



## Pollinator News

Jan. 9, 2016

### Research

**A Locomotor Deficit Induced by Sublethal Doses of Pyrethroid and Neonicotinoid Insecticides in the Honeybee *Apis mellifera*,** Mercédès Charreton<sup>1,2</sup>, Axel Decourtye<sup>2,3,4</sup>, Mickaël Henry<sup>1,2</sup>, Guy Rodet<sup>1,2</sup>, Jean Christophe Sandoz<sup>5</sup>, Pierre Charnet<sup>6</sup>, Claude Collet<sup>1,2\*</sup>

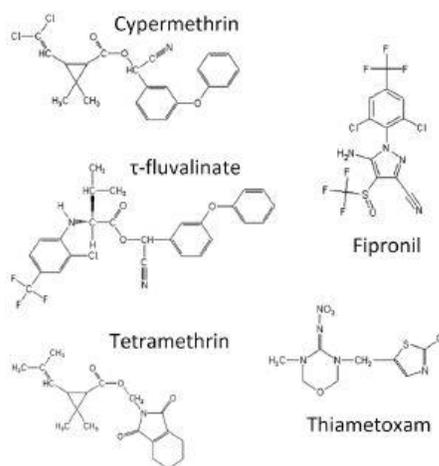


#### Abstract

The toxicity of pesticides used in agriculture towards non-targeted organisms and especially pollinators has recently drawn the attention from a broad scientific community. Increased honeybee mortality observed worldwide certainly contributes to this interest. The potential role of several neurotoxic insecticides in triggering or potentiating honeybee mortality was considered, in particular phenylpyrazoles and neonicotinoids, given that they are widely used and highly toxic for insects. Along with their ability to kill insects at lethal doses, they can compromise survival at sublethal doses by producing subtle deleterious effects. In this study, we

compared the bee's locomotor ability, which is crucial for many tasks within the hive (e.g. cleaning brood cells, feeding larvae...), before and after an acute sublethal exposure to one insecticide belonging to the two insecticide classes, fipronil and thiamethoxam. Additionally, we examined the locomotor ability after exposure to pyrethroids, an older chemical insecticide class still widely used and known to be highly toxic to bees as well.

Our study focused on young bees (day 1 after emergence) since (i) few studies are available on locomotion at this stage and (ii) in recent years, pesticides have been reported to accumulate in different hive matrices, where young bees undergo their early development. At sublethal doses (SLD48h, i.e. causing no mortality at 48h), three pyrethroids, namely cypermethrin (2.5 ng/bee), tetramethrin (70 ng/bee), tau-fluvalinate (33 ng/bee) and the neonicotinoid thiamethoxam (3.8 ng/bee) caused a locomotor deficit in honeybees. While the SLD48h of fipronil (a phenylpyrazole, 0.5 ng/bee) had no



**Fig 1. Synthetic insecticides from three classes.** Chemical structure of 3 pyrethroids (cypermethrin, tau-fluvalinate, tetramethrin), a phenylpyrazole (fipronil) and a neonicotinoid (thiamethoxam).

doi:10.1371/journal.pone.0144879.g001

measurable effect on locomotion, we observed high mortality several days after exposure, an effect that was not observed with the other insecticides. Although locomotor deficits observed in the sublethal range of pyrethroids and thiamethoxam would suggest deleterious effects in the field, the case of fipronil demonstrates that toxicity evaluation requires information on multiple endpoints (e.g. long term survival) to fully address pesticides risks for honeybees. Pyrethroid-induced locomotor deficits are discussed in light of recent advances regarding their mode of action on honeybee ion channels and current structure-function studies.

## Managed Pollinator Protection Plan Symposium

The Honey Bee Health Coalition is partnering with the U.S. Environmental Protection Agency, the U.S. Department of Agriculture, and the National Association of State Departments of Agriculture to convene a symposium that brings key Managed Pollinator Protection Plan (MP3) stakeholders together for dialogue and sharing learnings for achieving a well-supported MP3 in each of the states. This Symposium will present best practices to develop a state or tribal Pollinator Protection Plan. Participants will learn about current state plans, work with other stakeholders, and obtain tools to engage their local, state, and tribal stakeholders to develop their state MP3. This event is invitation-only and takes place on March 10 and 11, 2016 in Washington, D.C. For more information, please contact [MP3Symposium@NASDA.org](mailto:MP3Symposium@NASDA.org).



## We are a member of the Honey Bee Health Coalition

Tools for Varroa Management <http://honeybeehealthcoalition.org/varroa/>

Quick Guide to Reporting A Bee Kill  
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With the warm weather in the east you can still plant for spring. Pollinator Stewardship Council has partnered with Ohio Prairie Nursery in support of pollinator habitat. *You can get native seeds for all U.S. planting zones here.* . Select “[Support our Cause](http://www.ohioprairienursery.com/?ref=pollsteco)” (<http://www.ohioprairienursery.com/?ref=pollsteco>) to view featured seed selections to benefit pollinators. *A portion of sales generated from our website will help support our work.*



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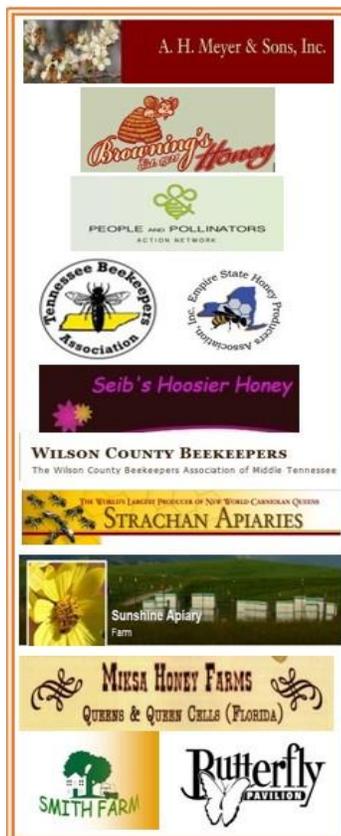
**Pollinator Stewardship Council**  
P.O. Box 304, Perkinston, MS 39573  
832-727-9492 [www.pollinatorstewardship.org](http://www.pollinatorstewardship.org)

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