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CRDC
COTTON RESEARCH AND DEVELOPMENT CORPORATION

Can we really use a soil test to manage black root rot risks? The initial approach

Dr Maria Manjarrez
Microbiology Laboratories Australia

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Microbe Labs Australia: Who we are?

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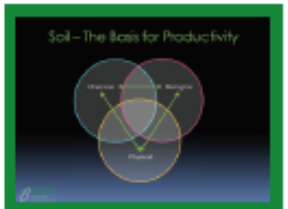
Affordable, easy-to-understand tests that put you in control

BETTER SOILS GUIDE

Microbe Labs' soil microbiology tests can help you find the missing piece in the picture of your soil's productivity, here's how:



Your soil is made of three components - chemistry, physics and biology. All three are important and interact.

Ordinary soil nutrient tests only give you part of the picture - a snapshot of the chemistry in your soil at one moment in time. They don't take into account the effects of microbiology, which has a large effect on nutrient availability and uptake, disease suppression, drought resistance, residue breakdown, carbon accumulation, and the ability to keep your soil productive despite changing environmental conditions.

Microbe Labs' tests give you all this information and show the relationships between soil microbiology, nutrients and structure. This means you can make better, more informed management decisions to improve soil and crop productivity.

Here's some of our best value tests - bundle and save (see back page)

Microbe Wise

Microbe Wise measures the biomasses of 12 key groups of microbes important to soil processes. Microbe Wise uses molecular markers unique to each group of microbes to accurately measure what and how may microbes are in your actual soil samples. The measurements are taken directly from the samples you send in. The measurements are used to estimate several soil indicators that show how your soil rates on important soil processes related to soil and crop productivity.

Microbe Activity Wise / Plus

Microbe Activity Wise reports the activity of the microbes in your samples by measuring their CO_2 respiration (breathing) rate. This measurement is also used to calculate soil based respiration (SBR) and soil microbial biomass carbon (SMBC).

The Microbe Activity Wise Plus version involves estimates of how much nitrogen (N) and phosphorus (P) are released from dry soil on rewetting, which can be a substantial source of xxxxxxxx nutrition for non-irrigated crops.

N Wise & P Wise

N Wise and P Wise are unique, advanced soil tests that are 'hybrids' between nutrient and microbiology tests. They measure the effects of microbiology on soil nitrogen (N) and phosphorus (P). Unlike ordinary nutrient tests that only give you a snapshot in time, N Wise and P Wise measure the amount of N and P produced over time by microbial processes, as if under a crop. By measuring all the pools of N and P in the soil, N Wise and P Wise give you the whole picture, to enable you to benchmark your soil and optimise fertilisation.

VAM Wise & Glomalin Wise

Mycorrhizal fungi (VAM) live in a symbiotic relationship with most plant types, including the majority of agricultural and horticultural crops. They increase plant nutrient uptake, particularly phosphorus, and also nitrogen, potassium, magnesium, zinc and other nutrients. They can also improve plant drought tolerance and disease resistance, and produce a carbon-rich exudate called glomalin which binds soil particles to form aggregates. Soil glomalin is highly correlated with soil structure. VAM are the single most important indicator of soil health.

Residue Wise & Humus Wise

Residue Wise is a unique, advanced analysis that helps manage crop residues better. It measures the rate of plant residue breakdown in your samples to calculate the number of days until 75% of the residue is broken down and how much of that residue will remain as resistant carbon, such as humus.

Humus Wise measures the amount of humic substances (humic and vulvic acids) in your samples. Humic substances are forms of recalcitrant carbon that have a positive effect on soil nutrient availability.

Crop Saver

This test helps you to improve your bottom line by getting on top of soil-borne disease when it counts, while eliminating unnecessary management actions. It predicts the baseline severity of disease in your crop before you even plant, giving you a valuable time advantage. Unlike other disease tests, Crop Saver measures the amount of disease a plant actually gets, directly from your soil. Available for Phytophtora, Phythium and Rhizoctaria.

Why wait? Bundle and save!

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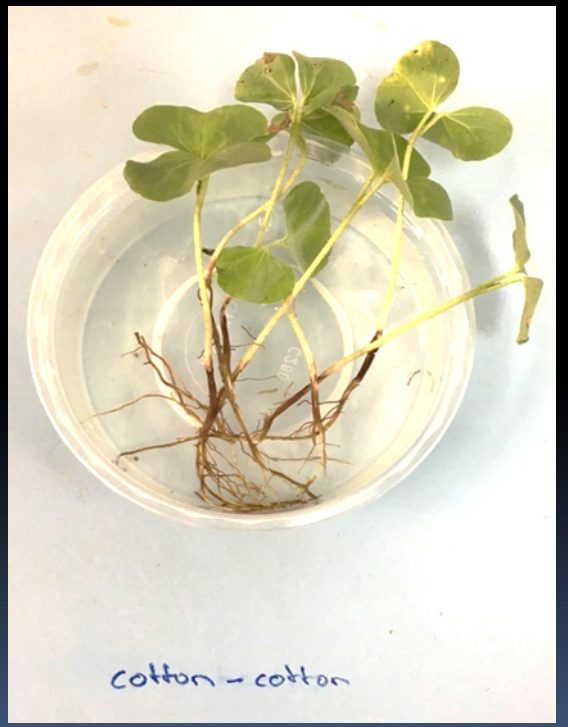
MINIMISE UNCERTAINTY, MAXIMISE RETURNS

BETTER SOILS GUIDE

Can we develop a test that can correlate Black Root Rot levels in the soil with the plant symptoms?

- ✓ Cost
- ✓ Practical – pre-plant
- ✓ Useful results for farmers



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What published literature says!

BLACK ROOT ROT OF COTTON – A (RE)VIEW BY AN OPTIMIST

School of Science and Technolo

SUMMARY

Black root rot is a fungal disease
seedlings upon germination. Disea
stunted or slow growth early
compared to surrounding
Belowground symptoms include b
root
was
patl
to a
area

Test Tube Method of Bioassay for Thielaviopsis basicola Root Rot of Soybean

J. N. C. Maduewesi and J. L. Lockwood

Research Associate and Professor of Botany and Plant Pathology, respectively, Michigan State University, East Lansing 48824. Present address of the senior author: Department of Botany, University of Nigeria, Nsukka, Nigeria.

Michigan

Enzyme-Linked Immunosorbent Assay for Detection of *Thielaviopsis basicola*

Brent A. Holtz, Alexander E. Karu, and Albert R. Weinhold

Former graduate student researcher, director of the College of Natural Resources Hybridoma Facility, and professor, respectively, Department of Plant Pathology, University of California, Berkeley 94720.

Current address of B. A. Holtz: Department of Plant Pathology, University of California, Davis, Kearney Agricultural Center, 9240 S. Riverbend Ave., Parlier 93648.

We thank B. A. Roberts for his assistance in sampling Kings County cotton fields and J. G. Hancock for his review of this manuscript.
Accepted for publication 7 June 1994.

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soils for inoculum potentials of the pathogen. The advantages of the method are its economies in terms of soil, inoculum, and space, and the relatively short time required for disease development.

incubated at 20 C. Increasing inoculum densities of endoconidia or chlamydospores from 10^1 to 10^5 per gram soil resulted in correspondingly increased symptom severity. At 10^4 per gram, symptom expression in plants grown in the

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Testing for BRR in soils

GUNDALINE Black Root Rot Sampling						
Field	Date Sampled	Date Sampled	2014 Crop	2015 Crop	2016 Crop	Visual Severity of BRR
A1		20/05/2016	Cotton	Faba Beans	Fallow to Cotton	Low/Med
B1		20/05/2016	Cotton	Faba Beans	Fallow to Cotton	Med
B2		20/05/2016	Cotton	Faba Beans	Fallow to Cotton	Low/Med
B4	30/11/2015	20/05/2016	Wheat	Cotton Removed - Biofumigant Sorghum	Wheat	Very High
B7		20/05/2016	Cotton	Wheat	Wheat	Low/Med
C1		20/05/2016	Cotton	Faba Beans	Fallow to Cotton	Med
C2		20/05/2016	Cotton	Faba Beans	Fallow to Cotton	Med
C3		20/05/2016	Wheat	Cotton	Wheat	High
C4	30/11/2015	20/05/2016		Cotton Removed - Flooded for 36 days	Wheat	Very High
D2		20/05/2016	Wheat	Cotton	Cotton	Very High
D4		20/05/2016	Cotton	Wheat	Wheat	Med
P06 - Nil BRR		20/05/2016	Pasture	Pasture	Pasture	Nil

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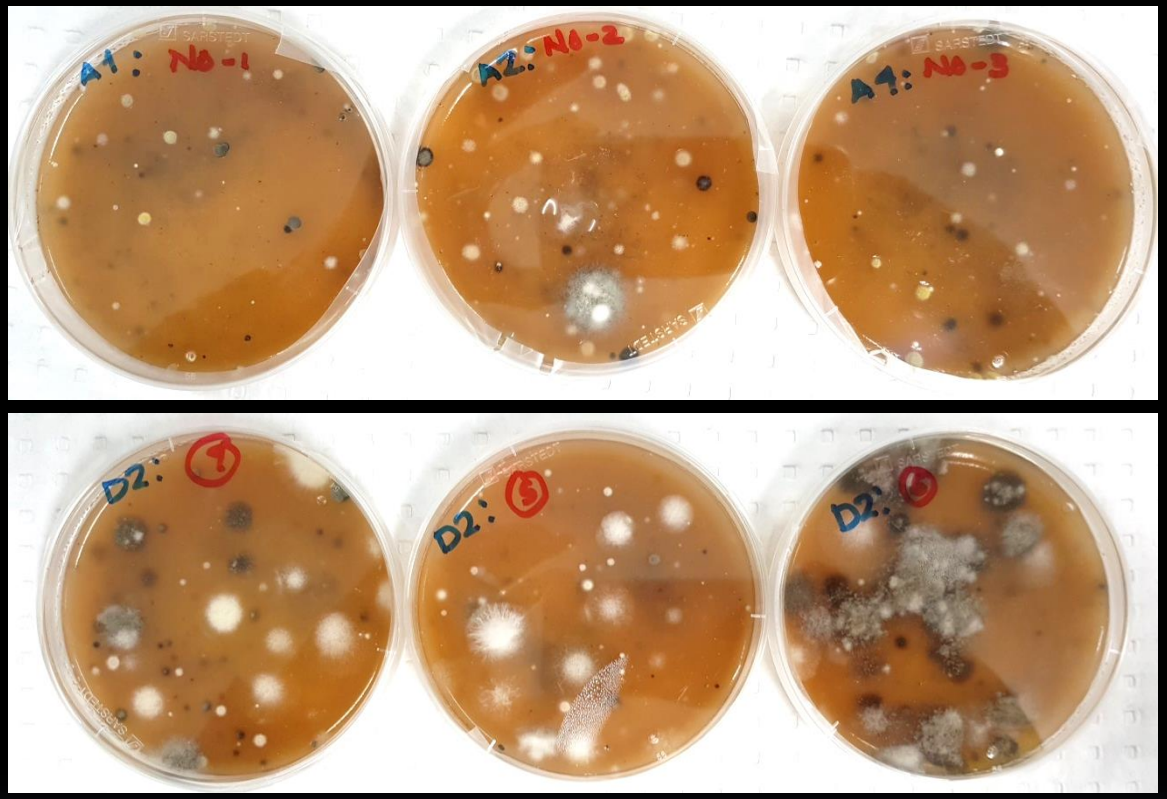
Predictive Test for BRR in soils



	Thielaviopsis basicola	Other Fungi	
Nil BRR-1	4	78	*Clonostachys roseae*
Nil BRR-2	1.3	213	*Trichoderma* spp.
Nil BRR-3	0	9	
High BRR-1	23	82	
High BRR-2	12	48	*Alternaria alternata*
High BRR-3	220	16	*Cylindrocarpon destructans*

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Testing for BRR in soils

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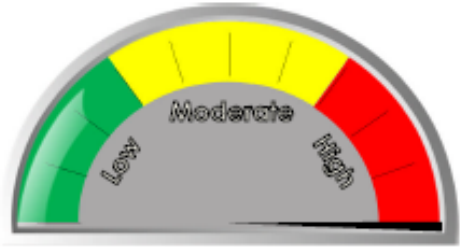
Microbiology Test

Name: **Kieran Okeeffe** Sample: **Wilga 3, 34,35, 33 146.12.OE** Analysis no.: **1302-1** Date: **10/11/2016**

Customer name	Kieran Okeeffe	**Date received**	10/11/2016
Client name	Before Rice-BRR level	**Agent**	Microbiology Laboratories
Sample name	Wilga 3, 34,35, 33 146.12.OE	**Advisor**	
Crop	Rice (before cotton)	**Authorised by**	Dr Maria Manjarrez
Date sampled	11/10/2016	**Analysis no.**	1302-1

Black Root Rot-Cotton

Disease Pressure Indicator



Data

		Yours	Guide
Black Root Rot infective biomass	Colony Units Per g/soil	180.0	100.0

	Yours	Guide
Disease Pressure Indicator	18	10.0

Risk key: Low | Moderate | High

* Assumes a sampling depth of 20 cm and a bulk density (BD) of 1.1 g/mL. For other depths and densities use mg/kg × (depth (cm)/10) × BD (g/mL).

Comments

The levels of infective Black root rot complex were almost twice the guide level in this sample. The potential for disease in this soil is likely to be very high. Use the appropriate agronomy note to help minimise and manage crop risk throughout the growth season.

Explanations

This test helps you to improve your bottom line by getting on top of disease when it counts while eliminating unneccessary management actions. It predicts the baseline severity of disease in your crop before you even plant, giving you a valuable time advantage. It then helps you predict the likelihood and severity of outbreaks during the seaon due to weather events.

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Testing for BRR in soils

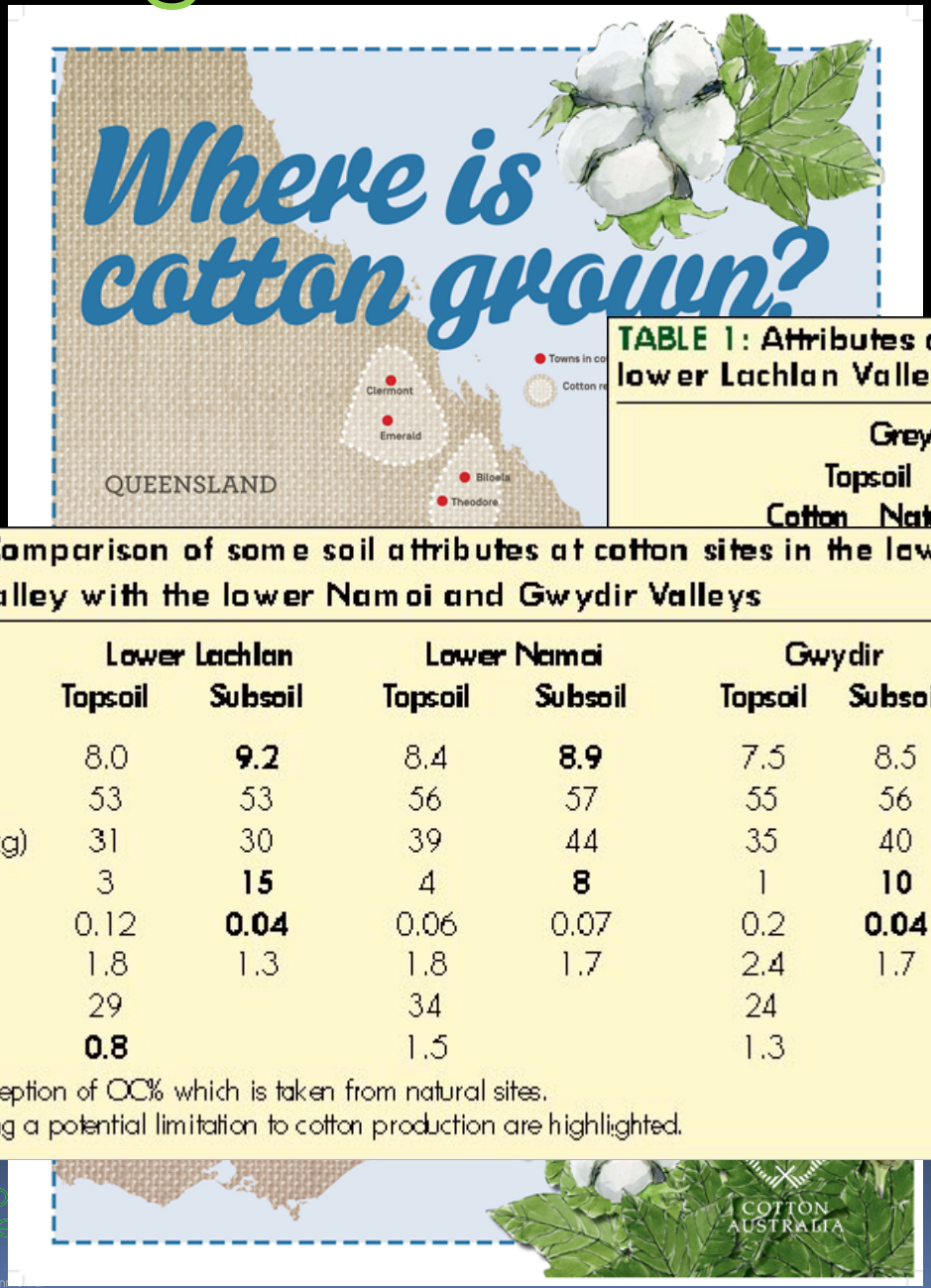

TABLE 1: Attributes of three soil classes of cotton-growing soils in the lower Lachlan Valley

	Grey Vertosol			Brown Vertosol			Red Vertosol		
	Topsoil		Subsoil	Topsoil		Subsoil	Topsoil		Subsoil
	Cotton	Natural		Cotton	Natural		Cotton	Natural	
	8.8	8.2	7.3	**9.0**	8.0	7.9	**9.2**		
	53	52	46	49	52	43	53		
	31	31	24	28	30	22	28		
	11	2	2	**11**	3	4	**15**		
	0.04	0.11	0.07	**0.02**	0.09	0.09	**0.04**		
	1.6	2.1	1.9	1.7	1.7	1.9	1.3		
	11	24	28	**12**	26	20	**8**		
		0.6	0.9		0.7	0.8			

soil (80-90 cm) results are shown, with topsoil results displayed for
dicating a potential limitation to cotton production are highlighted.

TABLE 2: Comparison of some soil attributes at cotton sites in the lower Lachlan Valley with the lower Namoi and Gwydir Valleys

	Lower Lachlan		Lower Namoi		Gwydir	
	Topsoil	Subsoil	Topsoil	Subsoil	Topsoil	Subsoil
pH	8.0	**9.2**	8.4	**8.9**	7.5	8.5
Clay (%)	53	53	56	57	55	56
CEC (cmol/kg)	31	30	39	44	35	40
ESP	3	**15**	4	**8**	1	**10**
ESI	0.12	**0.04**	0.06	0.07	0.2	**0.04**
Ca/Mg	1.8	1.3	1.8	1.7	2.4	1.7
P (mg/kg)	29		34		24	
OC (%)	**0.8**		1.5		1.3	

*With the exception of OC% which is taken from natural sites.
Data indicating a potential limitation to cotton production are highlighted.

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Testing for BRR in soils

Table 3. The themes identified from the interviews with the growers and consultants according to theme type

No.	Themes	Theme type
1	Soil acidity and salinity	soil property
2	Sodicity	soil property
3	Nitrogen management	management practice
4	Nutrient (non-nitrogen) management	management practice
5	Use of manures and stubble	management practice
6	Variability and Precision Agriculture	management practice
7	Disease and pest management	management practice
8	Soil temperature and seedling establishment	management practice
9	Crop rotations and back-to-back seasons	management practice
10	Compaction	management practice
11	Irrigation	management practice
12	Grower information sources and learning	development issue
13	Research opportunities and grower questions	development issue

Testing for BRR in soils

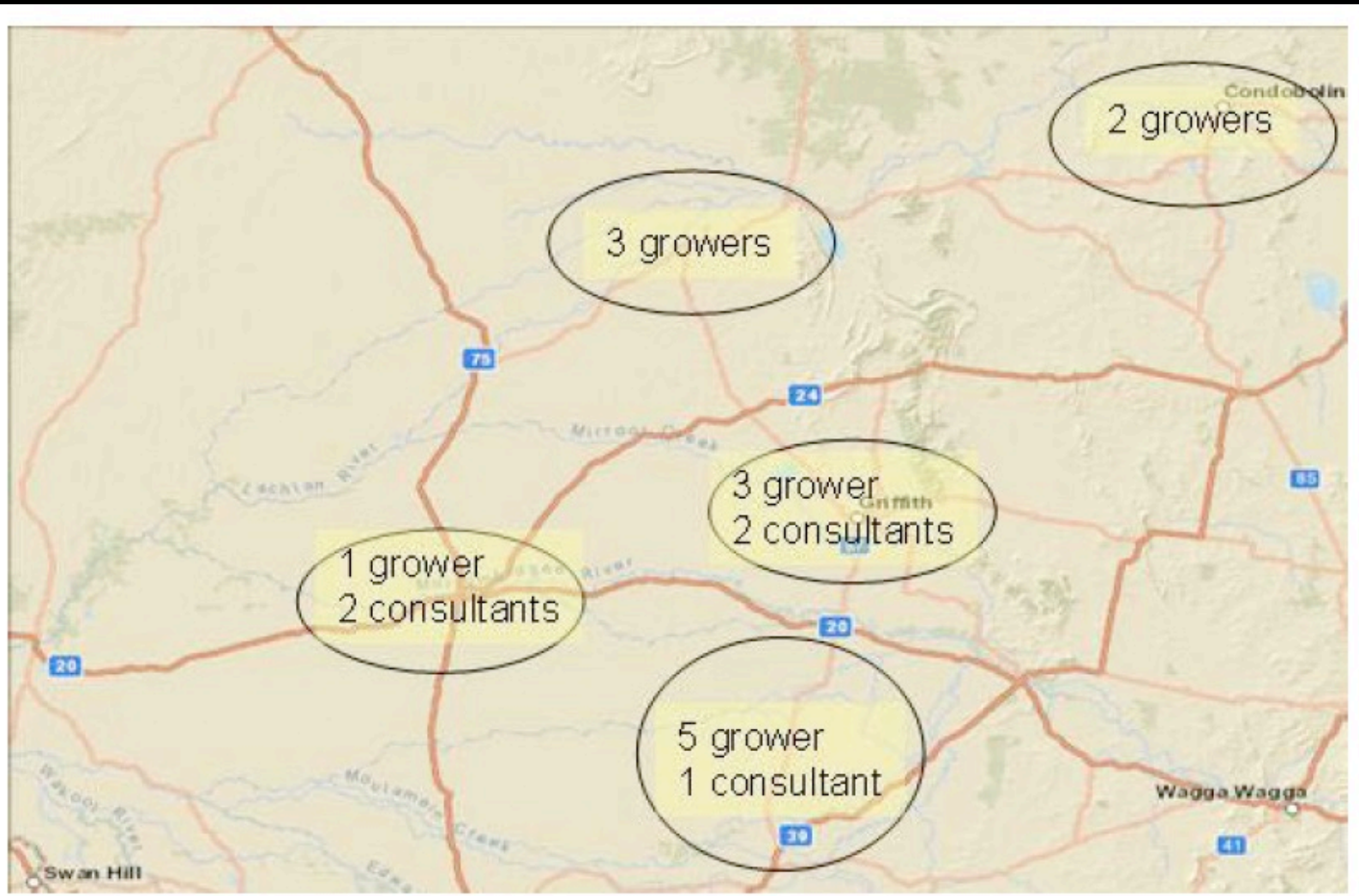

Figure 3. The districts where cotton growers and consultants were surveyed and interviewed from across Southern NSW. (NB. Consultants have clients in more than one district)

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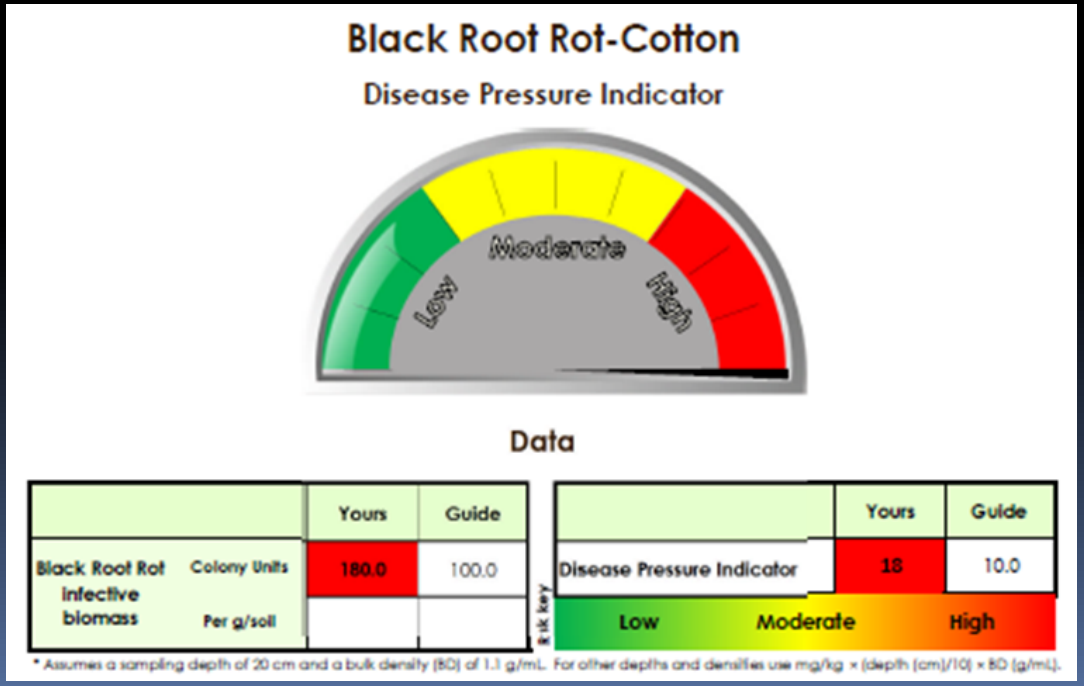
BRR test validation

- Can we validate these BRR tests as a predictive tool in different soils?
- Can we calibrate/asses the Levels of BRR in soil? To set "real" consistent thresholds



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Got Questions?