

Welcome.....

This is the first issue of our *Soils are Alive* Newsletter. It is about mites in soil.



Associate Prof.
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There will be four newsletters during 2000. Each newsletter will provide specific information on a different aspect of soil biology based on our studies at The University of Western Australia.

A new way to look at soil

Biological processes in soil are complex and indicators of the biological state of soil are not as easy to implement as physical and chemical indicators. However soil biological information may be pivotal to identifying an upper limit of production in different farming systems to ensure that the soil resource is sustained.

It is timely to reconsider the knowledge-base of soil biology in the context of land management practices – in agriculture, agroforestry, horticulture, minesite rehabilitation, forestry and reclamation of contaminated sites. The application of knowledge of soil biological processes in decision-making for maintaining the soil resource lags far behind other considerations.

Acknowledgements.....

We would like to thank the Ian Potter Foundation for their financial support in creating the *Soils are Alive* Newsletter and the Website on soil biology that we are developing.

Land Management Society initiated the **Know Your Soils: *Soils are Alive* workshops** that we present through WA.

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Mites in your soil by Dr Graham Osler

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No matter where you live, your soil contains millions of small animals. Mites are a major part of this community and all soils contain a large number of mite species.



These mites were found in pasture soils near Capel.

In recent studies we found more than 35 species of mites in cropping soils at Newdegate, Avondale and Cadoux in WA. If we had continued taking samples we would have found even more.

Mites are very small animals (usually less than half a millimeter long) that are related to spiders: so they have 8 legs and also chelicerae (pincers) that are bound to look scary to the other animals in your soil.



This mite is 0.5 mm long and was found in a compost heap. It is one of the few soil mites that eats plant material.

Some mites only eat bacteria or fungi (the microbes), whilst others are carnivores and eat other mites or nematodes (another important group of soil animals).

There are four suborders of mites in soil: prostigmatids, oribatids, astigmatids and mesostigmatids.

Prostigmatids are the dominant group in our soils. They are usually soft bodied and different species have a great variety of feeding habits. Over 14,000 prostigmatid species have been identified throughout the world, but very few species have been described in WA.



Examples of mites found in WA soil. They are all less than 1mm long.

What mites do in soil

Through their activity mites take part in the vital processes that occur in your soil. For example, mites can introduce microbes to fresh residues so that decomposition proceeds. Their grazing on microbes can stimulate microbial activity, just as sheep grazing can stimulate pasture growth.

The movement of mites in the soil may also mix the soil up so that microbes can have greater access to residue. Studies have shown that when mites are excluded from residue, its decomposition rate is slowed by an average of 23%. Our research has recently demonstrated that mites are integrally linked with the nitrogen cycle.

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Looking for mites

Mites are mainly found in the top 5cm of soil where the great majority of the soil biota lives. This is why protecting your top soil is so important: it harbours the life needed to perform vital ecosystem functions. However, mites are still found at great depth, and the deeper soil layers may act as a refuge for mites when conditions at the surface are inhospitable.

The best time to collect mites from your soil is in the winter when the soil is moist as mites move to deeper soil layers when the soil is dry. The soil should also be collected from the top few centimeters.

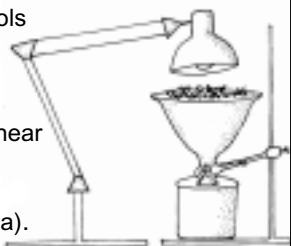


Collecting soil samples at Newdegate in winter. We found 2,500 mites per square metre in the plot on the left hand side of the fence (following lupins) and 9,500 mites per square metre in the plot on the right hand side of the fence (following canola).

A simple way to collect mites in your soil

Place some gauze over the top of a funnel and place some freshly collected soil on the gauze. Under the funnel place a collecting jar with some water in it. A lamp, producing heat, helps to move the mites downwards.

These simple tools for collecting mites are illustrated by Dr Adrienne Kinnear (Edith Cowan University, Western Australia).



After a day or two use a hand lens to look through the collecting jar for animals. There may be animals floating on the top of the water which are likely to be springtails. Springtails are an important group of animals closely related to insects.



Springtails collected from soil feeding on bakers yeast

The French Connection

In a recent study at Newdegate we collected a mite that has only ever been found in French sand dunes. The mite was previously discovered in France in 1983. Very few researchers have examined mites in Western Australian soils and there are potentially vast numbers of species to be discovered.

Knowing the diversity of species will assist in understanding how the food webs in our soils are composed and therefore help us understand the vital processes that occur in soil.

A lonely mite asks: Do I need companions?



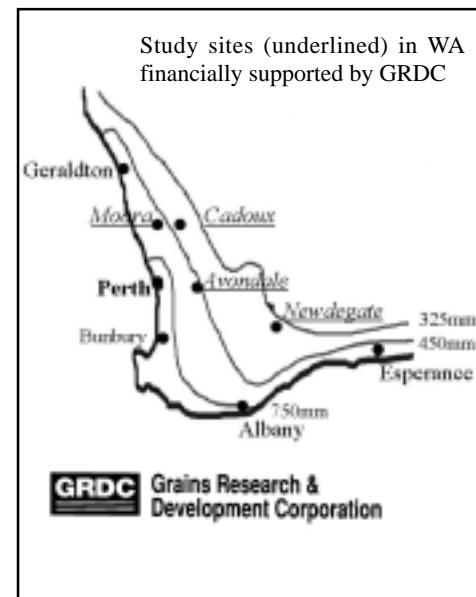
Oribatid mites are found throughout the world (including Antarctica). In forest soils they can be the most dominant small animal.

In NSW agricultural fields up to 23 Oribatid species have been found. In our studies at several sites in WA we have only identified 6 species. One of the species (belonging to the genus *Zygoribatula*) is dominant. This lower diversity reflects the contrast between the Western Australian environment and the richer soils in the eastern states. Many oribatid species have been found in native vegetation in very dry parts of WA. The range of different life histories and feeding biologies of oribatid mites means that their presence in agricultural fields may enhance decomposition processes and therefore benefit your farm.

We don't yet know whether practices such as minimum tillage can encourage the return of these animals or whether their presence will in fact benefit agriculture but are trying to find out.

Current studies in WA

We are in the final year of a GRDC project which has been investigating the effects of different crop plants on soil fauna. We have also been examining the role of the animals in nutrient cycling.



So far we have determined that the structure of mite communities can be quite different under different crops. We thought that this structure would reflect different nutrient cycling under the crops and have been studying whether this is the case. In conjunction with scientists from CSIRO, we found that mite community structure is related to an important aspect of the nitrogen cycle (immobilisation). This year we will try to determine the basis of this connection.

Over the past year we have been examining the changes in soil animal communities during the decomposition of canola stubble. The study will tell us whether different animals are associated with the stubble at particular stages of decomposition. Using this information we hope to be able to account for some of the effects of different crop residues on growth of the following crop.

The next issue

In the July newsletter we will discuss the impact of land management on arbuscular mycorrhizal fungi in WA.

Website :

Land Management Society
<http://www.lmsinfo.com>