about mambo-tox

Our capabilities

Mambo-Tox is a long-established contract research organisation that offers a versatile and quality service for the evaluation of agrochemicals and biocides. We provide comprehensive testing services in the field of terrestrial ecotoxicology, involving non-target arthropods, honeybees and soil invertebrates. We also carry out a wide range of specialist studies to evaluate the efficacy of agrochemical products, under both laboratory and field conditions.

Mambo-Tox has efficient and adaptable facilities, ideally suited for the production of reliable and robust data to satisfy regulatory requirements. We produce clear, detailed study reports in English and can adapt our reporting format to that of our individual clients. We can also produce summaries in electronic format, for incorporation directly into regulatory dossiers.

We understand the importance of meeting tight deadlines and have therefore organised our extensive facilities to give us maximum flexibility when scheduling projects. As a result, we are able to offer a rapid turnaround for particularly-urgent projects.

Staff and expertise

We have a team of enthusiastic, qualified professionals with many years of experience in the evaluation of plant protection products. Most of our scientific personnel have higher degrees in entomology or applied biology. Coming from a research background, they are experienced in solving problems with respect to difficult testing scenarios. Should you need it, our Study Directors are able to provide you with information and advice on testing methods and guidelines.

facilities

The company has extensive laboratory and glasshouse facilities that include:

- a suite of walk-in **controlled-environment rooms** that can be adapted for most designs of laboratory and 'extended-laboratory' study.
- invertebrate **toxicology laboratories** that are equipped with precision application equipment.
- purpose-built **insectaries** that can be used for rearing a wide range of test organisms and their hosts/prey. These also include a quarantine facility for holding non-indigenous species of insect under a DEFRA license.
- large temperature-regulated **glasshouses** alongside the laboratories.

We maintain small-scale trials plots at a **local field station**. For long-term persistence studies, we are able to house plants under removable UV-permeable screens, so as to provide protection from rainfall and thus ensure 'worst-case' conditions for the ageing of residues.

We also have access to a wide range of local agricultural sites for our field studies.

tests with non-target arthropods

Mambo-Tox offers a comprehensive service with respect to evaluating effects on non-target arthropods at all tiers of a sequential test programme. Our experience in this field extends to more than 1000 GLP-compliant studies.

We are able to carry out studies with the following indicator species:

Parasitic wasps

- *Aphidius rhopalosiphi*
- *Trichogramma cacoeciae*
- *Encarsia formosa*

Predatory mites

- *Typhlodromus pyri*
- *Phytoseiulus persimilis*

Foliage-dwelling predators

- *Chrysoperla carnea*
- *Coccinella septempunctata*
- *Episyrphus balteatus*
- *Orius laevigatus*

Ground-dwelling predators

- *Aleochara bilineata*
- *Poecilus cupreus*
- *Pardosa* spp.

For most of these there are laboratory, 'extended laboratory' and semi-field testing scenarios available. Further information is given on these in the following pages. For details of currently-accepted test methods, or advice on appropriate test species, please contact us.

We also work with other non-target species, mostly to provide data for IPM purposes. So please feel free to contact us if you need alternative species to be tested.

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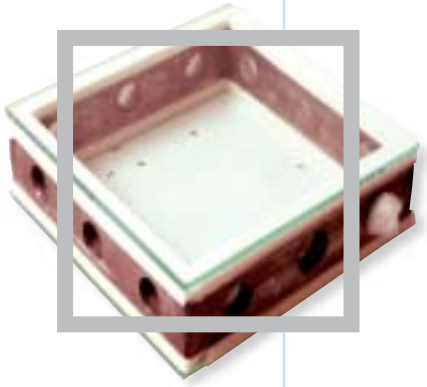
tests with non-target arthropods

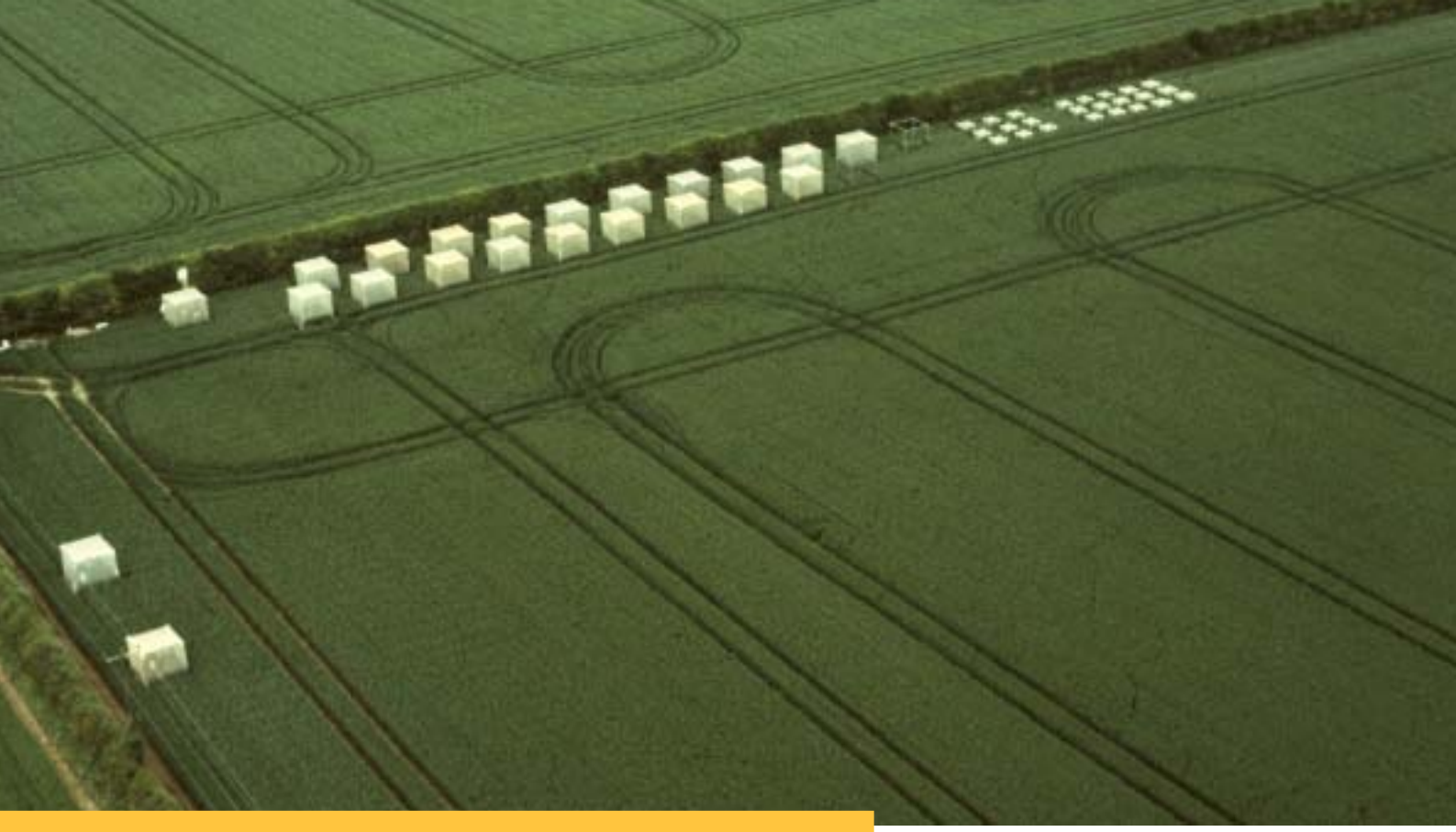
Laboratory & extended-laboratory studies

Sequential testing programmes with non-target arthropods are designed to demonstrate the inherent toxicity (or lack of it) of plant protection products and biocides to key indicator species. Testing normally commences with laboratory studies using the mandatory species (for Europe) of *Aphidius rhopalosiphi* and *Typhlodromus pyri*. Mambo-Tox has extensive experience with:

- **Laboratory studies** using an inert test substrate (glass or quartz sand). These are typically of a rate-response design, to determine the median lethal rate (LR_{50}) for a test item, for inclusion in Hazard Quotient calculations. Bioassays are carried out in accordance with the latest European testing guidelines.
- **'Extended laboratory' studies** using a natural test substrate (most commonly seedling barley, excised bean and apple leaves, or standard natural soils). These studies are typically run to experimental designs adapted from those used in laboratory tests, except where alternative formal testing guidelines already exist.
- **Aged-residue studies**, the aim of which is to determine the decline in activity of harmful treatments applied to plants growing outdoors or in the glasshouse. We are able to grow plants outdoors for extended periods at our field station, but offering them protection from rainfall where this is required to ensure 'worst-case conditions'.



It is not always the case that the standardised test methods in common usage can be applied to all testing situations without some well thought-out modifications. We have the technical expertise developed over many years of testing to give advice and to adapt standard experimental designs to meet clients' special requirements.



tests with non-target arthropods

Semi-field & field studies

Where laboratory and extended laboratory tests fail to demonstrate an acceptable level of environmental safety, it may be necessary to test a product under field conditions. Mambo-Tox also has extensive experience with:

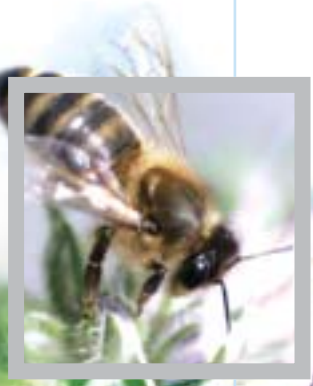
- **Semi-field bioassays** using a variety of model crop systems, such as cereals, beans, apple trees and vines. Test designs can incorporate multiple product applications or can simulate spray programmes using multiple application factors (MAF). We have a wide selection of confinement cages (large and small) that can be used for semi-field studies.
- **Field trials** in which sampling programmes are carried out to determine the impact of a test item on the natural arthropod fauna. We have extensive experience of such trials in both arable crops (cereals, oilseed rape and maize) and in orchards. A range of sampling techniques is available to monitor numbers of the key groups of arthropods pre- and post-treatment. Sampling methods (e.g. pitfall traps, suction samplers, sticky traps, sweep netting, fogging) are tailored to the arthropod guilds considered to be of greatest interest in a particular crop.

Our earliest full-scale field trial to evaluate the effects of agrochemicals on the non-target arthropod fauna of a cereal crop was carried out in 1985, and we have run many similar large-scale field studies since then.

tests with honeybees

Mambo-Tox can offer laboratory, semi-field and field trials with the honeybee, *Apis mellifera*. We utilise the services of a highly-experienced professional beekeeper to prepare hives of uniform strength and quality for our studies, and to advise on treatment-related side-effects. The types of projects we can undertake are:

- **Laboratory studies** (oral and topical exposure) to derive LD_{50} values. These can be carried out between May and late-August each year and testing is carried out to the current EPPO or OECD guidelines.
- **Semi-field studies** in which nucleus hives are caged over large plots within a flowering crop.
- **Honeybee brood studies**, to evaluate effects on the juvenile life stages within the hive itself. This is particularly appropriate for evaluating Insect Growth Regulators.
- **Field trials** with full-sized hives.



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testing soil invertebrates

Collembola, soil mite and earthworm studies

Most agrochemicals and veterinary products have to be evaluated for their effects on soil invertebrates. In addition, under the recent Biocidal Products Directive (98/8/EC), many other biocidal chemicals (disinfectants, preservatives, etc.) now have to be tested for effects on such organisms. With this in mind, we now offer the following laboratory services:

- acute toxicity and reproduction bioassays with the earthworm, *Eisenia foetida*, to OECD test guidelines.
- inhibition of reproduction in the springtail, *Folsomia candida*, to ISO test guidelines.
- acute toxicity and inhibition of reproduction in the soil mite, *Hypoaspis aculeifer*.

Litterbag and soil fauna studies

Chemicals that reach the soil may potentially have harmful effects on the non-target invertebrate fauna present, including organisms that are important in the processes that result in the breakdown of organic litter. There is, therefore, a requirement to demonstrate that such chemicals have no lasting effect on the degradation rate of organic matter lying in treated soil. Although there is currently no internationally-agreed guideline, evaluation techniques currently being considered in Europe involve so-called 'litterbag' studies. For these, parcels of organic straw are buried in soil at the time of treatment and assessments are made at regular intervals of their rate of decomposition. We have experience with such litterbag studies and can offer advice on their design and implementation.

We are also able to carry out field studies to determine the effects of treatments on the soil meso- and macro-fauna. Standard ecological sampling methods and extraction techniques (such as Tullgren funnels) are used in making a full faunal audit of soil invertebrates both before and at intervals after treatment. This is one of the best ways for assessing gross effects on key groups such as springtails (Collembola) and soil mites.

efficacy studies

Insect and mite pests

Mambo-Tox staff have many years of experience in carrying out studies to evaluate the efficacy of agrochemical products against a wide variety of pests, weeds and diseases. We can either design studies to answer specific scientific questions about a product, or we can carry out tests to established guidelines and protocols.

We have specialised culturing facilities for the maintenance of a range of insect pests of field and glasshouse crops. We are also able to hold non-endemic species under quarantine in our licensed Insectary.

Studies can be carried out under laboratory, glasshouse, semi-field or field conditions. In the field, pest outbreaks are often sporadic in time and space, or numbers may prove too low for meaningful data analysis. Thus we have developed techniques for introducing and establishing pest populations on growing crops, prior to field trials commencing.

Resistance monitoring

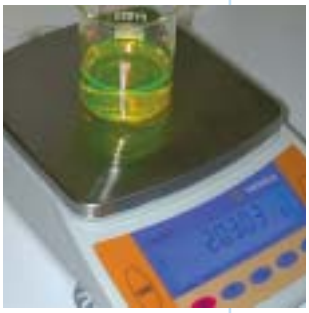
We are also able to screen active substances or formulations for insecticidal and acaricidal activity. This process can be particularly useful when developing a resistance monitoring strategy, as required under EU Directive 91/414/EEC.

quality assurance

GLP

Our Test Facility received its first Statement of Compliance for Good Laboratory Practices (GLP) in 1991 and we are routinely audited (typically on a biennial basis) by the UK GLP Monitoring Authority to ensure our continued compliance with the standards laid down in the relevant UK and OECD guidelines. A copy of our current Statement of Compliance is included in each study report.

We use our own in-house Quality Assurance staff to monitor all studies (both in the laboratory and the field) and to review all protocols and reports.



Official recognition for efficacy testing

So as to comply with Commission Directive 93/71/EEC with respect to efficacy testing (for agriculture and horticulture), Mambo-Tox is registered in the UK under the scheme for Official Recognition of Efficacy Testing Facilities and Organisations (ORETO).