

# A methodology to evaluate the effects of pesticides: recording individual behaviour of bees using microchips

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When studying the impact of pesticides on the honeybee's behaviour, the current classical means only allow simultaneous monitoring of a limited number of individual bees and only for a few hours. However techniques of automatic tracking and identification of individuals might be used to study behavioural symptoms [1]. **Radio Frequency Identification (RFID)** seems to offer the most advantages (unlimited number of codes, large number of simultaneous recording, quick reading and through materials such as wood) [2]. **We have developed a method under tunnel to study the effects of insecticides on the life-history traits of foragers.** We present the results obtained with **fipronil**.

## Principle

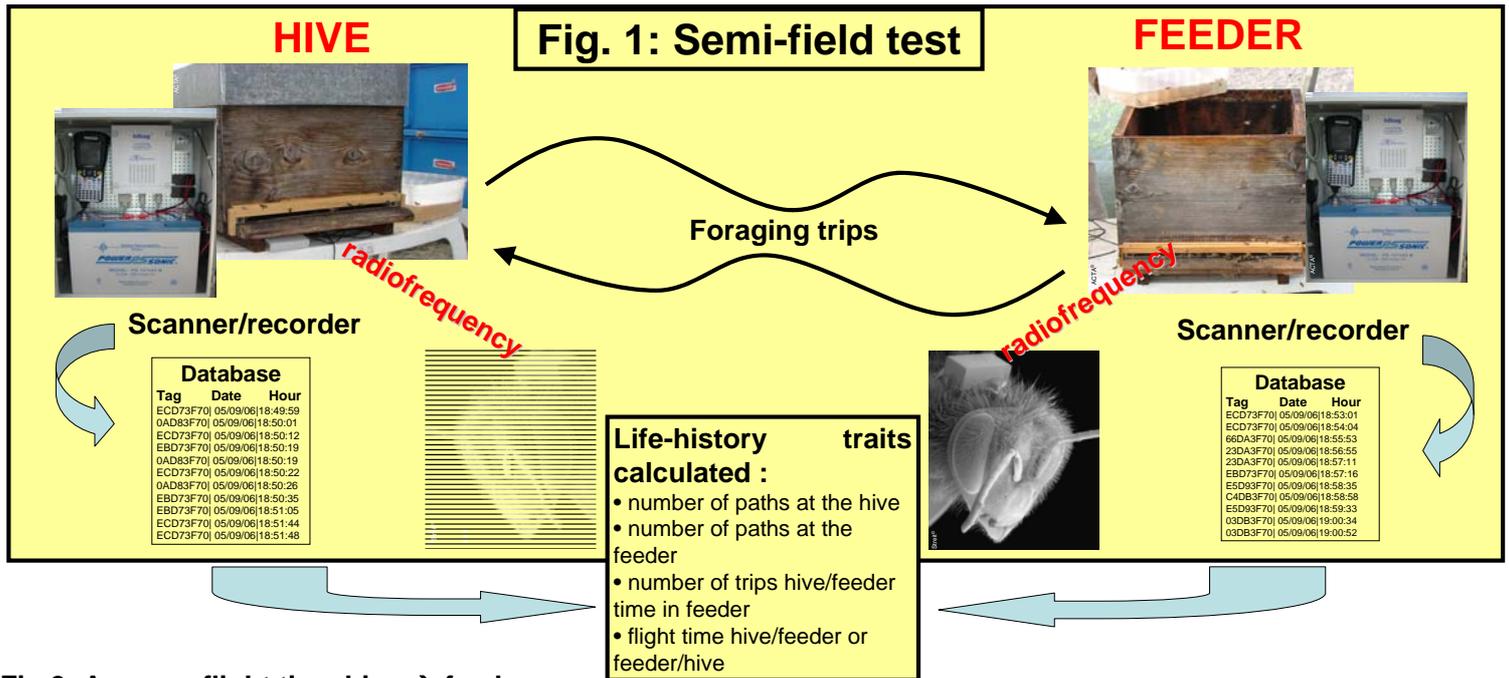
RFID allows precise identification of the moment when a bee that has been labeled with an electronic transponder passes by a reader.

## Device

The colony (20 000 workers, fertilised queen) was kept under a tunnel (8 m x 20 m x 3.5 m high). A feeding site provided a sugar solution, a multi-flower pollen and a drinking site was placed 18 metres away from the colony. Five scanners were positioned at the hive entrance and at the syrup feeder (Fig.1).

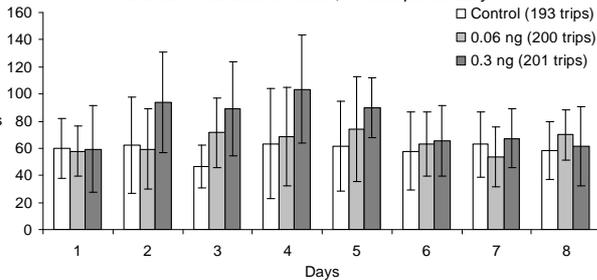
## Procedure

1. Foragers were captured on the syrup feeder.
2. In the laboratory, RFID tags were glued onto the thorax.
3. We administered a sucrose solution according to 3 modalities: control, 0.06 ng of fipronil per bee (DL50/100), 0.3 ng of fipronil per bee (DL50/20) [3].
4. Bees were released back into the colony at the end of the day.
5. Recording was carried out over 8 days.
6. A program was developed to organize data recorded by the RFID systems.



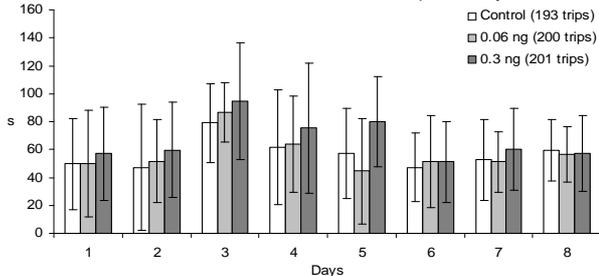
**Fig.2: Average flight time hive → feeder**

vertical bars = standard deviation ; 40 bees per modality



**Fig.3: Average flight time feeder → hive**

vertical bars = standard deviation ; 40 bees per modality



## Results

After oral treatment of **0.3 ng of fipronil per bee (LD50/20)**:

- the number of foraging trips was reduced (Khi-2 test;  $P < 0.001$ ).
- the flight times of round-trips between the hive and the feeder were increased (Wilcoxon test;  $P < 0.01$ ; Fig. 2 & 3).

**A dose of 0.06 ng per bee of fipronil had no effect.**

## References:

- [1] Lefort et al. (2006). De la traçabilité même chez les butineuses ! Bulletin Technique Apicole, 32(4):153-164.
- [2] Streit et al., 2003. Automatic life-long monitoring of individual insect behaviour now possible. Zoology, 106:169-171.
- [3] Decourtye et al., (2005) Comparative sub-lethal toxicity of nine pesticides on olfactory learning performances of the honeybee *Apis mellifera*. AECT, 48(2):242-250

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