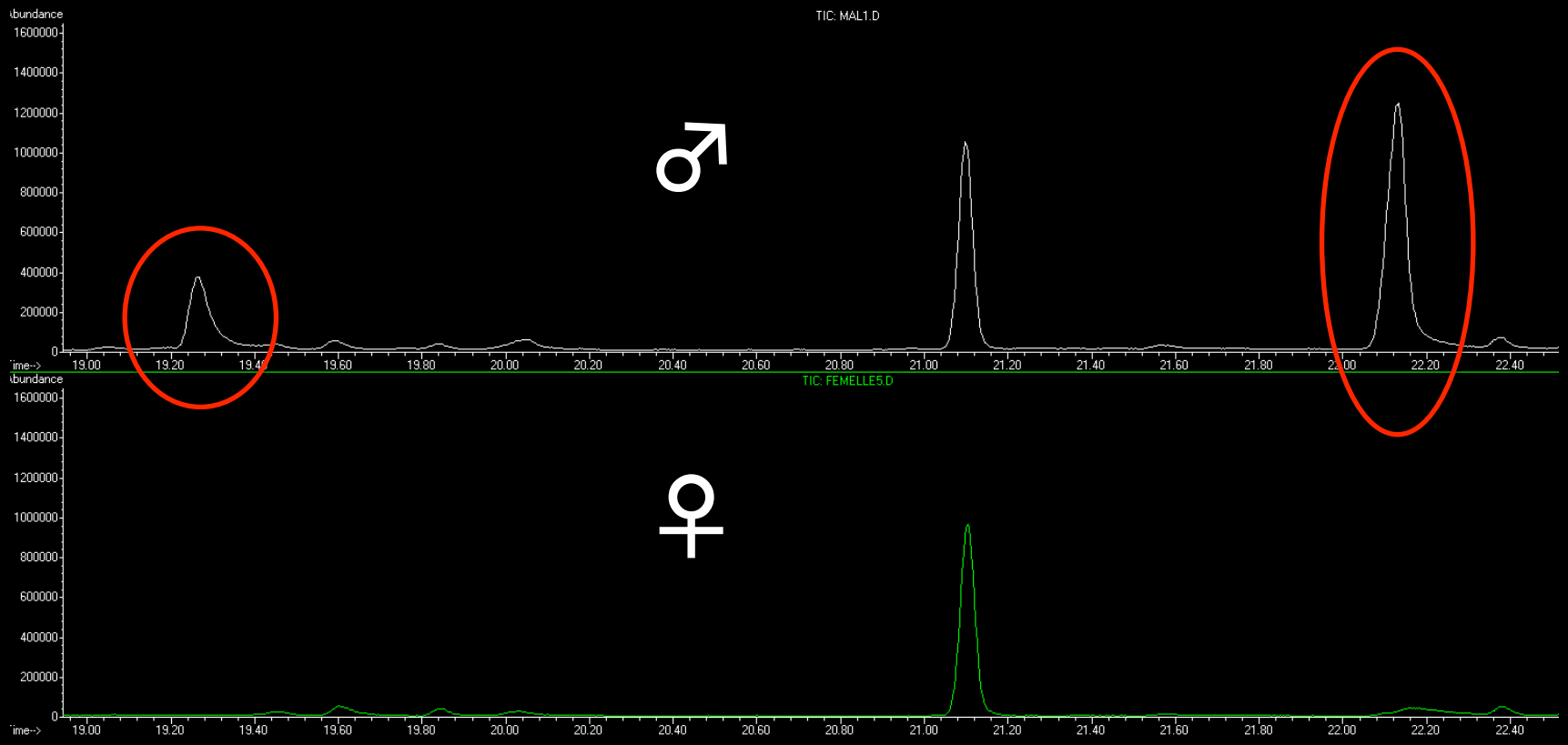
Mouche du noyer | Taupins | Coccinelles asiatiques | Pucerons

De la confusion sexuelle?

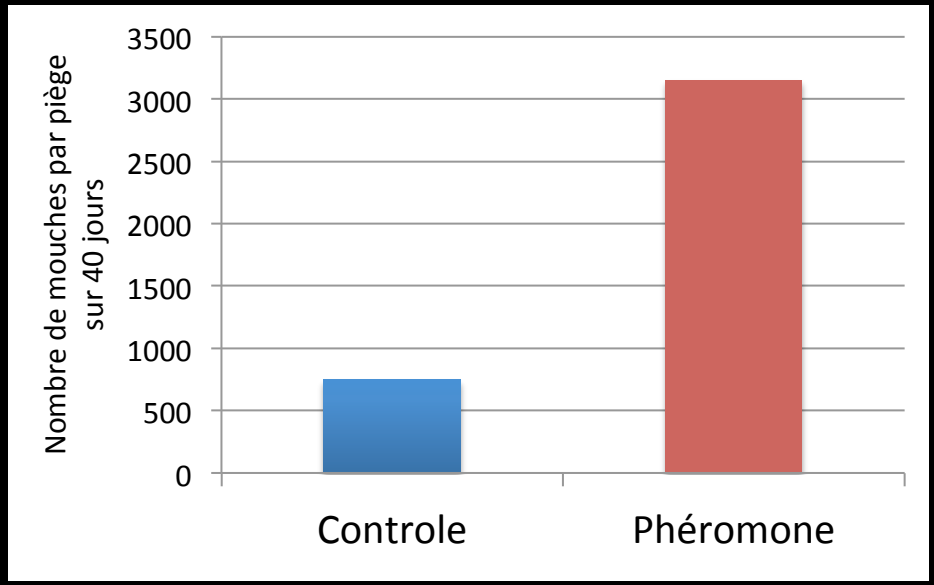


Mouche du noyer | Taupins | Coccinelles asiatiques | Pucerons

Identification d'une phéromone sexuelle

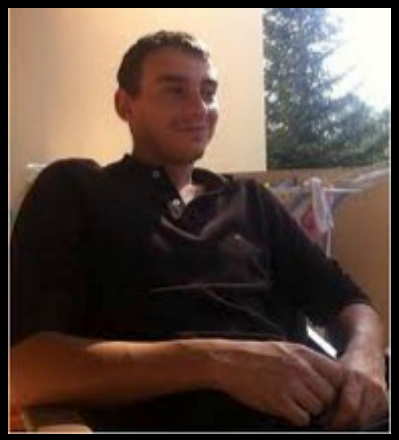


Mouche du noyer | Taupins | Coccinelles asiatiques | Pucerons



Mouche du noyer → Taupins → Coccinelles asiatiques → Pucerons

La suite …



Antoine Boullis

- Affiner l'identification de la phéromone sexuelle et l'encapsuler
- Mener des essais de confusion sexuelle sur le terrain

SENURA

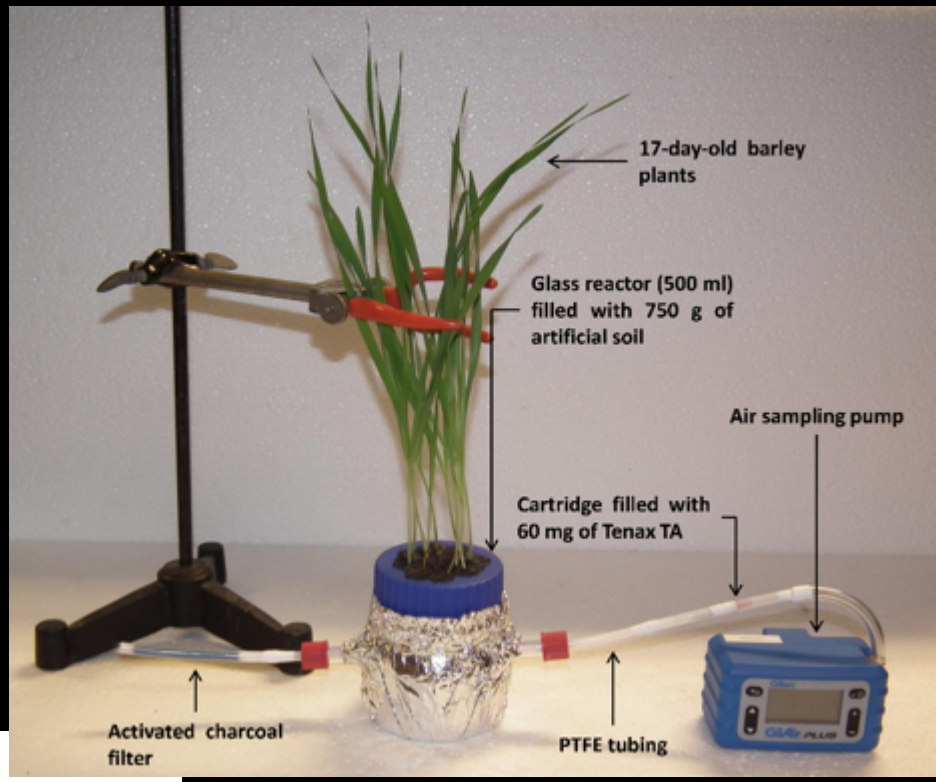
M2 Life Sciences

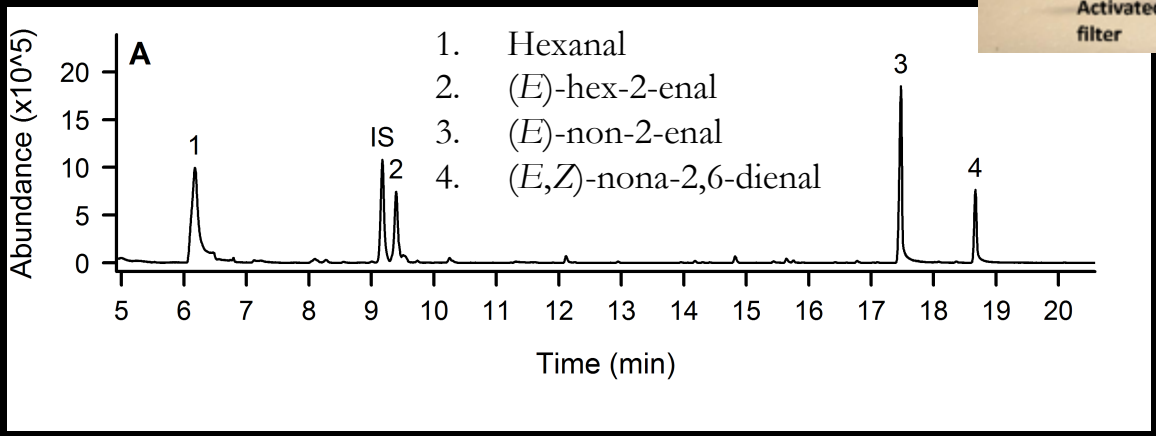
Des pièges attractifs et des variétés de maïs aux racines odorantes pour lutter contre les taupins

C-IPM Coordinated Integrated Pest Management in Europe

ARVALIS Institut du végétal

Mouche du noyer | Taupins | Coccinelles asiatiques | Pucerons





Mouche du noyer | **Taupins** | Coccinelles asiatiques | Pucerons

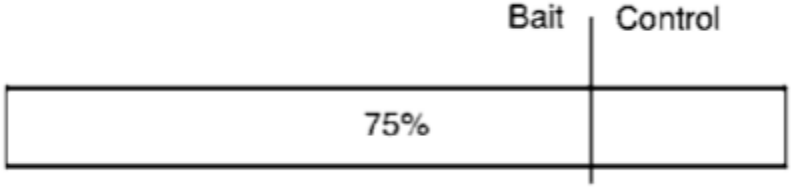
Sémiochimique

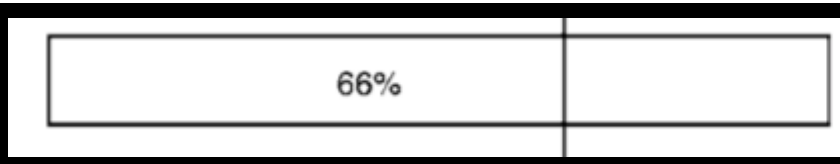
Introduction du taupin

Controle

Mouche du noyer | Taupins | Coccinelles asiatiques | Pucerons

Mouche du noyer | Taupins | Coccinelles asiatiques | Pucerons





P	Non-responding (%)
0,004***	10
0,032*	15,3

J Pest Sci
DOI 10.1007/s10340-016-0734-y

CrossMark

ORIGINAL PAPER

Foraging wireworms are attracted to root-produced volatile aldehydes

Fanny Barsics[1] · Benjamin M. Delory[2,4] · Pierre Delaplace[2] · Frédéric Francis[1] · Marie-Laure Fauconnier[3] · Éric Haubruge[1] · François J. Verheggen[1]

Mouche du noyer | Taupins | Coccinelles asiatiques | Pucerons

La suite ...

Diana La Forgia

- Développer un mélange attractif de sémiochimique fonctionnel sur le terrain
- Associer cet attractant à un microorganisme entomopathogène
- Identifier des variétés résistantes aux racines « malodorantes »

C-IPM Coordinated Integrated Pest Management in Europe

ARVALIS Institut du végétal

Des pièges attractifs pour piéger les coccinelles asiatiques

Wallonie domo bios

Mouche du noyer → Taupins → Coccinelles asiatiques → Pucerons

NUISANCE DOMESTIQUE – Invasions dans les habitations

NUISANCE AGRICOLE – Pertes économiques dans les vignobles

Mouche du noyer | Taupins | Coccinelles asiatiques | Pucerons

Bérénice Fassotte

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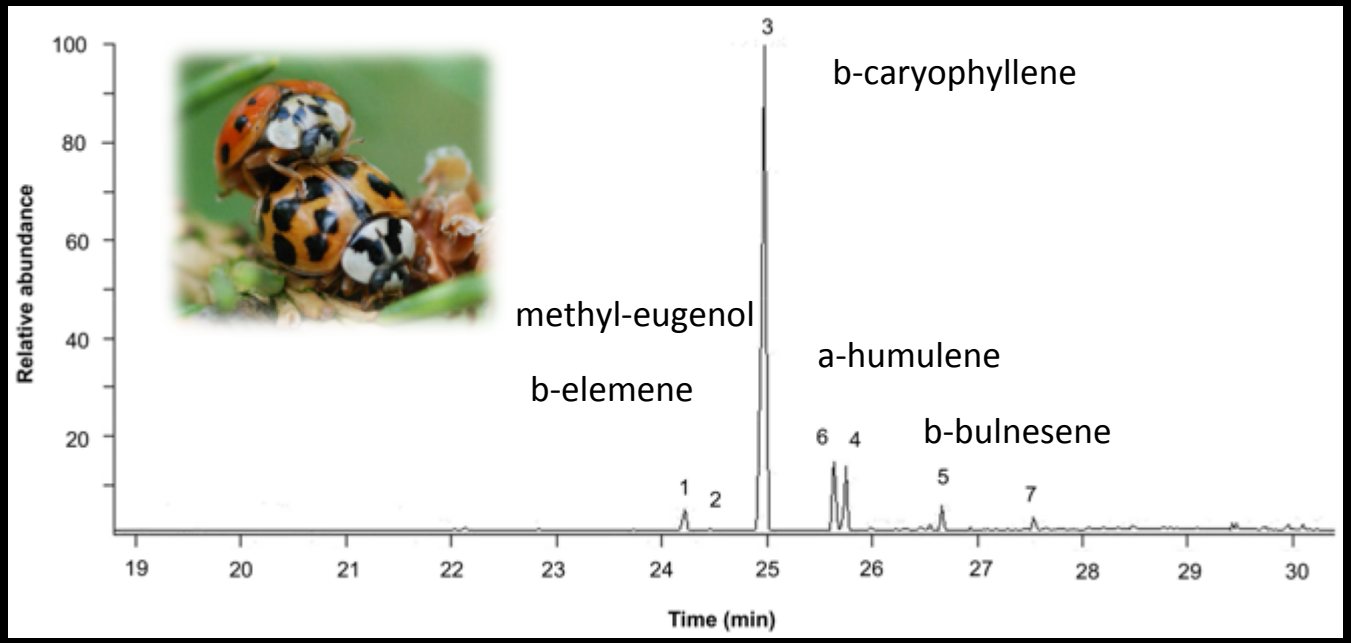


Bérénice Fassotte

PLOS ONE

RESEARCH ARTICLE

First Evidence of a Volatile Sex Pheromone in Lady Beetles

Bérénice Fassotte[1]*, Christophe Fischer[2], Delphine Durieux[1], Georges Lognay[2], Eric Haubruge[1], Frédéric Francis[1], François J. Verheggen[1]

1. Functional and Evolutionary Entomology, Gembloux Agro-Bio Tech, University of Liege, Gembloux, Belgium, 2. Unit of Analysis Quality and Risk, Laboratory of Analytical Chemistry, Gembloux Agro-Bio Tech, University of Liege, Gembloux, Belgium

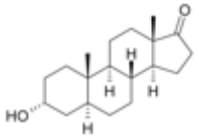
Mouche du noyer | Taupins | Coccinelles asiatiques | Pucerons

Mouche du noyer → Taupins → Coccinelles asiatiques → Pucerons

Programme First Entreprise : collaboration entre Domobios et l'ULg

ANNEE 2016

Facteurs chimiques



Facteurs physiques

Observation sur le terrain

Tests en laboratoire

Sondages chez les personnes envahies

Scan complet des stimuli attractifs
Mise au point d'un piège et validation de son efficacité en labo

Programme subsidié par un First Entreprise, Région Wallonne, BE

Mouche du noyer → Taupins → Coccinelles asiatiques → Pucerons

ANNEE 2017

Protection intellectuelle

Dépôt d'un brevet

Prototypage

Pièges pour l'int et l'ext

PoC market

Tests sur le terrain

Protection de nos innovations
Validation de l'efficacité sur le terrain

Mise sur le marché de pièges sans toxique

Programme subsidié par un First Entreprise, Région Wallonne, BE

Une phéromone d'alarme pour faire fuir les pucerons

Mouche du noyer | Taupins | Coccinelles asiatiques | Pucerons

Insect Biochemistry and Molecular Biology xxx (2012) 1–9

Contents lists available at SciVerse ScienceDirect

Insect Biochemistry and Molecular Biology

journal homepage: www.elsevier.com/locate/ibmb

Review

Aphid alarm pheromone: An overview of current knowledge on biosynthesis and functions

Sophie Vandermoten[a,*], Mark C. Mescher[b], Frédéric Francis[a], Eric Haubruge[a], François J. Verheggen[a]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La suite ...

nature COMMUNICATIONS

OPEN

Received 30 Nov 2010 | Accepted 11 May 2011 | Published 14 Jun 2011

DOI:10.1038/ncomms1347

Microorganisms from aphid honeydew attract and enhance the efficacy of natural enemies

Pascal D. Leroy[1], Ahmed Sabri[2], Stéphanie Heuskin[3], Philippe Thonart[2], Georges Lognay[3], François J. Verheggen[1], Frédéric Francis[1], Yves Brostaux[4], Gary W. Felton[5] & Eric Haubruge[1]

MICROBIAL ECOLOGY

Bacterial volatiles give the game away

Aphids are a major crop pest, but chemical pesticides lead to the emergence of resistant organisms, and biological control can be hampered by the natural dispersal of many aphid predators. When aphids feed on plant phloem sap they excrete honeydew, a complex mixture of sugars, amino acids, lipids and organic acids that can serve as a growth medium for bacteria. Honeydew also emits volatile compounds that are thought to act as kairomones, which can attract predators to infested plants. Now, Leroy *et al.* show that, surprisingly, several of these volatiles are produced by an aphid-associated bacterium that can be isolated from honeydew.

The authors first used gas chromatography–mass spectrometry to identify the volatiles that are emitted from honeydew of the pea aphid, *Acyrthosiphon pisum*, finding 15 different molecules in total. Because bacteria can produce volatiles when metabolizing organic products, the authors then tested the honeydew flora for the presence of bacteria. *Staphylococcus sciuri*, which had previously been found in the gut of laboratory strains, was identified in honeydew of both laboratory and natural pea aphid clones. To determine whether this bacterium is the source of honeydew volatiles, the authors reinoculated sterilized honeydew with *S. sciuri*. Of the volatiles that were identified in the crude aphid honeydew, nine were found in the reinoculated sample but not in the sterile honeydew, indicating that they are produced by *S. sciuri*.

The hoverfly *Episyrphus balteatus* is considered to be one of the most abundant natural aphid predators; the adults sense volatiles to help locate prey-infested plants as sites for oviposition (egg laying), and the larvae feed on aphids. The authors carried out wind tunnel assays to test the effect of the bacterially produced volatiles on this predator: plants at one end of the tunnel were sprayed with a honeydew sample, and hoverfly movement from the other end of the tunnel towards the plants was monitored. Sterile honeydew had no effect, but crude and reinoculated honeydew attracted hoverflies to the plants. Moreover, both samples stimulated hoverfly oviposition to a similar extent as aphid infestation. Of the individual bacterially derived honeydew volatiles, 3-methylbutanoic acid was found to be an attractant, and 3-methyl-2-butenal and 2-methylbutanoic acid were shown to be both attractants and oviposition stimulators. Similar effects on hoverfly movement were seen in the greenhouse and the field using medium from *S. sciuri* cultures as an attractant.

This insight into an unusual predator–prey relationship occurring between hoverflies and aphids, in which the prey position is betrayed by a prey-associated bacterium, could be used to greatly improve the efficacy of biological control methods. Why aphids retain their association with such a bacterium remains unclear, but one possibility is that *S. sciuri* is obtained from the plant as part of an elaborate plant defence mechanism.

Lucie Wootton

ORIGINAL RESEARCH PAPER Leroy, P.D. *et al.* Microorganisms from aphid honeydew attract and enhance the efficacy of natural enemies. Nature Commun. 2, 348 (2011)

Nature Reviews Microbiology 2011

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Des odeurs pour contrôler les insectes indésirables : Du laboratoire au terrain

Prof François VERHEGGEN
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