SOIL FOODWEB INTERNATIONAL NEWSLETTER

May 2009

Soil Foodweb International, 1 Crawford Road, East Lismore, NSW 2480
Ph: (02) 6622 5150 Fax: (02) 6622 5170
www.soilfoodweb.com.au contact@soilfoodweb.com.au

NEMATODES

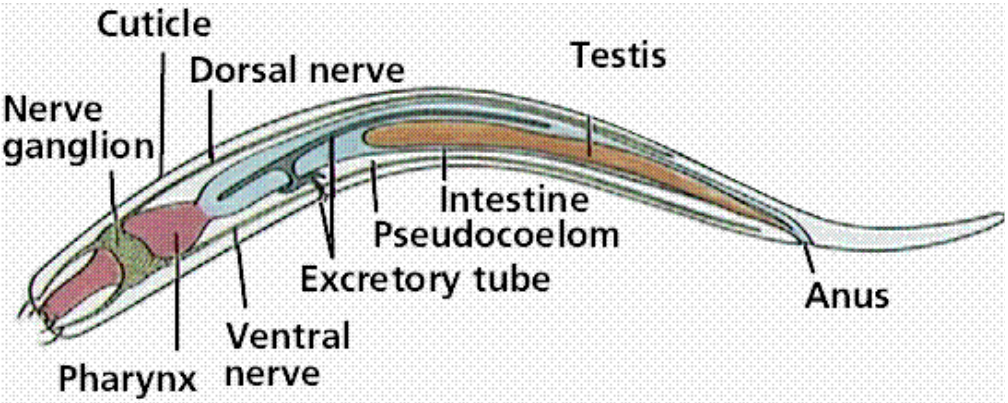
"Nematodes are the most numerous multi-cellular animals on earth." Over 20,000 species have been identified but, even so, they are still poorly understood. They can be as small as 0.3mm or as long as 8 metres.
Source: http://nematode.unl.edu/wormgen.htm

"Four out of every five multicellular animals on the planet are nematodes (Platt, 1994). Cobb (1914) calculated that if the nematodes resident in a single acre of soil near San Antonio, Texas, USA, were to proceed in head-to-tail procession to Washington D.C., some 2000 miles away, the first nematode would reach Washington before the rear of the procession left San Antonio!"

"The developmental biology of one nematode species, Caenorhabditis elegans, is better characterized than that of any other multicellular organism. C. elegans is studied as a model system in molecular and developmental biology, and is providing insights into many other areas of biology and medicine."
Source: http://plpnemweb.ucdavis.edu/nemaplex/General/Intronem.htm

(University of California Davis has an extensive, though cluttered, website devoted to Nematology, including extensive course notes and exercises for Nematology 100 – see http://plpnemweb.ucdavis.edu/nemaplex/index.htm . You will need to enter your email address to gain free access.

Nematodes have been described as "a tube within a tube" – with a mouth, a long alimentary canal, which leads to the anus near the tail.



Picture source: http://www.biologie.uni-hamburg.de/b-online/library/onlinebio/BioBookDiversity_7.html

NEMATODES continued

Continued from Page 1

Many nematodes are beneficial for the development of healthy soils. Nematodes can be responsible for cycling nutrients through the soil when they eat bacteria and fungi containing the nutrients and the excess nutrients pass through the systems of the nematodes and out into the soil.

(Additional source: *"THE ROLE OF NEMATODES IN THE MINERALIZATION OF NUTRIENTS FROM TERRESTRIAL ECOSYSTEMS"*
B. S. Griffiths
Soil Plant Dynamics Unit,
Scottish Crop Research Institute (available via the US Society of Nematologists' website – see below)

Nematodes also assist to transport bacteria and fungi through the soil.

And beneficial nematodes can perform a role in the control of pests and diseases by killing borers, grubs, thrips and beetles. They can do this by "attacking" the pests and gaining access through a body orifice. Once inside bacteria are released leading to the death of the attacked prey. The nematodes will then feed on the bacteria, which have rapidly multiplied. Alternatively, insects consume some types of nematodes bearing bacteria and the bacteria then multiply to kill the insect.

In the book, "Fundamentals of soil ecology", mention is made (p.92) of a nematode with a mouth only 1um wide able to take in a bacteria that is 10um wide – indicating that the bacteria (cyanobacteria) can be compressed by the nematode prior to/during ingestion.
Source: "Fundamentals of soil ecology", Coleman, Crossley and Hendrix, Second Edition, Elsevier Academic Press, quoting Yeates, 1998.

In the preface to the second edition (p. xiii), Coleman notes that soil without its organic components is not soil – it is just "weathered parent material".

Nematode numbers can be used to assess the health of soil. *"Analysis of the diversity and complexity of nematode communities in the soil is a valuable tool which indicates soil biological fertility, or soil health. The different ratios of bacterial, fungal feeders and other types indicate the type of soil functions are occurring. Varying ratios can indicate if the food web is disturbed, maturing, structured or degraded."*
Source:
http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0015/41640/Nematodes.pdf

On the other hand nematodes can be responsible for crop disease as seen in this photo of a Victorian potato crop (left hand side) afflicted with PCN (potato cyst nematode).

Photo source:
http://www.dpi.vic.gov.au/DPI/nreninf.nsf/childdocs/-71E8091F577D52D24A2568B30004F3B2-07E8C65C31CFC12CCA256BC800029303-4C9C6833948D4DF54A256DEA00274836-386AFCFE1CD9F10ECA256BCF000BBFE4?open

"Some effects of nematode damage are stunting, chlorosis (yellowing), nutrient deficiencies, wilting, root abnormalities, and reduced yield, but nematode damage cannot be positively determined as the cause merely by looking at the generalized plant symptoms that are produced in the field or garden.

MORE NEMATODES

Continued from Page 2

To correctly diagnose nematode damage, it is also necessary to see and identify the nematodes associated with the injured plants. Nematodes must be extracted from root or soil samples, identified, and then counted by trained personnel."

The University of Illinois has an easy to read website describing how to take soil samples when you wish to test for the presence (or not) of parasitic nematodes. See: http://web.aces.uiuc.edu/vista/pdf_pubs/1100.PDF

The US Society of Nematologists has a website with some detailed information on nematodes. It notes: *"The structural diversity of non-parasitic nematodes reflects the variety of ecologic niches they occupy. Many feed on bacteria, and thus help soils retain the minerals and organic materials that might otherwise be lost, and even regulate the rate of nutrient cycling. Other nematodes feed on unicellular algae and other creatures, and are in turn the food of many higher animals. Substantial evidence shows the significant roles nematodes play in the ecology of soil and aquatic habitats."*

ORGANIC CONTROL FOR LOCUSTS

Waves of plague locusts seen in front of the propeller (Photo: NSW DPI)

During the period of heightened concern regarding increasing locust numbers in late 2008, the ABC Rural department ran an item about organic control that could be effective in controlling locusts. A native Australian fungus, the *metarhizium* fungus, was available to be used by organic growers to kill locusts and grasshoppers, with a 95% effectiveness rate. The treatment was developed by CSIRO about 8 years ago and is commercially available.

Spores of the fungus are picked by the locust as it feeds in the treated vegetation. These spores germinate and infiltrate the body of the locust where they grow and overcome the locust's immune system, to kill it. This process takes 1 to 2 weeks.

Conventional farmers can provide a buffer around their properties, where they abut organic growers, by using the product.
Source:
http://www.abc.net.au/rural/content/2008/s2398925.htm

SMITHSONIAN SOIL EXHIBIT

In 2008, a new exhibit focussing on soil was opened at the Smithsonian's National Museum of Natural History (Washington DC). The exhibit is entitled "Dig it! The Secrets of Soil" and has a range of interactive and static displays.

"Dig It! will transport visitors to the world of fungi, bacteria, worms, and countless other organisms. Visitors will discover the amazing connections between soils and everyday life and think about this hidden world in a whole new way."

SMITHSONIAN SOIL EXHIBIT continued

Continued from Page 3

There are sample sols from each of the 50 states as well as the 4 "territories" of Puerto Rica, Guam, US Virgin Islands and the District of Columbia. Two "soil chefs" use the same basic ingredients to mix up two very different soils.
Source: http://forces.si.edu/soils/pdfs/Exhibition%20Fact%20Sheet.pdf

The US National Association of Conservations Districts is featuring this exhibit in its 2009 Stewardship Week (April 26 – May 3). Source: http://www.nacdnet.org/stewardship/2009/

Check out the educational materials available to teach US kids about soils and its inhabitants. Wouldn't it be great to have Australian kids educated about our soils too? See http://www.nacdnet.org/stewardship/2009/materials_preview.pdf

INCREASED CO2 and A GREENING WORLD

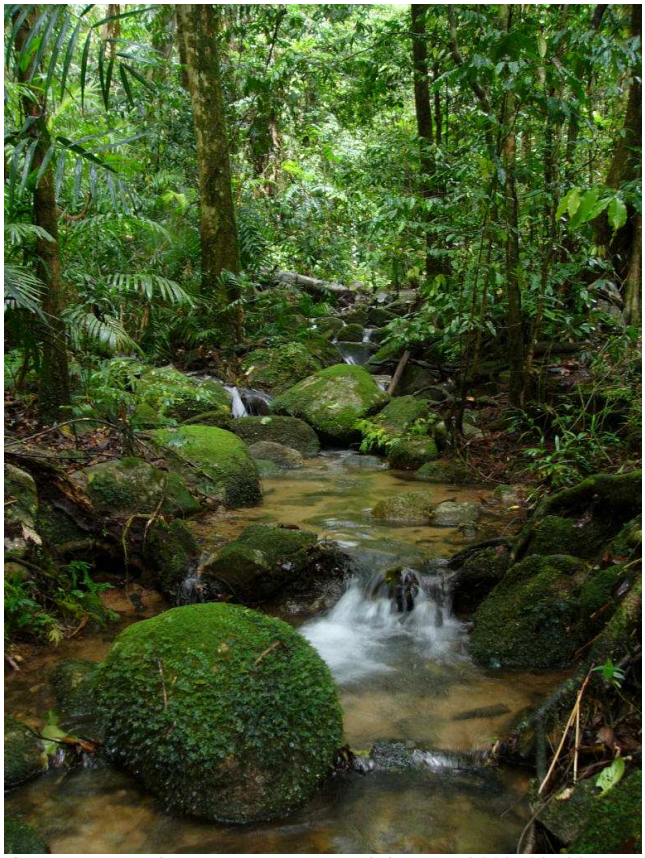


Photo source: http://www.impactlab.com/2009/03/09/amazon-rainforest-carbon-sink-threatened-by-drought/

It is commonly known that greenhouse growers can pump additional CO2 into their greenhouses to obtain better growth from their crops. Whether or not increased human caused CO2 emissions are leading to the warming of the atmosphere or not, it appears that they are causing significant growth in plant material.

Continued from Page 4

The UK Daily Telegraph has reported that plants and trees are growing faster because of the increased levels of CO2. Quoting a study undertaken by researchers from Leeds University and published in the journal, Nature, the Telegraph notes that "*each hectare of African forest is trapping an extra 0.6 tons of CO2 a year, compared with the 1960s*". At this rate, tropical rainforests around the globe would be removing about 5 billion tons of CO2 per year.

Other scientists (e.g. at UK's Rothamsted Research) have been looking at the impact on crop yields of the higher CO2 and consider that yields of crops such as maize, rice and soy would increase by about 13%.

Nevertheless, the scientists involved have noted that human emissions are generating more CO2 than the plants are removing from the atmosphere.
Source: http://www.telegraph.co.uk/earth/environment/climatechange/5109251/Trees-are-growing-faster-and-could-buy-time-to-halt-global-warming.html

APOLOGY: APRIL NEWSLETTER

MAINTAINING YIELDS WITH REDUCED CHEMICAL FERTILSER INPUTS

Those of you who are sharper of eye than this writer will have noticed that the caption on the two photos of trial plots of wheat, with and without the presence of the diazotroph *Azorhizobium caulinodans,* was incorrect (reversed). The corrected caption is below.

If any reader is interested in more details of the paper summarised in the April article, the author (Dr Mike Walker) can be contacted at:

Dr Mike Walker
Plant Physiology Consultant
870 Castra Road
SPALFORD
Tasmania 7315
Tel: (03)6429 3259
Mob: 0439 371 145
Email: wvipl@skymesh.com.au

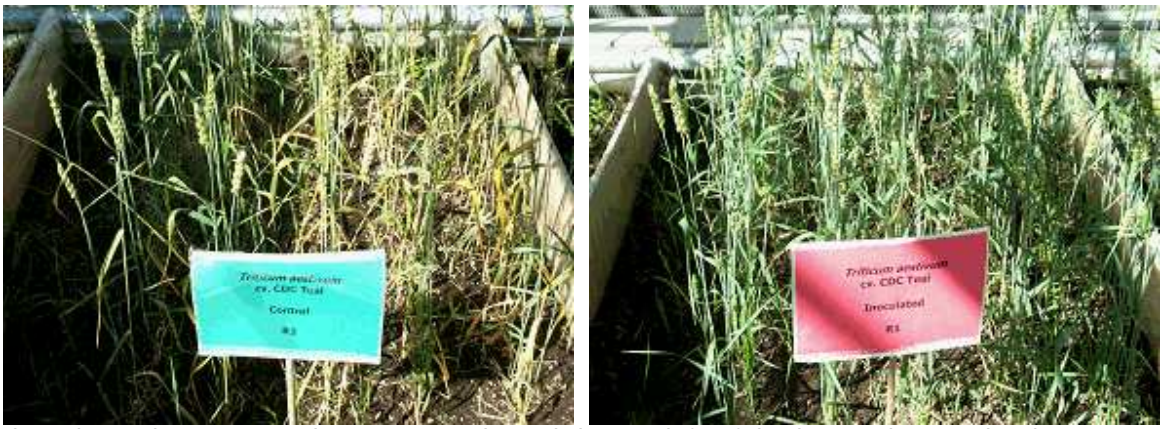


Photo shows wheat grown in the presence (right) and absence (left) of the diazotroph, *A. caulinodans*
Source: http://www.cropscience.org.au/icsc2004/poster/2/5/6/863_anyiaa.htm

AUSTRALIAN SOIL UNDERESTIMATED AS A CO2 SINK

A study released in Nature Geoscience last year indicated that previous estimates of carbon dioxide emitted from soils could have been overestimated. Models had been based on an estimate of 6.6% black carbon (charcoal) in Australian soils. But the recent study undertaken by CSIRO and based on 452 samples from the Australian National Soil Archive and from two landscape transects (about 3000 kilometres) in the Northern Territory and Queensland had returned charcoal contents ranging from 0% to 82%, with an average of 20.4%.

On this basis, carbon dioxide released from Australian savannah regions would be about 20% lower than previously calculated. This equates to 135 billion kilograms across the continent, equal to about 85% of the emissions associated with Australian aviation.

The presence of 'black carbon' in soil, created by bushfires, reduces the level of carbon dioxide emissions *(Source: Malcolm Paterson/CSIRO)*
Source: http://www.abc.net.au/science/articles/2008/11/17/2421790.htm

FURTHER STUDY OF SOIL CARBON FUNDED

National Farmers Federation President David Crombie has written about the Australian Government's provision of A$32 million to research the role of soil in storing greenhouse gases.

"How do we monitor, measure and evaluate the net emissions and/or storage of carbon across Australia's 155,000 farms?" asks Crombie. Although agriculture will not be covered initially by Australia's CPRS (Carbon "Pollution" Reduction Scheme), Crombie argues that it should be allowable for those growers who so elect, to opt in. *"Through research and development on soil carbon, we can explore human-induced sequestration opportunities throughout the complete biological system.*

From what we already know, farmers can start designing appropriate, voluntary, market-based means that incentivise maximising soil carbon - and other forms of biosequestration - through complementary activities to the CPRS."
Source: http://www.abc.net.au/news/stories/2009/03/31/2530642.htm

USING TECHNOLOGY TO STABILISE FIRE DAMAGED SOIL

Soil scientists in Wisconsin, USA have developed a new product that can help stabilise fire damaged topsoil and speed growth of recovering plant cover. Recycled paper is used to enclose a polymer which *"bonds to positive ions in soil to form clumps"* and this forms a "net" in the topsoil. Normally, following a fire the topsoil often develops a hard surface, but the clumping action reduces this occurring and promotes the absorption of water, *"which stops soil from being flushed away during a heavy rain"*. Naturally this aids plant growth which in turns helps to keep the topsoil in place.

The new product is called AST – Advanced Soil Technology. It has been sprayed from aircraft by sections of the US Forest Service to stabilise burn areas. The basic component in the product is polyacrylamide and in the US is sold under the trade name "PAM 12".

The new technology also has application in domestic situations, to stabilise new lawns, particularly in sloping situations.
Source: http://www.sciencedaily.com/videos/2008/0709-growing_greener_lawns.htm

Polyacrylamide can also be used in agricultural situations to reduce soil erosion and increase water infiltration of the soil.
Source: http://www.cropinfo.net/bestpractices/bmppamreport.html

An Australian study suggesting use of PAM has been undertaken by a scientist from Charles Sturt University and is available from the Australian Society of Agronomy website..
Source: http://www.regional.org.au/au/asa/2003/c/3/sivapalan.htm and
http://www.greenmountpress.com.au/cottongrower/issues/234jacot02/234pamaust.htm

THE ROLE OF HEALTHY FOOD

"*The Land*", Australia's major rural newspaper, features an article entitled, "*The Good Soil Diet*" (p.26, 31 March 2009). In the article, Dr Carole Hungerford, is quoted as saying that we have "*stuffed up, by not looking to the soil and its nutrients for our good health*".

Dr Hungerford is dismayed at the lack of biochemistry in today's medical degrees and calls for student doctors to receive *"10 to 12 lectures on agricultural science run by people like Dr Arden Anderson (US medical doctor and biological farming specialist); Dr Elaine Ingham (Soil Foodweb Inc) or Adam Wilson (former NSW Agriculture Department agronomist who is now a biological farming consultant)."*

Continued from Page 7

Bathurst doctor, Carole Hungerford

Photo source: http://theland.farmonline.com.au/news/state/agribusiness-and-general/general/dr-hungerford-tracks-our-lost-nutrients/1469612.aspx

She also recommends the UK study on "*Why Health is the Key to the Future of Food and Farming*" – see http://news.bbc.co.uk/1/hi/health/1778384.stm

Dr Hungerford believes that doctors should be trained in biochemistry so that they are able to deal with pharmaceutical companies from a position of knowledge.

Dr Hungerford has written "*Good Health in the 21st Century*", available from Scribe Publications: http://www.scribepublications.com.au/book/goodhealthinthe21stcentury
(H/t to Gerhard Grasser for this item)

ELAINE INGHAM IN AUSTRALIA – THE FULL TOUR

Dr Ingham will be visiting Australia during May and June this year. Details of the extended course she will be conducting at Southern Cross University, Lismore are at the top of this newsletter. Other activities include:

DATES	LOCATION	ACTIVITY
13-15 May	Gippsland	AgriSolutions (see below)
20-22 May	Mildura	Australian Vermiculture
28-29 May	Trangie	Macquarie Valley Landcare Group
1-2 June	Biloela	DPI&F
9-10 June	Geraldton	Northern Agricultural Catchments Council
15-26 June	Lismore	EAL at USC (see top of newsletter)

AgriSolutions will be presenting a two day seminar and a one day refresher course on "True Fertility – combining soil biology, chemistry and structure" at ECG McMillan, Korumburra Road, Warragul, Vic from 13 to 15 May 2009. Full details can be found at http://www.agriculturalsolutions.com.au/pdf/True%20Fertility%20March%202009.pdf