# Section 1 – Risk Assessment

## 1.1 Estimating honeybee forager background mortality: a case study in the Netherlands

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### Abstract

One of the key assumptions in the EFSA guidance on the risk assessment of plant protection products on bees (2013) concerns the value of honeybee forager background mortality. This background mortality is crucial because its value feeds directly into the trigger value used in the Tier-1 risk assessment. Low forager background mortality results in conservative trigger values, whereas higher forager mortality values result in less conservative triggers. A proper estimate of forager background mortality is therefore key to a realistic and robust risk assessment.

Data underlying the current estimate of forager mortality mostly originate from studies performed outside of Europe, with only one European study being available in the city centre of Basel. The value used in Tier 1 (5.3% mortality per day) is the measurement from Basel because this was the lowest value found. Since the city centre of Basel is not representative for European agricultural environments, a new study was performed that was focussed on the estimation of forager mortality in a realistic agricultural setting in the Netherlands. Freshly emerged honeybees (age <24h) from two hives were tagged every two weeks with micro-transponder RFID chips at the outdoor experimental station 'De Sinderhoeve' . Tagging continued from June to October and every tagged cohort was followed in time. Bees were detected: a) upon tagging, b) when they left the hive and c) when they entered the hive. First results of data evaluation indicate that already within 1 week some bees left the hive briefly but that foraging commenced usually after two weeks and lasted in individual cases for more than 5 weeks after tagging. Based on the obtained data sets, first estimates reveal a honeybee forager background mortality of at least 10% indicating that the EFSA assumption is conservative.

## 1.2 Three cardinal numbers to safeguard bees against pesticide exposure: $LD_{50}$, NOEC (revised) and the Haber exponent.

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### Abstract

Regulators often employ cardinal indicators to justify measures to protect the health of farmland bees from pesticides used in crop protection. Previously, in evaluating the likely hazard of a compound, they have made extensive use of its $LD_{50}$ ('lethal dose to 50% of exposed subjects'), and NOEC ('no observable effect concentration'). Here, I argue that regulators should also use a third indicator, namely the Haber exponent. The Haber exponent qualifies the meaning of the $LD_{50}$ by revealing the relative hazard of environmentally relevant exposures longer than that used to determine the $LD_{50}$ originally. Additionally, I show how the experimental protocol used to determine the Haber exponent will also produce a well-founded, parametric value of the NOEC. Taken together, these three numbers establish a strong foundation on which to evaluate the potential impact of an agrochemical on bees.

### Introduction

Regulators need scientific evidence to justify measures to protect the health of farmland bees from pesticides used in crop protection. The best evidence is provided by experiments that closely simulate realistic scenarios, such as field trials that reveal the degree of harm that a pesticide causes to bees when used in farming practice. However, regulators also can make use of cardinal indicators, by which I mean certain numbers whose values carry information about either the comparative toxicity or absolute hazard of an active substance. Two of the cardinal values are

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4th Symposium, Řež, Czech Republic, 1990
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6th Symposium, Braunschweig, Germany, 1996
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Guy Smagghe (organiser, symposium host and new board member),
Job & Margreet van Praagh with award,
Anne Alix (secretary of the board)

**Foto**

Pieter A. Oomen (Bumble bee *Bombus lapidarius* on thistle)

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