Australian Government
Cotton Research and Development Corporation

TRAVEL, CONFERENCE or SCIENTIFIC EXCHANGE REPORT 2016

Part 1 - Summary Details

Please use your TAB key to complete Parts 1 & 2.

CRDC Project Number: DAN 1602

Project Title: Attend the XXV International Congress of Entomology Conference in Orlando, Florida, 20-30 September 2016

Project Commencement Date: 20/9/2016 **Project Completion Date:** 3/10/2016

CRDC Research Program: 2 Industry

Part 2 – Contact Details

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Signature of Research Provider Representative: _____

Date Submitted: _____

Part 3 – Travel, Conference or Scientific Exchange Report

(Maximum two pages)

1. A brief description of the purpose of the travel.

The International Congress of Entomology (ICE) is held every four years in different countries in the world. In 2016, the conference was held in the Orange County Convention Centre in Orlando in Florida in USA from the 24th September – 1 October 2016. The conference was attended by 6,568 delegates from 102 countries. The conference serves as a forum for entomologists working on various aspects of entomology to interact and learn from each other.

The purpose of travel were:

- Invitation by the Organising Committee of the International Congress of Entomology (ICE) to attend and organise Integrated Pest Management (IPM) symposium at the Conference held in Orlando in Florida, USA from 20 September to 30 September 2016.
- To attend and present a paper on IPM in cotton cropping systems: Development and exploitation of a new semiochemical product for cotton IPM on transgenic cotton in Australia at the ICE Conference
- Meet and discuss field experimentation, preliminary results and commercialization pathway of DAT 511 (a new NSWDPI Fungal Biopesticide product developed by Dr Robert Mensah) with Mr Mark Peacock (BASF Global Lead Researcher Biologicals). Mr Mark Peacock BASF-USA is lead researcher of the independent testing of DAT 511 against stink bugs on soybeans in Spain. BASF has indicated that the commercialization of DAT 511 product will depend on the results of the trials. Hence the need for Dr Mensah to visit Mr Peacock while in the USA to discuss DAT 511 trial protocols and review preliminary results.

2. What were the:

a) major findings and outcomes

- The conference created an opportunity for Dr Mensah to have discussions with cotton researchers around the world
- Dr Mensah had immediate access to renowned cotton pest management experts and one- one discussion with them in his area of research. This will enhance Dr Mensah's research in Australia.
- The conference allowed Dr Mensah to interact with cotton scientists working in areas of biological control and IPM which is of direct interest to the Australian cotton industry.
- It provided Dr Mensah with the opportunity to liaise with cotton scientists and study novel analytical techniques, methodologies and specialist biological control and IPM programs which have been recently developed.
- It will improve Dr Mensah's effectiveness as a research officer through the opportunity to learn the latest developments in integrated pest management and biocontrol of emerging pests on Bt cotton.
- The conference has facilitated and expedited the progress and refinement of the IPM tools being developed by Dr Mensah.
- BASF has joined the CRDC and NSWDPI to lodge international patent on the Dr Mensah's fungal biopesticide; a major step towards commercialization by BASF.
- NSWDPI through DPI Agriculture (Plant Systems and IP Unit) have had discussions with the CRDC to arrange a meeting with BASF to expedite action of the DAT 511 commercialization process.
- Dr Mensah is already refining some of the techniques used in developing fungal biopesticide and semiochemical products. He has commenced coating cotton seeds with fungal isolates for endophytic control of early season pests.

b) other highlights

Dr Mensah had meetings with the following:

i. Prof Gregory Sword of the Texas A&M University to discuss fungal endophytes and their potential for biocontrol in cotton;

ii. Prof John Pickett of Rothamsted Research, United kingdom to discuss semiochemical based crop protection through the seed.

iii. Prof. Silvie Dorn, Adjunct Professor of Applied Entomology ETH Switzerland to discuss insect-host plant interactions and plant volatiles

iv. Dr Baldwyn Torto, ICIPE, Kenya to discuss techniques ICIPE used to develop and commercialized his semiochemical-based tools

v. Dr Jose Roberto Postali Parra, Univ of Sao Paulo, Brazil, to discuss the use of Trichogramma as a tool in IPM

vi. Dr Zeyaur Khan on his chemical ecology based IPM strategy (Push pull strategy) for agricultural systems

vii. Prof. Douglas Pfeiffer (Virginia State Univ) on a 24 year study of New York State IPM that utilizes soft option IPM based on Environmental Impact Quocient (EIQ).

3. Detail the persons and institutions visited, giving full title, position details, location, duration of visit and purpose of visit to these people/places. (NB:- Please provide full names of institutions, not just acronyms.)

Dr Robert Mensah met with Mr Mark Peacock (BASF Global Lead Researcher Biologicals) in BASF Research Laboratories in Research Triangle, Raleigh Durham, North Carolina. Mr Peacock is the lead researcher of the independent testing of DAT 511 against stink bugs on soybeans in Spain.

Reason for BASF-USA meeting

Dr Robert Mensah has developed a new Fungal biopesticide product (DAT 511) for NSWDPI for use in IPM on cotton crops. BASF Australia, USA and Germany has expressed interest in commercializing DAT 511. For BASF to finalize decision on the product, they are undertaking independent efficacy trials of the product against stink bugs on soybeans. Damage by stink bugs to soybeans in Brazil and Europe exceeds USA$100 million. These countries have indicated their need for biopesticides and BASF is determined to enter the global soybean market. BASF has indicated that the results of the DAT 511 trial will determine their decision to commercialize the DAT 511 product. BASF has not communicated the results of the trials to NSWDPI.

Therefore, while attending the ICE conference, Dr Mensah also travelled to Raleigh Durham (NC) and met with Mr Mark Peacock (BASF Global Biological Product Development Manager) at BASF Research Triangle Laboratories in Raleigh, North Carolina and had discussions on DAT 511 trial protocols and reviewed the results of the DAT 511 efficacy tests undertaken by Mr Peacock. Through Dr Mensah's visit, Mr Peacock has communicated the trial results to Mr Gavin Heard (BASF Australia) to enable them make informed decision about DAT 511 commercialization. Also, BASF, CRDC and NSWDPI have jointly taken International patent to protect DAT 511 biopesticide product.

4. a) Are there any potential areas worth following up as a result of the travel?

Key recommendations

1	Prof. Douglas Pfeiffer (Virginia State Univ) presented a 24 year study on New York State IPM that utilizes soft option IPM based on Environmental Impact Quocient (EIQ). The study listed all the major active ingredients of synthetic and biological insecticides and their impacts on birds, bees, beneficial insects, farmworkers, applicator effects, picker effects, consumer effects, ground leaching, fish etc. Most of the chemicals in the list are used in cotton in Australia. Dr Mensah has attached a detail table of the Cornell University study (see Table 1) for the Australian Cotton Industry use as part of "soft" option spray decisions against pests on Bt cotton crops

2	NSWDPI and the Cotton Industry (CRDC) meet with BASF Australia to firm BASF plans for commercialization of the new Fungal product (DAT 511)
3	NSWDPI to negotiate with the CRDC to come into agreement in the setting up of the Centre for Biopesticides and Semiochemicals (CBS). The CBS, if set up, will be one of the leading centres developing and commercialising new novel biological products to support IPM in cotton and other crops worldwide. NSWDPI will be the Lead Agency and any new biopesticide products commercialized will generate revenue for NSWDPI and the Australian Cotton Industry.

b) Any relevance or possible impact on the Australian Cotton Industry?

- The cotton industry is a significant production of export income for NSW and Australia. The adoption of transgenic (Bt) cotton into the Australian cotton cropping system has reduced synthetic insecticide sprays against the major pests, *Helicoverpa* spp. Despite the reduction in synthetic insecticide use, cotton growers continue to use insecticide to control green mirids, aphids, silver leaf whiteflies, green vegetable bugs etc which are not affected by the Bt toxin. In India, China, Pakistan and many countries where Bt cotton has been adopted, sucking pests are major problem and there have been resistance problems.
- The conference covered aspects of entomology such as integrated pest management, insect biological control agents (fungi, nematodes and Bt), insect behaviour and chemical ecology, pesticides, GM crops, resistance, toxicology, conservation, biodiversity, climate change, insect biological control, medical and veterinary entomology, invasive species and quarantine, stored products and post-harvest entomology, acarology, insect related interactions at a multi-trophic ecosystem, genetics, genomics and evolutionary entomology, systematics, phylogeny and zoogeography. These research areas provided new knowledge for research to control cotton pests in Australia without the need for synthetic insecticides. The conference also attracts extension officers, agro-chemical companies, administrators, entomological suppliers and publishers. The conference has enhanced Drs Mensah's research in Australia.
- Dr Mensah has gained new knowledge and contacts by attending the ICE conference. For example the cotton industry needs products for seed treatment. Cruiser (neonicotinoid) is creating resistance problems in cotton aphids. No alternative seed treatment products are in chemical company's commercialisation pipeline. Hence, the need for evaluation of biopesticides for use as seed treatment products is very crucial. Similarly selective control of mirids, silver leaf whiteflies, stinkbugs, mealybugs, aphids, late season *Helicoverpa* spp., pupae busting etc remains a challenge and investigation of biopesticides and semiochemicals are worthwhile. The conference has enabled Dr Mensah to gain new techniques in the use of biopesticide based crop protection through the seed. This is an important research area that is already being undertaken (currently in the laboratory) to address the problem of cotton seed treatment to control soil and seedling pests that can affect cotton germination, plant stand and yield. Further, new initiatives will ultimately be developed in Dr Mensah's IPM research and this will lead to future project proposals that will develop new IPM tools to manage cotton pests.

Title of the symposium we organized at the conference

Dr Robert Mensah and Dr Lewis Wilson were invited by the Organising Committee of the XXV ICE conference to jointly organise a symposium on 'New Tools and Strategies for Integrated Pest Management (IPM) on Transgenic (Bt) and Non-Transgenic (conventional) cotton crops' which is of significant importance to our situation in the cotton industry in Australia. Many audiences attended our symposium, showed significant interest in papers presented and generated good discussion, especially about the contribution of GM crops to enhance biological control. Dr Mensah presented a paper on "IPM on cotton cropping systems: development and exploitation of a new semiochemical product (Sero X®) for cotton IPM in Australia". The paper was well received and stimulated good discussions with the audience. Many of the applied entomologists working on IPM in field crops were interested in using Sero X® against target pests (global recognition of Sero X® product developed by Dr Mensah and commercialized by a Regional NSW company Innovate Ag. Pty Ltd).

Dr Mensah's paper was well received and stimulated a range of questions by the audience. Many of the applied entomologists working on IPM in field crops were most interested to use biopesticides being developed in Dr Mensah's research for field trials in their target pests and crops. The Commissioning Editor of CABI Biosciences, Dr Ward Cooper Ward Cooper, discussed the possibility of publishing a book based around our symposium session on IPM in cotton crops. The symposium organizers Dr Robert Mensah, Dr Lewis Wilson and Prof. Megha Parajulee (Texas A & M) University are currently discussing this offer from CABI.

Symposium: New Tools and Strategies for Integrated Pest Management (IPM) on Transgenic (Bt) and Non-Transgenic (conventional) cotton Crops: Organizers: Dr Robert Mensah; Dr Lewis Wilson and Prof. Megha Parajulee (Texas A & M) University.

Papers presented:

Paper-0622: Integrated pest management in Ethiopia: Development and use of a supplementary food spray to manage pests and beneficial insects on conventional cotton crops. **Tadesse Amera** (Swedish University of Agricultural Sciences, Uppsala, Sweden), Robert Mensah (New South Wales Department of Primary Industries, Australian Cotton Research Institute, Narrabri, NSW, Australia), and Atalo Belay (Pesticide Action Nexus Association, Adis Ababa, Ethiopia).

Paper-0623: Biosafety of transgenic crops to the non-target arthropods. Hari Sharma and Y S. Parmar (University of Horticulture & Forestry, Nauni, Solan, India)

Paper 0624: Cotton pest management in Bt cotton system in Northern China. Feng Ge and Fang Ouyang (Chinese Academy of Sciences, Beijing, China), and Xingyuan Men (Shandong Academy of Agricultural Sciences, Jinan, China).

Paper 0625: Revised targets and tools in IPM for insect pests on cotton in India. Shanshikant Udikeri (Indian Ministry of Agriculture, Bangalore, India).

Paper 0626: Cotton IPM in the Texas High Plains: Host plant mediated management system. Megha Parajulee, Texas A & M AgriLife Research, Lubbock, Tx).

Paper 0627: IPM in cotton cropping systems: Development and exploitation of a new semiochemical product for cotton IPM. Robert Mensah, Alison Young (NSW Department of Primary Industries, Australian Cotton research Institute, Narrabri, Australia), David Leach (Southern Cross University, Lismore, Australia) and Nick Watts (Growth Agriculture Pty Ltd, Wee Waa, Australia).

Paper 0628: Strategies to manage emergent pests in GM-cotton: A case study with Nezara viridula. Simone Heimoana (CSIRO, Narrabri, Australia)

Paper 0629 EPG investigation of feeding behavioural response of cotton aphid, Aphis gossypii, to elevated Co2. Fajun Chen, Shoulin Jiang, Guijin Wan (Nanjing Agricultural University, Nanjing, China), and Megha Parajulee (Texas A & M AgriLife Research, Lubbock, TX)

Paper 0630 Habitat Management and biological control in Bt cotton. Fang Ouyang, Quanfeng Yang (Chinese Academy of Sciences, Beijing, China), and Yongsheng Zhang (Hunan Agricultural University, Changsha, China).

Paper 0631 Integrated regional thrips management in southwestern United States cotton. Robert Bowling, Michael Brewer (Texas A & M) University, AgriLife Extension Service, Corpus Christi, TX), and Megha Parajulee (Texas A & M) University AgriLife Research, Lubbock, TX).

5. How do you intend to share the knowledge you have gained with other people in the cotton industry?

This will occur through extension of research outcome that have benefitted from the new knowledge and contacts gained by attending the ICE. Further, new initiatives will ultimately lead to

future extension documents. The research idea which is currently being tried is the use of fungal spores as seed treatments to control early season pests on cotton.

Travel itinerary (Provide full details of travel and activities undertaken**)**

Date	Country / Location	Activity
14/9/2016	Departing: Australia/Tamworth - 1015 Arriving: Australia/Sydney – 1125 (Term. 3) Economy class – QF 2003	Dr Robert Mensah has developed a new Fungal biopesticide product (DAT 511) for IPM on cotton crops. BASF has expressed interest in commercializing DAT 511. For BASF to finalize decision on the product, they are undertaking independent efficacy testing of the DAT 511 product against stink bugs on soybeans. Since Dr Mensah was attending ICE conference in the USA, a meeting with Mr Mark Peacock (Manager, BASF Global Biological products) was scheduled on 16 and 17 Sept because Mr Peacock will be out of the USA for a meeting in Germany. On arrival, BASF re-scheduled the meeting for 19 and 20 Sept 2016 because BASF-USA had scheduled research meeting on 17 and 18 Sept. The meeting discussed DAT 511 field trial protocols, preliminary results, follow up trial and regulatory data requirements for DAT 511 registration globally and NSWDPI role in efficacy data collation. NSWDPI paid one night accommodation (15 Sept) in Orlando and Dr Mensah paid 3 night accommodation (16, 17, 18 Sept).
14/9/2016	Departing: Australia/Sydney - 1300 Arriving: USA/Dallas FT Worth/Intl (Terminal D) scheduled at 1335but arrived 2235. Economy class: QF 7	Flight was delayed by QANTAS due to technical problems with Aircraft. Flight departed 2145 (8 hours delay). Flight arrived Dallas/FT Worth 2235 USA Time. QANTAS paid for overnight accommodation and transportation to and from Dallas FT Worth Airport to hotel because Dr Mensah missed his connecting flight to Orlando. QANTAS re-booked flight on 15 Sept 2016 at no extra cost. All expenses paid by QANTAS
15/9/2016	Departing: USA/Dallas FT Worth – 0845 Arriving: USA/Orlando FL – 1245 Economy class: QF 4652	QANTAS operated American Airways
16-18/9 2016	Courtyard Marriott Hotel, Orlando, FL	BASF re-scheduled meeting in Raleigh Durham to 19 and 20 Sept 2016
19/9/2016	Depart: USA/Orlando FL – 0837 Arrive: USA/Raleigh Durham Au – 1025 (Terminal 2) Economy class: DL3620	Delta Airlines Meeting at BASF Triangle Park Research Facility (all day) Accommodation: Marriott, Research Triangle Park booked by FMC
20/9/2016	Raleigh Durham	Meeting with BASF from 1000 – 1630 Accommodation: Marriott, Research Triangle Park
21/9/2016	Depart: USA/Raleigh Durham–1713 (Term2) Arrive: USA/Orlando – 1910 Economy class: DL 3612	Delta Airlines
22-24/9/2016	ICE Conference – ICE conference Organized Accommodation in Rosen Plaza Hotel	Meetings for symposium organizers with ICE conference organizing Committee
25-30/9/2016	ICE conference in progress in Orange County Convention Centre	Attending ICE conference

1/10/2016	Depart: USA/Orlando – 1536 Arrive: USA/Dallas FT Worth- 1734 Economy class: QF 4557	QANTAS operated American Airlines. Return trip back to Australia
1/10/2016	Depart: USA/FT Worth – 2115 (Term D) Arrive: Australia/Sydney (3/10/16) 0605	In transit/return trip to Australia. Arrive in Australia on 3/10/2016
3/10/2016	Depart: Australia/Sydney – 0845 (Term 3) Arrive: Australia/Tamworth – 0955 Economy class: QF2002	Arrive in Tamworth at 0955
3/10/2016	Road trip Depart Tamworth: 1040 Arrive: Narrabri – 1240	2 hour road trip to Narrabri

Justification of original budget

Dr Robert Mensah has developed a new Fungal biopesticide product (DAT 511) for NSWDPI for use in IPM on cotton crops. BASF Australia, USA and Germany has expressed interest in commercializing DAT 511. For BASF to finalize decision on the product, they are undertaking independent efficacy trials of the product against stink bugs on soybeans. Damage by stink bugs to soybeans in Brazil and Europe exceeds USA$100 million. These countries have indicated their need for biopesticides and BASF is determined to enter the global soybean market. BASF has indicated that the results of the DAT 511 trial will determine their decision to commercialize the DAT 511 product. BASF has not communicated the results of the trials to NSWDPI. Therefore, while attending the ICE conference, Dr Mensah also travelled to Raleigh Durham (NC) and met with Mr Mark Peacock (BASF Global Biological Product Development Manager) at BASF Research Triangle Laboratories in Raleigh, North Carolina and had discussions on DAT 511 trial protocols and reviewed the results of the DAT 511 efficacy tests undertaken by Mr Peacock. The difference in the cost of $1422.24 is due to Dr Mensah travelling from Orlando to Raleigh to meet with BASF and discuss DAT 511 efficacy tests and results. Through Dr Mensah's visit, Mr Peacock has communicated the trial results to Mr Gavin Heard (BASF Australia) to enable them make informed decision about DAT 511 commercialization. Also, BASF, CRDC and NSWDPI have jointly taken International patent to protect DAT 511 biopesticide product.

6. Please list expenditure incurred. (Double click inside the table to enter the data)

Date	Item	Amount Excl GST	GST	Total
14/9/16	Airfare- Economy - QANTAS Tamworth-Sydney-Dallas FT-Orlando FL (Return)	2,687.84		2687.84
	Booking fee (FCM)	96.85		96.85
19/9/16	Airfare-Economy-Delta Airlines-Orlando-Raleigh (Return)	388.40		388.40
	Booking fee (FCM)	40.48		40.48
Total Airfare				**3,213.57**
15/9 - 1/10/16	Accommodation	2,613.94		2,613.94
15/9 - 1/10/16	Sustenance ($200/day x 13 days)	2,600.00		2,600.00
	Other expenses	382.37		382.37
Total				**8,809.88**
Total funds provided by CRDC				**4,681.00**
Total funds provided by other sources				**4,128.88**

Please email your report 30 days after travel/conference to: research@crdc.com.au

APPENDIX FROM NEXT PAGE

A Method to Measure the Environmental Impact of Pesticides, Table 2: List of Pesticides, Part 4: Insecticides 2012

New York State Integrated Pest Management Program
www.nysipm.cornell.edu

Action: IGR = insect growth regulator, PGR = plant growth regulator, PA = plant activator, CP = crop protectant, BP = biopesticides, B = bacteriacide, AC = acaracide, I = insecticide, F = fungicide, H = herbicide, Fum = Soil fumigant

EIQ Revision Date: Date of latest revision. Original = EIQ value from 1992 bulletin

Old EIQ Rating: EIQ value from original 1992 bulletin or from previous revision.

Missing Data: None=no missing data values, B= toxicity to beneficial insects, P=plant surface half life, Z= toxicity to bees, C=chronic health effects, R=runoff potential, L=leaching potential, S=soil residue half life

Formula Symbols: DT = Acute dermal toxicity D = Toxicity to birds F = Toxicity to fish Z = Toxicity to bees L = Leaching potential R = Runoff potential S = Soil residue half life SY = Mode of action C = Chronic health effects P = Plant surface health effects B = Toxicity to beneficials

Formulas			(Farm Worker+ Consumer+ Ecological)/3				C(DT*5)	C(DT*P)	C(DT*5) +C(DT*P)	C* ((S+P)/2) *SY)	L	C*((S+P)/2) *SY)+L	(F*R)	(D*((S+P) /2*3)	(Z*P*3)	(B*P*5) (Beneficial)+ (Plant 1/2L)	(D+B) (Bird)+ (Beneficial)	(Fish)+(Bird) +(Bee)+ (Beneficial)
Common Name	**Trade Name**	**Action**	**EIQ total**	**EIQ Rev Date**	**Old EIQ Rating**	**Missing Data**	**Applicator Effects**	**Picker Effects**	**Farm Worker**	**Consumer Effects**	**Grd H2O Leaching**	**Consumer + Leaching**	**Fish**	**Birds**	**Bee**	**Beneficials**	**Terrestrial**	**Ecology**
Insecticides																		
abamectin,avermectin	Agri-mek	I	34.68	Mar-08	38.00	P	10.00	3.80	13.80	2.90	1.00	3.90	25.00	4.35	28.50	28.50	61.35	86.35
acephate	Orthene	I	24.88	Mar-09	23.38		12.50	2.50	15.00	7.50	5.00	12.50	1.00	9.00	15.00	22.15	46.15	47.15
acetamiprid	Assail	I	28.73	Mar-09	26.90	P	5.00	1.90	6.90	4.35	3.00	7.35	3.00	4.35	17.10	47.50	68.95	71.95
acibenzolar S-methyl	Actigard	I	20.74	Mar-09	22.60	B	5.00	1.90	6.90	4.35	1.00	5.35	25.00	4.35	5.70	14.92	24.97	49.97
aldicarb	Temik	I	38.67	Jan-04	38.67	None	25.00	5.00	30.00	6.00	5.00	11.00	5.00	30.00	15.00	25.00	70.00	75.00
allethrin	Pynamin	I	35.61	Mar-09	36.10	D, B	11.00	4.18	15.18	5.39	1.00	6.39	25.00	7.35	17.10	35.82	60.27	85.27
amitraz	Mitac	I	25.17	Mar-09	23.30	P	22.50	4.50	27.00	1.50	1.00	2.50	25.00	3.00	3.00	15.00	21.00	46.00
amitraz	Mitac	I	25.17	Mar-09	23.30	P	22.50	4.50	27.00	1.50	1.00	2.50	25.00	3.00	3.00	15.00	21.00	46.00
avermectin, abamectin	Agri-mek	I	34.68	Mar-08	38.00	P	10.00	3.80	13.80	2.90	1.00	3.90	25.00	4.35	28.50	28.50	61.35	86.35
azadirachtin	Turplex, Aza-direct	I	12.10	Apr-08	12.77	none	5.00	1.00	6.00	0.50	5.00	5.50	5.00	1.50	9.00	9.30	19.80	24.80
azinphos-methyl	Guthion	I	53.05	Mar-09	44.90	P	15.00	5.70	20.70	2.45	1.00	3.45	25.00	36.75	28.50	44.75	110.00	135.00
azocyclotin	Clairmate	I	41.83	Mar-09	New	D,Z,S,P,B	15.00	5.70	20.70	2.10	1.00	3.10	25.00	22.05	18.81	35.82	76.68	101.68
Bacillus thuringiensis (kustaki)	Xentari, Dipel	I	13.33	Mar-08	7.92	P	5.00	1.90	6.90	1.45	1.00	2.45	5.00	4.35	5.70	15.58	25.63	30.63
bendiocarb	Turcam	I	41.04	Mar-09	25.70	P, B	15.00	5.70	20.70	4.35	3.00	7.35	9.00	21.75	28.50	35.82	86.07	95.07
bensultap	Cartap	I	32.21	Mar-09	New	S, P, B	15.00	5.70	20.70	2.10	1.00	3.10	25.00	6.30	5.70	35.82	47.82	72.82
beta-cyfluthrin, cyfluthrin same	Tempo	I	31.57	Jan-04	Original	none	5.00	1.90	6.90	1.45	1.00	2.45	5.00	4.35	28.50	47.50	80.35	85.35
bifenazate	Floramite	I	28.10	Mar-09	14.77	P	5.00	1.90	6.90	1.45	1.00	2.45	25.00	4.35	17.10	28.50	49.95	74.95
bifenthrin	Brigade, Talstar, Capture	I	44.35	Apr-08	87.83	P	10.00	3.80	13.80	6.90	1.00	7.90	25.00	10.35	28.50	47.50	86.35	111.35
bistrifluron	Hanaro	I	32.84	Mar-09	New	B,F,P,C,D,Z	9.50	3.61	13.11	1.81	1.00	2.81	18.00	9.98	18.81	35.82	64.60	82.60
buprofezin	Applaud	I	34.97	Feb-10	27.63	P	7.50	4.50	12.00	18.00	1.00	19.00	25.00	12.00	9.00	27.90	48.90	73.90
buprofezin	Applaud	I	34.97	Feb-10	27.63	P	7.50	4.50	12.00	18.00	1.00	19.00	25.00	12.00	9.00	27.90	48.90	73.90
carbaryl	Sevin	I	22.73	Mar-09	21.70		12.50	2.50	15.00	2.50	3.00	5.50	9.00	3.00	15.00	20.70	38.70	47.70
carbofuran	Chlordane, Furadan	I	50.67	Apr-04	50.67	None	50.00	10.00	60.00	12.00	5.00	17.00	5.00	30.00	15.00	25.00	70.00	75.00
carbosulfan	Posse	I	47.33	Mar-09	New	B, P	5.00	1.90	6.90	7.35	1.00	8.35	25.00	25.73	28.50	47.50	101.73	126.73
cartap-hydrochloride	Suntap	I	47.17	Mar-09	47.17	P,B,C,D,F,R,S,Z,L	28.50	10.83	39.33	11.97	2.00	13.97	11.52	22.05	18.81	35.82	76.68	88.20
chlofuazuron		I	30.31	Mar-09	New	C,P,B	9.50	3.61	13.11	3.99	1.00	4.99	25.00	6.30	5.70	35.82	47.82	72.82
chlorantraniliprole	Altacor	I	18.34	Mar-09	New	D,Z,P	5.00	1.90	6.90	3.45	3.00	6.45	3.00	10.35	18.81	9.50	38.66	41.66
chlordane	Chlordane	I	59.30	Mar-09	Original	P, B	37.50	14.25	51.75	5.25	1.00	6.25	25.00	18.90	28.50	47.50	94.90	119.90
chlordimeform	Bermat	I	62.67	Jul-09		C, B,L,R,P	75.00	28.50	103.50	31.50	2.00	33.50	3.20	6.30	5.70	35.82	47.82	51.02
chlorethoxyfos or -phos	Fortress	I	37.33	Mar-09	37.30	P, B	25.00	5.00	30.00	1.00	1.00	2.00	25.00	15.00	15.00	25.00	55.00	80.00
chlorfenapyr	Phantom	I	46.11	Mar-09	84.50	P,C,S	6.25	2.38	8.63	7.88	1.00	8.88	25.00	31.50	28.50	35.82	95.82	120.82
chlorfenvinphos	CFV	I	55.58	Mar-09	43.90	D,F,C	47.50	18.05	65.55	4.66	3.00	7.66	10.80	25.73	28.50	28.50	82.73	93.53
chloropicrin	Brom-o-gas	I	42.43	Mar-09	36.40	D,Z,P,B	25.00	9.50	34.50	2.45	5.00	7.45	5.00	25.73	18.81	35.82	80.35	85.35
chlorpyrifos	Lorsban	I	26.85	Apr-08	43.50	none	5.00	1.00	6.00	1.00	1.00	2.00	25.00	9.00	15.00	23.55	47.55	72.55
chromafenozide	Matric	I	20.39	Mar-09	New	D, P	5.00	1.90	6.90	7.35	1.00	8.35	5.00	25.73	5.70	9.50	40.93	45.93
cinnamaldehyde	Cinnamite	I	34.56	Jan-03	9.18	C,F,D,Z,B,S,P	5.00	1.90	6.90	6.30	3.00	9.30	10.80	22.05	18.81	35.82	76.68	87.48
clofentezine	Apollo	I	26.28	Mar-09	26.30	P	7.50	1.50	9.00	3.00	1.00	4.00	25.00	30.00	3.00	7.85	40.85	65.85
clofentezine	Apollo	I	26.28	Mar-09	26.30	P	7.50	1.50	9.00	3.00	1.00	4.00	25.00	30.00	3.00	7.85	40.85	65.85
clothianidin	Poncho	I	32.06	Mar-09	31.78	P, B	7.50	2.85	10.35	5.18	3.00	8.18	3.00	10.35	28.50	35.82	74.67	77.67
cryolite	Kryocide	I	20.16	Mar-09	21.40	Z, S, P	9.50	3.61	13.11	3.99	1.00	4.99	5.00	6.30	18.81	12.26	37.37	42.37

Formulas			(Farm Worker+ Consumer+ Ecological)/3				C(DT*5)	C(DT*P)	C(DT*5) +C(DT*P)	C* ((S+P)/2) *SY)	L	C*((S+P)/2) *SY)+L	(F*R)	(D*((S+P) /2*3)	(Z*P*3)	(B*P*5) (Beneficial)+ (Plant 1/2L)	(D+B) (Bird)+ (Beneficial)	(Fish)+(Bird) +(Bee)+ (Beneficial)
Common Name	Trade Name	Action	EIQ total	EIQ Rev Date	Old EIQ Rating	Missing Data	Applicator Effects	Picker Effects	Farm Worker	Consumer Effects	Grd H2O Leaching	Consumer + Leaching	Fish	Birds	Bee	Beneficials	Terrestrial	Ecology
Insecticides																		
cyfluthrin	Baythroid	I	39.57	Apr-08	39.60	P	5.00	1.90	6.90	2.45	1.00	3.45	25.00	7.35	28.50	47.50	83.35	108.35
cyhalothrin, lambda	Warrior	I	47.22	Mar-09	43.50	C,P,B	28.50	10.83	39.33	4.66	1.00	5.66	25.00	7.35	28.50	35.82	71.67	96.67
cyhexatin	Cyhexatin	I	24.20	Jan-05	32.80	P	5.00	1.90	6.90	2.45	1.00	3.45	25.00	22.05	5.70	9.50	37.25	62.25
cypermethrin	Cymbush	I	36.35	Mar-09	27.30	P	10.00	3.80	13.80	4.90	1.00	5.90	25.00	7.35	28.50	28.50	64.35	89.35
cyromazine	Trigard	I	18.29	Apr-04	24.18	P, B	5.00	1.90	6.90	10.35	3.00	13.35	3.00	10.35	5.70	15.58	31.63	34.63
deltamethrin	Deltagard, Decis	I	28.38	Apr-08	25.72	none	15.00	3.00	18.00	1.00	1.00	2.00	25.00	3.00	15.00	22.15	40.15	65.15
demeton-S-methyl	Meta Systox	I	42.83	Mar-09	85.50	S, P	31.25	11.88	43.13	7.88	5.00	12.88	3.00	31.50	28.50	9.50	69.50	72.50
diazinon	Diazinon	I	44.03	Apr-03	43.40	P	5.00	1.90	6.90	1.45	1.00	2.45	25.00	21.75	28.50	47.50	97.75	122.75
dichlorvos	Vapona	I	53.27	Mar-09	40.58	S,P,B	30.00	11.40	41.40	12.60	5.00	17.60	5.00	31.50	28.50	35.82	95.82	100.82
dicofol	Kelthane	I	29.92	Mar-09	29.92	P	7.50	2.85	10.35	3.68	1.00	4.68	25.00	7.35	5.70	36.67	49.72	74.72
dienochlor	Pentac	I	34.67	Mar-09	15.10	Z,S,P,B,C	9.50	3.61	13.11	11.97	3.00	14.97	15.00	6.30	18.81	35.82	60.93	75.93
diflubenzuron	Dimilin	I	25.33	Mar-09	25.33	none	5.00	3.00	8.00	2.00	1.00	3.00	5.00	6.00	9.00	45.00	60.00	65.00
dimethoate	Cygon	I	33.49	Mar-09	74.00	P	7.50	2.85	10.35	6.53	5.00	11.53	1.00	4.35	28.50	44.75	77.60	78.60
dinocap	Karathane	I	18.35	Apr-04	21.02	None	12.50	2.50	15.00	2.50	3.00	5.50	15.00	3.00	3.00	13.55	19.55	34.55
dinotefuran	HotShot	I	22.26	Jan-05	Original	P, B	5.00	1.90	6.90	2.45	5.00	7.45	1.00	7.35	28.50	15.58	51.43	52.43
disulfoton	Di-Syston	I	101.83	Jan-03	104.50	P,B	62.50	37.50	100.00	22.50	3.00	25.50	15.00	45.00	45.00	75.00	165.00	180.00
DNOC	Trifocide	I	48.18	Mar-09	New	S,C,P,B	28.50	10.83	39.33	3.99	3.00	6.99	15.00	18.90	28.50	35.82	83.22	98.22
emamectin benzoate	Proclaim	I	26.28	Jan-03	26.28	D, Z	7.50	1.50	9.00	3.00	1.00	4.00	25.00	18.00	15.00	7.85	40.85	65.85
endosulfan	Thiodan	I	38.55	Feb-01	42.10	none	22.50	4.50	27.00	4.50	1.00	5.50	25.00	27.00	9.00	22.15	58.15	83.15
esfenvalerate	Asana	I	39.57	Apr-08	39.6	P	5.00	1.90	6.90	2.45	1.00	3.45	25.00	7.35	28.50	47.50	83.35	108.35
ethion	Ethion	I	43.20	Jan-07	41.00	B	25.00	15.00	40.00	3.00	1.00	4.00	25.00	27.00	9.00	24.60	60.60	85.60
ethoprop or ethoprophos	Mocap	I	43.21	Mar-09	58.80	P,B	50.00	19.00	69.00	2.90	3.00	5.90	9.00	13.05	17.10	15.58	45.73	54.73
etoxazole	Terasan 5 WDG	I	13.42	Mar-09	13.42	P, F	5.00	1.90	6.90	1.45	1.00	2.45	5.00	4.35	5.70	15.87	25.92	30.92
etoxazole	Terasan 5 WDG	I	13.42	Mar-09	13.42	P, F	5.00	1.90	6.90	1.45	1.00	2.45	5.00	4.35	5.70	15.87	25.92	30.92
fenamiphos	Nemacur	I	71.33	Jan-04	71.33	P	25.00	15.00	40.00	6.00	3.00	9.00	15.00	30.00	45.00	75.00	150.00	165.00
fenbutatin-oxide (was hexakis)	Vendex	I	24.53	Mar-09	27.50	P, C	6.13	2.33	8.45	3.00	1.00	4.00	25.00	7.35	5.70	23.09	36.14	61.14
fenoxycarb	Comply, Precision	I	14.15	Dec-00	13.00	P	10.00	2.00	12.00	2.00	1.00	3.00	15.00	3.00	3.00	6.45	12.45	27.45
fenpropathrin	Tame, Danitrol	I	25.33	Jan-03	25.33	P	5.00	1.00	6.00	1.00	1.00	2.00	25.00	3.00	15.00	25.00	43.00	68.00
fenpyroximate	Akari	I	19.33	Jan-04	19.33	none	5.00	1.00	6.00	2.00	1.00	3.00	25.00	6.00	3.00	15.00	24.00	49.00
fensulfothion	Dasanit	I	59.40	Jan-01	Original	C,Z,P,B	47.50	18.05	65.55	8.27	3.00	11.27	25.00	21.75	18.81	35.82	76.38	101.38
fenvalerate	Pydrin	I	39.57	Mar-09	49.60	P	5.00	1.90	6.90	2.45	1.00	3.45	25.00	7.35	28.50	47.50	83.35	108.35
fipronil	Regent	I	88.25	Jan-04	90.92	none	30.00	30.00	60.00	8.00	3.00	11.00	15.00	36.00	75.00	67.75	178.75	193.75
flonicamid	Flonicamid	I	8.67	Jan-05	-	C	5.00	1.00	6.00	3.00	5.00	8.00	1.00	3.00	3.00	5.00	11.00	12.00
flubendiamide	Profiler	I	19.36	Mar-09	New	D	7.50	2.85	10.35	2.18	1.00	3.18	25.00	4.35	5.70	9.50	19.55	44.55
flucycloxuron	Andalin	I	18.50	Mar-09	New	S, P	5.00	1.90	6.90	2.10	1.00	3.10	5.00	6.30	5.70	28.50	40.50	45.50
flufenoxuron	Cascade	I	27.87	Mar-09	27.80	P, S, C	9.50	3.61	13.11	3.99	1.00	4.99	25.00	6.30	5.70	28.50	40.50	65.50
fluvalinate	Mavrick	I	35.77	Jan-05	46.40	P	5.00	1.90	6.90	2.45	1.00	3.45	25.00	7.35	17.10	47.50	71.95	96.95
fonofos	Dyfonate	I	58.72	Mar-09	44.60	none	47.50	18.05	65.55	13.97	3.00	16.97	15.00	25.73	17.10	35.82	78.64	93.64
formetanate	Carzol	I	21.72	Mar-09	21.50	none	9.50	3.61	13.11	2.76	5.00	7.76	3.00	4.35	5.70	31.26	41.31	44.31
fosthiazate	Cierto	I	17.04	Mar-09	New	P	7.50	2.85	10.35	6.53	5.00	11.53	1.00	13.05	5.70	9.50	28.25	29.25
furathiocarb	Promet	I	33.30	Jan-04	35.33	B	5.00	1.00	6.00	6.00	3.00	9.00	15.00	30.00	15.00	25.00	70.00	85.00
gamma-cyhalothrin	Proaxis	I	44.05	Mar-07	New	D, P	9.50	3.61	13.11	3.99	1.00	4.99	25.00	13.04	28.50	47.50	89.04	114.04
halofenozide	Mach II	I	20.29	Jan-04	26.18	P, B, C	5.00	1.90	6.90	10.35	3.00	13.35	9.00	10.35	5.70	15.58	31.63	40.63
hexaflumuron	Consult	I	24.90	Jan-05	-	P, B	5.00	1.90	6.90	10.35	1.00	11.35	25.00	10.35	5.70	15.58	31.63	56.63
hexaflumuron	Consult	I	24.90	Jan-05	-	P, B	5.00	1.90	6.90	10.35	1.00	11.35	25.00	10.35	5.70	15.58	31.63	56.63

Formulas			(Farm Worker+ Consumer+ Ecological)/3				C(DT*5)	C(DT*P)	C(DT*5) +C(DT*P)	C* ((S+P)/2) *SY)	L	C*((S+P)/2) *SY)+L	(F*R)	(D*((S+P) /2*3)	(Z*P*3)	(B*P*5) (Beneficial)+ (Plant 1/2L)	(D+B) (Bird)+ (Beneficial)	(Fish)+(Bird) +(Bee)+ (Beneficial)
Common Name	Trade Name	Action	EIQ total	EIQ Rev Date	Old EIQ Rating	Missing Data	Applicator Effects	Picker Effects	Farm Worker	Consumer Effects	Grd H2O Leaching	Consumer + Leaching	Fish	Birds	Bee	Beneficials	Terrestrial	Ecology
Insecticides																		
hexakis (now fenbutatin oxide)	Vendex	I	24.53	Mar-09	12.80	P, C	6.13	2.33	8.45	3.00	1.00	4.00	25.00	7.35	5.70	23.09	36.14	61.14
hexythiazox	Nexygon	I	33.00	Jan-03	38.40	none	7.50	7.50	15.00	6.00	1.00	7.00	25.00	12.00	15.00	25.00	52.00	77.00
hydramethylnon	Extinguish	I	21.39	Mar-08	New	P, B	7.50	2.85	10.35	2.18	1.00	3.18	25.00	4.35	5.70	15.58	25.63	50.63
imidacloprid	Admire	I	36.71	Dec-08	34.90	P	5.00	1.90	6.90	7.35	3.00	10.35	3.00	22.05	28.50	39.33	89.88	92.88
indoxacarb	Avaunt	I	31.19	Apr-08	42.97	P	5.00	1.90	6.90	1.45	1.00	2.45	25.00	13.05	28.50	17.67	59.22	84.22
isazofos	Triumph	I	35.68	Mar-09	30.74	C, Z, P, B	9.50	3.61	13.11	8.27	3.00	11.27	15.00	13.05	18.81	35.82	67.68	82.68
isofenphos	Oftanol	I	89.33	Mar-09	103.50	B	25.00	25.00	50.00	15.00	3.00	18.00	9.00	75.00	75.00	41.00	191.00	200.00
lambda-cyhalothrin	Warrior, Battle	I	44.17	Apr-08	45.50	P	15.00	5.70	20.70	2.45	1.00	3.45	25.00	7.35	28.50	47.50	83.35	108.35
lindane	Lindane	I	85.33	Jan-01	69.20		45.00	45.00	90.00	15.00	1.00	16.00	5.00	45.00	75.00	25.00	145.00	150.00
lufenuron	Match	I	16.29	Jan-04	Original	none	5.00	1.90	6.90	7.35	1.00	8.35	5.00	7.35	5.70	15.58	28.63	33.63
malathion	Cythion	I	23.83	Apr-04	23.83	none	7.50	1.50	9.00	1.50	3.00	4.50	15.00	3.00	15.00	25.00	43.00	58.00
metaflumizone	Accel	I	32.89	Mar-09	New	C,D,R,L,S,P ,B	9.50	3.61	13.11	3.99	2.00	5.99	16.00	22.05	5.70	35.82	63.57	79.57
methamidophos	Monitor	I	36.83	Jan-03	36.80	P	37.50	7.50	45.00	4.50	5.00	9.50	1.00	15.00	15.00	25.00	55.00	56.00
methidathion	Supracide	I	32.67	Mar-09	69.30	none	25.00	5.00	30.00	1.00	3.00	4.00	15.00	9.00	15.00	25.00	49.00	64.00
methiocarb	Mesural	I	22.08	Jan-05	-	Z, P, B	5.00	1.90	6.90	1.45	3.00	4.45	15.00	4.35	19.95	15.58	39.88	54.88
methomyl	Lannate	I	22.00	Apr-08	30.70	none	5.00	1.00	6.00	6.00	5.00	11.00	3.00	6.00	15.00	25.00	46.00	49.00
methoxychlor	Marlate	I	53.67	Feb-01	53.67	none	10.00	10.00	20.00	10.00	1.00	11.00	25.00	15.00	15.00	75.00	105.00	130.00
methoxyfenozide	Intrepid	I	32.08	Jan-03	33.42	P	5.00	5.00	10.00	5.00	3.00	8.00	9.00	15.00	15.00	39.25	69.25	78.25
methyl bromide	Brom-o-gas	I	53.57	Mar-09	New	P	50.00	24.00	74.00	5.40	5.00	10.40	1.00	40.50	7.20	27.60	75.30	76.30
methyl parathion	Penncap-M	I	35.22	Feb-01	35.22	-	45.00	9.00	54.00	3.00	1.00	4.00	9.00	3.00	15.00	20.65	38.65	47.65
mevinphos	Phosdrin	I	15.31	Mar-09	28.20	P	25.00	9.50	34.50	4.35	5.00	9.35	5.00	13.05	28.50	35.82	77.37	82.37
naled	Dibrom	I	49.19	Mar-09	37.70	C, P, B	28.50	10.83	39.33	2.76	3.00	5.76	9.00	4.35	28.50	35.82	68.67	77.67
novaluron	Novaluron 10SC	I	14.33	Jan-07	New	none	5.00	1.00	6.00	2.00	1.00	3.00	15.00	6.00	3.00	10.00	19.00	34.00
novaluron	Novaluron 10SC	I	14.33	Jan-07	New	none	5.00	1.00	6.00	2.00	1.00	3.00	15.00	6.00	3.00	10.00	19.00	34.00
noviflumuron	Recruit	I	21.63	Jan-05	-	P, B	5.00	1.90	6.90	10.35	1.00	11.35	15.00	10.35	5.70	15.58	31.63	46.63
noviflumuron	Recruit	I	21.63	Jan-05	-	P, B	5.00	1.90	6.90	10.35	1.00	11.35	15.00	10.35	5.70	15.58	31.63	46.63
oil	Oil	I	30.09	Original	Original	DT,F,Z,B,P,L, R	10.00	3.80	13.80	4.40	2.20	6.60	8.64	6.60	18.81	35.82	61.23	69.87
oxamyl	Vydate	I	33.33	Mar-09	22.90		5.00	1.90	6.90	1.45	5.00	6.45	3.00	13.05	28.50	42.09	83.64	86.64
oxydemeton-methyl	Metasytox-R	I	75.03	Apr-04	75.03	None	50.00	30.00	80.00	12.00	5.00	17.00	3.00	18.00	45.00	62.10	125.10	128.10
parathion	Niran, Phoskil	I	69.65	Mar-09	104.40	P,C	47.50	18.05	65.55	4.66	1.00	5.66	25.00	36.75	28.50	47.50	112.75	137.75
parathion methyl'	Penncap-M	I	25.97	Mar-09	35.20	P	5.00	1.90	6.90	1.45	3.00	4.45	9.00	4.35	5.70	47.50	57.55	66.55
pentacholorophenol	PCP	I	88.63	Aug-09	Original	B, P	100.00	48.00	148.00	32.40	3.00	35.40	15.00	24.30	7.20	36.00	67.50	82.50
permethrin	Ambush	I	29.33	Apr-08	88.67	none	10.00	2.00	12.00	4.00	1.00	5.00	25.00	6.00	15.00	25.00	46.00	71.00
phorate	Thimet	I	48.83	Mar-09	68.20	D, P, B	25.00	9.50	34.50	7.35	1.00	8.35	25.00	25.73	17.10	35.82	78.64	103.64
phosalone	Zolone	I	34.43	Mar-09	24.40	P	5.00	1.90	6.90	1.45	1.00	2.45	25.00	4.35	17.10	47.50	68.95	93.95
phosmet	Imidan	I	32.82	Mar-09	23.90	P	5.00	1.90	6.90	1.45	1.00	2.45	25.00	4.35	28.50	31.26	64.11	89.11
phosphamidon	Swat	I	47.78	Mar-09	26.30		22.50	8.55	31.05	6.53	5.00	11.53	3.00	21.75	28.50	47.50	97.75	100.75
piperonyl butoxide	Butacide	I	25.77	Mar-09	20.80	S, P, B	7.50	2.85	10.35	3.15	1.00	4.15	15.00	6.30	5.70	35.82	47.82	62.82
pirimicarb	Pirimor	I	16.00	Jan-03	16.70	none	5.00	1.00	6.00	3.00	5.00	8.00	1.00	15.00	3.00	15.00	33.00	34.00
profenofos	Curacron	I	59.53	Mar-09	New	P	5.00	3.10	8.10	2.05	1.00	3.05	25.00	18.45	46.50	77.50	142.45	167.45
propargite	Omite	I	68.67	Jan-05	42.70	P	10.00	10.00	20.00	8.00	1.00	9.00	25.00	12.00	15.00	125.00	152.00	177.00
propoxur	Baygon	I	35.02	Mar-09	87.30	P	10.00	3.80	13.80	2.90	5.00	7.90	3.00	4.35	28.50	47.50	80.35	83.35

Formulas			(Farm Worker+ Consumer+ Ecological)/3				C(DT*5)	C(DT*P)	C(DT*5) +C(DT*P)	C* ((S+P)/2) *SY)	L	C*((S+P)/2) *SY)+L	(F*R)	(D*((S+P) /2*3)	(Z*P*3)	(B*P*5) (Beneficial)+ (Plant 1/2L)	(D+B) (Bird)+ (Beneficial)	(Fish)+(Bird) +(Bee)+ (Beneficial)
Common Name	Trade Name	Action	EIQ total	EIQ Rev Date	Old EIQ Rating	Missing Data	Applicator Effects	Picker Effects	Farm Worker	Consumer Effects	Grd H2O Leaching	Consumer + Leaching	Fish	Birds	Bee	Beneficials	Terrestrial	Ecology
Insecticides																		
pymetrozine	Fulfill, Sterling, Chess	I	19.57	Jan-03	17.10	none	10.00	2.00	12.00	18.00	1.00	19.00	5.00	9.00	3.00	10.70	22.70	27.70
pyrethrin	Pyronone	I	37.12	Mar-09	18.00	B, P	10.00	3.80	13.80	2.90	1.00	3.90	25.00	4.35	28.50	35.82	68.67	93.67
pyridaben	Pyramite	I	31.29	Mar-09	25.80	P	5.00	1.90	6.90	1.45	1.00	2.45	15.00	4.35	28.50	36.67	69.52	84.52
pyriproxyfen	Distance IGR	I	14.67	Jan-03	14.67	P	5.00	1.00	6.00	1.00	1.00	2.00	25.00	3.00	3.00	5.00	11.00	36.00
pyriproxyfen	Distance IGR	I	14.67	Jan-03	14.67	P	5.00	1.00	6.00	1.00	1.00	2.00	25.00	3.00	3.00	5.00	11.00	36.00
quinalphos	Starlux	I	42.86	Mar-09	New	S,P,B	15.00	5.70	20.70	18.90	1.00	19.90	25.00	18.90	28.50	15.58	62.98	87.98
resmethrin	Resmethrin	I	29.01	Mar-09	33.60	P,B	5.00	1.90	6.90	2.45	1.00	3.45	5.00	7.35	28.50	35.82	71.67	76.67
rotenone	Fertilome	I	29.43	Mar-09	33.00	S, P	5.00	1.90	6.90	2.10	1.00	3.10	15.00	6.30	28.50	28.50	63.30	78.30
ryania	Ryania	I	37.87	Mar-09	Original	Z,L,R,P,B,C	9.50	3.61	13.11	7.58	2.00	9.58	4.80	31.50	18.81	35.82	86.13	90.93
s-kinoprene	Enstar II	I	28.04	Mar-09	New	Z,L,R,S,P,B	10.00	3.80	13.80	4.20	2.00	6.20	3.20	6.30	18.81	35.82	60.93	64.13
s-kinoprene	Enstar II	I	28.04	Mar-09	New	Z,L,R,S,P,B	10.00	3.80	13.80	4.20	2.00	6.20	3.20	6.30	18.81	35.82	60.93	64.13
sabadilla	Red Devil	I	39.41	Original	Original	DT,D,S,P,R,L	22.50	8.55	31.05	3.15	2.00	5.15	11.52	22.05	17.10	31.35	70.50	82.02
soap	M-Pede	I	19.45	Original	Original	E,T,M,O,F,D, B,S,R,L	9.50	1.90	11.40	3.14	2.00	5.14	12.48	16.34	3.00	10.00	29.34	41.82
spinetoram	Delegate	I	27.78	Mar-09	New	P, B, Z	5.00	1.90	6.90	1.45	1.00	2.45	15.00	4.35	18.81	35.82	58.98	73.98
spinosad	SpinTor,Tracer	I	14.38	Apr-08	17.70	none	5.00	1.00	6.00	1.00	1.00	2.00	5.00	3.00	15.00	12.15	30.15	35.15
spiridoclofen	Envidor	I	17.18	Jan-07	New	P,F,D	5.00	1.90	6.90	1.45	1.00	2.45	18.00	9.00	5.70	9.50	24.20	42.20
spiridoclofen	Envidor	I	17.18	Jan-07	New	P,F,D	5.00	1.90	6.90	1.45	1.00	2.45	18.00	9.00	5.70	9.50	24.20	42.20
spiromesifen	Oberon	I	27.93	Mar-09	New	D, P	5.00	1.90	6.90	1.45	1.00	2.45	25.00	15.23	5.70	28.50	49.43	74.43
spirotetramat	Movento	I	35.29	Mar-09	New	D,F,L,R,S,C,P	9.50	3.61	13.11	3.99	2.00	5.99	11.52	22.05	5.70	47.50	75.25	86.77
tebufenozide	Confirm	I	16.44	Jan-03	17.77	P	5.00	1.90	6.90	2.45	3.00	5.45	9.00	7.35	5.70	14.92	27.97	36.97
teflubenzuron	Dart	I	23.93	Mar-09	New	P	5.00	1.90	6.90	7.35	1.00	8.35	15.00	7.35	5.70	28.50	41.55	56.55
tefluthrin	Force	I	25.33	Mar-09	25.30	P, B	5.00	1.00	6.00	1.00	1.00	2.00	25.00	3.00	15.00	25.00	43.00	68.00
terbufos	Counter	I	66.00	Apr-03	66.00	P, B	25.00	15.00	40.00	3.00	3.00	6.00	15.00	27.00	27.00	75.00	129.00	144.00
thiacloprid	Calypso	I	31.33	Jan-04	31.33	none	10.00	6.00	16.00	12.00	3.00	15.00	3.00	6.00	9.00	45.00	60.00	63.00
thiamethoxam	Actara	I	33.30	Dec-00	33.30	P	7.50	2.85	10.35	11.03	1.00	12.03	5.00	7.35	28.50	36.67	72.52	77.52
thiocyclam	Evisect or Tryclam	I	33.77	Mar-09	New		15.00	5.70	20.70	4.35	5.00	9.35	5.00	13.05	5.70	47.50	66.25	71.25
thiodicarb	Larvin	I	23.33	Mar-01	23.30	None	15.00	3.00	18.00	3.00	3.00	6.00	9.00	3.00	9.00	25.00	37.00	46.00
tralomethrin	Saga	I	26.67	Jan-03	26.67	none	5.00	1.00	6.00	2.00	1.00	3.00	25.00	6.00	15.00	25.00	46.00	71.00
triazophos, triazofos	Hostathion	I	35.59	Jan-04	Original		45.00	17.10	62.10	4.35	3.00	7.35	3.00	13.05	5.70	15.58	34.33	37.33
trichlorfon	Dipterex	I	20.17	Apr-08	14.83		12.50	2.50	15.00	2.50	5.00	7.50	5.00	9.00	9.00	15.00	33.00	38.00
triflumuron	Alsystin	I	34.47	Mar-09	New	D,Z,C,P	9.50	3.61	13.11	2.76	1.00	3.76	5.00	15.23	18.81	47.50	81.54	86.54

2016 XXV International Congress of Entomology, Orlando, Florida, USA | September 25-30

SYMPOSIA AGENDA

Acarology

Dynamic Interactions at the Tick-Host-Pathogen Interface: Organizer: Stephen Wikel
Global Perspectives on Soft Ticks (Argasidae) as Pests and Disease Vectors: Organizer: Job Lopez

Agricultural and Forest Entomology

Agronomic and Economic Benefits of Seed Treatments: The IPM Perspective: Organizers: Palle Pedersen, Bill Striegel and Bradley W. Hopkins
Avocados, Blueberries, and Olives: Pests of Small Fruit in Florida: Organizers: Jennifer Gillett-Kaufman and Sandra A. Allan
Bark and Ambrosia Beetles: Biology, Ecology, and Management: Organizers: Fernando E. Vega, Richard W. Hofstetter and Peter Biedermann
Forest Entomology Without Borders: Balancing Market Forces with Government Intervention Organizer: Kimberly Wallin
Global Challenges in Rice Pest Management : Organizers: Mark Stevens and Larry D. Godfrey
Innovative Responses to the Global Homogenization of Plantation Pests: Organizers: Brett Hurley, Timothy Paine, Simon Lawson
Insect Crop Pests in the Mediterranean Basin: Organizer: Sabah Razi
Invasive Bark and Ambrosia Beetles: A Pest Problem of Worldwide Significance: Organizers: Steven Seybold and M. Faccoli
Microbial Associates and Microbial Control of Ambrosia Beetles: Organizers: John Vandenberg and Louela Castrillo
Millions of Hectares and Counting: Knowledge Gained During Recent Bark Beetle Outbreaks in Western North America: Organizers: Christopher J. Fettig and Ann M. Lynch
Pest Shifting, Invasive Species, and Resistant Development in Key Growing Areas of the World and The Need For New Technology to Manage Insect Pests: Organizers: Melissa Siebert and Luis E. Gomez
Profiles of Forest Pests Ready to Cross Boarders and Invade New Areas: Organizers: Melody A. Keena, Alain Roques and Yuri Baranchikov
Public- Private Partnerships for Development of Next Generation Pest Management Methods: Organizers: Bryony Bonning and Subba Reddy Palli
Technological Innovations and Integrated Pest Management: Organizers: Grzegorz Krawczyk and Wakas Wakil
The Brown Marmorated Stink Bug: An Invasive Insect of Global Importance: Organizers: George C. Hamilton, Tracy C. Leskey and Anne L. Nielsen

Apidology, Sericulture and Social Insects

Breeding Honey Bees, Apis mellifera, for Resistance to Varroa Destructor: Organizers: Robert G. Danka, Ralph Büchler and Stephen Pernal

Evolution of Insect Sociality: From Theory to Genomes and Back Again: Organizers: Amro Zayed and Amy L. Toth
Excavation and Construction by Social Insects- Integrating Positive and Negative Space: Organizer: Paul Bardunias
Genomics and Genome Engineering in the Silkworm: Organizers: Takashi Kiuchi and Kallare Arunkumar:
Harnessing the Power of Genomics Tools: Functional Genomics of Pollinator Health: Organizers: Christina M. Grozinger and Robert Paxton
Harnessing the Power of Genomics Tools: Monitoring Stressors in Pollinator Populations Organizers: Christina M. Grozinger and Robert Paxton
Insects and Ecosystem Services with Special Reference to Pollination Biology: Organizer: O.K. Remadevi
Insights into the Biology of Wild and Managed Native Bees: Organizers: S. Woodard, Quinn McFrederick and Theresa L. Pitts-Singer:
Integrated Crop Pollination in Theory and Practice: Organizers: Jason Gibbs, Cory Stanley-Stahr and Rufus Isaacs
Interactions Between Pollination Services and Agricultural Practices: Organizer: Decio Gazzoni
Invasive Ants: Biology and Control: Organizers: Sanford Porter, Joshua R. King and David Oi
IPM Strategies for the Management and Sustainability of Honey Bees (Apis mellifera) Across the Globe: Organizers: Jennifer M. Tsuruda and Juliana Rangel
Regulation of Honey Bee Polyethism: Clock, Neuroendocrine System and Environmental Toxicants Organizers: Makio Takeda and Darrell Moore
Status of Worldwide Honey Bee Health and Its Impacts on Agriculture: Organizers: Jeffrey Pettis, Robyn Rose and Peter Neumann

Arthropod Vectors of Animal and Plant Disease

Biology, Ecology and Management of the Asian Citrus Psyllid Diaphorina Citri, Vector of Huanglongbing: Organizers: Philip A. Stansly and Jawwad A. Qureshi
Ecology, Surveillance, and Control of Biting Midges: Organizers: Simon T. Carpenter, Lee Cohnstaedt and Glenn Bellis:
In Honour of Past ESA President Donald L. McLean: Electropenetrography (EPG) Without Borders: Plant Pathogen Vector Research Inspiring Novel Animal Disease Studies: Organizers: Elaine Backus and Andrew Li
Insect Vectors as Drivers of Emerging Plant Diseases: Organizers: Alberto Fereres, Rodrigo Almeida and Joao R. S. Lopes
Insect-transmitted Phytoviruses and Agricultural Pandemics: Current Scenarios and Sustainable Management: Organizers: Rajagopalbabu Srinivasan and Juan Alvarez
Partners in Crime: Vector-pathogen Interactome: Organizers: Michelle Cilia and Cecilia Tamborindeguy
Rhipicephalus sanguineus: Tick Without Borders: Organizers: Emma N. I. Weeks and Phillip E. Kaufman

Biodiversity, Bioeography and Conservation of Arthropods

Arthropods of Madagascar: Historical Biogeography, Diversity, and Patterns of Distribution: Organizer: Michael Irwin
Biodiversity, Distribution, Behavior and Activity of Forensically Important Entomofauna and Microbiota in Different Ecoregions: Organizer: M Denise Gemmellaro:
Biogeographical Lessons Learned from the West Indies: Organizers: Jacqueline Miller and Michael A. Ivie
Building the Biodiversity Knowledge Graph for Insects – Components, Progress, Challenges Organizers: Nico Franz and Katja C. Seltmann
Current Status and Biodiversity of Indian Curculionidae: Organizer: Dalip Kumar
Data without Borders: Collecting, Digitizing, Using, and Re-using Biological Specimen Data: Organizers: Deborah Paul, Pamela Soltis, Paul Flemons and Nicole Fisher
From Diet Breadth to Diversification: Understanding Host Shifts in Phytophagous Insects:

Organizers: Peri A. Mason, Angela Smilanich and M. Deane Bowers
Global Status of Native and Invasive Coccinellids: Organizer: Leslie Allee
Insects, Ecosystem Functioning, and Services: New Questions and Experimental Perspectives Organizers: Jorge Noriega, Joaquin Hortal and Ana Santos
Keeping Science in Citizen Science: Organizers: Kathleen Prudic, Maxim Larrivée and Kent McFarland
Phylogeny and Evolution of Insect Communication Systems: Organizers: Susan J. Weller and Jennifer Zaspel
Resource Management and Biodiversity in Cockroach and Termite Lineages: Exploring the Common Ground in Their Nutrition, Biodiversity and Systematics: Organizers: Donald Mullins, Aaron Mullins, Christine Nalepa, Clifford Keil and Jessica Ware
SOLA Scarab Workers: Organizer: Andrew B. T. Smith

Bioinformatics, and Comparative Genomics of Arthropods

Ecological and Developmental Insights from Comparative Hemipteroid Genomics Organizer: Kristen Panfilio
Spruce Budworm Genomics: From Basic Science to Outbreak Management: Organizer: Michel Cusson

Biological Control and Insect Pathology

Advancement and Challenges in Biological Control of Invasive Forest Insects: A Global Perspective Organizers: Juli Gould, Leah S. Bauer, Xiao-yi Wang and Jian Duan
Advances in the Behavioral Ecology of Entomopathogenic Nematodes: Organizers: David Shapiro-Ilan and Ed Lewis
Behavior and Ecology of Native, Naturalized and Invasive Ladybird Beetles: Organizers: Eric Riddick, Louis Hesler, Oldrich Nedved, Helen Roy, John Sloggett, Antonio Soares
Biocontrol and Induced Plant Defences: A Tale of Three Trophic Levels: Organizers: Geoff Gurr and Olivia Reynolds
Biological Control of the Invasive Brown Marmorated Stink Bug, Halyomorpha halys, by Exotic and Native Parasitoids and Predators: A Global Perspective: Organizers: Paula Shrewsbury and Tim Haye
Biological Control Perspective in South and Southeast Asia: Organizers: Alberto Barrion and Divina Amali
Industry-Academia Collaborative Research & Development in Biological Control of Arthropod Pests: Results and Feedback from Four Years of Marie-Curie Staff-exchange: Organizer: Thibaut Malausa
Regional Status of Microbial Control Programs: Organizers: Steven P. Arthurs, Surendra Dara and Ralf-Udo Ehlers
Status and Prospects for Biological Control in the 21st Century: Organizers: Russell Messing and Jacques Brodeur
Trichogramma in Augmentative Biological Control : A Worldwide View of the Past, Present and Future: Organizers: Brad Vinson, Asha Rao and Shoil Greenberg
Virus-Insect Interactions: Organizers: Bryony Bonning, Lyric Bartholomay and Carla Saleh

Ecology and Population Dynamics

Arthropod Movement in Agro-ecosystems: Linking Individual Behaviours and Population Patterns Across Spatio-temporal Scales. Just What Does Emerge?: Organizers: Cate Paull, Hazel R. Parry and Nancy Schellhorn
Arthropods and Decomposition: Organizers: Michael D. Ulyshen and Jennifer L. Pechal
Climate Change Impacts and Insect Population Dynamics: Organizers: James Bell, Carol Boggs, John Terblanche and Toke Høye
Ecology, Biodiversity and Geography of Gall-Inducing Insects: Now and Beyond: Organizer: G Wilson Fernandes
Host Relations of Gall-inducing Insects: Organizers: Donald Miller and Anantanarayanan Raman
Insects and Landscape Ecology: Defining an Entomological Perspective: Organizer: Robinson Sudan
Monitoring and Forecasting of Migratory Insect Movements: Organizers: Haikou Wang and Baoping

Zhai
Population Biology of Winter Moth, Operophtera brumata L, and Related Geometrids on Two Continents: Organizer: Joseph Elkinton
Population Consequences of Pest Management Tactics for Non-target Species: Organizer: David A. Andow
Stable Isotope 'Fingerprinting' in Insect Ecology: Organizers: Shawn Steffan and Yoshito Chikaraishi

Ecology of Pesticides, Resistance, Toxicology and Genetically Modified Crops
Biotechnologically-Based Insect Control Strategies: Organizers: Angharad M. R. Gatehouse and Gongyin Ye
Globally Important Pests & Globally Important Control Tools – Comparing and Contrasting IRM Successes and Challenges, IRAC US Symposium: Organizers: Graham P. Head, Bradley W. Hopkins, Scott W. Ludwig, Clinton D. Pilcher, Christopher Sansone, Caydee Savinelli and Sean Whipple
Insect-Resistant GM Crops in Asia-Pacific: Current Status, Challenges, and Opportunities: Organizers: Edwin P. Alcantara, Andi Trisyono and Mao Chen
Key Challenges with Bt Crops in Latin America: Organizers: Analiza P. Alves, Amit Sethi and Ana Maria Vélez:
Next Generation Technologies for Insect Control: Organizers: Nandi Nagaraj, Murugesan Rangasamy, Renata Bolognesi, Blair Siegfried and Swapna Priya Rajarapu

Entomological Effects of Global Warming in Agriculture and Medical Entomology
Climate Change: Preventing the Spread of Invasive Species in Agriculture: Organizers: Alvin M. Simmons, Andrew Cuthbertson and Jesusa C. Legaspi
Critical Factors Modifying the Effects of Climate Change on the Distributions of Vector-borne Diseases: Organizers: Howard Ginsberg and Jean Tsao
Effect of Global Climate Change on Vector-Borne Disease Transmission: Organizers: Ephantus J. Muturi, Allison Parker, and Paul A. Weston

Entomology Around the World
Aquatic Entomology Around the World
Organizers: Kayla I. Perry and Kyndall Dye
Case studies in Entomology: Four Examples of Global Excellence: Organizers: Margaret Hardy and Myron Zalucki
Cassava and Bean IPM throughout the Developing World: Honoring the Contributions of Anthony Bellotti and César Cardona Mejia: Organizers: Stephen L. Lapointe and Kris Wyckhuys
Department of Defense Entomology and Global Public Health: Working Together to Combat Vector Borne Disease and Protect the Environment: Organizer: Mark Pomerinke
Engaging the World of Arthropod Education in a Digital Age: Organizers: John Guyton, Rebecca Baldwin and Andrine A. Shufran
Entomological Issues Beyond Borders: Challenges and Opportunities for Sustainable Solutions: Organizers: Suhas Vyavhare, M.O. Way, Raul Medina and Juliana Rangel
Entomological Research in China: Major Progresses and Perspectives: Organizer: Tong-Xian Liu
Entomologists Without Borders: The Need for Collaboration Between Medical Professionals and Entomologists for the Betterment of Global Public Health: Organizers: Kyndall Dye, Jennifer Gordon and Sydney Crawley
Entomology Around the World: Past, Present and Future Challenges: Organizers: Michelle Samuel-Foo, Mamoudou Setamou, Simon Zebelo and Joseph Munyaneza
Entomology Without Borders in the Neotropical Region: Organizer: Pedro Neves
Entomology Without Borders Member Symposium with Retired and Emeriti Seniors on Sharing and Exchanging their Involvement in Research, Teaching, Special Interests, International Travel, Consulting and Mentoring: Organizers: Kenneth A. Sorensen and Ken Pruess

Global Entomological Collaborations: Organizer: Theresa M. Cira
Global Status and Future of GM Crops for Insect Control: Organizers: Murugesan Rangasamy, Nandi Nagaraj and Srinivas Parimi

Insect Photography Symposium; Bringing the Small to the World: Organizers: Stephen Doggett and Thomas V. Myers
Insects and the Public: Engagement, Education and Outreach: Organizer: Luke Tilley
International Graduate Student Showcase: Organizers: Paul Abram, Chandra Moffat, Carey Minteer and Mervat A. B. Mahmoud
Modern Studies of Gerromorphan Insects: Behavior, Phylogeny, Physiology and Ecology: Organizers: Tetsuo Harada and John Spence
Orthopteroids Without Borders: Organizers: Alexandre V. Latchininsky and Derek Woller
Regulatory Entomology: Organizer: Reg Coler
Sin Fronteras: Forging Collaborations Through the Americas – 4th Latin American/Hispanic Symposium: Organizers: Ana Legrand and Silvia Rondon, Raul Medina
Symposium of Neotropical Insect Galls: Organizer: Valéria Maia
Tales from the Understory: Unraveling Secrets Behind Tropical Butterfly Communication, Behavior, Wing Patterns, and Diversity: Organizers: Adrea Susan Gonzalez-Karlsson and Susan D. Finkbeiner
Where are the Six Legs of Advanced Entomology Publishing taking us?: Organizers: Frank Krell, Michiel Thijssen and Lyubomir Penev

Entomophagy, and Entomology in Popular Culture

A Emerging Food Supply: Edible Insects: Organizer: Marianne Shockley
Insects and the Global Human Experience: Organizer: Gene Kritsky
Sericigenous Insects and 3F's – Fibre, (human)Food and Feed-Global Status and Future Role in Resolving Global Challenges: Organizers: Motoyuki Sumida and C. J. Prabhakar
Weaving your Web: Science Communication and Social Media for Insect Scientists: Organizers: Margaret Hardy and Gwen Pearson

Frontiers in Entomology

Biology and Evolution of Social Insect Symbionts: Organizers: Joseph Parker, K. Taro Eldredge and Christoph von Beeren
Crop Domestication Effects on Plant-insect Interactions: Patterns, Mechanisms, and Future Directions: Organizers: Katja Poveda and Susan Whitehead
Discovering Sustainable Insecticides: Resistance, Innovation, and Responsibility: Organizers: Margaret Hardy and Stephen Duke
Economics of IPM in the 21st Century: Multiple Perspectives from Around the World: Organizers: P Crain and David Onstad
Entomology in the Digital Age: Organizers: Barbara J. Sharanowski, Miles Zhang, Ana Dal Molin and Leanne Peixoto
Future Approaches for the Control of Insect Pests: Organizer: Phil Wege
In the Light of Morphometrics: Frontiers in Ecology and Evolution of Insect Morphology: Organizers: Kazuo Takahashi, Chris Klingenberg and Haruki Tatsuta
Insect Effects on Ecosystem Services: Organizers: Timothy D Schowalter and Teja Tscharntke
Microbial Modulation of Insect Immunity: Organizers: Elizabeth McGraw and Kerry M. Oliver
Next Generation Ecology, Morphology and Genomics: What Can We Learn About the Evolution of Odonata? Organizers: Maren Wellenreuther, Sebastian Büsse and Seth Bybee
Novel Insecticidal Agents and Next Gen Approaches for Insect Control: Organizers: William Moar and Kenneth Narva
Optical Manipulation of Arthropod Pests and Beneficials: Organizers: David Ben-Yakir and Irene Vänninen
Recent Approaches in Fossil Insect Studies: Organizer: Conrad Labandeira
Small RNAs – A New Frontier in Insect Science: Organizers: Sassan Asgari and Alexander Raikhel
Symposium in Honor of the 2016 Recipients of Certificates of Distinction: Organizer: Walter S. Leal and Alvin M. Simmons
Talking to Swarms Without Borders: Methods for Engaging the Public in the Buzz about Entomology: Organizers: William R. Morrison and Nicole F. Quinn
Unmanned Aerial Systems (Drones) for Precision Mosquito Control and Agricultural Use:

Organizers: Ary Faraji, Randy Gaugler and Greg Williams
What Constitutes Responsible Field Release of Transgenic Insects?: Organizer: Fred Gould
Wood Borer-Fungus Alliances and Conflicts: The Frontier of Forest Entomology: Organizer: Jiri Hulcr

Functional Genomics and Transgenesis

Epigenetics and Insect Adaptation to Their Environment: Organizers: Denis Tagu and Jennifer A. Brisson
Genomic and Genetic Strategies toward Integrated Pest Management: Organizers: Fang Zhu and Laura C Lavine
Insect Genetic Technologies: State of the Art and Promise for the Future: Organizers: Jennifer A. Brisson and Marcé Lorenzen
Workshop on Gene Editing Technologies: Organizers: Anjian Tan and Subba Reddy Palli

Genetics and Evolutionary Entomology

Arthropod Population Genomics: Organizer: David G. Heckel
Evolution of Biological Clocks: Organizers: Astrid Groot and Charalambos Kyriacou
Genetic Architecture of Species Differences: Organizer: Jürgen Gadau
Insect Sex Determination: Organizers: Leo Beukeboom, Daniel Bopp, Richard Meisel and Aaron Tarone
Jumping genes: Horizontal Gene Transfer in Insects and Beyond: Organizers: Yannick Pauchet and Roy Kirsch
Rapid Evolution of Insect Pests within Agroecosystems: Organizers: Sean Schoville and Yolanda Chen

Insect Biomechanics and Insect-Inspired Robotics

Bio-inspiration Crossing Disciplinary Borders: Organizers: Marianne Alleyne and Catherine Loudon

Insect Chemical Ecology

Cross-continental Patterns of Chemical Communication among Subcortical Insects: Organizers: Kamal Gandhi, Christiane Helbig and Michael Müller
From the Laboratory Bench to Commercial Products: Semiochemical-based Technology Development and Regulation Worldwide: Organizers: Jerry Zhu, Jocelyn G. Millar and Thomas C. Baker
Global Research and Develolpment of Insect Repellents: Organizer: Mustapha Debboun
Modulation of Insect Chemical Response at Different Time Scales: Ethology, Ecology, and Evolution:
Organizers: Fredrik Schlyter and Bill Hansson
Novel Contributions of Chemical Ecology to Global IPM: Organizers: Baldwyn Torto and Christian Borgemeister
Olfaction and Olfaction Mediated Behaviors: Organizers: Bill Hansson and Laurence Zwiebel
Sex and Drugs and Bee Control: The Chemical Ecology of Pollination: Organizers: Lynn S. Adler, Rebecca E. Irwin and Phil Stevenson
Worldwide Use of Kairomones to Enhance Management of Tortricids in Fruit Crops: New Opportunities and New Problems: Organizers: Alan L. Knight and Peter Witzgall

Insect Immunology

The Biochemical Signaling Interface Between Invaders and Their Insect Hosts: Organizers: Qisheng Song, David W. Stanley, Yonggyun Kim and Gong-yin Ye
Eco-Immunology of Invertebrates: Organizers: Kenneth Wilson, Fleur Ponton and Sheena Cotter
Host Adaptations in Insect Symbioses: Elements That Facilitate Stability and Persistence: Organizers: Gaelen Burke and Kevin J. Vogel
Insect Gut Microbe Interactions: Organizers: Bruno Lemaitre and Angela Douglas
Insect Symbiosis and Immunity: Organizers: Bessem Chouaia and Abdelaziz Heddi
Interactions Between the Insect Immune System and Parasites: Organizers: Michael R. Strand and Francesco Pennacchio

Outlaws of Immunology and Infection: Organizers: David Schneider and Ann Thomas Tate
Parasitoids, Polydnaviruses and Pathogens: Genomes to Immune Physiology: Organizers: Bruce Webb and Nathalie Volkoff
Social Insect Pathobiology: Organizers: Rebeca B. Rosengaus and Elke Genersch
Trade-offs and Immunity: Physiology, Life-History and Evolution: Organizers: Nicole Gerardo and Seth M. Barribeau
Vector Immunology Symposium: Organizer: Petros Ligoxygakis
Wound Healing and Damage Signals in Insects: Organizers: Ulrich Theopold and Will Wood

Insect Neurobiology

Endocrine and Neural Network in Control of Physiology: Organizers: Jan Veenstra and Yoonseong Park
Endocrine and Neural Networks That Control and Regulate Behavioral Programs: Organizers: Erik Johnson and Young-Joon Kim

Insect-Plant Interactions in a Changing Climate

Ant-Plant Interactions in a Changing World: Organizers: Suzanne Koptur and Paulo S. Oliveira
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