

## PRECISION AG

## BIG DATA IN LITTLE BOXES

A SPECIAL FEATURE OF THE WESTERN PRODUCER | E-MAIL: NEWSROOM@PRODUCER.COM | 306-665-3544 | EDITOR: MICHAEL RAINE

## It's the little things in life that count

Measuring microbial biomass may be more relevant than NPK, but how do you count the little bugs?

BY RON LYSENG  
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Microbes are the vehicles that transfer nutrients to plant roots in your fields. Counting these tiny living beings may give you a meaningful reading on the health and potential of your soil.

As the science of soil becomes increasingly aware of the role microbes play, we're seeing more commercial soil additives claiming to foster microbial activity.

In a roundabout way, farmers judge the efficacy of these new products by measuring crop yield. But how can we quantify microbe levels in a specific field? How can we come up with a number that relates to the soil's potential?

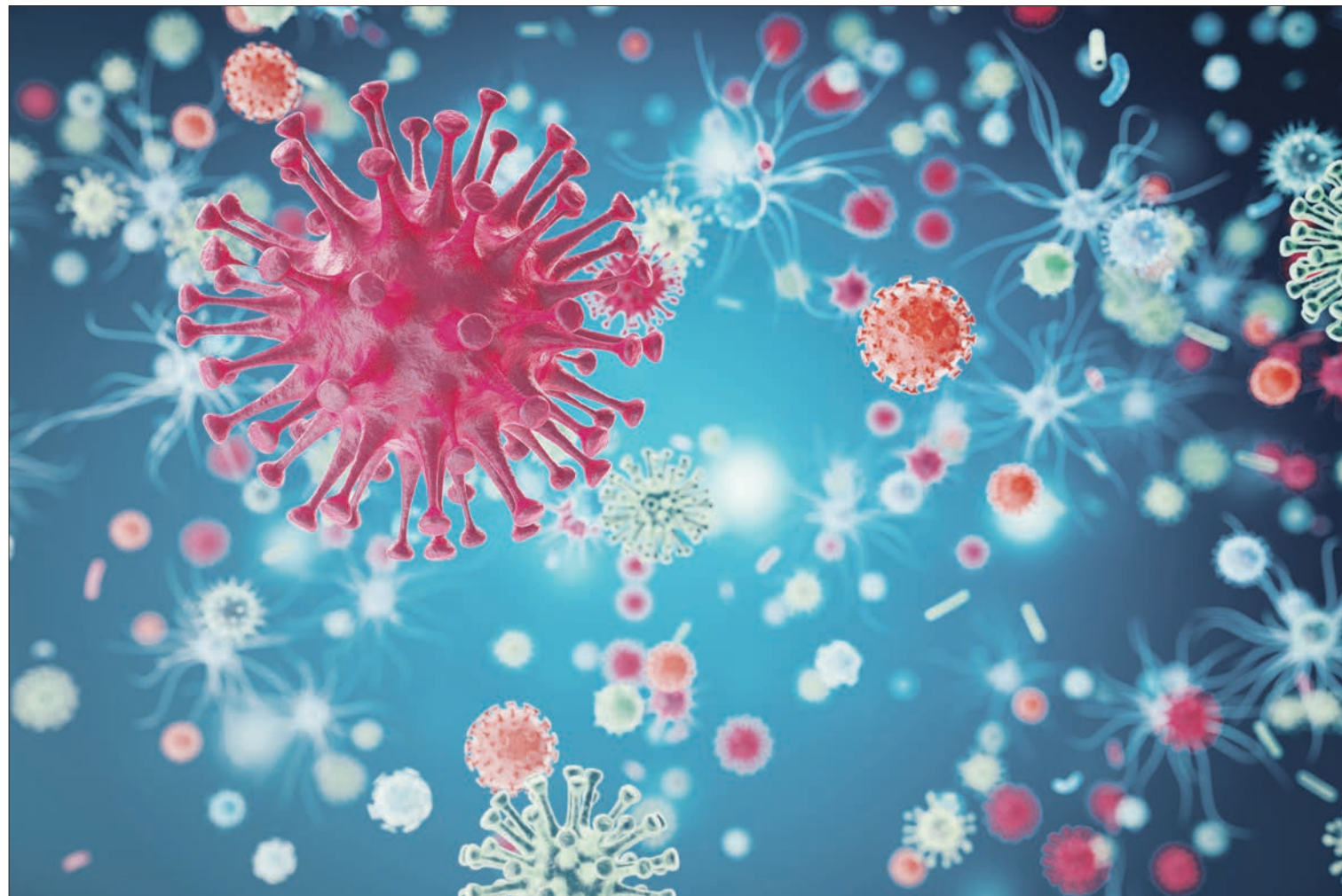
There is a way. It's done with a US\$500 laboratory test called Carbon Fumigation Assay. It provides a good reading on microbial biomass but it's a costly and time-consuming process, says Judith Fitzpatrick, president of Prolific Earth Sciences and inventor of the MicroBiometer.

The MicroBiometer, introduced seven months ago, is an inexpensive device a farmer can use in the field to obtain accurate readings on levels of microbial biomass. Instead of waiting weeks, the results appear on the farmer's smartphone in a matter of 10 minutes. Instead of \$500, the cost averages \$30 per test.

"There are nearly two million published scientific articles dealing with microbial biomass and soil health, but there's been no readily available way for a farmer to know about microbes in his soil," says Fitzpatrick, adding that her new MicroBiometer matches the accuracy of the Carbon Fumigation Assay.

Time is one factor contributing to the accuracy of the MicroBiometer, says the scientist. Soil samples shipped to a lab lose their biological activity because of the time lapse, whereas soil samples tested in the field are more likely to measure the full strength of the microbial population.

She says running the same sample 10 times through her MicroBiometer shows a variation of less



Finding out what kind of microbes are living in the soil may help producers determine overall soil health. | GETTY ILLUSTRATION

than 10 percent.

Fitzpatrick, a microbiologist who owns a corn farm but does not operate it herself, says the quick results of MicroBiometer are more usable than sending the sample away to a lab.

"I go out all the time into our corn and I see the crop is looking pretty uniform throughout the field. I run some samples and I see the microbial activity is good. But then when I get into an area where the corn isn't looking so healthy, the microbial activity is always low. These are problems a farmer can rectify by planting cover crops to increase microbe levels."

Fitzpatrick has found that the test is especially good in determining

what cover crops work best at rehabilitating soil. Data on her website show that the test can steer farmers to the best cover crops for their specific fields. Some crop combinations greatly improve the biological activity, while others accomplish little.

The MicroBiometer starter kit costs US\$185 plus shipping and handling. It uses a smartphone or tablet app to read the card and calculate microbial biomass.

The kit includes all tools required for processing samples and supplies for 10 tests:

- 10 extraction vials with extraction fluid components
- one 10-sample test card for analyzing soil samples with the app

- one whisker
- one soil sifter
- one soil sampler
- 10 disposable pipettes

The \$140 refill kit has supplies to analyze 10 soil samples:

- 10 extraction vials with extraction fluid components
- one 10-sample test card for analyzing soil samples with the app
- 10 disposable pipettes

Fitzpatrick says her company has been developing their device for four years. They started out using a spectrophotometer connected to a laptop, but found that too complicated for field use.

The kit being sold now was basically ready to market two years ago, but the company ran into a glitch in

getting people to accurately read the test cards. The solution was to develop an app for smartphones and tablets. Now, the operator calls up the MicroBiometer app, aims it at the grey scale test card and the app calculates biomass and gives the reading.

Fitzpatrick says if farmers had a better understanding of the activity down below the surface, it might allow them to grow better crops while spending less money on inputs.

"There's two ways we kill those microbes. Number one, salts in the fertilizer directly kills them. Then you have to add more nitrogen to

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feed the roots instead of feeding through the microbes.

“Number two, once the plant is getting nitrogen directly from fertilizer, it doesn’t create the stimulus to feed the microbes around the roots, so they die off.

“It’s worse than a double whammy because here’s the other thing that happens. Those microbes prime the plant’s immune system. Without the microbial interaction, the plant is far more susceptible to any kind of pathogen or stress such as disease, insects, drought, excess rain, weed competition or other stress factor.”

Prolific Earth Sciences plans to soon market similar in-field soil-testing devices for bacteria, fungi and soil pH. The series is expected to be in the same smartphone app format.

Fitzpatrick says MicroBiometer’s Canadian distributor will likely be Crystal Mountain Hydroponics in Abbotsford, B.C., one of the world’s largest hydroponics suppliers.

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### MICROBES, THE CANARIES IN YOUR FARM’S SOIL

In the world below the field surface, microbial biomass correlates almost perfectly with soil organic matter and the other critical plant nutrients. This makes microbial biomass an excellent indicator of soil fertility.

In the normal course of events, microbes convert dead plant material to soil organic matter, recycling it for next year’s crop. Microbes feed on the soil organic matter and other nutrients and pass them to the plant as they die. Plants and microbes are in a symbiotic relationship, totally dependent on one another.

Microbial biomass is high when soil organic matter and all other nutrients are in plentiful supply and no toxins are present or no adverse conditions such as disease, drought or prolonged flooding. So whatever kills plants, kills the microbes and vice versa.

Source: Judith Fitzpatrick, president of Prolific Earth Sciences



The MicroBiometer kit includes everything you need to test ten soil samples for microbial biomass, which pencils out to about \$30 per test. The smartphone app reads the Test Card and does all the calculations for you. It takes ten minutes to process each sample. Judith Fitzpatrick says accuracy of the MicroBiometer field test is equal to that of the \$500 carbon fumigation assay lab test. Refill kits can be ordered. | MICROBIOMETER PHOTO