# BeeLife- Scientific watch

## Quelques articles scientifiques :

Néonicotinoides et Chlorantraniliprole

Vous trouverez ci-après 3 articles qui viennent de paraître dans des revues scientifiques internationales. Les articles ayant une retombée dans la presse nationale quotidienne européenne en sont pas repris.

# A large-scale survey of house sparrows feathers reveals ubiquitous presence of neonicotinoids in farmlands

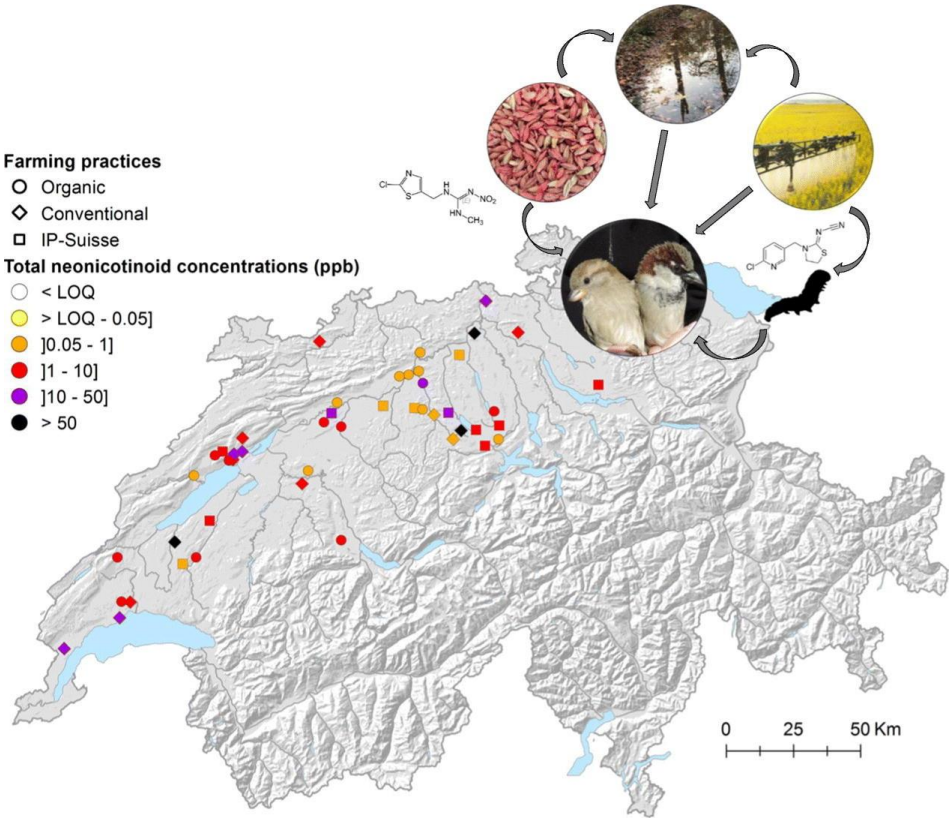
***Science of The Total Environment***
**Volume 660, 10 April 2019, Pages 1091-1097**

## Abstract

The massive use of neonicotinoid insecticides has been repeatedly incriminated for their impacts to avian populations. Some studies have reported contamination of granivorous birds by neonicotinoids but very little is known about exposure to neonicotinoids in other bird species. To fill this lack of knowledge, we trapped house sparrows *Passer domesticus*, an omnivorous bird whose diet is composed of both grains and insects, and we collected 617 feathers from individuals living on 47 conventional, integrated-production (IP-Suisse) and organic farms distributed all over the Swiss plateau, the country's main agricultural area. We then assessed the concentration of five neonicotinoids in 146 pools of feathers. We found that all feather samples were contaminated by at least one neonicotinoid at measurable concentration (>LOQ), with thiacloprid accounting for most of the prevalence (99%), while clothianidin was found at highest concentrations (with averages ranging from 1.68 to 9.2 ppb). Additionally, house sparrows living on conventional farms showed higher concentrations of neonicotinoids ($15.26 \pm 3.58$ ppb) than individuals living on IP-Suisse ($3.38 \pm 0.86$ ppb), and organic farms ($2.59 \pm 0.56$ ppb). Our large-scale survey highlights how ubiquitous neonicotinoid insecticides have become in agricultural habitats, and reveals generalized exposure of house sparrows, and potentially other species inhabiting farmlands, to neonicotinoids.

## Highlight

- We quantified neonicotinoids in 146 feather samples of house sparrows using UHPLC/MS-MS.
- All samples were positive for neonicotinoids.
- Thiacloprid was the most prevalent (99% of samples) and clothianidin attained the highest levels (up to 131.4 ng/g).
- Feathers of birds living on conventional farms showed higher concentrations than in the other farms.
- Our results highlight the ubiquity of neonicotinoids in farmland birds feathers and hence in our agroecosystems.




**Source:** [https://doi.org/10.1016/j.scitotenv.2019.01.068](https://doi.org/10.1016/j.scitotenv.2019.01.068)

# Long-term effects of chlorantraniliprole reduced risk insecticide applied as seed treatment on lady beetle *Harmonia axyridis* (Coleoptera: Coccinellidae)

***Chemosphere***
**Volume 219, March 2019, Pages 678-683**

## Abstract

Chlorantraniliprole (CAP) is a reduced risk insecticide, which used as seed treatment in many crops. However, CAP residues can contaminate pollen and nectar, becoming a potential risk to beneficial arthropods. The aims of this study were to (1) determine the non-target effects of CAP seed treatment of cotton on *Harmonia axyridis* (Coleoptera: Coccinellidae) over two generations, and (2) assess the ability of the lady beetles to avoid plants grown from treated seeds. The exposure of *H. axyridis* larvae and adults to cotton seedlings grown from CAP treated seeds did not have a significantly affect on any life history parameters of the lady beetles directly exposed (F0). However, CAP caused significant transgenerational effects in the both larval and adult stages of *H. axyridis*. The CAP treatment of larvae exposure reduced the larval and pupal developmental time and the male body weight of F1 generation as well as the survival of the lady beetles over the developmental stages. In the adult bioassay, CAP seed treatment reduced both pupal developmental time and egg viability of F1 generation and decreased the survival of *H. axyridis* over the F1 generation developmental. In olfactometer test, only the *H. axyridis* larvae were able to avoid cotton seedlings grown from CAP treated seeds. The results of this study confirm the hypothesis that systemic insecticides, when applied to seed treatments, can cause negative effects on non-target organisms. In addition, the study emphasizes the importance of long-term assessments of the pesticides side-effects on beneficial arthropods.

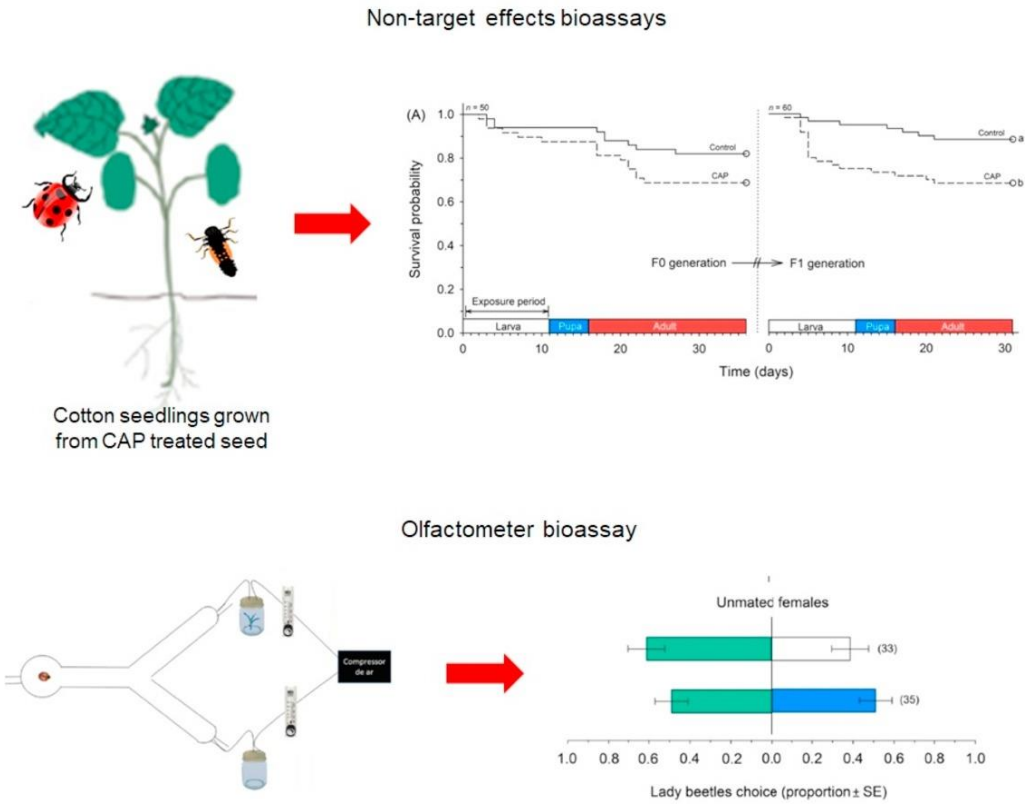
## Highlights

- Seed treatment with systemic insecticides poses risks to beneficial arthropods.

Chlorantraniliprole did not affect H. axyridis directly exposed to cotton plants.

- Chlorantraniliprole caused transgenerational effects on H. axyridis.

- *H. axyridis* larvae were able to avoid cotton plants grown from treated seeds.




**Source:** https://doi.org/10.1016/j.chemosphere.2018.12.058

# Honey bees long-lasting locomotor deficits after exposure to the diamide chlorantraniliprole are accompanied by brain and muscular calcium channels alterations

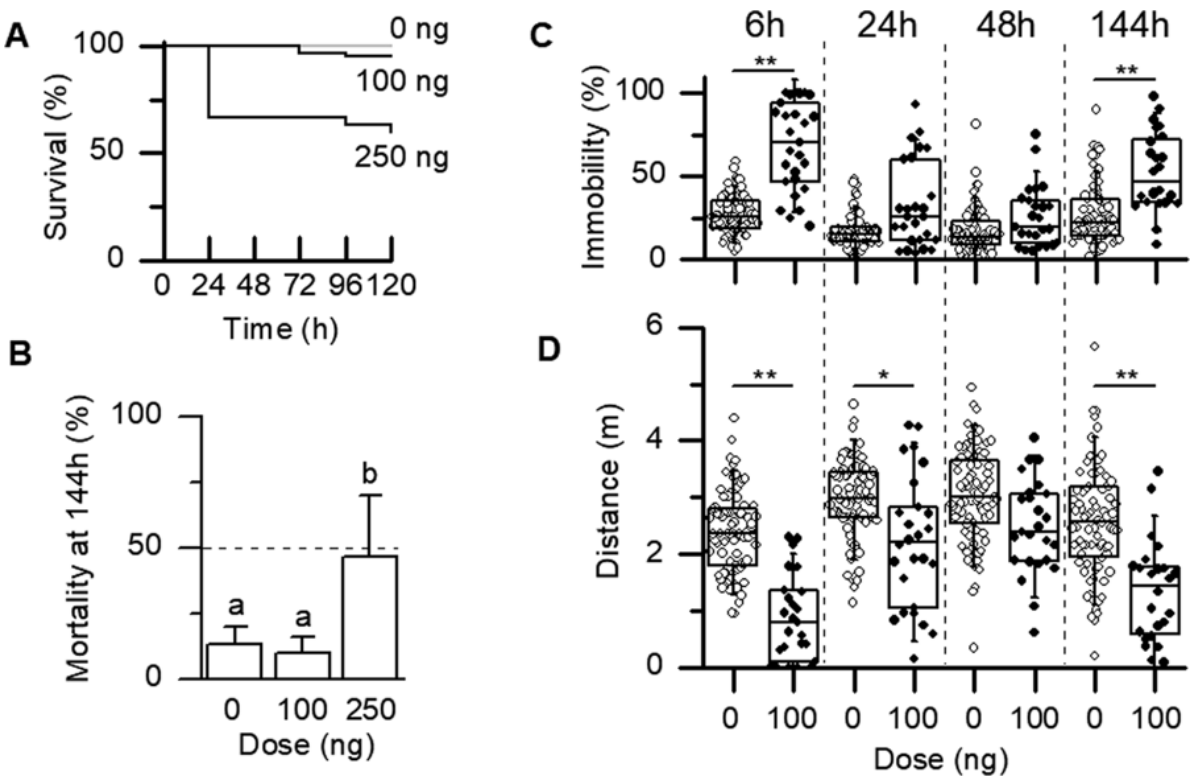
***Scientific Reports***
**volume 9, Article number: 2153 (2019)**

## Highlights

- Chlorantraniliproleat sub-lethal doses: consequences 1 week after.
- Intoxication symptoms
- No significant effect at 100ng
- With 250ng, mortality = 50% after 6 days

## Abstract

Diamides belong to one of the newest insecticides class. We characterized cellular effects of the first commercialized diamide, chlorantraniliprole (ChlorAnt). ChlorAnt not only induces a dose-dependent calcium release from internal stores of honey bee muscle cells, but also a dose-dependent blockade of the voltage-gated calcium current involved in muscles and brain excitability. We measured a long lasting impairment in locomotion after exposure to a sublethal dose and despite an apparent remission, bees suffer a critical relapse seven days later. A dose that was sublethal when applied onto the thorax turned out to induce severe mortality when applied on other body parts. Our results may help in filling the gap in the toxicological evaluation of insecticides that has recently been pointed out by international instances due to the lack of suitable tests to measure sublethal toxicity. Intoxication symptoms in bees with ChlorAnt are consistent with a mode of action on intracellular calcium release channels (ryanodine receptors, RyR) and plasma membrane voltage-gated calcium channels ($Ca_V$). A better coupling of *in vitro* and behavioral tests may help in more efficiently anticipating the intoxication symptoms.




Classical toxicology of chlorantraniliprole and locomotor deficits induced at a sublethal dose. (**A**) Bees exposed according to current mandatory classical mortality tests experienced a severe decrease in survival for doses >100 ng/bee during a long-lasting period of observation (6 days). In this survival test, all control bees (grey line) were alive after 6 days (120 h). (**B**) Seven days after exposure, the dose 100 ng induced a level of mortality not more elevated than the control exposure and is thus retained as a sublethal dose at 144 h ($SLD_{144h}$), whereas 250 ng was highly toxic ($p < 0.01$, mean ± SEM). Different letters indicate a significant difference. (**C**) A daily locomotor test revealed that a dose characterized as sublethal at 7 days ($SLD_{144h}$) increased periods of prostration 6 hours and 7 days after exposure ($p < 0.001$) with a transient attenuation of symptoms at day 2 and day 3. In box and whiskers graphs, individual data are presented as circles (open and filled for control and exposed bees, respectively), boxes show quantiles and whiskers the minimum and the maximum values. (**D**) Periods of prostration were not compensated by periods of intense phases of activity, since the distances covered by bees during active walking was decreased, not only at 6 h and 7 days after exposure, but at 24 h as well ($p < 0.001$, $p < 0.05$ and $p < 0.001$ respectively). An apparent but transient recovery was thus observed at day 2 (48 h).

**Source:** [https://www.nature.com/articles/s41598-019-39193-3](https://www.nature.com/articles/s41598-019-39193-3)