CURRICULUM VITAE

Prof. Dr. Felix Wäckers

Address

Biobest
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PROFESSIONAL EXPERIENCE:

Since 01.10.2009. Director R&D Biobest Belgium

Since 01.10.2005. Full Professor and until 1.10. 2009 Director of the Centre for Sustainable Agriculture, Lancaster University, Lancaster, UK.

1.1.2000 – 01.10.2005: Senior Researcher at the Center for Terrestrial Ecology at the Netherlands Institute of Ecology. Focus on conservation biological control; insect food ecology; plant defense; risk assessment of transgene crops.

1.3.2000 – 1.3.2003 Academy Researcher for the Royal Dutch Academy of Sciences. Conflicts and trade-offs in insect-plant interactions.

1.10.1993 – 1.1.2000: Assistant Professor at the Institute of Plant Sciences, Federal Institute of Technology (ETH) Zürich: Focus on the role of functional biodiversity in sustainable agriculture; biological control; sensory- and food ecology of insect parasitoids.

1991 - 1993: Research Entomologist, Depart of Entomology, Wageningen Agricultural Univ. Multi-trophic interactions between plants, herbivores and their parasitoids.

1991 - 1992: Plant Protection Specialist, Dutch Plant Protection Service, Wageningen (50% part-time). Developing legislation for the registration of biological control agents; Supporting the registration process of three microbial plant protection products.

1990 - 1991: Research Entomologist, USDA-ARS, Insect Biology and Population Management Research Lab, Tifton, GA, USA. Developing strategies for the use of semiochemicals to support biological control of *Heliothis* spp.; Field studies on how the composition of undergrowth vegetation affects biological control of cantaloupe pests.

1989 - 1990: Plant Protection Specialist, Dutch ministry of Environment, Leidschendam. Production of an investigative report on the status of biological and integrated pest management in the Netherlands.

1988 - 1989: Research Entomologist, USDA-ARS, Insect Biology and Population Management Research Lab, Tifton, GA, USA. Strategies to enhance the efficacy of parasitoids in controlling *Heliothis* spp.

ACADEMIC RECORD:
1988 - 1993 Agricultural University, Wageningen, the Netherlands. PhD on the subject of 'Multisensory orientation by hymenopterous parasitoids'.

1986 - 1988 Agricultural University, Wageningen, the Netherlands. Master of Science in Entomology, Phytopathology and Extension Science (Knowledge and Technology Transfer).

PROFESSIONAL ACTIVITIES

Courses Taught

1993-2000 *ETH Zürich, Switzerland*

- 1993-2000 Insect Ecology (MSc course Biology and Agronomy)
- 1994-2000 Tropical Entomology (bi-annual MSc course Agronomy)
- 1994-2000 Participation (50%) in Labcourse Ecophysiology (MSc level Biology)
- 1999 Postgraduate course (summerschool), University of Würzburg.
- 2000-2005 *NIOO-CTE, Heteren, the Netherlands*
  Field ecology (three weeks field course for students Biology of the University Utrecht).
- Since 2005 *Lancaster University*
  MSc course 'Agriculture and Climate Change'
  Participated in MSc course 'Trends in Environmental Biology'

Participation in postgraduate courses at Wageningen University, University of Bayreuth, University of Neuchatel, and the Università della Basilicata Potenza, Italy.

Projects Supervised

- Postdocs Dr. Erich Mitter, Dr. Jörg Romeis, Dr. Martijn Bezemer, Dr. Erick Campan, Dr. Paul van Rijn, Dr. Karin Winkler, Dr. Cristina Faria, Dr. Mor Salomon-Botner, Dr. David George
- PhD Students
  ◦ Sven Bacher. Vibrational signals in a leafminer parasitoid system: the sensory ecology of a leafminer in a tritrophic context.
  ◦ Hedi Otten. Vibrational sounding: a sophisticated host-searching strategy of the pupal parasitoid *Pimpla turionella*.
  ◦ Kristina Schmale. Biological control of the bean weevil, *Acanthoscelides obtectus*, by a hymenopteran parasitoid, as part of an IPM system.
  ◦ Sabine Fischer. How parasitoids use vibrational sounding and vision in multisensory location of their concealed pupal hosts.
  ◦ Karin Winkler. Strategic Use of Nectar Sources to Boost Biological Control (Wageningen University)
  ◦ Petra Hogervorst. Transgene Product in Honeydew: Estimating Risks for Non-Target Insects (FAL Reckenholz, CH)
  ◦ Ines Vollhardt. Survival of natural enemy populations in simple and complex landscapes (University of Göttingen)
  ◦ Hichem Azzouz. Risques d'exposition et effets potentiels d' inhibiteurs de protéases sur des parasitoïdes de pucerons. (University of Amiens)
  ◦ Cristina Faria. The nutritional value of aphid honeydew for parasitoids of lepidopteran pests. (University of Neuchatel)
  ◦ Nora Lawo Compatibility of *Bt*-Transgenic Crops with Biological Control (FAL Reckenholz, CH)
  ◦ Georgina Key. Optimizing cross-crop benefits; Lancaster University
  ◦ Mark Ramsden. Identification of resource bottlenecks in agro-ecosystems and quantification of the impact on biological pest control. Lancaster University.
  ◦ Alistair Campbell. Stacking ecosystem services: The response of pollinators and natural enemies to flower mixes. Lancaster University

- Twenty six MSc Research Projects (4-8 months)

Patents:

- 60/195,218. Utilization of invertebrate learning for flexible and sensitive monitoring of chemicals
- PCT/EP2010/057508. Hive mounted disseminator device
- Utilization of invertebrate learning for the detection of concentration thresholds of volatile chemicals (submitted, May, 2010)

Symposia organized

- "Inducible Plant Responses and its Impact on Biological Control of Plant Pests". Session at the 3rd International Symposium on Biological Control of Arthropods. Christchurch, New Zealand, 8-13 February 2009 (Together with Marco D'Allesandro)
- "Chemical Approaches to Parasitoid Behavioural Ecology" BEPAR Workshop, An ESF Science Meeting September 2008 (together with Ian Hardy)
- "Novel tools to assess impacts of functional biodiversity" IOBC-WPRS working group Landscape Management for Functional Biodiversity, Bordeaux, France 2008.
- "Elucidating Plant/Herbivore/Parasitoid Interactions: A Forty-Year Report" Symposium at the Entomological Society of America 2007. (together with Prof Jim Tumlinson)
- "Bugs did it first: insect-inspired technology". Program symposium. Entomological Society of America 2006. (together with Dr. Karen Kester).
- "Nutrional Ecology of Biological Control Agents" Session at the International Symposium on the Biological Control of Arthropods, Davos, Switzerland 2005.
- Measuring and Analyzing Dispersal. Session at the International Symposium 'Measuring Behaviour 2005', Wageningen, the Netherlands 31.08.2005 (together with Dr Roel Potting).
- "Bioindicators and Biosensors". NIOO Symposium, Heteren 19.11.2001.
- "The Effect of Plant-Derived Food Supplements on Tri-Trophic Interactions", at the XXI International Congress of Entomology 20.8-26.8.2000, Iguassu Falls, Brazil (together with Dr. P.C.J. van Rijn).
- Meeting of the IOBC WPRS study group "Integrated Protection of Stored foodstuffs and other Commodities", ETH Zürich, 31.8 - 2.9.97.
- "Do Herbivore-Damaged Plants Actively Recruit Natural Enemies" 15.12.1993 ESA National Conference, Indianapolis, USA. (together with Dr. T.C.J. Turlings)
- "Guidelines for the Registration of Biological Control Agents", 13.5.1992, IAC, Wageningen (under the auspices of the Dutch Ministry of Agriculture).

Grants acquired

- Kleijn, D., Biesmeijer, J.C., Wäckers, F.L. (2012). Linking resource availability to pollinator diversity and pollination services in agricultural landscapes. NWO, €162.000
- Wäckers, F.L. (2010). Stacking ecosystem services: The response of pollinators and natural enemies to flower mixes. Syngenta/BBSRC Industrial Case studentship £80K.
- Wäckers, F.L., Binley, A., Frogbrook, Z. (2010) How do trees influence soil permeability? Species differences and the underlying mechanisms effecting permeability change. BBSRC Industrial Case studentship £74K.
- Wäckers (2009) Identification of resource bottlenecks in agro-ecosystems and quantification of the impact on biological pest control. BBSRC Industrial Case studentship £74K.
- Wäckers, F.L., Croft, P., Northing, P. (2008). Perennial field margins with combined agronomical and ecological benefits for vegetable rotation schemes (Defra HortLINK). £1.480K
- Romeis, J. & Wäckers, F.L. (2008). Interactions between genetically engineered and inherent plant defence mechanisms – implications for non-target arthropods. Swiss National Fund, CHF 233K

- Salomon-Botner, M. & Wäckers, F.L. (2008). Catering to omnivore nutrition as a tool to optimize biological control. Royal Society, Newton International Fellowship. £160K
- Wäckers, F.L. Wilby A (2008). Cross-crop benefits: developing crop combinations to promote conservation biological control in horticulture. HDC Studentship £61,650
- Wäckers, F.L. (2007) Using wasps for the detection of boar taint. Subcontractor to Norwegian Institute for Food Research MATFORSK €23.000
- Van de Wiel, D. and Wäckers, F.L. (2006) Using wasps for the detection of boar taint Netherlands Ministry of Agriculture € 100.000
- Wäckers, F.L. (2006). Incorporating biodiversity in conventional fruit production. Ministry of Environment (VROM) € 205.000
- Faria, C., Romeis, J., and Wäckers, F.L. (2006). Insect-resistant transgenic plants: Interactions between transgene and inherent plant defense mechanisms. Postdoc grant Swiss National Fund. € 52.000
- Wäckers, F.L. van Alebeek, F. and den Belder, E. (2004). Functional Agrobiodiversity: Using non-crop elements to enhance sustainable agricultural production. Netherlands Ministry of Agriculture (LNV). € 260.000
- Wäckers, F.L. (2003). Designing field borders to enhance biological control of aphid pests. Netherlands Cooperation of Vegetable Producers. € 35.000
- Hogervorst, P., Romeis, J. and Wäckers, F.L. (2003). Transgenic snowdrop lectin in honeydew: estimating risks for non-target insects. 3 year PhD project. Schweizer Nationalfond. SFr. 160.000,- (€ 102.000)
- Wäckers, F.L. (2003). Using Parasitic Wasps as Biosensors for the detection of TNT (VESPA). TNO funding, € 15.000.
- Campan, E. and Wäckers, F.L. (2002). Non-target risks of honeydew from transgenic plants. Postdoc grant Swiss National Fund. € 45.000
- Hogervorst, P., Romeis, J. and Wäckers, F.L. (2002). ESF Scientific Programme on the Assessment of Impacts of Genetically Modified Plants (AIGM). € 30.000
- Kaiser, L and Wäckers, F.L. (2001). Food foraging by parasitoids as a route of exposure to insecticidal compounds: new methods for risk assessment. European exchange grant (van Gogh). € 10.000
- Winkler, K., van Lenteren, J.C., Wäckers, F.L. (2000). Functional Biodiversity: Strategic use of nectar and pollen sources to boost biological control. 4 year PhD project. Bosch Foundation. €115.000
- Wäckers, F.L. (1999). Extrafloral nectar in a tri-trophic context. Royal Dutch Academy of Science Research Grant. DFl. 360.000 (€ 163.000)
- Romeis, J. and Wäckers, F.L. (1998). Selective Food Resources: A Novel Approach to Improve Natural Control of Insect Pests. One year Postdoc Grant. Deutscher Akademischer Austauschdienst, Berlin. DM 60.000,-
- Wäckers, F.L. and Dorn, S. (1997). Protection of grain legumes by integrated biological means. 3 year PhD Project. Zentrum Internationale Landwirstchaft, Zürich, Switzerland. SFr. 195.000,-
- Ignacimuthu, S., Wäckers, F.L. and Dorn, S., (1997). Preventing post harvest losses in grain legumes using Integrated Pest Management. Novartis Foundation. SFr 40.000,-
- Wäckers, F.L. and Dorn, S. (1996). Energetic requirements and energy intake of *Cotesia glomerata*, a parasitic wasp of cabbage pests. 3 year PhD project. Schweizer Nationalfond Projekt Nr. 31-45917. SFr. 120.000,-

Editorships

- Subject editor *Biological Control* (2004-2010)
- Scientific Advisory Board *Journal of Applied Entomology*
- Editorial Board *Biological Control*
- Editorial Board *Open Entomology Journal*
- Editorial Board *Open Access Journal Insects*

PUBLICATIONS (2010-2013)

Peer reviewed journals

1. Balzan, M., Wäckers, F.L. (2013) Adult feeding by *Tuta absoluta* and its parasitoid *Necremnus artynes*. Biological Control (in press)
2. Hagenbucher, F., Wäckers, F.L. and Romeis J. 2013 Does Induced Insect-Resistance in Cotton Interfere with Aphid Parasitoids? Biology Letters (submitted)
3. Mommaerts, V., Wäckers, F.L., Smagghe, G. (2013) Assessment of gustatory responses to different sugars in harnessed and semi-free moving bumblebee workers (Bombus terrestris)
4. Meeus, I., Mommaerts, V., Billiet, A., Mosallanejad, H., Van de Wiele, T., Wäckers, F.L., Smagghe, G. Assessment of mutualism between *Bombus terrestris* and its microbiota by use of microcolonies. Apidology (submitted)
5. Tena, A., Pekas, A., Wäckers, F.L., Urbaneja A. (2013) Energy reserves of parasitoids depend on honeydew from non-hosts. Ecological Entomology
6. Hagenbucher, S., Olson, D.M., Ruberson, J.R., Wäckers, F.L., and Romeis, J. (2013). Resistance mechanisms against arthropod herbivores in cotton and their interactions with natural enemies. Crit. Rev. Plant Sci. (invited, currently under review).
7. Hagenbucher, S., Wäckers, F.L., Wettestein, F.E., Olson, D.M., Ruberson, J.R., and Romeis, J. (2013). Pest tradeoffs in technology: Reduced damage by caterpillars in Bt cotton benefits aphids. Proc. Roy. Soc. B (accepted).
8. Whitehorn, P.R., O'Connor1, S., Wäckers, F.L. and Goulson, D. (2012) Neonicotinoid pesticide reduces bumblebee colony growth and queen production. Science
9. Harvey, J.A, Cloutier, J., Visser, B. Ellers, J., Wäckers, F.L. and Gols, R. (2012) The effect of different dietary sugars and honey on longevity and fecundity in two hyperparasitoid wasps. Journal of Insect Physiology 58: 816-823.
10. Put, K. Bollens, T., Wäckers, F.L., Pekas, A. (2012). Type and spatial distribution of food supplements impact population development and dispersal of the omnivore predator *Macrolophus pygmaeus* (Rambur) (Hemiptera: Miridae). Biological Control 63:172-180.
11. Olson, D., Wäckers, F.L., Haugen, J-E. (2012). Threshold Detection of Boar Taint Chemicals Using Parasitic Wasps. Journal of Food Science 77:356-361.
12. Romain, C., David, G., Wackers, F.L. (2012). Selection of floral resources to optimise conservation agriculturally-functional insect groups. Journal of Insect Conservation
13. Dieckhoff, C. Theobald, J.C., Wäckers, F.L. Heimpel, G.E. Egg load dynamics and the risk of egg and time limitation in the soybean aphid parasitoid *Binodoxys communis* in the field. Ecological Entomology (submitted)
14. Makol, J., Arijs, Y., Wäckers, F.L. 2012. A new species of *Balaustium* von Heyden, 1826 (Acari: Actinotrichida, Erytraeidae) from Spain. Zootaxa 3178:1-21.
15. Campbell , A.J., Biesmeijer, J.C., Varma, V., Wäckers, F.L. (2012) Realizing multiple ecosystem services based on the response of three beneficial insect groups to floral traits and trait diversity. Basic and Applied Ecology 13:363-370.
16. Géneau, C. E., Wäckers, F. L. Luka, H. Daniel, C. and Balmer O. (2011). Selective flowers to enhance biological control of cabbage pests by parasitoids. Basic and Applied Ecology 13:85-93.
17. Olson, D.M., Wäckers, F.L., F. Haugen, J.E. Boar taint threshold detection using parasitic wasps. Journal of Food Science 77:356-361
18. Andersson, P., Sadek M., Hansson B.S, Wäckers, F.L. (2011). Root feeding affects oviposition and foraging behaviour of an aboveground herbivore. Behavioral Ecology 22:1272-1277
19. Wäckers, F.L., Olson, D.M., Rains, G.C., Lundby, F., Haugen, J.E. (2011). Boar Taint Detection Using Parasitoid Biosensors. Journal of Food Science, 76:41-47.
20. Tompkins, J. Wratten, S.D., Wäckers, F.L. (2010). Nectar to improve parasitoid fitness in biological control: does the sucrose:hexose ratio matter? Basic and Applied Ecology 11:264-271.
21. Vollhardt, I.M.G., Bianchi, F.J.J.A., Wäckers, F.L., Thies, C., Tscharntke, T. (2010) Nectar versus honeydew feeding by aphid parasitoids: does it pay to have a discriminating palate? Entomologia Experimentalis et Applicata 137:1-10.

22. Vollhardt, I.M.G., Bianchi, F.J.J.A., Wäckers, F.L., Thies, C., Tscharntke, T. (2010). Spatial distribution of flower vs. honeydew resources in cereal fields and its impact on aphid parasitism. Biological Control 53:204-213
23. Lawo, N.C., Wäckers, F.L., Romeis, J (2010). Characterizing indirect prey-mediated effects of a Bt crop on predatory larvae of the green lacewing, *Chrysoperla carnea*. Journal of Insect Physiology 56:1702-10.
24. Winkler, K. Wäckers, F.L., Termorshuizen, A.J., van Lenteren, J.C. (2010). Assessing potential risks and benefits of floral supplements in conservation biological control. BioControl 55:719-727.

Book chapters

1. Wäckers, F.L., van Rijn, P.C.J. (2012). Pick and Mix: selecting flowering plants to meet requirements of target biological control insects. In: Biodiversity and Insect Pests, G. Gurr (ed) Wiley Blackwell, pp. 139-165.
2. Vet, L.E.M., Wäckers, F.L. (2006). Sluipwespen: macabere meesterspeurders. In: Muggenzifters en Mierenneukers: Insecten onder de Loep Genomen.
3. Romeis, J., Städler, E., Wäckers, F.L. (2005). Nectar and pollen feeding by adult herbivorous insects. In: Plant-provided Food for Carnivorous Insects: A Protective Mutualism and its Applications. F.L. Wäckers, P.C.J. van Rijn & J. Bruin (eds.), Cambridge University Press, Cambridge.
4. Wäckers, F.L., van Rijn, P.C.J. (2005). Food for Protection: an introduction. In: Plant-provided Food for Carnivorous Insects: A Protective Mutualism and its Applications. F.L. Wäckers, P.C.J. van Rijn & J. Bruin (eds.), Cambridge University Press, Cambridge.
5. Wäckers, F.L. (2005). Suitability of (extra-) floral nectar, pollen and honeydew as insect food sources. In: Plant-provided Food for Carnivorous Insects: A Protective Mutualism and its Applications. F.L. Wäckers, P.C.J. van Rijn & J. Bruin (eds.), Cambridge University Press, Cambridge.
6. Turlings, T.C.J., Wäckers, F.L. (2004). Recruitment of predators and parasitoids by herbivore-injured plants. In: Advances in Chemical Ecology of Insects, Cardé, R.T., Millar, J. (eds.), Cambridge University Press, Cambridge, pp. 21-75.
7. Wäckers, F.L. (2003). The parasitoids' need for sweets: sugars in mass rearing and biological control. In: Quality Control of Natural Enemies. Van Lenteren, J.C. (ed.) CABI Publishing pp. 59-72.
8. Vet L.E.M., Hemerik L., Visser, M.E., Wäckers, F.L. (2002). Flexibility in host search and patch use strategies of insect parasitoids. In: Cambell, J.F., Lewis, E. and Sukhdeo, M. Behavioural Ecology of Parasites. CABI Publishing, pp. 39-64.
9. Turlings, T.C.J., Wäckers, F.L. Vet, L.E.M.; Lewis, W.J., Tumlinson, J.H. (1992). Learning of Host Location Cues by Insect Parasitoids. In: Insect Learning: Ecological and Evolutionary Perspectives. Lewis A.C. and Papaj, D.R. (eds.) Chapman and Hall, New York.

INVITED LECTURES (2010-2013 SELECTION)

2013

Are generalist predators particularly suitable targets to be supported through non-prey food?
Functional biodiversity: How to make non-crop vegetation work for the farmer

How to make biodiversity work for biocontrol

2012

1. Quo Vadis Farmland Biodiversity. Baltic Sea Regional Conference. 14-15.11.2012
2. Developments in Biological Control and Biological Pollination in Europe. 2nd International Symposium Insect Bio-Industry, Yecheon, Korea 17-19.8.2012

3. The ELN-FAB Initiative. ELN-FAB European Seminar –Avignon, France. 14-15.06.2012
4. Opportunities and challenges for biological control. Inauguration symposium for the Centre for Biological Control, Uppsala 'Towards integrated biological control'. Uppsala, Sweden, 19-20.4.2012.
5. Sustainable Crop Management: A vision for a greener future. LTO, Zoetermeer, the Netherlands. 20.03.2012
6. Informed landscape management to maximize ecosystem services. 5th SETAC Europe Special Science Symposium 'Ecosystem Services: From practice to policy'. 13.02.2012, Brussels, Belgium

2011

7. Mix & Match: Optimizing seed mixes to match the requirements of target beneficial arthropods. AAB/BES Meeting, Dundee University, 15.6-16.6.2011
8. Landscape management to cater to the nutritional needs of beneficial arthropods. BOKU Vienna. 12.04.2011

2010

9. Landscape management to optimize ecosystem services for sustainable agriculture. Green work(s)! International Biodiversity Conference. Brugge Belgium. 12.10-13.10.2010
10. Flower power to optimize biocontrol and pollination: Potential and pitfalls. Sustainable Agriculture Initiative Platform, Berlin. 27.9.2010
11. Optimizing biocontrol and pollination services. Food Security Meeting, Lancaster University, 13.09-15.09.2010
12. Optimizing biodiversity benefits: supporting biocontrol through informed landscape management. European Congress of Entomology, Budapest, Hungary. 22.08-27.08.2010 (keynote)
13. Generating field margins that provide combined benefits in terms of biocontrol & conservation. Neartic & Neotropical Regional Sections IOBC, Niagara Falls, Canada. 11.05-13.05.2010
14. Sugars in plant-pest-predator interactions: trick and treat. Syngenta Entomology Seminar, Stein, Switzerland. 21.06.2010
15. Conservation biocontrol in vegetable production. ADAS/Syngenta UK Vegetable Industry Conference and Exhibition, Peterborough, UK. 27.01.2010.