

SOIL YOUR UNDIIES CHALLENGE

The Great Worm Hunt

Parent/teacher information sheet



The Great Worm Hunt

What do we do?

1. To undertake this experiment, we'll need a couple of things:
 - i. a watering can
 - ii. Around 30mL of dishwashing liquid
 - iii. 2 tbs mustard powder (although you may come up with alternatives, like curry powder or chilli flakes to see how they go), and
 - iv. a quadrat. The quadrat could be an old wire coat hanger bent into a square or a piece of string/rope 2 m long that you use to make a square pattern on the ground. (If you like math and algebra then it might be fun to think about the length of the rope and what happens to the area it encloses depending on whether you use it as a square or a circle.)
2. Ideally you want a bit of moisture in the soil, so this is best done after we have had some rain, because when it is dry most native Australian earthworms tend to burrow deeper into the soil.
3. Next, establish your hypothesis. This is what you think the outcome of your experiment will be. Ask yourself and participants, what will happen when you pour the different liquids onto the soil? Will you recover earthworms and will the numbers differ between the treatments? If so, which solution will give you the most or the least? This is just an educated guess.
4. Put down your quadrat, fill your watering can with one of your solutions (water, water and mustard powder, and water and dishwashing liquid).
5. Next, pour the entire watering can over the area the quadrat encloses.
6. Over the next 5 to 15 minutes look at the soil surface and recover the earthworms that come up. Count them and perhaps give them a rinse in water before returning them to another part of the garden.
7. Do this for each of your test solutions. What did you find? Was your hypothesis correct or did something else happen?

Treatment	Number of worms
Water	
Water & Detergent	
Water & mustard	

What's happening in this experiment?

Earthworms often come to the surface when the soil becomes flooded as they require air to breathe, just like us. Pouring 6-8 litres of water into a small area of soil, such as marked out by a 0.3x0.3 m quadrat fills the soil pore spaces and the worms' burrows, which both allow air in and out of the soil. Having no air to breathe the earthworms surface. This can be quite slow though as earthworms are not renowned for their sprinting prowess, so we can try and speed it up? You might consider using hot and cold water in one experiment?

What does an earthworm feel like when it is on your hand? 'Slimy' is a good word for it, but why is that?

Earthworms don't have lungs like us, but they need oxygen to breathe and they get this by transferring it through their skin. Their skin if you like is similar to the inside of our lungs – wet and covered in mucus. Washing up liquid is a detergent and it breaks down the worm's mucus, so they surface to get better access to air. Mustard powder irritates and burns the worm's sensitive skin and so they surface to get away. This is also why we quickly wash them before returning them to the soil surface.

Further Information:

Nematodes are tiny roundworms that are common in most soils and represent one of the major organisms found in soil. One cup of soil may contain 1,000s of nematodes (most are less than 1 mm long,) and over 5,000 species have been described. Some are serious plant pests, but many help provide plant food for plants, mix up the soil and recycle soil nutrients. Soil nematodes can be sub-divided into several broad groups based on their feeding habits.

- **Plant parasites:** Nematodes armed with a hypodermic-like spear that is used to feed on plant roots. This group includes the three main pests of grain crops in Australia: cereal cyst nematode (*Heterodera avenae*), lesion nematodes (*Pratylenchus*) and stunt nematodes (*Merlinius*).
- **Needle nematodes** (*Longidorus spp*) are ectoparasites that damage host roots by feeding on root tips causing galls, stunting the lateral roots and destroying the fibrous root system. They can also act as a vector to some plant viruses. Two factors make needle nematode damage relatively easy to diagnose. Size- (4 to 5 mm long) and habitat - they are confined to sandier soils (with larger pore spaces) and are considered as the cause of problems in heavier soils.
- **Bacterial feeders:** Bacteria are the most abundant microbes in soil, and nematodes are one of their main predators. One group of bacterial-feeding nematodes suck suspensions of bacteria into their mouths from the water film surrounding soil particles. Others use their lips to scrape bacteria from the surface of soil particles and organic matter.

- **Fungal feeders:** Fungi, often the dominant component of soil microbial biomass, are an important food source for nematodes. Nematodes that feed on fungi are armed with a spear which is similar to the spear of a plant parasite, but smaller. After it is inserted into a fungal hypha or spore, the contents are sucked out.
- **Omnivores:** Omnivorous nematodes are relatively large (1–3 mm long) and have a spear with a wide aperture that is used to feed on algal cells, fungal hyphae, oligochaete eggs and other nematodes. They are termed omnivores because they are able to obtain food from several sources.
- **Predators:** The mouth of some nematodes is an open cavity armed with a tooth, and it is used to capture and consume nematodes and other small animals. Other carnivorous nematodes have a spear that is used to suck out the body contents of the prey.