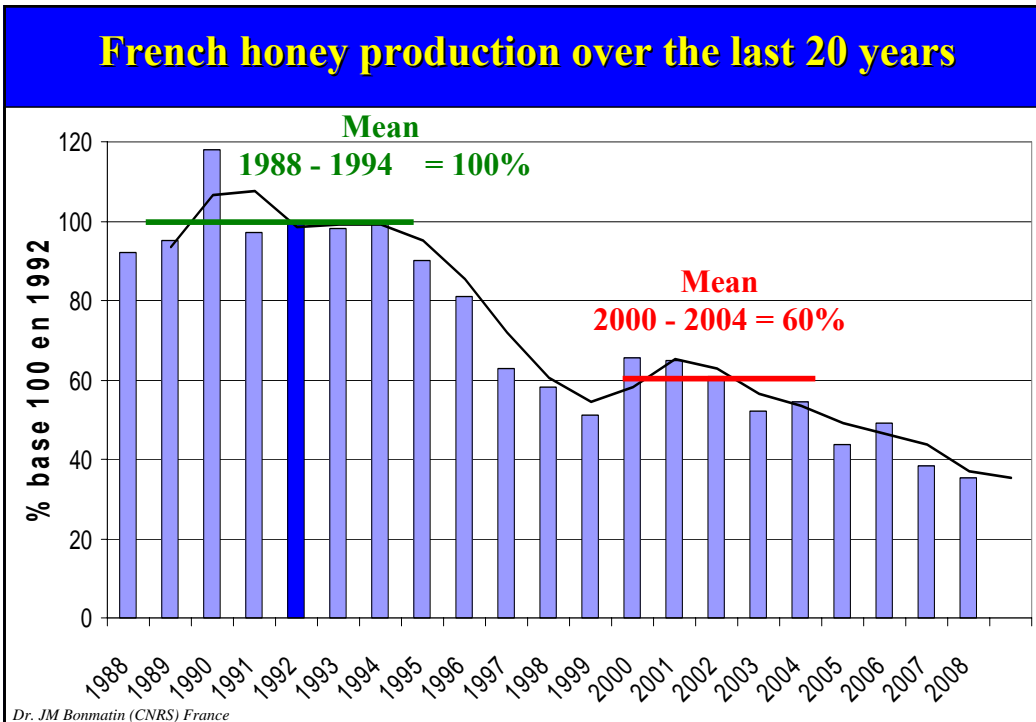

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ROUND TABLE 3

Intoxication of bees due to pesticides : results from scientists

THURSDAY 17 SEPTEMBER 2009 MORNING PASTEUR ROOM 9:00-13:00

Moderator : JM BONMATIN (Centre National de la Recherche Scientifique, Orléans, France)



Bee problems reflect pollinator problems

- Parasitism (*varroa, nosema*)
- Pathology (viruses etc.)
- Appropriate management of colonies

- Environment (biodiversity, climate ...)
- Chemicals including pesticides

... thus probably our future environmental problems

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Pesticides : insecticides, fungicides & herbicides



Protection of crops, local environment, wood structure (timber), pets ...

Toxicity :

- Acute effects : knock down, short term mortality and LD50 (24/48h) ...
- Sublethal effects : behavior, foraging/feeding, communication, thermoregulation, learning & memory ...
- Long term effects : chronic intoxication, mortality after 10 days, immunity, colony weakening, resistance to pathogens/parasites ...

Mode of exposure :

- Soil treatment - Oral ingestion (nectar, pollen, air & water...)
- Seed-dressing - Entering into the beehive and dissemination
- Foliar application - Bees and larvae
- Delayed consumption (winter resources ...)

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Pesticides : Toxicity / bees (DL50 ng/bee)

pesticide	®	utilisation	DL50 ng/ab	Tox/DDT
DDT	Dinocide	insecticide	27 000,0	1
amitraze	Apivar	i/acaricide	12 000,0	2
coumaphos	Perizin	i/acaricide	3 000,0	9
tau-fluvalinate*	Apistan	i/acaricide	2 000,0	13,5
methiocarb	Mesurool	insecticide	230,0	117
carbofuran	Curater	insecticide	160,0	169
λ-cyhalothrine	Karate	insecticide	38,0	711
deltamethrine	Décis	insecticide	10,0	2 700
thiaméthoxam	Cruiser	insecticide	5,0	5 400
fipronil	Regent	insecticide	4,2	6 475
clothianidine	Poncho	insecticide	4,0	6 750
imidaclopride	Gaucho	insecticide	3,7	7 297

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Speakers :

Dr Jean-Marc BONMATIN, Centre de Biophysique Moléculaire, Centre national de la Recherche Scientifique (CNRS), Orléans, France.

Dr Marc-Edouard COLIN, Laboratoire de pathovigilance et de développement apicole, Montpellier SupAgro, Montpellier, France.

Dr Jean-Luc BRUNET, Laboratoire de toxicologie environnementale, Institut National de la Recherche Agronomique (INRA), Avignon, France.

Dr Piotr MEDRZYCKI, Unità di ricerca di apicoltura e bachicoltura, Consiglio per la Ricerca e la Sperimentazione in Agricoltura (CRSA), Bologna, Italia.

Dr Cécile FLECHE, Centre National d'Etudes Vétérinaires et Alimentaires (CNEVA), Nice Sophia-Antipolis, France.

Dr Marie-Pierre CHAUZAT & Dr Paul MARTIN, Laboratoire d'études et de recherches sur les ruminants et les abeilles, Agence française de Sécurité Sanitaire des Aliments, AFSSA, Nice Sophia-Antipolis, France.

Charles POINSOT & Alain GAZEAU, ATMO France & ATMO Poitou-Charentes : Fédération des associations agréées de surveillance de la qualité de l'air (AASQA) , Dunkerque & Périgny, France.

Janine KIEVITS, Centre Apicole de Recherche et d'Information (CARI), Louvain-la-Neuve, Belgique.

Conclusions

Excused : *Dr L. BELZUNCES (Fr), Dr J. PISTORIUS (De), Dr F. PUERTA (Sp).*

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General rules

Speakers :

- brief introduction of the lab
- expose the main results
- respect the timing

Participants and questions :

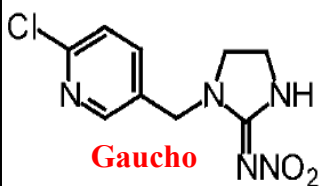
- introduce yourself briefly
- ask clear questions
- distinguish questions from debate

Then debate is not conflict :

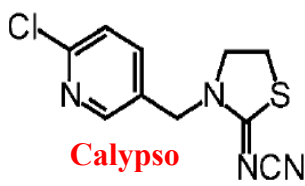
- all points of view are welcome
- keep within the subject
- discussion and argumentation

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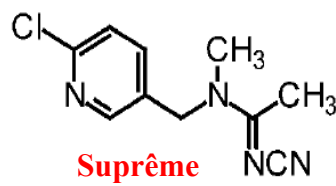
Nicotinoids



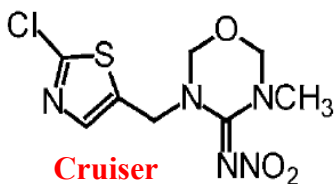
imidacloprid



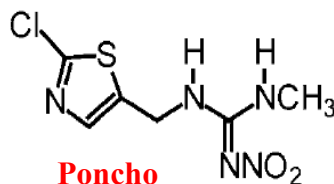
thiacloprid



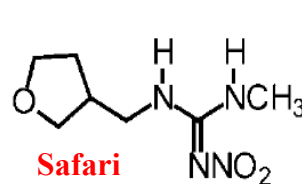
acetamiprid



thiamethoxam



clothianidin



dinotefuran

Bade-Württemberg (De) in spring 2008 :



Seed-dressing Poncho Pro (Clothianidin) for maize : 11 000 beehives dead



→ Huge release of clothianidin during sowing with pneumatic material.

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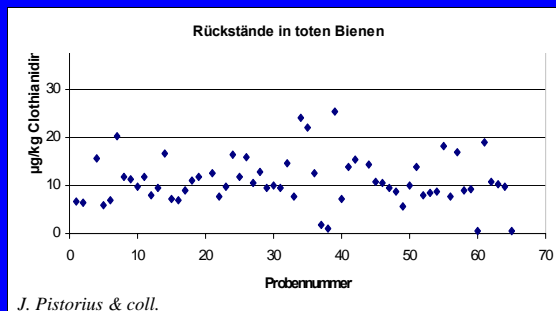
→ Contamination of the surroundings :

- Apple-trees (up to 87 ppb)
- Weed flowers (3 to 25 ppb)
- Oilseed rape (up to 95 ppb)

→ Contamination of the beehives :

- Pollen (4 to 10 ppb)
- Bee brood (10 to 20 ppb)
- Bee bread (10 - 25 ppb)
- Dead bees (0 to 200 ppb)

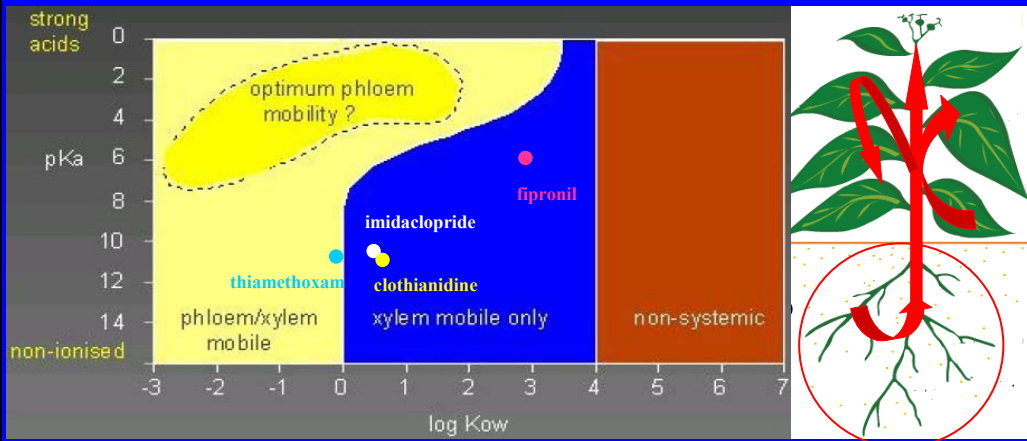
Bee bread (ppb)	Nbr of samples
n.n.	3
<3	0
3 - 10	3
10 - 25	7
> 25	6



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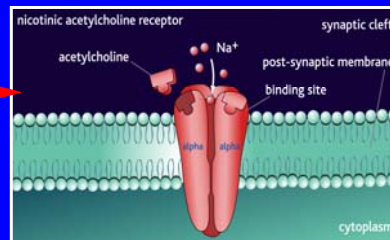
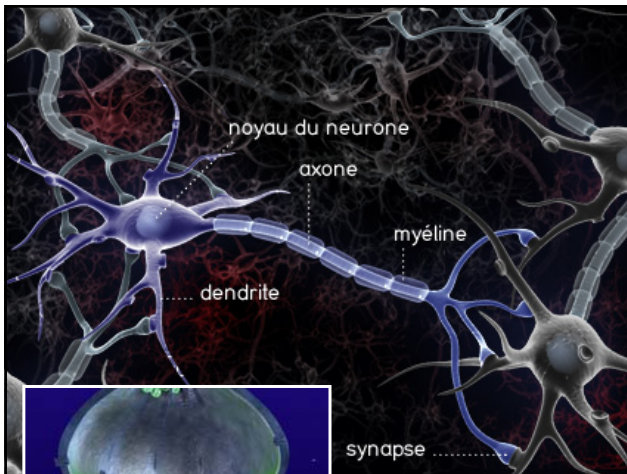
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Systemic insecticides : xylemic and phloemic transport



- Bromilow, R.H., Chamberlain, K. & Evans, A.A. (1990) *Weed Science*, 38, 305-314.

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France :

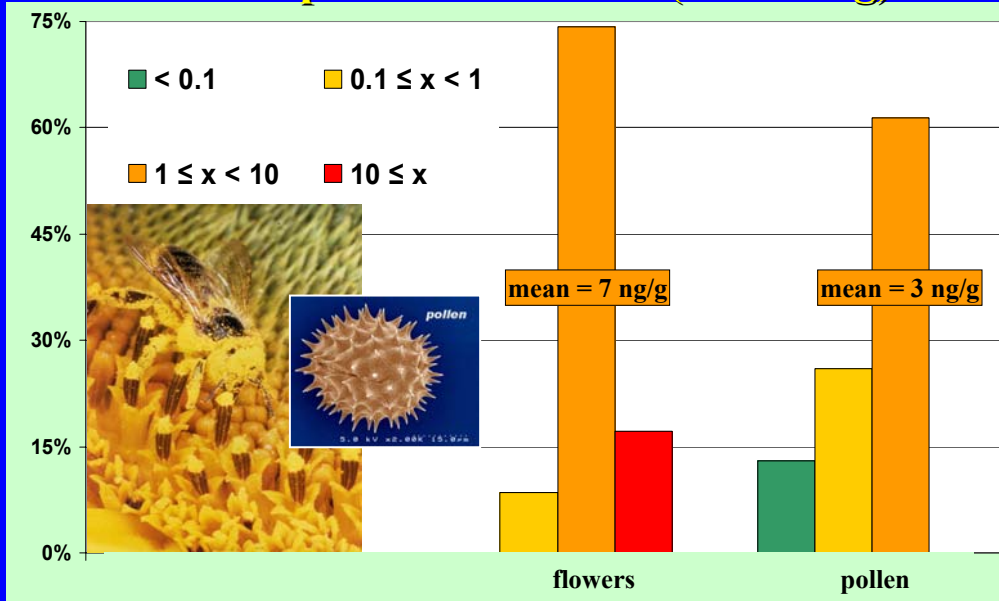
- Imidacloprid 1994
suspended /sunflower 1999
suspended /maize 2004
- Fipronil 1997
suspended 2004
- Clothianidin non authorized
- Thiaméthoxam 2008
suspended 2009

Doses ~ 50 à 100 g/ha

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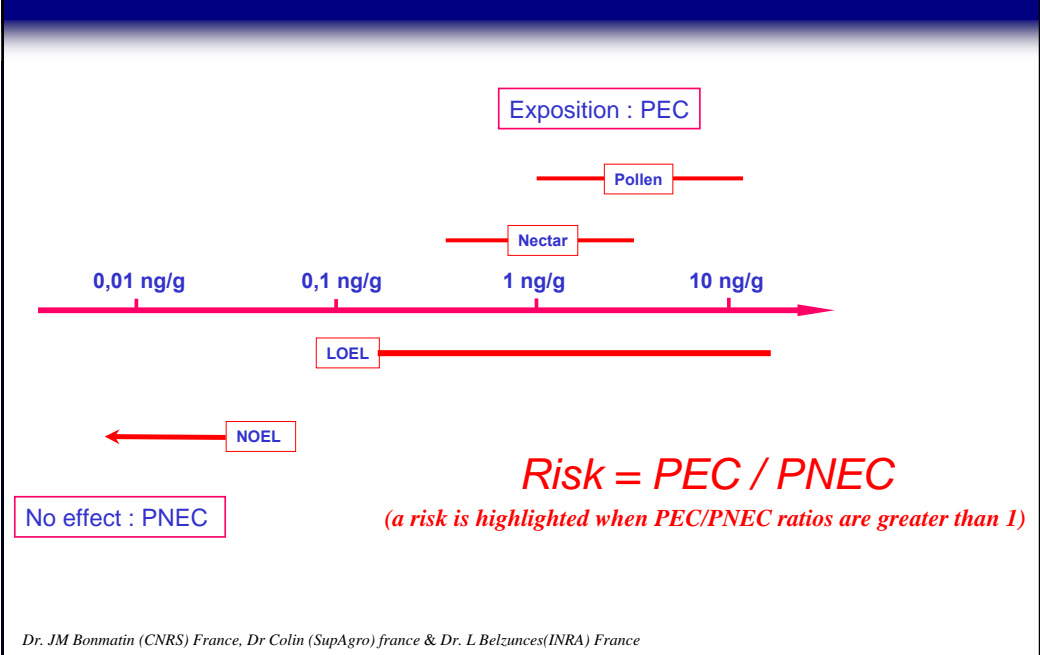
Imidacloprid in sunflower (flowering)



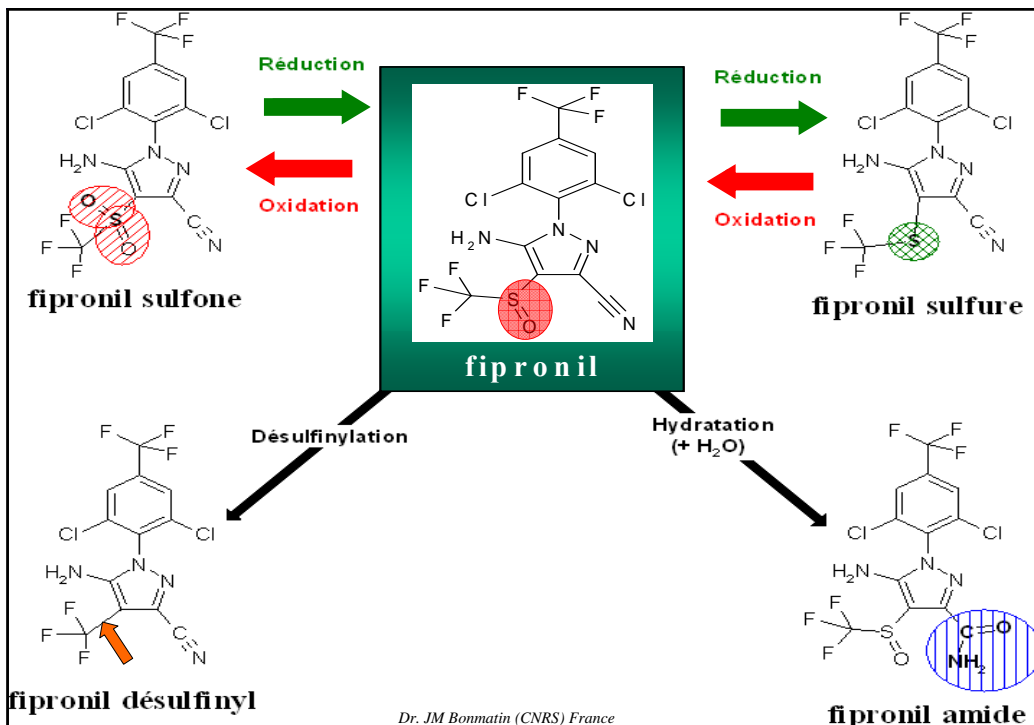
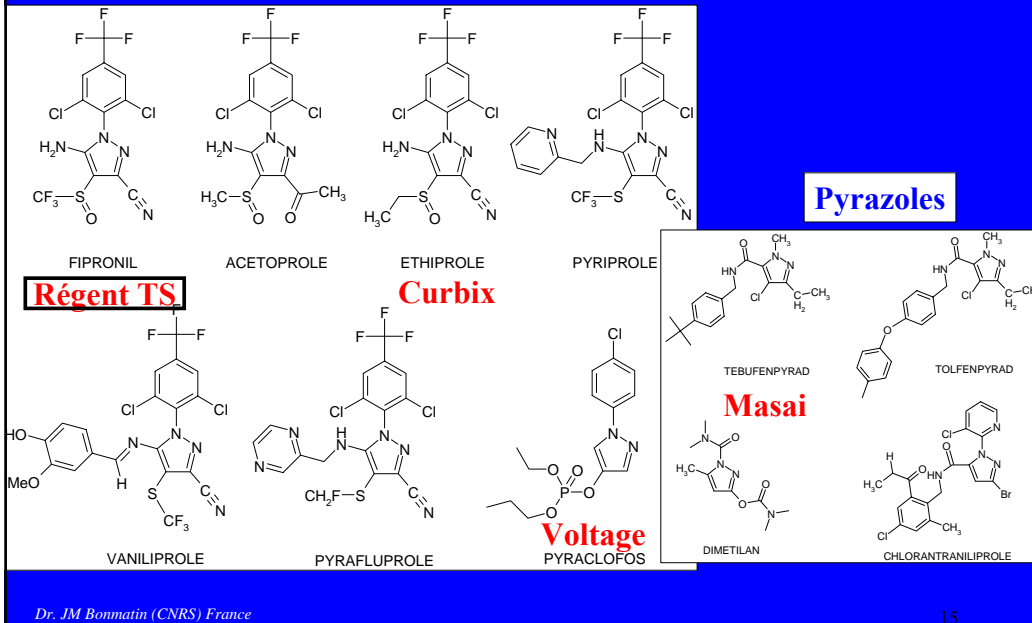
- unit in nano-gram/gram = 1 ng/g = 1 ppb = 1 μ g/kg = 0,000000001 g/g
 - Bonmatin et al., Analytical Chemistry, 2003.

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Effects of nicotinoids on bees : Risk assessment



phénylpyrazoles / pyrazoles

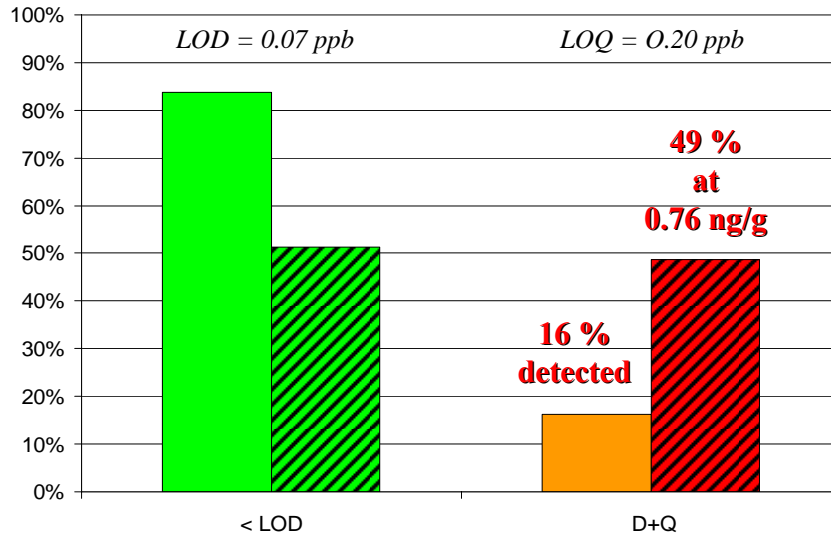


Fiproles / 197 pollen samples

□ non traités ▣ Regent TS

Pollen (non-treated crop): $\Sigma f = 0,03 \text{ ng/g}$

Pollens (treated crop) : $\Sigma f = 0.36 \text{ ng/g}$

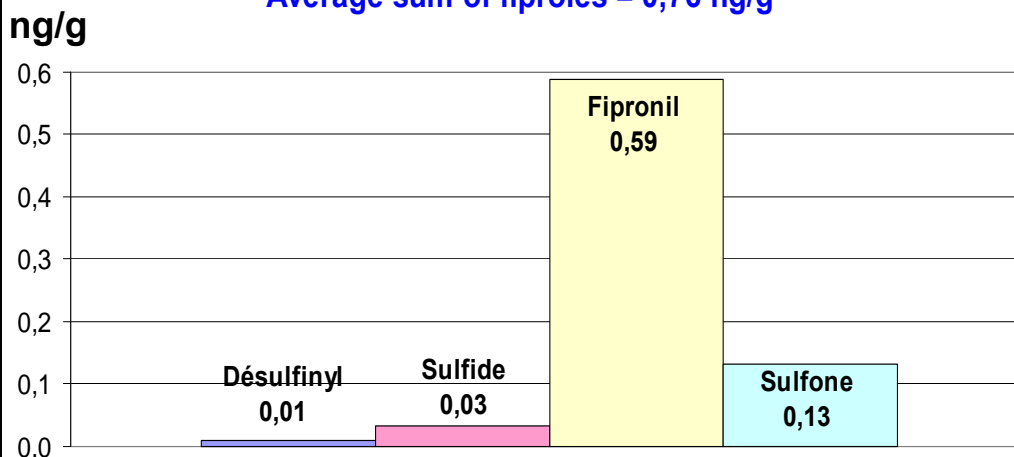


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Fiproles in pollen : Quantitative

Mean concentrations of fipronil and metabolites in positive pollen from treated crops by Regent TS (ng/g)

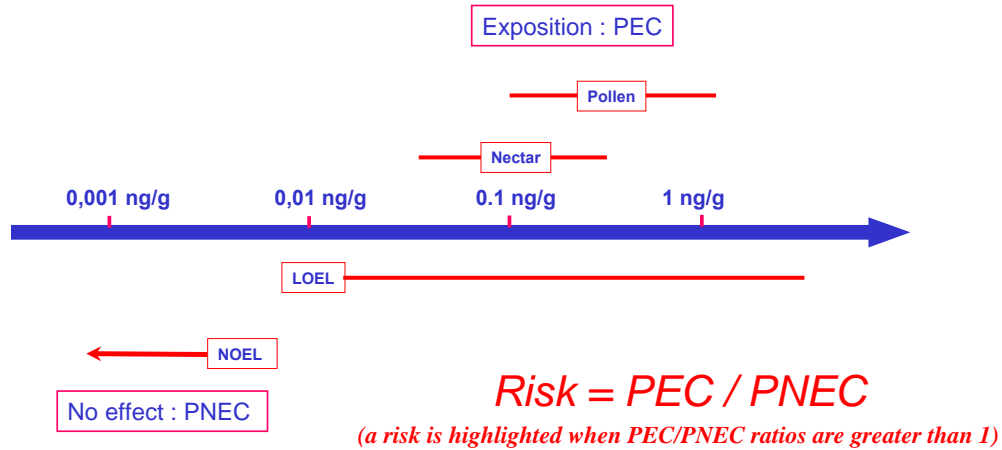
Average sum of fiproles = 0,76 ng/g



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Effects of fiproles on bees : Risk assessment



Dr. JM Bonmatin (CNRS) France, Dr Colin (SupAgro) France & Dr. L Belzunces(INRA) France

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- INRA, Xénobiotiques (Toulouse), F. Laurent.
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- National Research Center for Environment and Health (GSF-Munich), A. Kettrup.
- Wageningen University (LUW), D. Peters.