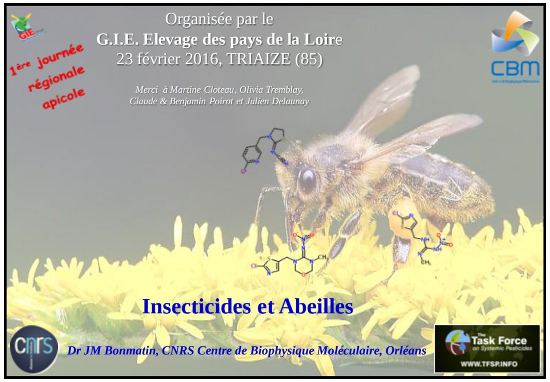

Organisée par le
G.I.E. Elevage des pays de la Loire
23 février 2016, TRIAIZE (85)

Merci à Martine Cloteau, Olivia Tremblay,
Claude & Benjamin Poirot et Julien Delaunay

Insecticides et Abeilles

Dr JM Bonmatin, CNRS Centre de Biophysique Moléculaire, Orléans

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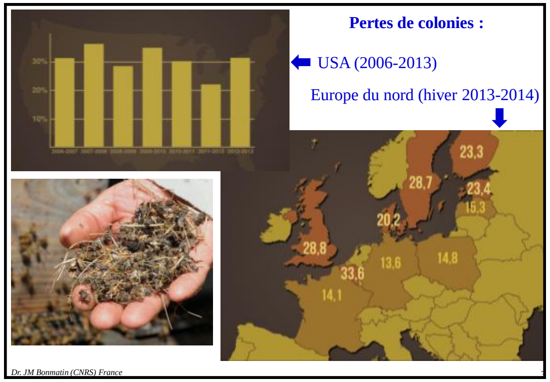
PLAN

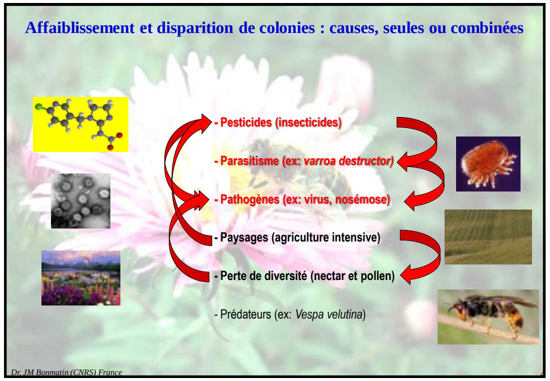
- ➢Exemple des néonicotinoïdes
- ➢Effets chroniques sur l'abeille et la mouche
- ➢Analyses de pollen, nectar, abeilles
- ➢Impacts sur les abeilles
- ➢Evaluation mondiale
- ➢Impacts sur la biodiversité et l'Homme
- ➢Conclusions



Pertes de colonies :

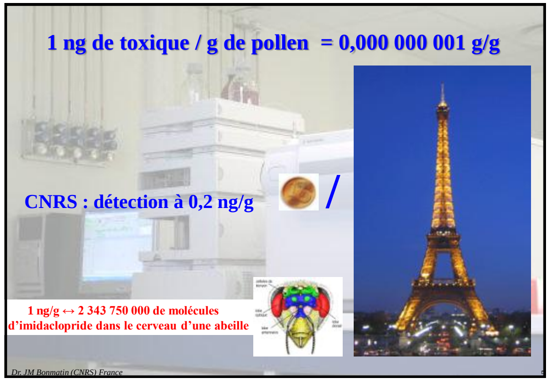
⬅ USA (2006-2013)

Europe du nord (hiver 2013-2014) ⬇



Affaiblissement et disparition de colonies : causes, seules ou combinées

- Pesticides (insecticides)
- Parasitisme (ex: *varroa destructor*)
- Pathogènes (ex: virus, nosémose)
- Paysages (agriculture intensive)
- Perte de diversité (nectar et pollen)
- Prédateurs (ex: *Vespa velutina*)



1 ng de toxique / g de pollen = 0,000 000 001 g/g

CNRS : détection à 0,2 ng/g /

1 ng/g ↔ 2 343 750 000 de molécules d'imidaclopride dans le cerveau d'une abeille

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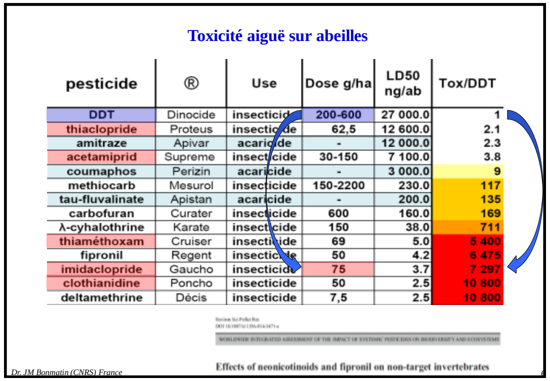
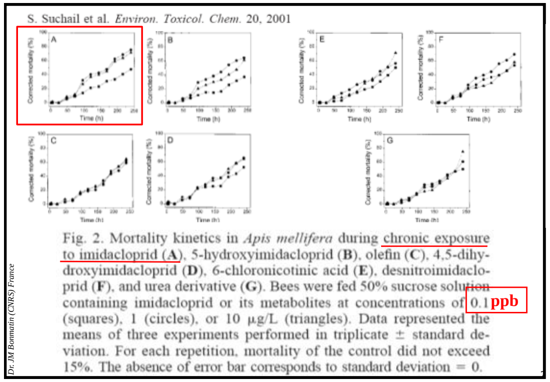


Toxicité aiguë sur abeilles

pesticide	®	Use	Dose g/ha	LD50 ng/ab	Tox/DDT
DDT	Dinocide	insecticide	200-600	27 000.0	1
thiaclopride	Proteus	insecticide	62,5	12 600.0	2.1
amitraze	Apivar	acaricide	-	12 000.0	2.3
acetamiprid	Supreme	insecticide	30-150	7 100.0	3.8
coumaphos	Perizin	acaricide	-	3 000.0	9
methiocarb	Mesurol	insecticide	150-2200	230.0	117
tau-fluvalinate	Apistan	acaricide	-	200.0	135
carbofuran	Curater	insecticide	600	160.0	169
λ-cyhalothrine	Karate	insecticide	150	38.0	711
thiaméthoxam	Cruiser	insecticide	69	5.0	5 400
fipronil	Regent	insecticide	50	4.2	6 475
imidaclopride	Gaucho	insecticide	75	3.7	7 297
clothianidine	Poncho	insecticide	50	2.5	10 800
deltamethrine	Décis	insecticide	7,5	2.5	10 800

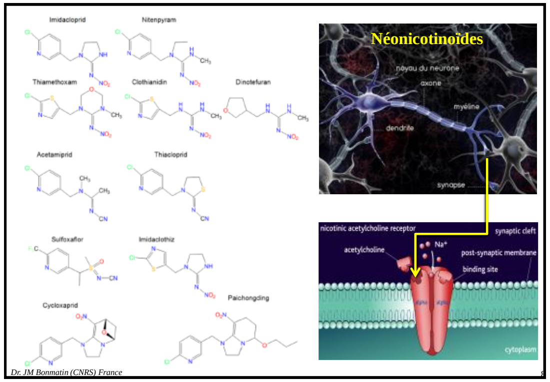
WORLDWIDE INTEGRATED ASSESSMENT OF THE IMPACT OF SYSTEMIC PESTICIDES ON BIODIVERSITY AND ECOSYSTEMS

Effects of neonicotinoids and fipronil on non-target invertebrates

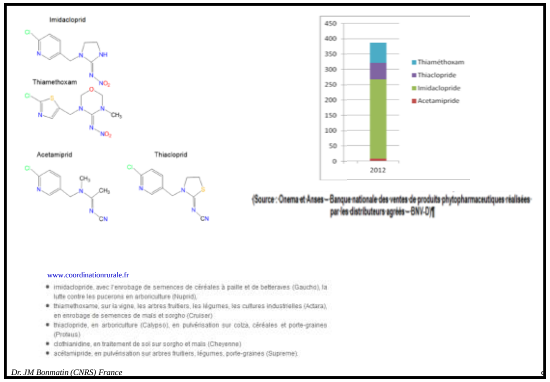


S. Suchail et al. *Environ. Toxicol. Chem.* 20, 2001

Fig. 2. Mortality kinetics in *Apis mellifera* during chronic exposure to imidacloprid (**A**), 5-hydroxyimidacloprid (**B**), olefin (**C**), 4,5-dihydroxyimidacloprid (**D**), 6-chloronicotinic acid (**E**), desnitroimidacloprid (**F**), and urea derivative (**G**). Bees were fed 50% sucrose solution containing imidacloprid or its metabolites at concentrations of 0.1 **ppb** (squares), 1 (circles), or 10 µg/L (triangles). Data represented the means of three experiments performed in triplicate ± standard deviation. For each repetition, mortality of the control did not exceed 15%. The absence of error bar corresponds to standard deviation = 0.



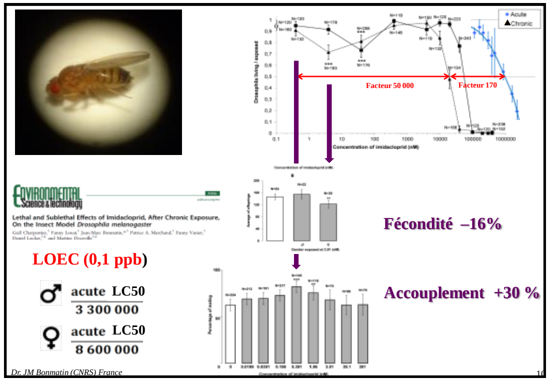
Néonicotinoïdes



(Source : Onema et Anses – Banque nationale des ventes de produits phytopharmaceutiques réalisées par les distributeurs agréés – BNV-D)

www.coordinationrurale.fr

- imidaclopride, avec l'enrobage de semences de céréales à paille et de betteraves (Gaucho), la lutte contre les pucerons en arboriculture (Nuprid),
- thiaméthoxame, sur la vigne, les arbres fruitiers, les légumes, les cultures industrielles (Actara), en enrobage de semences de maïs et sorgho (Cruiser)
- thiaclopride, en arboriculture (Calypso), en pulvérisation sur colza, céréales et porte-graines (Proteus)
- clothianidine, en traitement de sol sur sorgho et maïs (Cheyenne)
- acétamipride, en pulvérisation sur arbres fruitiers, légumes, porte-graines (Supreme).



Environmental Science & Technology

Lethal and Sublethal Effects of Imidacloprid, After Chronic Exposure, On the Insect Model *Drosophila melanogaster*

Gaël Charpentier, Fanny Louat, Jean-Marc Bonmatin, Patrice A. Marchand, Fanny Vanier, Daniel Locker, and Martine Decoville

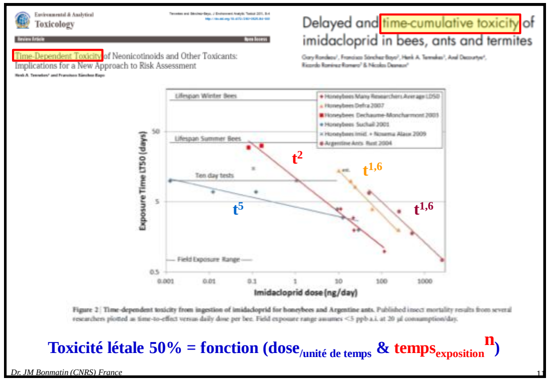
LOEC (0,1 ppb)

♂ $\frac{\text{acute LC50}}{3\,300\,000}$

♀ $\frac{\text{acute LC50}}{8\,600\,000}$

Fécondité –16%

Accouplement +30 %



Environmental & Analytical Toxicology

Time-Dependent Toxicity of Neonicotinoids and Other Toxicants: Implications for a New Approach to Risk Assessment

Henk A. Tennekes and Francisco Sánchez-Bayo

Delayed and time-cumulative toxicity of imidacloprid in bees, ants and termites

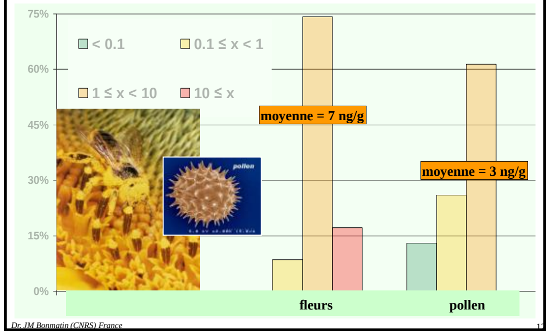
Gary Rondeau, Francisco Sánchez-Bayo, Henk A. Tennekes, Axel Decourtye, Ricardo Ramírez-Romero & Nicolas Desneux

Figure 2 | Time-dependent toxicity from ingestion of imidacloprid for honeybees and Argentine ants. Published insect mortality results from several researchers plotted as time-to-effect versus daily dose per bee. Field exposure range assumes <5 ppb a.i. at 20 µl consumption/day.

Toxicité létale 50% = fonction ($\text{dose}_{\text{/unité de temps}}$ & $\text{temps}_{\text{exposition}}{}^{n}$)

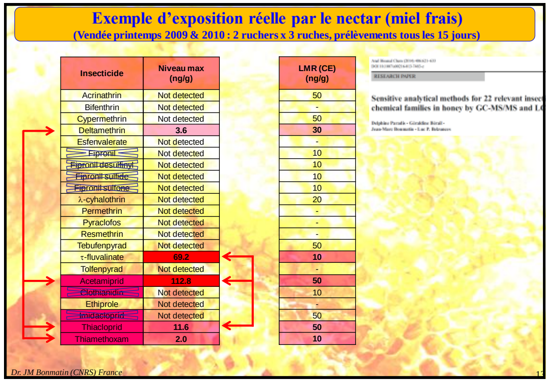
Imidaclopride et tournesol (floraison)

(Bonmatin et al. Analyical Chemistry, 2003)



moyenne = 7 ng/g

moyenne = 3 ng/g



Exemple d'exposition réelle par le nectar (miel frais)

(Vendée printemps 2009 & 2010 : 2 ruchers x 3 ruches, prélèvements tous les 15 jours)

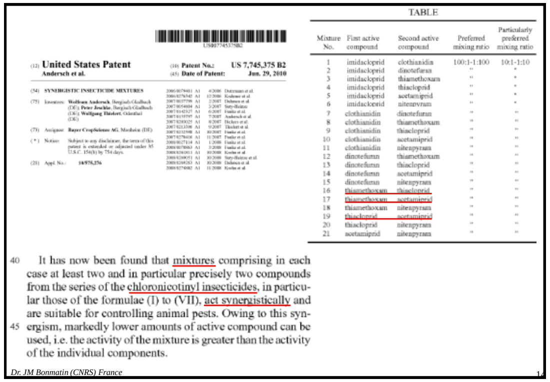
Insecticide	Niveau max (ng/g)	LMR (CE) (ng/g)
Acrinathrin	Not detected	50
Bifenthrin	Not detected	-
Cypermethrin	Not detected	50
Deltamethrin	3.6	30
Esfenvalerate	Not detected	-
~~Fipronil~~	Not detected	10
~~Fipronil desulfinyl~~	Not detected	10
~~Fipronil sulfide~~	Not detected	10
~~Fipronil sulfone~~	Not detected	10
λ-cyhalothrin	Not detected	20
Permethrin	Not detected	-
Pyraclofos	Not detected	-
Resmethrin	Not detected	-
Tebufenpyrad	Not detected	50
τ-fluvalinate	69.2	10
Tolfenpyrad	Not detected	-
Acetamiprid	112.8	50
~~Clothianidin~~	Not detected	10
Ethiprole	Not detected	-
~~Imidacloprid~~	Not detected	50
Thiacloprid	11.6	50
Thiamethoxam	2.0	10

Anal Bioanal Chem (2014) 406:621–633
DOI 10.1007/s00216-013-7483-z

RESEARCH PAPER

Sensitive analytical methods for 22 relevant insect
chemical families in honey by GC-MS/MS and L

Delphine Paradis · Géraldine Bérail ·
Jean-Marc Bonmatin · Luc P. Belzunces



US007745375B2

(12) **United States Patent**
Andersch et al.

(10) **Patent No.:** **US 7,745,375 B2**
(45) **Date of Patent:** **Jun. 29, 2010**

(54) **SYNERGISTIC INSECTICIDE MIXTURES**

(75) Inventors: **Wolfram Andersch**, Bergisch Gladbach (DE); **Peter Jeschke**, Bergisch Gladbach (DE); **Wolfgang Thielert**, Odenthal (DE)

(73) Assignee: **Bayer CropScience AG**, Monheim (DE)

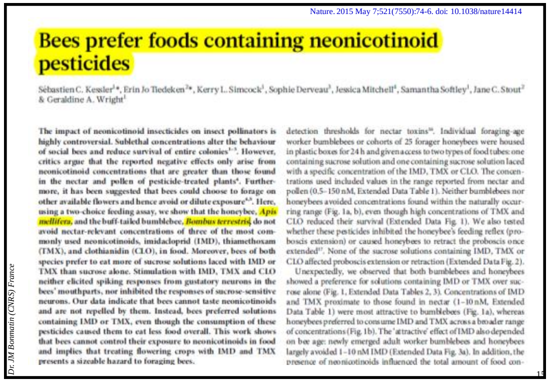
(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 754 days.

(21) Appl. No.: **10/578,256**

TABLE

Mixture No.	First active compound	Second active compound	Preferred mixing ratio	Particularly preferred mixing ratio
1	imidacloprid	clothianidin	100:1-1:100	10:1-1:10
2	imidacloprid	dinotefuran	"	"
3	imidacloprid	thiamethoxam	"	"
4	imidacloprid	thiacloprid	"	"
5	imidacloprid	acetamiprid	"	"
6	imidacloprid	nitenpyram	"	"
7	clothianidin	dinotefuran	"	"
8	clothianidin	thiamethoxam	"	"
9	clothianidin	thiacloprid	"	"
10	clothianidin	acetamiprid	"	"
11	clothianidin	nitenpyram	"	"
12	dinotefuran	thiamethoxam	"	"
13	dinotefuran	thiacloprid	"	"
14	dinotefuran	acetamiprid	"	"
15	dinotefuran	nitenpyram	"	"
16	thiamethoxam	thiacloprid	"	"
17	thiamethoxam	acetamiprid	"	"
18	thiamethoxam	nitenpyram	"	"
19	thiacloprid	acetamiprid	"	"
20	thiacloprid	nitenpyram	"	"
21	acetamiprid	nitenpyram	"	"

It has now been found that mixtures comprising in each case at least two and in particular precisely two compounds from the series of the chloronicotinyl insecticides, in particular those of the formulae (I) to (VII), act synergistically and are suitable for controlling animal pests. Owing to this synergism, markedly lower amounts of active compound can be used, i.e. the activity of the mixture is greater than the activity of the individual components.



Nature. 2015 May 7;521(7550):74-6. doi: 10.1038/nature14414

Bees prefer foods containing neonicotinoid pesticides

Sébastien C. Kessler[1]*, Erin Jo Tiedeken[2]*, Kerry L. Simcock[1], Sophie Derveau[3], Jessica Mitchell[4], Samantha Softley[1], Jane C. Stout[2] & Geraldine A. Wright[1]

The impact of neonicotinoid insecticides on insect pollinators is highly controversial. Sublethal concentrations alter the behaviour of social bees and reduce survival of entire colonies[1–3]. However, critics argue that the reported negative effects only arise from neonicotinoid concentrations that are greater than those found in the nectar and pollen of pesticide-treated plants[4]. Furthermore, it has been suggested that bees could choose to forage on other available flowers and hence avoid or dilute exposure[4,5]. Here, using a two-choice feeding assay, we show that the honeybee, *Apis mellifera*, and the buff-tailed bumblebee, *Bombus terrestris*, do not avoid nectar-relevant concentrations of three of the most commonly used neonicotinoids, imidacloprid (IMD), thiamethoxam (TMX), and clothianidin (CLO), in food. Moreover, bees of both species prefer to eat more of sucrose solutions laced with IMD or TMX than sucrose alone. Stimulation with IMD, TMX and CLO neither elicited spiking responses from gustatory neurons in the bees' mouthparts, nor inhibited the responses of sucrose-sensitive neurons. Our data indicate that bees cannot taste neonicotinoids and are not repelled by them. Instead, bees preferred solutions containing IMD or TMX, even though the consumption of these pesticides caused them to eat less food overall. This work shows that bees cannot control their exposure to neonicotinoids in food and implies that treating flowering crops with IMD and TMX presents a sizeable hazard to foraging bees.

detection thresholds for nectar toxins[16]. Individual foraging-age worker bumblebees or cohorts of 25 forager honeybees were housed in plastic boxes for 24 h and given access to two types of food tubes: one containing sucrose solution and one containing sucrose solution laced with a specific concentration of the IMD, TMX or CLO. The concentrations used included values in the range reported from nectar and pollen (0.5–150 nM, Extended Data Table 1). Neither bumblebees nor honeybees avoided concentrations found within the naturally occurring range (Fig. 1a, b), even though high concentrations of TMX and CLO reduced their survival (Extended Data Fig. 1). We also tested whether these pesticides inhibited the honeybee's feeding reflex (proboscis extension) or caused honeybees to retract the proboscis once extended[17]. None of the sucrose solutions containing IMD, TMX or CLO affected proboscis extension or retraction (Extended Data Fig. 2).

Unexpectedly, we observed that both bumblebees and honeybees showed a preference for solutions containing IMD or TMX over sucrose alone (Fig. 1, Extended Data Tables 2, 3). Concentrations of IMD and TMX proximate to those found in nectar (1–10 nM, Extended Data Table 1) were most attractive to bumblebees (Fig. 1a), whereas honeybees preferred to consume IMD and TMX across a broader range of concentrations (Fig. 1b). The 'attractive' effect of IMD also depended on bee age: newly emerged adult worker bumblebees and honeybees largely avoided 1–10 nM IMD (Extended Data Fig. 3a). In addition, the presence of neonicotinoids influenced the total amount of food con-

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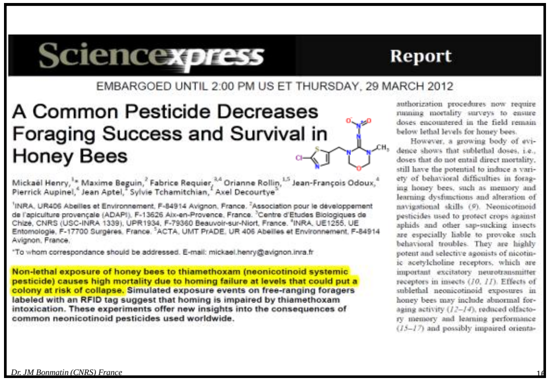

Sciencexpress Report

EMBARGOED UNTIL 2:00 PM US ET THURSDAY, 29 MARCH 2012

A Common Pesticide Decreases Foraging Success and Survival in Honey Bees

Mickaël Henry,[1]* Maxime Beguin,[2] Fabrice Requier,[3,4] Orianne Rollin,[1,5] Jean-François Odoux,[4] Pierrick Aupinel,[4] Jean Aptel,[2] Sylvie Tchamitchian,[1] Axel Decourtye[5]

[1]INRA, UR406 Abeilles et Environnement, F-84914 Avignon, France. [2]Association pour le développement de l'apiculture provençale (ADAPI), F-13626 Aix-en-Provence, France. [3]Centre d'Etudes Biologiques de Chizé, CNRS (USC-INRA 1339), UPR1934, F-79360 Beauvoir-sur-Niort, France. [4]INRA, UE1255, UE Entomologie, F-17700 Surgères, France. [5]ACTA, UMT PrADE, UR 406 Abeilles et Environnement, F-84914 Avignon, France.

*To whom correspondance should be addressed. E-mail: mickael.henry@avignon.inra.fr

Non-lethal exposure of honey bees to thiamethoxam (neonicotinoid systemic pesticide) causes high mortality due to homing failure at levels that could put a colony at risk of collapse. Simulated exposure events on free-ranging foragers labeled with an RFID tag suggest that homing is impaired by thiamethoxam intoxication. These experiments offer new insights into the consequences of common neonicotinoid pesticides used worldwide.

authorization procedures now require running mortality surveys to ensure doses encountered in the field remain below lethal levels for honey bees.

However, a growing body of evidence shows that sublethal doses, i.e., doses that do not entail direct mortality, still have the potential to induce a variety of behavioral difficulties in foraging honey bees, such as memory and learning dysfunctions and alteration of navigational skills (*9*). Neonicotinoid pesticides used to protect crops against aphids and other sap-sucking insects are especially liable to provoke such behavioral troubles. They are highly potent and selective agonists of nicotinic acetylcholine receptors, which are important excitatory neurotransmitter receptors in insects (*10*, *11*). Effects of sublethal neonicotinoid exposures in honey bees may include abnormal foraging activity (*12*–*14*), reduced olfactory memory and learning performance (*15*–*17*) and possibly impaired orienta-

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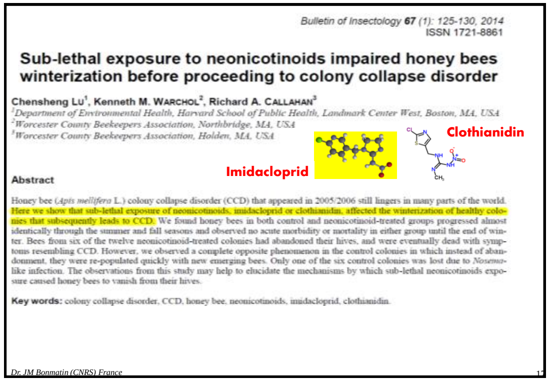


Bulletin of Insectology **67** *(1): 125-130, 2014*
ISSN 1721-8861

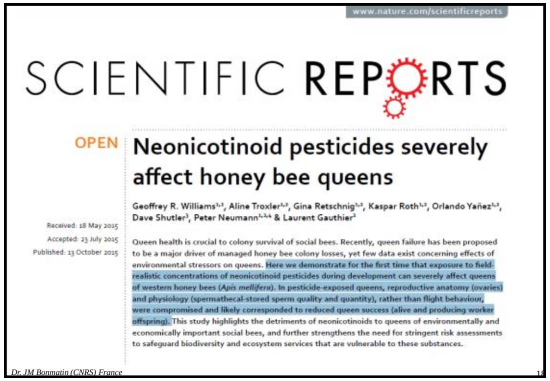
Sub-lethal exposure to neonicotinoids impaired honey bees winterization before proceeding to colony collapse disorder

Chensheng Lu[1], Kenneth M. Warchol[2], Richard A. Callahan[3]
[1]*Department of Environmental Health, Harvard School of Public Health, Landmark Center West, Boston, MA, USA*
[2]*Worcester County Beekeepers Association, Northbridge, MA, USA*
[3]*Worcester County Beekeepers Association, Holden, MA, USA*

Abstract

Honey bee (*Apis mellifera* L.) colony collapse disorder (CCD) that appeared in 2005/2006 still lingers in many parts of the world. Here we show that sub-lethal exposure of neonicotinoids, imidacloprid or clothianidin, affected the winterization of healthy colonies that subsequently leads to CCD. We found honey bees in both control and neonicotinoid-treated groups progressed almost identically through the summer and fall seasons and observed no acute morbidity or mortality in either group until the end of winter. Bees from six of the twelve neonicotinoid-treated colonies had abandoned their hives, and were eventually dead with symptoms resembling CCD. However, we observed a complete opposite phenomenon in the control colonies in which instead of abandonment, they were re-populated quickly with new emerging bees. Only one of the six control colonies was lost due to *Nosema*-like infection. The observations from this study may help to elucidate the mechanisms by which sub-lethal neonicotinoids exposure caused honey bees to vanish from their hives.

Key words: colony collapse disorder, CCD, honey bee, neonicotinoids, imidacloprid, clothianidin.



www.nature.com/scientificreports

SCIENTIFIC REPORTS

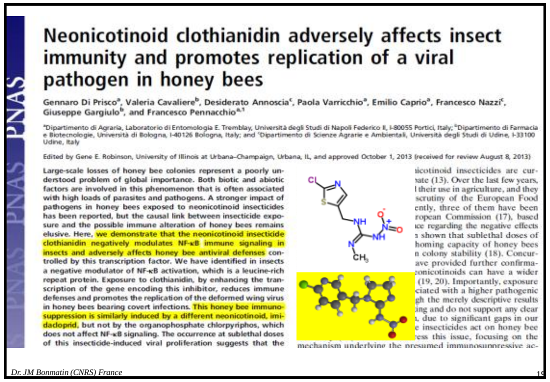
OPEN

Neonicotinoid pesticides severely affect honey bee queens

Geoffrey R. Williams[1,2], Aline Troxler[1,2], Gina Retschnig[1,2], Kaspar Roth[1,2], Orlando Yañez[1,2], Dave Shutler[3], Peter Neumann[1,2,4] & Laurent Gauthier[2]

Received: 18 May 2015
Accepted: 23 July 2015
Published: 13 October 2015

Queen health is crucial to colony survival of social bees. Recently, queen failure has been proposed to be a major driver of managed honey bee colony losses, yet few data exist concerning effects of environmental stressors on queens. Here we demonstrate for the first time that exposure to field-realistic concentrations of neonicotinoid pesticides during development can severely affect queens of western honey bees (*Apis mellifera*). In pesticide-exposed queens, reproductive anatomy (ovaries) and physiology (spermathecal-stored sperm quality and quantity), rather than flight behaviour, were compromised and likely corresponded to reduced queen success (alive and producing worker offspring). This study highlights the detriments of neonicotinoids to queens of environmentally and economically important social bees, and further strengthens the need for stringent risk assessments to safeguard biodiversity and ecosystem services that are vulnerable to these substances.



Neonicotinoid clothianidin adversely affects insect immunity and promotes replication of a viral pathogen in honey bees

Gennaro Di Prisco[a], Valeria Cavaliere[b], Desiderato Annoscia[c], Paola Varricchio[a], Emilio Caprio[a], Francesco Nazzi[c], Giuseppe Gargiulo[b], and Francesco Pennacchio[a,1]

[a]Dipartimento di Agraria, Laboratorio di Entomologia E. Tremblay, Università degli Studi di Napoli Federico II, I-80055 Portici, Italy; [b]Dipartimento di Farmacia e Biotecnologie, Università di Bologna, I-40126 Bologna, Italy; and [c]Dipartimento di Scienze Agrarie e Ambientali, Università degli Studi di Udine, I-33100 Udine, Italy

Edited by Gene E. Robinson, University of Illinois at Urbana–Champaign, Urbana, IL, and approved October 1, 2013 (received for review August 8, 2013)

Large-scale losses of honey bee colonies represent a poorly understood problem of global importance. Both biotic and abiotic factors are involved in this phenomenon that is often associated with high loads of parasites and pathogens. A stronger impact of pathogens in honey bees exposed to neonicotinoid insecticides has been reported, but the causal link between insecticide exposure and the possible immune alteration of honey bees remains elusive. Here, we demonstrate that the neonicotinoid insecticide clothianidin negatively modulates NF-κB immune signaling in insects and adversely affects honey bee antiviral defenses controlled by this transcription factor. We have identified in insects a negative modulator of NF-κB activation, which is a leucine-rich repeat protein. Exposure to clothianidin, by enhancing the transcription of the gene encoding this inhibitor, reduces immune defenses and promotes the replication of the deformed wing virus in honey bees bearing covert infections. This honey bee immunosuppression is similarly induced by a different neonicotinoid, imidacloprid, but not by the organophosphate chlorpyriphos, which does not affect NF-κB signaling. The occurrence at sublethal doses of this insecticide-induced viral proliferation suggests that the

icotinoid insecticides are currate (13). Over the last few years, l their use in agriculture, and they scrutiny of the European Food ently, three of them have been ropean Commission (17), based ice regarding the negative effects shown that sublethal doses of homing capacity of honey bees n colony stability (18). Concurave provided further confirmaonicotinoids can have a wider (19, 20). Importantly, exposure ciated with a higher pathogenic gh the merely descriptive results ing and do not support any clear , due to significant gaps in our e insecticides act on honey bee ress this issue, focusing on the mechanism underlying the presumed immunosuppressive ac-

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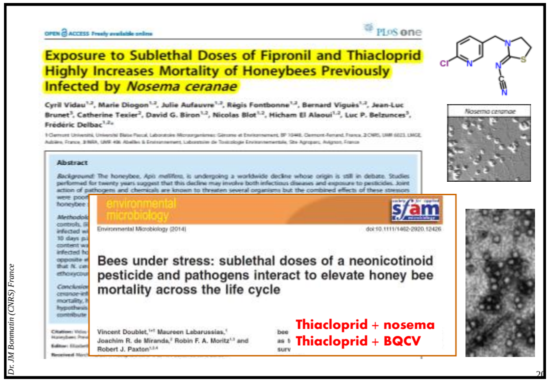


Exposure to Sublethal Doses of Fipronil and Thiacloprid Highly Increases Mortality of Honeybees Previously Infected by *Nosema ceranae*

Cyril Vidau[1,2], Marie Diogon[1,2], Julie Aufauvre[1,2], Régis Fontbonne[1,2], Bernard Viguès[1,2], Jean-Luc Brunet[3], Catherine Texier[2], David G. Biron[1,2], Nicolas Blot[1,2], Hicham El Alaoui[1,2], Luc P. Belzunces[3], Frédéric Delbac[1,2*]

Abstract

Background: The honeybee, *Apis mellifera*, is undergoing a worldwide decline whose origin is still in debate. Studies performed for twenty years suggest that this decline may involve both infectious diseases and exposure to pesticides. Joint action of pathogens and chemicals are known to threaten several organisms but the combined effects of these stressors were poo

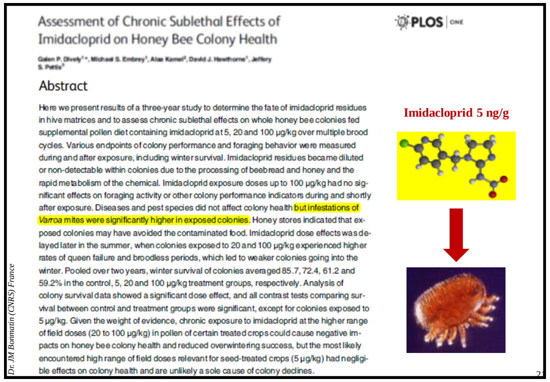
environmental microbiology

Environmental Microbiology (2014) doi:10.1111/1462-2920.12426

Bees under stress: sublethal doses of a neonicotinoid pesticide and pathogens interact to elevate honey bee mortality across the life cycle

Vincent Doublet,[1*†] Maureen Labarussias,[1] Joachim R. de Miranda,[2] Robin F. A. Moritz[1,3] and Robert J. Paxton[1,3,4]

Thiacloprid + nosema
Thiacloprid + BQCV



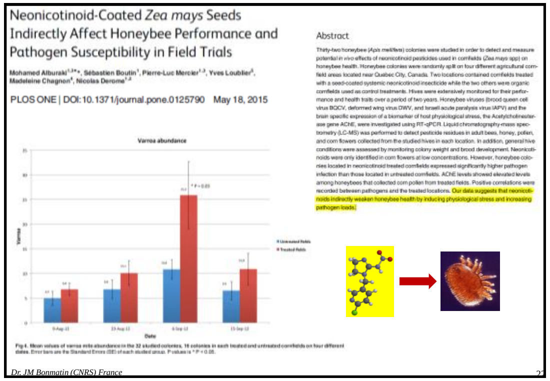
Assessment of Chronic Sublethal Effects of Imidacloprid on Honey Bee Colony Health

Galen P. Dively[1*], Michael S. Embrey[1], Alaa Kamel[2], David J. Hawthorne[1], Jeffery S. Pettis[3]

Abstract

Here we present results of a three-year study to determine the fate of imidacloprid residues in hive matrices and to assess chronic sublethal effects on whole honey bee colonies fed supplemental pollen diet containing imidacloprid at 5, 20 and 100 μg/kg over multiple brood cycles. Various endpoints of colony performance and foraging behavior were measured during and after exposure, including winter survival. Imidacloprid residues became diluted or non-detectable within colonies due to the processing of beebread and honey and the rapid metabolism of the chemical. Imidacloprid exposure doses up to 100 μg/kg had no significant effects on foraging activity or other colony performance indicators during and shortly after exposure. Diseases and pest species did not affect colony health but infestations of *Varroa* mites were significantly higher in exposed colonies. Honey stores indicated that exposed colonies may have avoided the contaminated food. Imidacloprid dose effects was delayed later in the summer, when colonies exposed to 20 and 100 μg/kg experienced higher rates of queen failure and broodless periods, which led to weaker colonies going into the winter. Pooled over two years, winter survival of colonies averaged 85.7, 72.4, 61.2 and 59.2% in the control, 5, 20 and 100 μg/kg treatment groups, respectively. Analysis of colony survival data showed a significant dose effect, and all contrast tests comparing survival between control and treatment groups were significant, except for colonies exposed to 5 μg/kg. Given the weight of evidence, chronic exposure to imidacloprid at the higher range of field doses (20 to 100 μg/kg) in pollen of certain treated crops could cause negative impacts on honey bee colony health and reduced overwintering success, but the most likely encountered high range of field doses relevant for seed-treated crops (5 μg/kg) had negligible effects on colony health and are unlikely a sole cause of colony declines.

Imidacloprid 5 ng/g



Neonicotinoid-Coated *Zea mays* Seeds Indirectly Affect Honeybee Performance and Pathogen Susceptibility in Field Trials

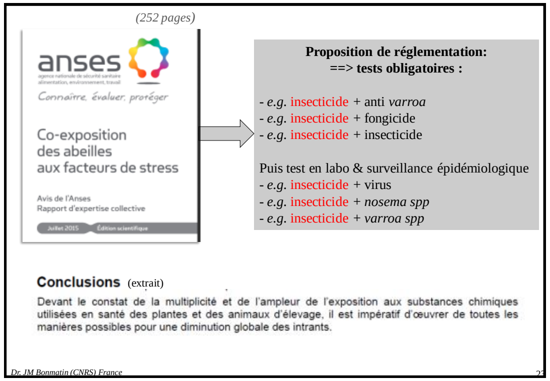
Mohamed Alburaki[1,2*], Sébastien Boutin[1], Pierre-Luc Mercier[1,3], Yves Loublier[3], Madeleine Chagnon[4], Nicolas Derome[1,2]

PLOS ONE | DOI:10.1371/journal.pone.0125790 May 18, 2015

Abstract

Thirty-two honeybee (*Apis mellifera*) colonies were studied in order to detect and measure potential in vivo effects of neonicotinoid pesticides used in cornfields (*Zea mays* spp) on honeybee health. Honeybee colonies were randomly split on four different agricultural cornfield areas located near Quebec City, Canada. Two locations contained cornfields treated with a seed-coated systemic neonicotinoid insecticide while the two others were organic cornfields used as control treatments. Hives were extensively monitored for their performance and health traits over a period of two years. Honeybee viruses (brood queen cell virus BQCV, deformed wing virus DWV, and Israeli acute paralysis virus IAPV) and the brain specific expression of a biomarker of host physiological stress, the Acetylcholinesterase gene AChE, were investigated using RT-qPCR. Liquid chromatography-mass spectrometry (LC-MS) was performed to detect pesticide residues in adult bees, honey, pollen, and corn flowers collected from the studied hives in each location. In addition, general hive conditions were assessed by monitoring colony weight and brood development. Neonicotinoids were only identified in corn flowers at low concentrations. However, honeybee colonies located in neonicotinoid treated cornfields expressed significantly higher pathogen infection than those located in untreated cornfields. AChE levels showed elevated levels among honeybees that collected corn pollen from treated fields. Positive correlations were recorded between pathogens and the treated locations. Our data suggests that neonicotinoids indirectly weaken honeybee health by inducing physiological stress and increasing pathogen loads.

Fig 4. Mean values of varroa mite abundance in the 32 studied colonies, 16 colonies in each treated and untreated cornfields on four different dates. Error bars are the Standard Errors (SE) of each studied group. P values is * P < 0.05.


(252 pages)

Co-exposition des abeilles aux facteurs de stress

Avis de l'Anses
Rapport d'expertise collective

Juillet 2015 Édition scientifique

Proposition de réglementation:
==> tests obligatoires :

- *e.g.* insecticide + anti *varroa*
- *e.g.* insecticide + fongicide
- *e.g.* insecticide + insecticide

Puis test en labo & surveillance épidémiologique
- *e.g.* insecticide + virus
- *e.g.* insecticide + *nosema spp*
- *e.g.* insecticide + *varroa spp*

Conclusions (extrait)

Devant le constat de la multiplicité et de l'ampleur de l'exposition aux substances chimiques utilisées en santé des plantes et des animaux d'élevage, il est impératif d'œuvrer de toutes les manières possibles pour une diminution globale des intrants.


Human and Ecological Risk Assessment, 20: 566–591, 2014
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DOI: 10.1080/10807039.2013.831263

WORKSHOP REPORT

A Causal Analysis of Observed Declines in Managed Honey Bees (*Apis mellifera*)

Jane P. Staveley,[1] Sheryl A. Law,[1] Anne Fairbrother,[2] and Charles A. Menzie[1]
[1]Exponent, Alexandria, VA, USA; [2]Exponent, Bellevue, WA, USA

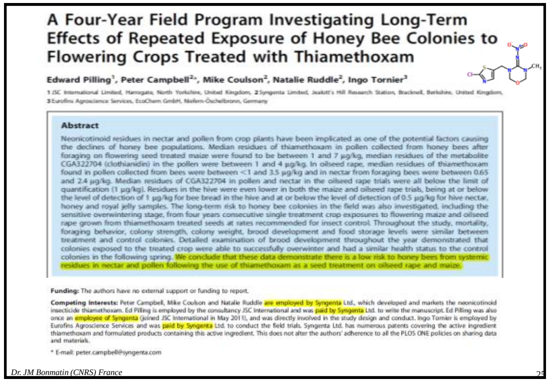
ABSTRACT

The European honey bee (*Apis mellifera*) is a highly valuable, semi-free-ranging managed agricultural species. While the number of managed hives has been increasing, declines in overwinter surviv
in 2006, precipitated a large amount o
late the causative factors. A workshop w
introduced to a formal causal analysi
against specified criteria to evaluate t
survivability observed since 2006 of co
industry. Candidate causes were categ
eral candidate causes were categorized
Due to time limitations, a full causal an
this article, examples are provided to il
findings, using three candidate causes. *Varroa* mites plus viruses were judged to be a "probable cause" of the reduced survival, while nutrient deficiency was judged to be a "possible cause." Neonicotinoid pesticides were judged to be "unlikely" as the sole cause of this reduced survival, although they could possibly be a contributing factor.

Key Words: honey bees, causal analysis, neonicotinoids, *Varroa*.

ACKNOWLEDGMENTS

We acknowledge the bee experts who attended the workshop: Troy Anderson, Tjeerd Blacquière, Jerry Bromenshenk, Diana Cox-Foster, James Cresswell, Chris Cutler, Galen Dively, Frank Drummond, David Epstein, Richard Fell, Gerald Hayes, Josephine Johnson, Christian Maus, Richard Rogers, Melinda Rostal, Cynthia Scott-Dupree, Thomas Steeger, Helen Thompson, and Geoffrey Williams. Special thanks to Glenn Suter, Susan Cormier, and Erica Fleishman for their expertise in causal analysis. Financial support for this workshop was provided by Bayer CropScience.



A Four-Year Field Program Investigating Long-Term Effects of Repeated Exposure of Honey Bee Colonies to Flowering Crops Treated with Thiamethoxam

Edward Pilling[1], **Peter Campbell**[2*], **Mike Coulson**[2], **Natalie Ruddle**[2], **Ingo Tornier**[3]

1 JSC International Limited, Harrogate, North Yorkshire, United Kingdom, 2 Syngenta Limited, Jealott's Hill Research Station, Bracknell, Berkshire, United Kingdom, 3 Eurofins Agroscience Services, EcoChem GmbH, Niefern-Öschelbronn, Germany

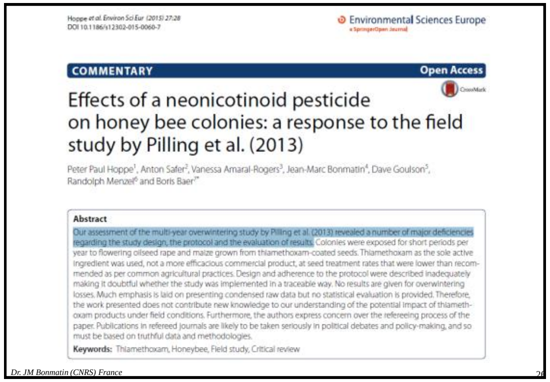
Abstract

Neonicotinoid residues in nectar and pollen from crop plants have been implicated as one of the potential factors causing the declines of honey bee populations. Median residues of thiamethoxam in pollen collected from honey bees after foraging on flowering seed treated maize were found to be between 1 and 7 µg/kg, median residues of the metabolite CGA322704 (clothianidin) in the pollen were between 1 and 4 µg/kg. In oilseed rape, median residues of thiamethoxam found in pollen collected from bees were between <1 and 3.5 µg/kg and in nectar from foraging bees were between 0.65 and 2.4 µg/kg. Median residues of CGA322704 in pollen and nectar in the oilseed rape trials were all below the limit of quantification (1 µg/kg). Residues in the hive were even lower in both the maize and oilseed rape trials, being at or below the level of detection of 1 µg/kg for bee bread in the hive and at or below the level of detection of 0.5 µg/kg for hive nectar, honey and royal jelly samples. The long-term risk to honey bee colonies in the field was also investigated, including the sensitive overwintering stage, from four years consecutive single treatment crop exposures to flowering maize and oilseed rape grown from thiamethoxam treated seeds at rates recommended for insect control. Throughout the study, mortality, foraging behavior, colony strength, colony weight, brood development and food storage levels were similar between treatment and control colonies. Detailed examination of brood development throughout the year demonstrated that colonies exposed to the treated crop were able to successfully overwinter and had a similar health status to the control colonies in the following spring. We conclude that these data demonstrate there is a low risk to honey bees from systemic residues in nectar and pollen following the use of thiamethoxam as a seed treatment on oilseed rape and maize.

Funding: The authors have no external support or funding to report.

Competing Interests: Peter Campbell, Mike Coulson and Natalie Ruddle are employed by Syngenta Ltd., which developed and markets the neonicotinoid insecticide thiamethoxam. Ed Pilling is employed by the consultancy JSC International and was paid by Syngenta Ltd. to write the manuscript. Ed Pilling was also once an employee of Syngenta (joined JSC International in May 2011), and was directly involved in the study design and conduct. Ingo Tornier is employed by Eurofins Agroscience Services and was paid by Syngenta Ltd. to conduct the field trials. Syngenta Ltd. has numerous patents covering the active ingredient thiamethoxam and formulated products containing this active ingredient. This does not alter the authors' adherence to all the PLOS ONE policies on sharing data and materials.

* E-mail: peter.campbell@syngenta.com



Hoppe *et al. Environ Sci Eur* (2015) 27:28
DOI 10.1186/s12302-015-0060-7

Environmental Sciences Europe
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COMMENTARY Open Access

Effects of a neonicotinoid pesticide on honey bee colonies: a response to the field study by Pilling et al. (2013)

Peter Paul Hoppe[1], Anton Safer[2], Vanessa Amaral-Rogers[3], Jean-Marc Bonmatin[4], Dave Goulson[5], Randolph Menzel[6] and Boris Baer[7*]

Abstract

Our assessment of the multi-year overwintering study by Pilling et al. (2013) revealed a number of major deficiencies regarding the study design, the protocol and the evaluation of results. Colonies were exposed for short periods per year to flowering oilseed rape and maize grown from thiamethoxam-coated seeds. Thiamethoxam as the sole active ingredient was used, not a more efficacious commercial product, at seed treatment rates that were lower than recommended as per common agricultural practices. Design and adherence to the protocol were described inadequately making it doubtful whether the study was implemented in a traceable way. No results are given for overwintering losses. Much emphasis is laid on presenting condensed raw data but no statistical evaluation is provided. Therefore, the work presented does not contribute new knowledge to our understanding of the potential impact of thiamethoxam products under field conditions. Furthermore, the authors express concern over the refereeing process of the paper. Publications in refereed journals are likely to be taken seriously in political debates and policy-making, and so must be based on truthful data and methodologies.

Keywords: Thiamethoxam, Honeybee, Field study, Critical review

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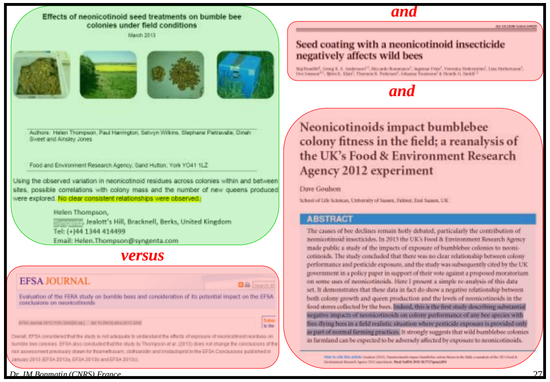

Effects of neonicotinoid seed treatments on bumble bee colonies under field conditions

March 2013

Authors: Helen Thompson, Paul Harrington, Selwyn Wilkins, Stephane Pietravalle, Dinah Sweet and Ainsley Jones

Food and Environment Research Agency, Sand Hutton, York YO41 1LZ

Using the observed variation in neonicotinoid residues across colonies within and between sites, possible correlations with colony mass and the number of new queens produced were explored. No clear consistent relationships were observed.

Helen Thompson,
Syngenta, Jealott's Hill, Bracknell, Berks, United Kingdom
Tel: (+)44 1344 414499
Email: Helen.Thompson@syngenta.com

versus

EFSA JOURNAL

Evaluation of the FERA study on bumble bees and consideration of its potential impact on the EFSA conclusions on neonicotinoids

EFSA Journal 2013;11(6):3242[20 pp.] doi:10.2903/j.efsa.2013.3242

Overall, EFSA considered that the study is not adequate to understand the effects of exposure of neonicotinoid residues on bumble bee colonies. EFSA also concluded that the study by Thompson et al. (2013) does not change the conclusions of the risk assessment previously drawn for thiamethoxam, clothianidin and imidacloprid in the EFSA Conclusions published in January 2013 (EFSA 2013a, EFSA 2013b and EFSA 2013c).

and

doi:10.1038/nature14420

Seed coating with a neonicotinoid insecticide negatively affects wild bees

Maj Rundlöf[1], Georg K. S. Andersson[1,2], Riccardo Bommarco[3], Ingemar Fries[3], Veronica Hederström[1], Lina Herbertsson[2], Ove Jonsson[4,5], Björn K. Klatt[2], Thorsten R. Pedersen[6], Johanna Yourstone[1] & Henrik G. Smith[1,2]

and

Neonicotinoids impact bumblebee colony fitness in the field; a reanalysis of the UK's Food & Environment Research Agency 2012 experiment

Dave Goulson

School of Life Sciences, University of Sussex, Falmer, East Sussex, UK

ABSTRACT

The causes of bee declines remain hotly debated, particularly the contribution of neonicotinoid insecticides. In 2013 the UK's Food & Environment Research Agency made public a study of the impacts of exposure of bumblebee colonies to neonicotinoids. The study concluded that there was no clear relationship between colony performance and pesticide exposure, and the study was subsequently cited by the UK government in a policy paper in support of their vote against a proposed moratorium on some uses of neonicotinoids. Here I present a simple re-analysis of this data set. It demonstrates that these data in fact do show a negative relationship between both colony growth and queen production and the levels of neonicotinoids in the food stores collected by the bees. Indeed, this is the first study describing substantial negative impacts of neonicotinoids on colony performance of any bee species with free-flying bees in a field realistic situation where pesticide exposure is provided only as part of normal farming practices. It strongly suggests that wild bumblebee colonies in farmland can be expected to be adversely affected by exposure to neonicotinoids.

How to cite this article Goulson (2015), Neonicotinoids impact bumblebee colony fitness in the field; a reanalysis of the UK's Food & Environment Research Agency 2012 experiment. PeerJ 3:e854; DOI 10.7717/peerj.854

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Research

Cite this article: Henry M, Cerutti N, Aupinel P, Decourtye A, Gayrard M, Odoux J-F, Pissard A, Rüger C, Bretagnolle V. 2015 Reconciling laboratory and field assessments of neonicotinoid toxicity to honeybees. *Proc. R. Soc. B* 282: 20152110. http://dx.doi.org/10.1098/rspb.2015.2110

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Subject Areas:
environmental science, ecology

Keywords:
Apis mellifera, imidacloprid, oilseed rape, pesticides, thiamethoxam

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Reconciling laboratory and field assessments of neonicotinoid toxicity to honeybees

Mickaël Henry[1,2,†], Nicolas Cerutti[2,3,†], Pierrick Aupinel[4], Axel Decourtye[2,5,6], Mélanie Gayrard[1], Jean-François Odoux[4], Aurélien Pissard[5], Charlotte Rüger[3] and Vincent Bretagnolle[7,8]

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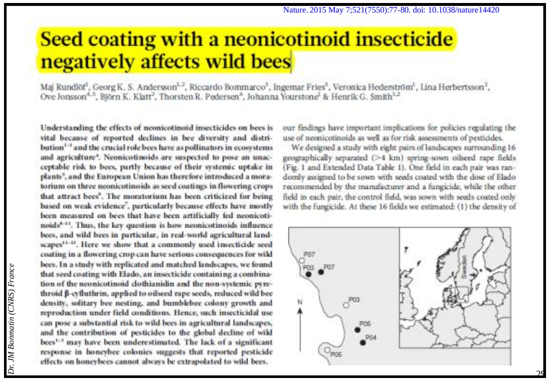
[7] Centre d'Etudes Biologiques de Chizé, UMR 7372, CNRS and Université de La Rochelle, 79360 Beauvoir-sur-Niort, France
[8] LTER 'Zone Atelier Plaine and Val de Sèvre', Centre d'Etudes Biologiques de Chizé, CNRS, 79360 Villiers-en-Bois, France

European governments have banned the use of three common neonicotinoid pesticides due to insufficiently identified risks to bees. This policy decision is controversial given the absence of clear consistency between toxicity assessments of those substances in the laboratory and in the field. Although laboratory trials report deleterious effects in honeybees at trace levels, field surveys reveal no decrease in the performance of honeybee colonies in the vicinity of treated fields. Here we provide the missing link, showing that individual honeybees near thiamethoxam-treated fields do indeed disappear at a faster rate, but the impact of this is buffered by the colonies' demographic regulation response. Although we could ascertain the exposure pathway of thiamethoxam residues from treated flowers to honeybee dietary nectar, we uncovered an unexpected pervasive co-occurrence of similar concentrations of imidacloprid, another neonicotinoid normally restricted to non-entomophilous crops in the study country. Thus, its origin and transfer pathways through the succession of annual crops need be elucidated to conveniently appraise the risks of combined neonicotinoid exposures. This study reconciles the conflicting laboratory and field toxicity assessments of neonicotinoids on honeybees and further highlights the difficulty in actually detecting non-intentional effects on the field through conventional risk assessment methods.

4. Conclusion

Overall, our results lead to two main conclusions. First, we found that field exposure to thiamethoxam combined with concomitant imidacloprid contamination is associated with a significant excess mortality in free-ranging bees. This provides a strong and unprecedented link between predictions drawn from artificial exposure experiments [9–11,40] and evidence from real-field surveys. Second, colonies appeared to be able to compensate for the excess mortality so as to preserve unaltered performance in terms of population size and honey production. Instead, the most exposed colonies modified the timing of their reproductive investment, delaying drone brood production in favour of increased worker brood production. We have now reconciled the conflicting laboratory and field assessments of neonicotinoid toxicity. It is thus urgent that risk assessors take into account the scientific evidence for behavioural disorders triggered by trace levels of neonicotinoids.



Nature. 2015 May 7;521(7550):77-80. doi: 10.1038/nature14420

Seed coating with a neonicotinoid insecticide negatively affects wild bees

Maj Rundlöf[1], Georg K. S. Andersson[1,2], Riccardo Bommarco[3], Ingemar Fries[3], Veronica Hederström[1], Lina Herbertsson[2], Ove Jonsson[4,5], Björn K. Klatt[2], Thorsten R. Pedersen[6], Johanna Yourstone[1] & Henrik G. Smith[1,2]

Understanding the effects of neonicotinoid insecticides on bees is vital because of reported declines in bee diversity and distribution[1–3] and the crucial role bees have as pollinators in ecosystems and agriculture[4]. Neonicotinoids are suspected to pose an unacceptable risk to bees, partly because of their systemic uptake in plants[5], and the European Union has therefore introduced a moratorium on three neonicotinoids as seed coatings in flowering crops that attract bees[6]. The moratorium has been criticized for being based on weak evidence[7], particularly because effects have mostly been measured on bees that have been artificially fed neonicotinoids[8–11]. Thus, the key question is how neonicotinoids influence bees, and wild bees in particular, in real-world agricultural landscapes[11–13]. Here we show that a commonly used insecticide seed coating in a flowering crop can have serious consequences for wild bees. In a study with replicated and matched landscapes, we found that seed coating with Elado, an insecticide containing a combination of the neonicotinoid clothianidin and the non-systemic pyrethroid β-cyfluthrin, applied to oilseed rape seeds, reduced wild bee density, solitary bee nesting, and bumblebee colony growth and reproduction under field conditions. Hence, such insecticidal use can pose a substantial risk to wild bees in agricultural landscapes, and the contribution of pesticides to the global decline of wild bees[1–3] may have been underestimated. The lack of a significant response in honeybee colonies suggests that reported pesticide effects on honeybees cannot always be extrapolated to wild bees. Our findings have important implications for policies regulating the use of neonicotinoids as well as for risk assessments of pesticides.

We designed a study with eight pairs of landscapes surrounding 16 geographically separated (>4 km) spring-sown oilseed rape fields (Fig. 1 and Extended Data Table 1). One field in each pair was randomly assigned to be sown with seeds coated with the dose of Elado recommended by the manufacturer and a fungicide, while the other field in each pair, the control field, was sown with seeds coated only with the fungicide. At these 16 fields we estimated: (1) the density of

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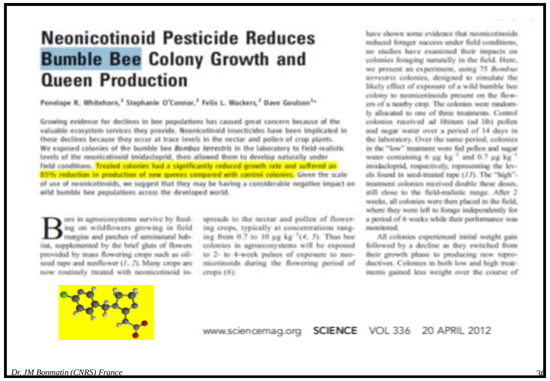

Neonicotinoid Pesticide Reduces Bumble Bee Colony Growth and Queen Production

Penelope R. Whitehorn,[1] Stephanie O'Connor,[1] Felix L. Wackers,[2] Dave Goulson[1*]

Growing evidence for declines in bee populations has caused great concern because of the valuable ecosystem services they provide. Neonicotinoid insecticides have been implicated in these declines because they occur at trace levels in the nectar and pollen of crop plants. We exposed colonies of the bumble bee *Bombus terrestris* in the laboratory to field-realistic levels of the neonicotinoid imidacloprid, then allowed them to develop naturally under field conditions. Treated colonies had a significantly reduced growth rate and suffered an 85% reduction in production of new queens compared with control colonies. Given the scale of use of neonicotinoids, we suggest that they may be having a considerable negative impact on wild bumble bee populations across the developed world.

Bees in agroecosystems survive by feeding on wildflowers growing in field margins and patches of seminatural habitat, supplemented by the brief gluts of flowers provided by mass flowering crops such as oilseed rape and sunflower (*1*, *2*). Many crops are now routinely treated with neonicotinoid in-

spreads to the nectar and pollen of flowering crops, typically at concentrations ranging from 0.7 to 10 μg kg^{-1} (*4*, *5*). Thus bee colonies in agroecosystems will be exposed to 2- to 4-week pulses of exposure to neonicotinoids during the flowering period of crops (*6*).

have shown some evidence that neonicotinoids reduced forager success under field conditions, no studies have examined their impacts on colonies foraging naturally in the field. Here, we present an experiment, using 75 *Bombus terrestris* colonies, designed to simulate the likely effect of exposure of a wild bumble bee colony to neonicotinoids present on the flowers of a nearby crop. The colonies were randomly allocated to one of three treatments. Control colonies received ad libitum (ad lib) pollen and sugar water over a period of 14 days in the laboratory. Over the same period, colonies in the "low" treatment were fed pollen and sugar water containing 6 μg kg^{-1} and 0.7 μg kg^{-1} imidacloprid, respectively, representing the levels found in seed-treated rape (*13*). The "high"-treatment colonies received double these doses, still close to the field-realistic range. After 2 weeks, all colonies were then placed in the field, where they were left to forage independently for a period of 6 weeks while their performance was monitored.

All colonies experienced initial weight gain followed by a decline as they switched from their growth phase to producing new reproductives. Colonies in both low and high treatments gained less weight over the course of

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Environ Sci Pollut Res
DOI 10.1007/s11356-014-3220-1

EDITORIAL

Worldwide integrated assessment on systemic pesticides

Global collapse of the entomofauna: exploring the role of systemic insecticides

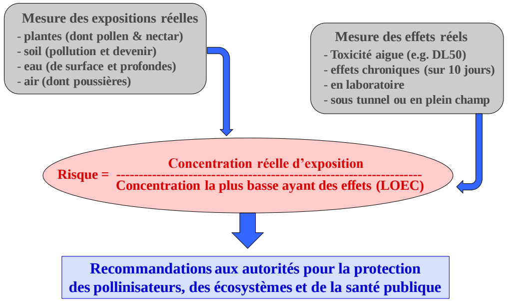
Maarten Bijleveld van Lexmond · Jean-Marc Bonmatin ·
Dave Goulson · Dominique A. Noome

The Task Force on Systemic Pesticides
WWW.TFSP.INFO

Evaluation mondiale intégrée
(8 articles scientifiques, 154 pages)

- **Première méta-analyse des pesticides systémiques**
- **Intégrant 1121 publications & données des fabricants**
- **29 scientifiques indépendants (auteurs)**
- **Publié dans *Environmental Science and Pollution Research*, 2015**

Objectif : évaluation des risques et mesure des impacts pour les espèces non-ciblées



Mesure des expositions réelles
- plantes (dont pollen & nectar)
- soil (pollution et devenir)
- eau (de surface et profondes)
- air (dont poussières)

Mesure des effets réels
- Toxicité aigue (e.g. DL50)
- effets chroniques (sur 10 jours)
- en laboratoire
- sous tunnel ou en plein champ

Risque = Concentration réelle d'exposition / Concentration la plus basse ayant des effets (LOEC)

Recommandations aux autorités pour la protection des pollinisateurs, des écosystèmes et de la santé publique

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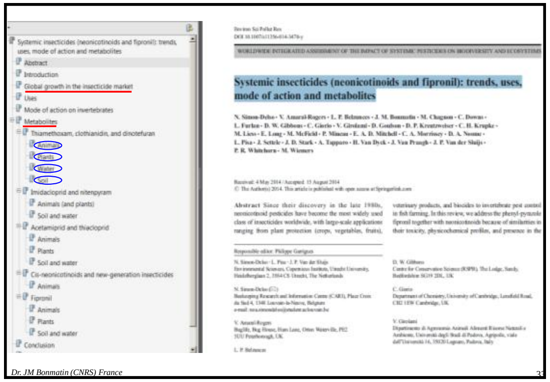

- Systemic insecticides (neonicotinoids and fipronil): trends, uses, mode of action and metabolites
  - Abstract
  - Introduction
  - Global growth in the insecticide market
  - Uses
  - Mode of action on invertebrates
  - Metabolites
    - Thiamethoxam, clothianidin, and dinotefuran
      - Animals
      - Plants
      - Water
      - Soil
    - Imidacloprid and nitenpyram
      - Animals (and plants)
      - Soil and water
    - Acetamiprid and thiacloprid
      - Animals
      - Plants
      - Soil and water
    - Cis-neonicotinoids and new-generation insecticides
      - Animals
    - Fipronil
      - Animals
      - Plants
      - Soil and water
  - Conclusion

Environ Sci Pollut Res
DOI 10.1007/s11356-014-3470-y

WORLDWIDE INTEGRATED ASSESSMENT OF THE IMPACT OF SYSTEMIC PESTICIDES ON BIODIVERSITY AND ECOSYSTEMS

Systemic insecticides (neonicotinoids and fipronil): trends, uses, mode of action and metabolites

N. Simon-Delso · V. Amaral-Rogers · L. P. Belzunces · J. M. Bonmatin · M. Chagnon · C. Downs · L. Furlan · D. W. Gibbons · C. Giorio · V. Girolami · D. Goulson · D. P. Kreutzweiser · C. H. Krupke · M. Liess · E. Long · M. McField · P. Mineau · E. A. D. Mitchell · C. A. Morrissey · D. A. Noome · L. Pisa · J. Settele · J. D. Stark · A. Tapparo · H. Van Dyck · J. Van Praagh · J. P. Van der Sluijs · P. R. Whitehorn · M. Wiemers

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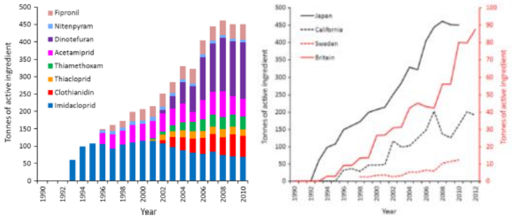
Abstract Since their discovery in the late 1980s, neonicotinoid pesticides have become the most widely used class of insecticides worldwide, with large-scale applications ranging from plant protection (crops, vegetables, fruits), veterinary products, and biocides to invertebrate pest control in fish farming. In this review, we address the phenyl-pyrazole fipronil together with neonicotinoids because of similarities in their toxicity, physicochemical profiles, and presence in the

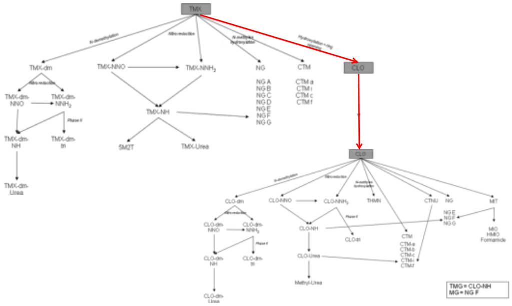
Responsible editor: Philippe Garrigues

Croissance du marché mondial (1992-2010)



Utilisation préventive & massive + multiplicité des toxiques

Un produit en cache des dizaines d'autres (*peu étudiés*…)



Schémas métaboliques du thiaméthoxam (TMX) et de la clothianidine (CLO)

- Environmental fate and exposure; neonicotinoids and fipronil
  - Abstract
  - Introduction
  - Chemical properties
  - Environmental fate—abiotic
    - Air—environmental exposure by neonicotinoid and fipronil&newnbsp;contaminated dust
    - Soil—environmental fate and exposure of neonicotinoid insecticides in soils
    - Water—environmental fate and exposure of neonicotinoid and fipronil insecticides in water and sediments
  - Environmental fate and exposure in plants
    - Introduction
    - Uptake by the roots and leaves
    - Transport of products within the plant
    - Exposure
      - Foliage
      - Tree treatment
      - Guttation and related risk for honeybees
      - Resin (propolis)
      - Presence in plant reproductive organs and fruits
      - Pollen and nectar
      - Honeydew
  - Conclusion
  - References

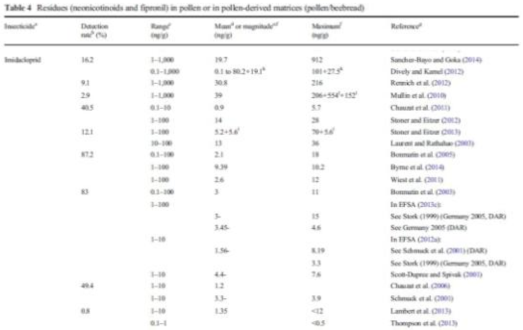
WORLDWIDE INTEGRATED ASSESSMENT OF THE IMPACT OF SYSTEMIC PESTICIDES ON BIODIVERSITY AND ECOSYSTEMS

Environmental fate and exposure; neonicotinoids and fipronil

J.-M. Bonmatin · C. Giorio · V. Girolami · D. Goulson · D. P. Kreutzweiser · C. Krupke · M. Liess · E. Long · M. Marzaro · E. A. D. Mitchell · D. A. Noome · N. Simon-Delso · A. Tapparo

Received: 27 May 2014 / Accepted: 11 July 2014

Imidaclopride dans les pollens : de 1 à 39 ng/g en moyenne

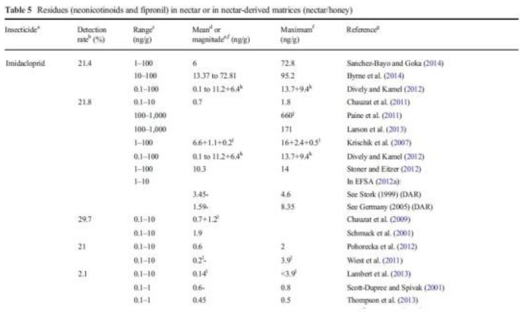


Environ Sci Pollut Res

Table 4 Residues (neonicotinoids and fipronil) in pollen or in pollen-derived matrices (pollen/beebread)

Insecticide^{a}	Detection rate^{b} (%)	Range^{c} (ng/g)	Mean^{d} or magnitude^{e,f} (ng/g)	Maximum^{f} (ng/g)	Reference^{g}
Imidacloprid	16.2	1–1,000	19.7	912	Sanchez-Bayo and Goka (2014)
		0.1–1,000	0.1 to 80.2+19.1^{h}	101+27.5^{h}	Dively and Kamel (2012)
	9.1	1–1,000	30.8	216	Rennich et al. (2012)
	2.9	1–1,000	39	206+554^{i}+152^{i}	Mullin et al. (2010)
	40.5	0.1–10	0.9	5.7	Chauzat et al. (2011)
		1–100	14	28	Stoner and Eitzer (2012)
	12.1	1–100	5.2+5.6^{j}	70+5.6^{j}	Stoner and Eitzer (2013)
		10–100	13	36	Laurent and Rathahao (2003)
	87.2	0.1–100	2.1	18	Bonmatin et al. (2005)
		1–100	9.39	10.2	Byrne et al. (2014)
		1–100	2.6	12	Wiest et al. (2011)
	83	0.1–100	3	11	Bonmatin et al. (2003)
		1–100			In EFSA (2013c):
			3-	15	See Stork (1999) (Germany 2005, DAR)
			3.45-	4.6	See Germany 2005 (DAR)
		1–10			In EFSA (2012a):
			1.56-	8.19	See Schmuck et al. (2001) (DAR)
				3.3	See Stork (1999) (Germany 2005, DAR)
		1–10	4.4-	7.6	Scott-Dupree and Spivak (2001)
	49.4	1–10	1.2		Chauzat et al. (2006)
		1–10	3.3-	3.9	Schmuck et al. (2001)
	0.8	1–10	1.35	<12	Lambert et al. (2013)
		0.1–1		<0.5	Thompson et al. (2013)

Imidaclopride dans les nectars : de 1 à 73 ng/g en moyenne



Environ Sci Pollut Res

Table 5 Residues (neonicotinoids and fipronil) in nectar or in nectar-derived matrices (nectar/honey)

Insecticide^{a}	Detection rate^{b} (%)	Range^{c} (ng/g)	Mean^{d} or magnitude^{e,f} (ng/g)	Maximum^{f} (ng/g)	Reference^{g}
Imidacloprid	21.4	1–100	6	72.8	Sanchez-Bayo and Goka (2014)
		10–100	13.37 to 72.81	95.2	Byrne et al. (2014)
		0.1–100	0.1 to 11.2+6.4^{k}	13.7+9.4^{k}	Dively and Kamel (2012)
	21.8	0.1–10	0.7	1.8	Chauzat et al. (2011)
		100–1,000		660^{j}	Paine et al. (2011)
		100–1,000		171	Larson et al. (2013)
		1–100	6.6+1.1+0.2^{l}	16+2.4+0.5^{l}	Krischik et al. (2007)
		0.1–100	0.1 to 11.2+6.4^{k}	13.7+9.4^{k}	Dively and Kamel (2012)
		1–100	10.3	14	Stoner and Eitzer (2012)
		1–10			In EFSA (2012a):
			3.45-	4.6	See Stork (1999) (DAR)
			1.59-	8.35	See Germany (2005) (DAR)
	29.7	0.1–10	0.7+1.2^{l}		Chauzat et al. (2009)
		0.1–10	1.9		Schmuck et al. (2001)
	21	0.1–10	0.6	2	Pohorecka et al. (2012)
		0.1–10	0.2^{l}-	3.9^{j}	Wiest et al. (2011)
	2.1	0.1–10	0.14^{l}	<3.9^{j}	Lambert et al. (2013)
		0.1–1	0.6-	0.8	Scott-Dupree and Spivak (2001)
		0.1–1	0.45	0.5	Thompson et al. (2013)

- Effects of neonicotinoids and fipronil on non-target invertebrates
  - Abstract
  - Introduction
  - Terrestrial invertebrates
    - Honeybees
      - Acute and chronic lethal toxicity to honeybees
      - Sublethal effects on honeybees
      - Interaction with pathogens
      - Synergistic effects with other pesticides
    - Toxicity to bumblebees and solitary bees
    - Butterflies and moths (Lepidoptera)
    - Other invertebrates
    - Routes of exposure
    - Diptera
    - Hymenoptera (excluding bees)
    - Hemiptera
    - Neuroptera
    - Coleoptera
    - Arachnida
    - Earthworms (Lumbricidae)
      - Effects on survival
      - Effects on reproduction
      - Effects on behaviour
      - Risks to earthworms
  - Aquatic invertebrates
    - Freshwater invertebrates
      - Laboratory studies
    - Marine and coastal invertebrates

Effects of neonicotinoids and fipronil on non-target invertebrates

L. W. Pisa · V. Amaral-Rogers · L. P. Belzunces · J. M. Bonmatin · C. A. Downs · D. Goulson · D. P. Kreutzweiser · C. Krupke · M. Liess · M. McField · C. A. Morrissey · D. A. Noome · J. Settele · N. Simon-Delso · J. D. Stark · J. P. Van der Sluijs · H. Van Dyck · M. Wiemers

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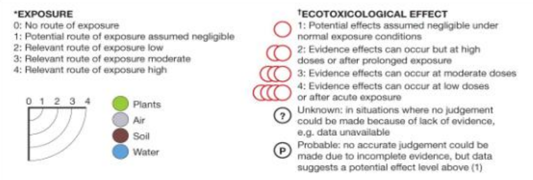
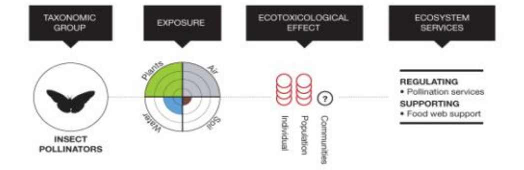
LEGENDE



*EXPOSURE
0: No route of exposure
1: Potential route of exposure assumed negligible
2: Relevant route of exposure low
3: Relevant route of exposure moderate
4: Relevant route of exposure high

†ECOTOXICOLOGICAL EFFECT
1: Potential effects assumed negligible under normal exposure conditions
2: Evidence effects can occur but at high doses or after prolonged exposure
3: Evidence effects can occur at moderate doses
4: Evidence effects can occur at low doses or after acute exposure
Unknown: in situations where no judgement could be made because of lack of evidence, e.g. data unavailable
Probable: no accurate judgement could be made due to incomplete evidence, but data suggests a potential effect level above (1)

Pollinisateurs



REGULATING
- Pollination services

SUPPORTING
- Food web support

Bee declines driven by combined stress from parasites, pesticides, and lack of flowers

Dave Goulson,* Elizabeth Nicholls, Cristina Botías, Ellen L. Rotheray

School of Life Sciences, University of Sussex, Falmer, Brighton BN1 9QG, UK

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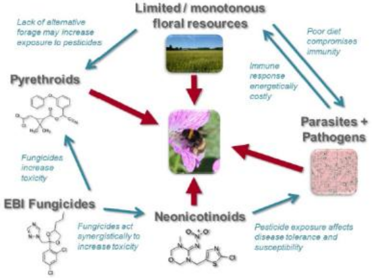
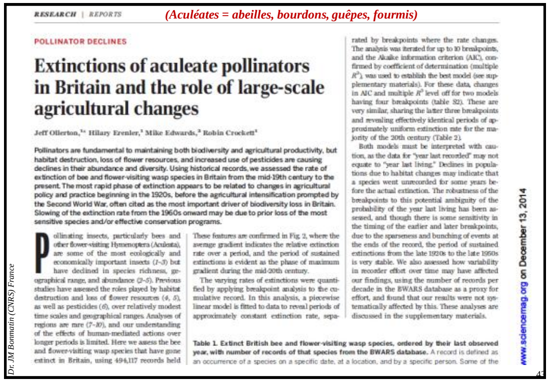
www.sciencemag.org on February 26, 2015





(Aculéates = abeilles, bourdons, guêpes, fourmis)

RESEARCH | *REPORTS*

POLLINATOR DECLINES

Extinctions of aculeate pollinators in Britain and the role of large-scale agricultural changes

Jeff Ollerton,[1]* Hilary Erenler,[1] Mike Edwards,[2] Robin Crockett[1]

Pollinators are fundamental to maintaining both biodiversity and agricultural productivity, but habitat destruction, loss of flower resources, and increased use of pesticides are causing declines in their abundance and diversity. Using historical records, we assessed the rate of extinction of bee and flower-visiting wasp species in Britain from the mid-19th century to the present. The most rapid phase of extinction appears to be related to changes in agricultural policy and practice beginning in the 1920s, before the agricultural intensification prompted by the Second World War, often cited as the most important driver of biodiversity loss in Britain. Slowing of the extinction rate from the 1960s onward may be due to prior loss of the most sensitive species and/or effective conservation programs.

Pollinating insects, particularly bees and other flower-visiting Hymenoptera (Aculeata), are some of the most ecologically and economically important insects (*1*–*3*) but have declined in species richness, geographical range, and abundance (*2*–*5*). Previous studies have assessed the roles played by habitat destruction and loss of flower resources (*4*, *5*), as well as pesticides (*6*), over relatively modest time scales and geographical ranges. Analyses of regions are rare (*7*–*10*), and our understanding of the effects of human-mediated actions over longer periods is limited. Here we assess the bee and flower-visiting wasp species that have gone extinct in Britain, using 494,117 records held

These features are confirmed in Fig. 2, where the average gradient indicates the relative extinction rate over a period, and the period of sustained extinctions is evident as the phase of maximum gradient during the mid-20th century.

The varying rates of extinctions were quantified by applying breakpoint analysis to the cumulative record. In this analysis, a piecewise linear model is fitted to data to reveal periods of approximately constant extinction rate, separated by breakpoints where the rate changes. The analysis was iterated for up to 10 breakpoints, and the Akaike information criterion (AIC), confirmed by coefficient of determination (multiple R^2), was used to establish the best model (see supplementary materials). For these data, changes in AIC and multiple R^2 level off for two models having four breakpoints (table S2). These are very similar, sharing the latter three breakpoints and revealing effectively identical periods of approximately uniform extinction rate for the majority of the 20th century (Table 2).

Both models must be interpreted with caution, as the data for "year last recorded" may not equate to "year last living." Declines in populations due to habitat changes may indicate that a species went unrecorded for some years before the actual extinction. The robustness of the breakpoints to this potential ambiguity of the probability of the year last living has been assessed, and though there is some sensitivity in the timing of the earlier and later breakpoints, due to the sparseness and bunching of events at the ends of the record, the period of sustained extinctions from the late 1920s to the late 1960s is very stable. We also assessed how variability in recorder effort over time may have affected our findings, using the number of records per decade in the BWARS database as a proxy for effort, and found that our results were not systematically affected by this. These analyses are discussed in the supplementary materials.

Table 1. Extinct British bee and flower-visiting wasp species, ordered by their last observed year, with number of records of that species from the BWARS database. A record is defined as an occurrence of a species on a specific date, at a location, and by a specific person. Some of the

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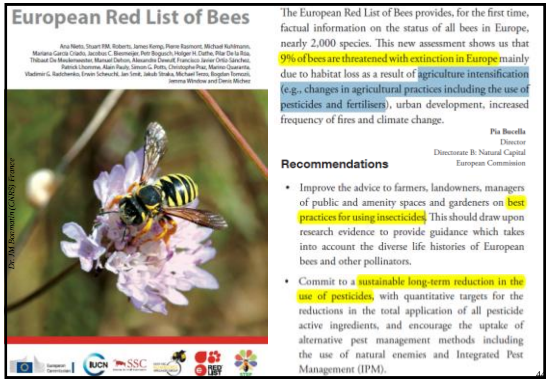


European Red List of Bees

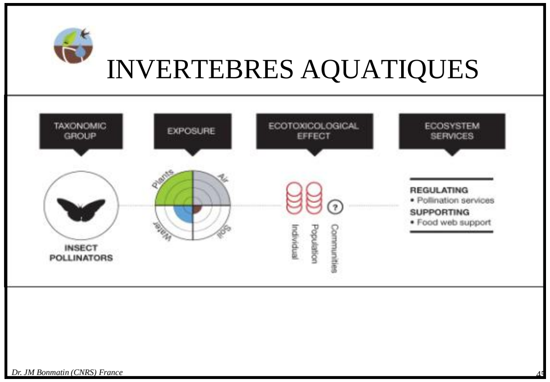
Ana Nieto, Stuart P.M. Roberts, James Kemp, Pierre Rasmont, Michael Kuhlmann, Mariana García Criado, Jacobus C. Biesmeijer, Petr Bogusch, Holger H. Dathe, Pilar De la Rúa, Thibaut De Meulemeester, Manuel Dehon, Alexandre Dewulf, Francisco Javier Ortiz-Sánchez, Patrick Lhomme, Alain Pauly, Simon G. Potts, Christophe Praz, Marino Quaranta, Vladimir G. Radchenko, Erwin Scheuchl, Jan Smit, Jakub Straka, Michael Terzo, Bogdan Tomozii, Jemma Window and Denis Michez

The European Red List of Bees provides, for the first time, factual information on the status of all bees in Europe, nearly 2,000 species. This new assessment shows us that 9% of bees are threatened with extinction in Europe mainly due to habitat loss as a result of agriculture intensification (e.g., changes in agricultural practices including the use of pesticides and fertilisers), urban development, increased frequency of fires and climate change.

Pia Bucella
Director
Directorate B: Natural Capital
European Commission

Recommendations

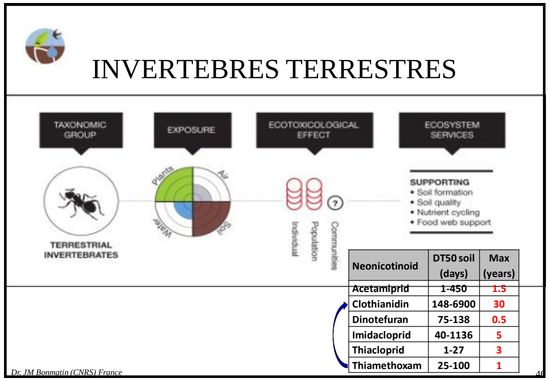
- Improve the advice to farmers, landowners, managers of public and amenity spaces and gardeners on best practices for using insecticides. This should draw upon research evidence to provide guidance which takes into account the diverse life histories of European bees and other pollinators.
- Commit to a sustainable long-term reduction in the use of pesticides, with quantitative targets for the reductions in the total application of all pesticide active ingredients, and encourage the uptake of alternative pest management methods including the use of natural enemies and Integrated Pest Management (IPM).



INVERTEBRES AQUATIQUES

REGULATING
- Pollination services

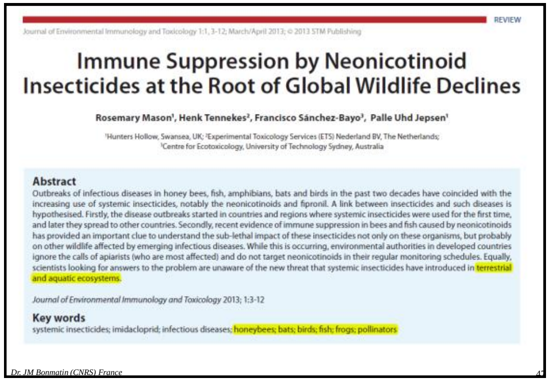
SUPPORTING
- Food web support



INVERTEBRES TERRESTRES

SUPPORTING
- Soil formation
- Soil quality
- Nutrient cycling
- Food web support

Neonicotinoid	DT50 soil (days)	Max (years)
Acetamiprid	1-450	1.5
Clothianidin	148-6900	30
Dinotefuran	75-138	0.5
Imidacloprid	40-1136	5
Thiacloprid	1-27	3
Thiamethoxam	25-100	1



REVIEW

Journal of Environmental Immunology and Toxicology 1:1, 3-12; March/April 2013; © 2013 STM Publishing

Immune Suppression by Neonicotinoid Insecticides at the Root of Global Wildlife Declines

Rosemary Mason[1], Henk Tennekes[2], Francisco Sánchez-Bayo[3], Palle Uhd Jepsen[1]

[1]Hunters Hollow, Swansea, UK; [2]Experimental Toxicology Services (ETS) Nederland BV, The Netherlands;
[3]Centre for Ecotoxicology, University of Technology Sydney, Australia

Abstract

Outbreaks of infectious diseases in honey bees, fish, amphibians, bats and birds in the past two decades have coincided with the increasing use of systemic insecticides, notably the neonicotinoids and fipronil. A link between insecticides and such diseases is hypothesised. Firstly, the disease outbreaks started in countries and regions where systemic insecticides were used for the first time, and later they spread to other countries. Secondly, recent evidence of immune suppression in bees and fish caused by neonicotinoids has provided an important clue to understand the sub-lethal impact of these insecticides not only on these organisms, but probably on other wildlife affected by emerging infectious diseases. While this is occurring, environmental authorities in developed countries ignore the calls of apiarists (who are most affected) and do not target neonicotinoids in their regular monitoring schedules. Equally, scientists looking for answers to the problem are unaware of the new threat that systemic insecticides have introduced in terrestrial and aquatic ecosystems.

Journal of Environmental Immunology and Toxicology 2013; 1:3-12

Key words
systemic insecticides; imidacloprid; infectious diseases; honeybees; bats; birds; fish; frogs; pollinators

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Environ Sci Pollut Res
DOI 10.1007/s11356-014-3180-5

WORLDWIDE INTEGRATED ASSESSMENT OF THE IMPACT OF SYSTEMIC PESTICIDES ON BIODIVERSITY AND ECOSYSTEMS

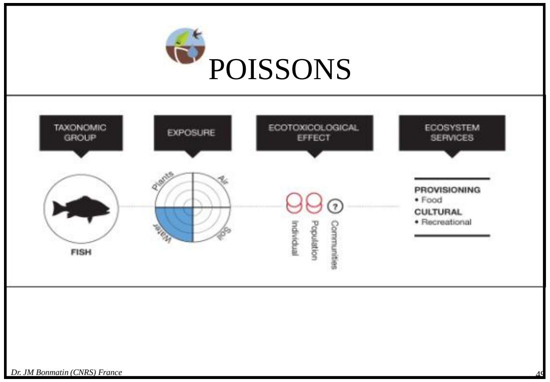
A review of the direct and indirect effects of neonicotinoids and fipronil on vertebrate wildlife

David Gibbons · Christy Morrissey · Pierre Mineau

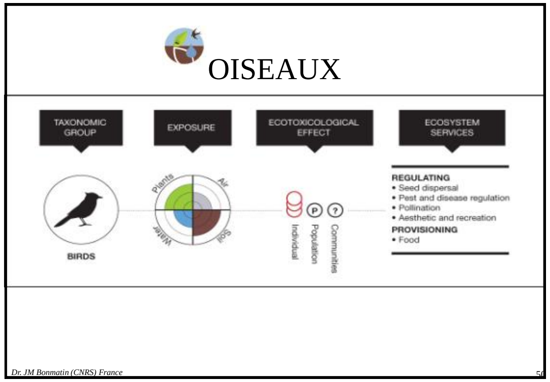
Received: 7 April 2014 / Accepted: 6 June 2014

Abstract Concerns over the role of pesticides affecting vertebrate wildlife populations have recently focussed on systemic products which exert broad-spectrum toxicity. Given that the neonicotinoids have become the fastest-growing class of insecticides globally, we review here 150 studies of their direct (toxic) and indirect (e.g. food chain) effects on vertebrate wildlife—mammals, birds, fish, amphibians and reptiles. We focus on two neonicotinoids, imidacloprid and clothianidin, and a third insecticide, fipronil, which also acts in the same systemic manner. Imidacloprid and fipronil were found to be toxic to many birds and most fish, respectively. All three insecticides exert sub-lethal effects, ranging from genotoxic and cytotoxic effects, and impaired immune function, to reduced growth and reproductive success, often at concentrations well below those associated with mortality. Use of imidacloprid and clothianidin as seed treatments on some crops poses risks to small birds, and ingestion of even a few treated seeds could cause mortality or reproductive impairment to sensitive bird species. In contrast, environmental concentrations of imidacloprid and clothianidin appear to be at levels below those which will cause mortality to freshwater vertebrates, although sub-lethal effects may occur. Some recorded environmental concentrations of fipronil, however, may be sufficiently high to harm fish. Indirect effects are rarely considered in risk assessment processes and there is a paucity of data, despite the potential to exert population-level effects. Our research revealed two field case studies of indirect effects. In one, reductions in invertebrate prey from both imidacloprid and fipronil uses led to impaired growth in a fish species, and in another, reductions in populations in two lizard species were linked to effects of fipronil on termite prey. Evidence presented here suggests that the systemic insecticides, neonicotinoids and fipronil, are capable of exerting direct and indirect effects on terrestrial and aquatic vertebrate wildlife, thus warranting further review of their environmental safety.

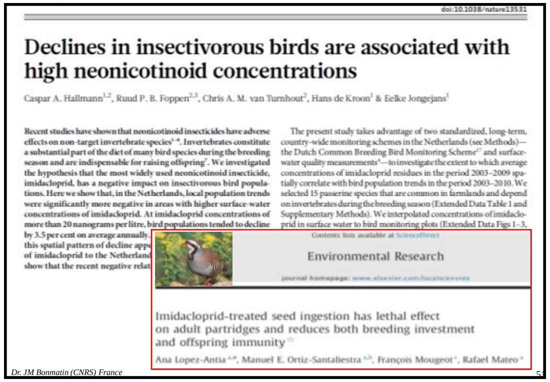
Keywords Pesticide · Neonicotinoid · Imidacloprid · Clothianidin · Fipronil · Vertebrate · Wildlife · Mammals · Birds · Fish · Amphibians · Reptiles · Risk assessment



POISSONS



OISEAUX



doi:10.1038/nature13531

Declines in insectivorous birds are associated with high neonicotinoid concentrations

Caspar A. Hallmann[1,2], Ruud P. B. Foppen[2,3], Chris A. M. van Turnhout[2], Hans de Kroon[1] & Eelke Jongejans[1]

Recent studies have shown that neonicotinoid insecticides have adverse effects on non-target invertebrate species[1-6]. Invertebrates constitute a substantial part of the diet of many bird species during the breeding season and are indispensable for raising offspring[7]. We investigated the hypothesis that the most widely used neonicotinoid insecticide, imidacloprid, has a negative impact on insectivorous bird populations. Here we show that, in the Netherlands, local population trends were significantly more negative in areas with higher surface-water concentrations of imidacloprid. At imidacloprid concentrations of more than 20 nanograms per litre, bird populations tended to decline by 3.5 per cent on average annually.

The present study takes advantage of two standardized, long-term, country-wide monitoring schemes in the Netherlands (see Methods)—the Dutch Common Breeding Bird Monitoring Scheme[17] and surface-water quality measurements[4]—to investigate the extent to which average concentrations of imidacloprid residues in the period 2003–2009 spatially correlate with bird population trends in the period 2003–2010. We selected 15 passerine species that are common in farmlands and depend on invertebrates during the breeding season (Extended Data Table 1 and Supplementary Methods). We interpolated concentrations of imidacloprid in surface water to bird monitoring plots (Extended Data Figs 1–3,

Contents lists available at ScienceDirect

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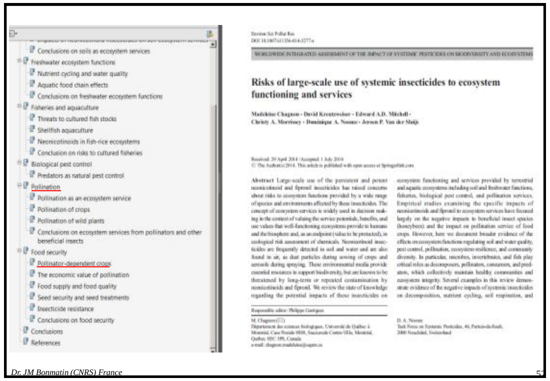
Imidacloprid-treated seed ingestion has lethal effect on adult partridges and reduces both breeding investment and offspring immunity

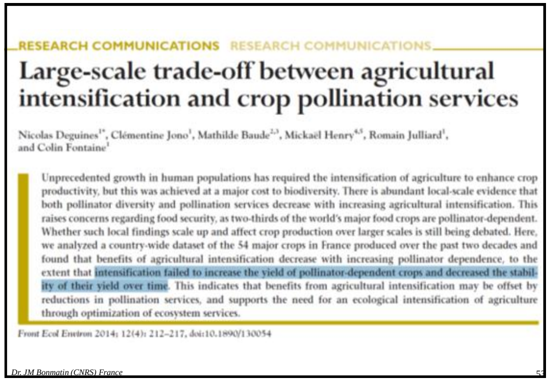
Ana Lopez-Antia[a,*], Manuel E. Ortiz-Santaliestra[a,b], François Mougeot[a], Rafael Mateo[a]



WORLDWIDE INTEGRATED ASSESSMENT OF THE IMPACT OF SYSTEMIC PESTICIDES ON BIODIVERSITY AND ECOSYSTEMS

Risks of large-scale use of systemic insecticides to ecosystem functioning and services

Madeleine Chagnon · David Kreutzweiser · Edward A.D. Mitchell · Christy A. Morrissey · Dominique A. Noome · Jeroen P. Van der Sluijs



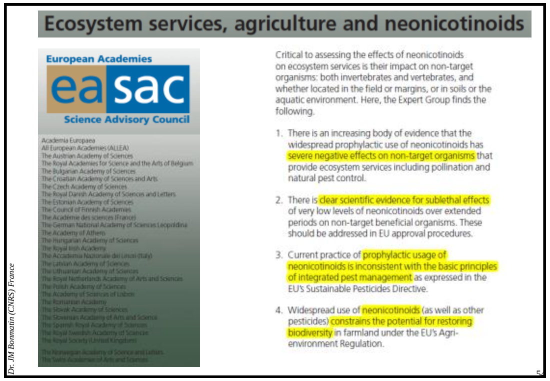
RESEARCH COMMUNICATIONS RESEARCH COMMUNICATIONS

Large-scale trade-off between agricultural intensification and crop pollination services

Nicolas Deguines[1*], Clémentine Jono[1], Mathilde Baude[2,3], Mickaël Henry[4,5], Romain Julliard[1], and Colin Fontaine[1]

Unprecedented growth in human populations has required the intensification of agriculture to enhance crop productivity, but this was achieved at a major cost to biodiversity. There is abundant local-scale evidence that both pollinator diversity and pollination services decrease with increasing agricultural intensification. This raises concerns regarding food security, as two-thirds of the world's major food crops are pollinator-dependent. Whether such local findings scale up and affect crop production over larger scales is still being debated. Here, we analyzed a country-wide dataset of the 54 major crops in France produced over the past two decades and found that benefits of agricultural intensification decrease with increasing pollinator dependence, to the extent that intensification failed to increase the yield of pollinator-dependent crops and decreased the stability of their yield over time. This indicates that benefits from agricultural intensification may be offset by reductions in pollination services, and supports the need for an ecological intensification of agriculture through optimization of ecosystem services.

Front Ecol Environ 2014; 12(4): 212–217, doi:10.1890/130054



Ecosystem services, agriculture and neonicotinoids

European Academies easac Science Advisory Council

Critical to assessing the effects of neonicotinoids on ecosystem services is their impact on non-target organisms: both invertebrates and vertebrates, and whether located in the field or margins, or in soils or the aquatic environment. Here, the Expert Group finds the following.

1. There is an increasing body of evidence that the widespread prophylactic use of neonicotinoids has severe negative effects on non-target organisms that provide ecosystem services including pollination and natural pest control.
2. There is clear scientific evidence for sublethal effects of very low levels of neonicotinoids over extended periods on non-target beneficial organisms. These should be addressed in EU approval procedures.
3. Current practice of prophylactic usage of neonicotinoids is inconsistent with the basic principles of integrated pest management as expressed in the EU's Sustainable Pesticides Directive.
4. Widespread use of neonicotinoids (as well as other pesticides) constrains the potential for restoring biodiversity in farmland under the EU's Agri-environment Regulation.

WORLDWIDE INTEGRATED ASSESSMENT OF THE IMPACT OF SYSTEMIC PESTICIDES ON BIODIVERSITY AND ECOSYSTEMS

Alternatives to neonicotinoid insecticides for pest control: case studies in agriculture and forestry

Lorenzo Furlan · David Kreutzweiser

Abstract

Introduction

ORIGINAL PAPER

Imidacloprid-mediated effects on survival and fertility of the Neotropical brown stink bug *Euschistus heros*

M. F. Santos[1] · R. L. Santos[2] · H. V. V. Tomé[1] · W. F. Barbosa[1,3] · G. F. Martins[4] · R. N. C. Guedes[1] · E. E. Oliveira[1]

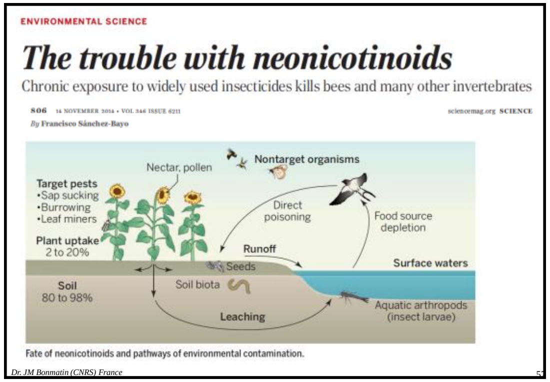
Abstract Enhanced reproductive output after sublethal insecticide exposure, including neonicotinoid exposure, has been reported in a diversity of arthropods. Suspicions of such a phenomenon in the Neotropical brown stink bug, *Euschistus heros* (Hemiptera: Pentatomidae), were sparked by the increasing densities of naturally occurring populations of this insect pest species in Brazilian soybean fields. Here, we tested whether the sublethal exposure to imidacloprid would induce changes in the survival and reproductive performances of *E. heros* adult females. The imidacloprid estimated LC_{50} was 0.83 (0.60–1.25) μg a.i./cm^2, and the dose recommended for field applications (4.2 μg a.i./cm^2) was within the concentration range of the imidacloprid estimated LC_{90} [2.66 (1.65–5.49) μg a.i./cm^2]. Newly emerged (≤24 h) adult females were exposed for 48 h to dry imidacloprid residues (0.042 μg/cm^2, equivalent to 1 % of the field rate dose) and exhibited higher levels of cell damage, greater ovariole length, and a larger area of the most developed follicle in their ovaries up to the 6th day of adulthood. Furthermore, these females exhibited reduced rates of survival but higher fecundity and fertility rates compared with untreated females. Our results thus suggest that females of *E. heros* increased their reproductive output in response to the imidacloprid sublethal exposure. These findings suggest a potential involvement of sublethal exposure to neonicotinoids in the recent outbreaks of the Neotropical brown stink bug *E. heros* observed in Brazilian soybean-producing regions.

Keywords Reproductive responses · Hormesis · Insect ovaries · Damaged cells · Stink bugs

Key message

- Insecticide-induced changes in *Euschistus heros* reproduction capacity has been sparked by the increasing densities of this pest in Brazilian soybean fields.
- Females of *E. heros* increased their reproductive output (fecundity and fertility rates) to overcome imidacloprid-induced sublethal stress (higher number of damaged ovarian cells and reduction on female's survival).
- These findings suggest a potential link between imidacloprid sublethal exposure and the recent outbreaks of *E. heros* observed in the Brazilian soybean fields.

Communicated by E. Roditakis.



ENVIRONMENTAL SCIENCE

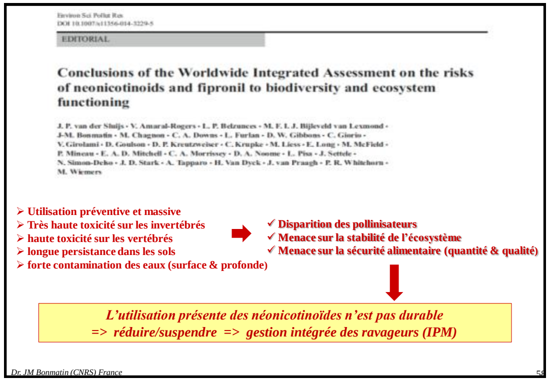
The trouble with neonicotinoids

Chronic exposure to widely used insecticides kills bees and many other invertebrates

806 14 NOVEMBER 2014 • VOL 346 ISSUE 6211 sciencemag.org SCIENCE

By Francisco Sánchez-Bayo

Fate of neonicotinoids and pathways of environmental contamination.



EDITORIAL

Conclusions of the Worldwide Integrated Assessment on the risks of neonicotinoids and fipronil to biodiversity and ecosystem functioning

J. P. van der Sluijs · V. Amaral-Rogers · L. P. Belzunces · M. F. I. J. Bijleveld van Lexmond · J-M. Bonmatin · M. Chagnon · C. A. Downs · L. Furlan · D. W. Gibbons · C. Giorio · V. Girolami · D. Goulson · D. P. Kreutzweiser · C. Krupke · M. Liess · E. Long · M. McField · P. Mineau · E. A. D. Mitchell · C. A. Morrissey · D. A. Noome · L. Pisa · J. Settele · N. Simon-Delso · J. D. Stark · A. Tapparo · H. Van Dyck · J. van Praagh · P. R. Whitehorn · M. Wiemers

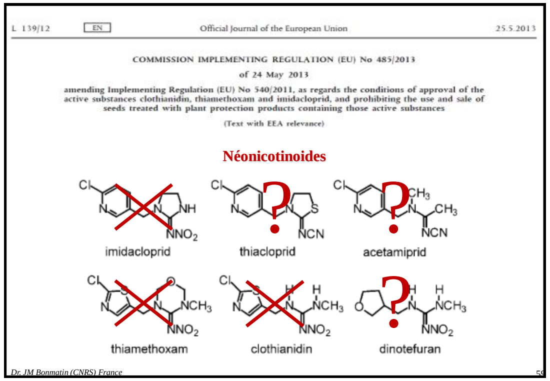
- Utilisation préventive et massive
- Très haute toxicité sur les invertébrés
- haute toxicité sur les vertébrés
- longue persistance dans les sols
- forte contamination des eaux (surface & profonde)

➡

- ✓ Disparition des pollinisateurs
- ✓ Menace sur la stabilité de l'écosystème
- ✓ Menace sur la sécurité alimentaire (quantité & qualité)

⬇

L'utilisation présente des néonicotinoïdes n'est pas durable
=> réduire/suspendre => gestion intégrée des ravageurs (IPM)



L 139/12 EN Official Journal of the European Union 25.5.2013

COMMISSION IMPLEMENTING REGULATION (EU) No 485/2013

of 24 May 2013

amending Implementing Regulation (EU) No 540/2011, as regards the conditions of approval of the active substances clothianidin, thiamethoxam and imidacloprid, and prohibiting the use and sale of seeds treated with plant protection products containing those active substances

(Text with EEA relevance)

Néonicotinoides

imidacloprid
thiacloprid
acetamiprid
thiamethoxam
clothianidin
dinotefuran

Réduire l'utilisation de pesticides et protéger la santé des pollinisateurs

L'Ontario se fixe l'objectif de réduire l'utilisation de néonicotinoïdes de 80 p. cent

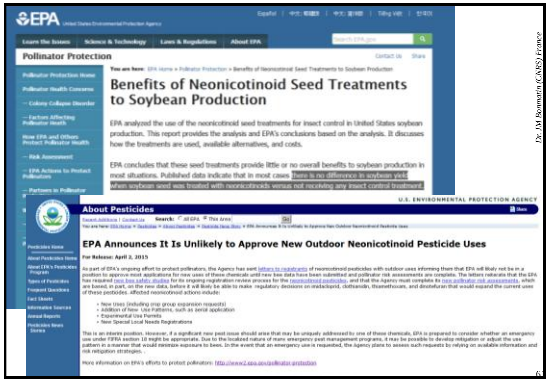
25 novembre 2014 10h00 | Ministère de l'Environnement

L'Ontario adopte des mesures pour renforcer la santé des oiseaux, des abeilles, des papillons et des autres pollinisateurs afin de garantir des écosystèmes en santé, un secteur agricole productif et une économie forte.

Les pollinisateurs jouent un rôle important dans la productivité agricole de l'Ontario. Des cultures comme les pommes, les cerises, les pêches, les prunes, les concombres, les asperges, les courges, les citrouilles et les melons ont besoin des pollinisateurs afin de pousser.

L'Agence de réglementation de la lutte antiparasitaire fédérale a conclu à l'existence d'un lien entre la plantation de semences de maïs et de soya traitées aux néonicotinoïdes – un insecticide agricole – et la mortalité d'abeilles en Ontario. L'approche de la province aidera à garder les cultures en santé et à améliorer l'environnement grâce aux moyens suivants :

- poursuivre l'objectif de réduire de 80 p.cent le nombre d'acres plantés avec des semences de maïs et de soya traitées aux néonicotinoïdes d'ici 2017;
- réduire le taux de mortalité des abeilles durant l'hiver à 15 p. cent d'ici 2020;
- établir un Plan d'action pour la santé des pollinisateurs exhaustif



Pollinator Protection

You are here: EPA Home » Pollinator Protection » Benefits of Neonicotinoid Seed Treatments to Soybean Production

Benefits of Neonicotinoid Seed Treatments to Soybean Production

EPA analyzed the use of the neonicotinoid seed treatments for insect control in United States soybean production. This report provides the analysis and EPA's conclusions based on the analysis. It discusses how the treatments are used, available alternatives, and costs.

EPA concludes that these seed treatments provide little or no overall benefits to soybean production in most situations. Published data indicate that in most cases there is no difference in soybean yield when soybean seed was treated with neonicotinoids versus not receiving any insect control treatment.

U.S. ENVIRONMENTAL PROTECTION AGENCY

About Pesticides

You are here: EPA Home » Pesticides » About Pesticides » Pesticide News Story » EPA Announces It Is Unlikely to Approve New Outdoor Neonicotinoid Pesticide Uses

EPA Announces It Is Unlikely to Approve New Outdoor Neonicotinoid Pesticide Uses

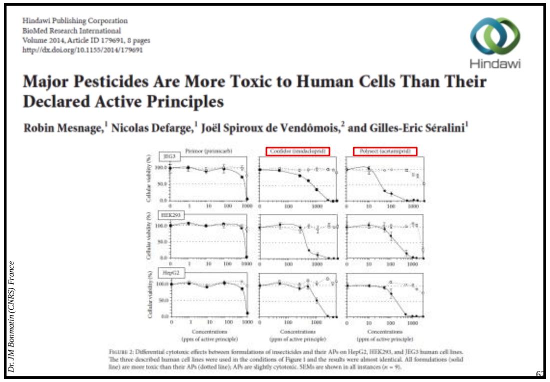
For Release: April 2, 2015

As part of EPA's ongoing effort to protect pollinators, the Agency has sent letters to registrants of neonicotinoid pesticides with outdoor uses informing them that EPA will likely not be in a position to approve most applications for new uses of these chemicals until new bee data have been submitted and pollinator risk assessments are complete. The letters reiterate that the EPA has required new bee safety studies for its ongoing registration review process for the neonicotinoid pesticides, and that the Agency must complete its new pollinator risk assessments, which are based, in part, on the new data, before it will likely be able to make regulatory decisions on imidacloprid, clothianidin, thiamethoxam, and dinotefuran that would expand the current uses of these pesticides. Affected neonicotinoid actions include:

- New Uses (including crop group expansion requests)
- Addition of New Use Patterns, such as aerial application
- Experimental Use Permits
- New Special Local Needs Registrations

This is an interim position. However, if a significant new pest issue should arise that may be uniquely addressed by one of these chemicals, EPA is prepared to consider whether an emergency use under FIFRA section 18 might be appropriate. Due to the localized nature of many emergency pest management programs, it may be possible to develop mitigation or adjust the use pattern in a manner that would minimize exposure to bees. In the event that an emergency use is requested, the Agency plans to assess such requests by relying on available information and risk mitigation strategies.

More information on EPA's efforts to protect pollinators: http://www2.epa.gov/pollinator-protection



Hindawi Publishing Corporation
BioMed Research International
Volume 2014, Article ID 179691, 8 pages
http://dx.doi.org/10.1155/2014/179691

Major Pesticides Are More Toxic to Human Cells Than Their Declared Active Principles

Robin Mesnage,[1] Nicolas Defarge,[1] Joël Spiroux de Vendômois,[2] and Gilles-Eric Séralini[1]

Figure 2: Differential cytotoxic effects between formulations of insecticides and their APs on HepG2, HEK293, and JEG3 human cell lines. The three described human cell lines were used in the conditions of Figure 1 and the results were almost identical. All formulations (solid line) are more toxic than their APs (dotted line); APs are slightly cytotoxic. SEMs are shown in all instances ($n = 9$).

Exposition (par la nourriture)

Quantitative Analysis of Neonicotinoid Insecticide Residues in Foods: Implication for Dietary Exposures

Mei Chen,[†] Lin Tao,[†] John McLean,[§] and Chensheng Lu[*,†]

USA 2015:
100% des fruits & légumes contiennent au moins 1 néonic
72% des fruits contiennent au moins 2 néonics
45% des légumes contiennent au moins 2 néonics

Exposition (détox par l'urine)

Advance Publication
Journal of Occupational Health
Accepted for Publication: Aug 7, 2014

Title: Biological Monitoring Method for Urinary Neonicotinoid Insecticides Using LC-MS/MS and Its Application to Japanese Adults

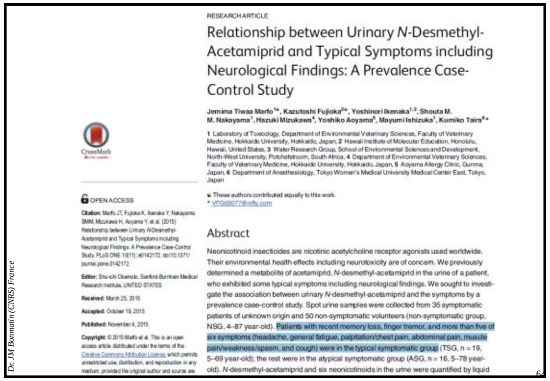
Running title: *Biological monitoring of neonicotinoids in Japanese adults*

Jun Ueyama[a,*], Hiroshi Nomura[a], Takaaki Kondo[a], Isao Saito[b], Yuki Ito[c], Aya Osaka[a] and Michihiro Kamijima[c]

Japon 2014:
90 % des individus testés sont positifs pour au moins 4 néonics (imidaclopride, clothianidine, dinotéfuran & thiaclopride)

Santé publique (effets)

- **2007 (ARLA): Perturbateurs endocrinien potentiels**
- **2012-2014: Génotoxique et cytotoxique**
- **2013 (ANSES): Cancérigène**
- **2013 (EFSA): Effets sur le neuro-développement**
- **2014: Effets hépatiques**
- **2014: Effets sur la thyroïde & testicules**
- **2014: Synergies entre pesticides**
- **2014 (Japon): effets sub-létaux et empoisonnements**
- **2015: Action sur récepteurs glutamates**



RESEARCH ARTICLE

Relationship between Urinary *N*-Desmethyl-Acetamiprid and Typical Symptoms including Neurological Findings: A Prevalence Case-Control Study

Jemima Tiwaa Marfo[1☯], Kazutoshi Fujioka[2☯], Yoshinori Ikenaka[1,3], Shouta M. M. Nakayama[1], Hazuki Mizukawa[4], Yoshiko Aoyama[5], Mayumi Ishizuka[1], Kumiko Taira[6*]

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OPEN ACCESS

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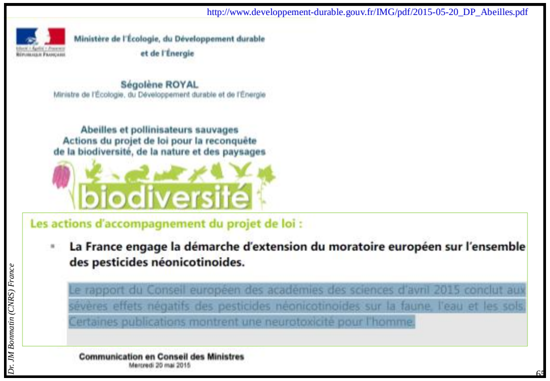
Abstract

Neonicotinoid insecticides are nicotinic acetylcholine receptor agonists used worldwide. Their environmental health effects including neurotoxicity are of concern. We previously determined a metabolite of acetamiprid, *N*-desmethyl-acetamiprid in the urine of a patient, who exhibited some typical symptoms including neurological findings. We sought to investigate the association between urinary *N*-desmethyl-acetamiprid and the symptoms by a prevalence case-control study. Spot urine samples were collected from 35 symptomatic patients of unknown origin and 50 non-symptomatic volunteers (non-symptomatic group, NSG, 4–87 year-old). Patients with recent memory loss, finger tremor, and more than five of six symptoms (headache, general fatigue, palpitation/chest pain, abdominal pain, muscle pain/weakness/spasm, and cough) were in the typical symptomatic group (TSG, n = 19, 5–69 year-old); the rest were in the atypical symptomatic group (ASG, n = 16, 5–78 year-old). *N*-desmethyl-acetamiprid and six neonicotinoids in the urine were quantified by liquid



http://www.developpement-durable.gouv.fr/IMG/pdf/2015-05-20_DP_Abeilles.pdf

Ministère de l'Écologie, du Développement durable et de l'Énergie

Ségolène ROYAL
Ministre de l'Écologie, du Développement durable et de l'Énergie

Abeilles et pollinisateurs sauvages
Actions du projet de loi pour la reconquête de la biodiversité, de la nature et des paysages

Les actions d'accompagnement du projet de loi :

- **La France engage la démarche d'extension du moratoire européen sur l'ensemble des pesticides néonicotinoides.**

  Le rapport du Conseil européen des académies des sciences d'avril 2015 conclut aux sévères effets négatifs des pesticides néonicotinoides sur la faune, l'eau et les sols. Certaines publications montrent une neurotoxicité pour l'homme.

Communication en Conseil des Ministres
Mercredi 20 mai 2015

Merci à tous mes collaborateurs et merci de votre attention