

Open ended investigations – Mealworm beetles

Background

The terms 'mealworm', 'mealworm beetle' and 'darkling beetle' are all used to refer to a number of beetle species in the *Tenebrio* genus. Mealworm beetles eat grains, seeds and dried food products. Their preferred environment is dry, dark and moderately warm.

Mealworm beetles are rarely seen in the wild, but when they are, it is likely to be in a field where wild grasses flourish and seeds are plentiful. They are most often found in barns, grain storage facilities, and food preparation areas.

These beetles are a minor pest of dried and stored foodstuffs. They are easy to keep and breed. Several species are sold by pet shops as a food source for fish and birds. The best species for study purposes is the *Tenebrio molitor* due to its larger size.

Life Cycle

As with most insects, there are four stages in the life cycle: egg, larva (mealworm), pupa and adult (beetle). The speed of the lifecycle is temperature dependent.

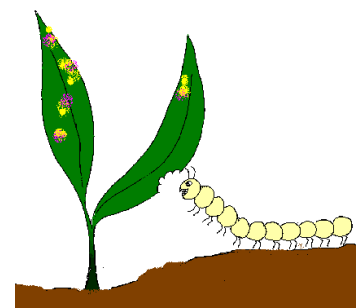
1. **Egg** - Dependent on incubation temperature, just days after mating the female will burrow into soft ground and lay between 70 and 100 eggs. The eggs are pale in colour.
2. **Larva (mealworm)** – After approximately 1 week, the eggs hatch and mealworms emerge. The mealworms undergo repeated bouts of moulting as they eat grains, vegetables and dead insects. During the last moult it loses its carapace (hard, outer covering) before curling into the pupal form.
3. **Pupa** – the mealworm remains in the pupal stage from 3 days to approximately 30 days, depending on the temperature. The pupa starts a creamy white and slowly turns brown. Pupae do not eat and don't move, apart from a twitch or two when disturbed. Inside the pupal case, the mealworm is turning into an adult beetle.
4. **Adult (beetle)** - After hatching, the beetle is a creamy colour. It will remain still while its wings unfold and dry. Over a period of a few days, the beetle will slowly darken in colour. Once the beetle has turned brown it is mature and will start looking for a mate.

Mealworm larvae can be purchased from most pet stores. They are usually sold in a container with dry bran or oatmeal for food. Mealworms are very easy to keep and breed.

They can be housed in a plastic container (ice-cream containers are ideal). Cut a square in the lid and cover with fly wire, something that can let air in but not the mealworms/beetles out. The container can be three-quarters filled with oats, bran or cereals and the mealworms will live happily in this. An occasional piece of carrot or fruit skin should be added to give a moisture source for the adults.

Relevance to plant biosecurity

Understanding a pest's habitat, behaviours and food preferences can give scientists an insight into how to control a particular organism. In this investigation, you will explore the ecology of mealworm beetles.



Investigating mealworm beetles

Using the information above and any other research you conduct, plan an investigation into mealworm beetles.

To plan an investigation, the first thing you need to do is **develop a question** that can be tested. Some examples of questions or ideas that could be explored:

- What foods do mealworm beetles prefer?
- Does temperature affect the length of the mealworm beetle lifecycle?
- Do mealworm beetles prefer light or dark backgrounds?
- Does the type of food affect the length of the mealworm beetle lifecycle?

Some points to consider when planning your investigation:

- Are there any safety hazards involved? How can any hazards be minimised? Will you need safety equipment?
- Is your question one that can be tested? Can you make a prediction about what you might find?
- What variables need to be taken into account?
- How many tests do you need to conduct for reliability?

Writing up a report

When writing up an experiment, most scientists include the following sections:

- Introduction – some background information about the topic
- Hypothesis – your question and prediction
- Materials and methods – a list of equipment and a procedure to explain what to do (including any safety information!)
- Results – what you found (the facts!)
- Discussion – an analysis of your results and what they mean
- Conclusion/Evaluation – an answer to your question!

Check with your teacher about the format they require for scientific reports or for more detail on what to include in each section.

