

HONEYBEE

(*APIS MELLIFERA L.*),
CHRONIC ORAL TOXICITY TEST
(10-DAY FEEDING) - OECD 245



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About the author



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Jigar is a senior officer, leading a team of Ecotoxicology. He has very good experience of conducting aquatic and terrestrial studies and has been actively involved in validation of Ecotoxicity studies. He is a member of Society of Toxicology, India. He has professional experience of more than 14 years in CRO industry.

The Honeybee, *Apis mellifera* is engaged in the most frequent floral visits around the world.

Honeybees are an important contributor to the pollination process as well as the conservation of the terrestrial ecosystem. Their long-term exposure to plant protection products (PPP) or harmful pesticides may develop the risk of chronic toxicity leading to a sharp decline in population which may severely affect the crop yield.

Therefore, a chronic oral toxicity study on the honeybee under laboratory conditions is essential to assess the environmental risk of harmful chemicals used as pesticides in the crop field.

Principle of the Test

Young worker honeybees of a maximum of 2 days old are subjected to unremitting and *ad libitum* exposure to test samples dissolved in aqueous sucrose solution (50%, w/v) for a period of 10 days. An untreated control group is kept for comparison of the study outcomes. The mortality rate and behavioral changes of the experimental honeybees are recorded throughout the study.

Study Design

Two days old young bees having no sign of disease are collected from the bee hives with a known history of maintenance and physiological status and kept in the passively ventilated test cage. A group of 10 bees is maintained per cage measuring a minimum of 200 cm³. The bees are assorted into control and treated groups. The test items are mixed in the 50% (w/v) aqueous sucrose solution and continuously provided to the respective groups for a period of 10 days. Whereas, the control group receive only sucrose solution (50% w/v) prepared in water. However, the test products insoluble or low soluble in water may be prepared in a solvent like acetone. The study is designed with at least 5 test concentrations with a factor not exceeding 2.5 covering the range for the LC₅₀ (Median Lethal Concentration). Further, a reference group is included in the study to validate the test system. The experiment is performed under controlled environmental conditions with a temperature of 33±2 °C, relative humidity of 50-70% and in a constant dark state.

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Evaluation Parameters

Mortality and behavioral changes in the bees under experiment are recorded daily. The behavioral abnormalities are categorized as per the health conditions of the bees like moribund, affected, cramp, apathy and vomiting. The consumption of feeding solutions is evaluated on a regular basis. The amount of feeding solution intake is determined by initially weighing the feeders before and after feeding using a calibrated balance. Evaporation of test solution from the feeders is also calculated and subtracted from the evaluated consumption of the feeding solution to obtain accuracy. After 10 days of the study period, the test is terminated by a humane method.

Outcomes

The data for the number of bees tested, mortality rate, adverse behavior, feed consumption etc. are analyzed using statistical methods and presented in tabular form. The LC_{50} (Median Lethal Concentration), LDD_{50} (Median Lethal Dietary Dose), NOEC (No Observed Effect Concentration) and NOEDD (No Observed Effect Dietary Dose) values after 10 days of exposure are estimated.

Jai Research Foundation (JRF) located at Vapi in the southern region of Gujarat maintains a facility for apiculture. Our campus is encircled by many flowering plants and the crop field which attracts honeybees. We have bee hives in our compound and provide toxicity study services on honeybees to our customers round the year.

References

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LC₅₀ (Median Lethal Concentration)

Concentration of a substance that cause a death in 50% of test organisms at the end of test period

LDD₅₀ (Median Lethal Dietary Dose)

Dietary dose of a substance that cause a death in 50% of test organisms at the end of test period

NOEC (No Observed Effect Concentration)

The highest tested concentration next below the lowest effect concentration

NOEDD (No observed effect dietary dose)

The highest tested dose per bee per day administered by chronic feeding exposure next below the lowest effect dietary dose