Evaluation of soil sampling procedures for soil nitrogen and diseases

by the Birchip Cropping Group

SUMMARY

The procedures in place for soil sampling for DNA testing for diseases and deep soil N, were investigated. The variability across the paddock in the level of Take-all and deep soil N were relatively low (co-efficient of variation of 25% or less between sampling sites) and the results can be used to devise a management plan. For Rhizoctonia and Pratylenchus neglectus the results between the sites were more variable.

The aim of this work was to test the robustness of current soil testing procedures.

METHODS

3 deep soil cores and topsoil samples were collected at 10 locations across a paddock before sowing. The sites were geo-referenced at the time of sampling. The paddock was yield monitored at harvest.

The soil samples were analysed for:

- Disease levels using the DNA tests
- Nitrate levels in the soil (deep soil N test)

RESULTS

The results of the DNA disease levels and deep soil N tests are presented in Table 1. The results for CCN and Pratylenchus thornei are not presented because of very low levels.

Table 1. DNA and deep soil N test results

	Average	Standard Deviation	Co-efficient of Variation %
Nitrate kg/ha	60.7	16.4	27
Take-All	29.0	5.9	20
Rhizoctonia	38.3	16.3	43
Prat neglectus	5.0	3.1	62

INTERPRETATION

Disease Levels

Take-all: the average of the ten sites is 29 (DNA/g soil) with a co-efficient of variation of 20%. The ten sites ranged in measurements from 18 to 37 DNA/g of soil. The relatively low co-efficient of variation (20%) demonstrates that there was a low level of variation across the paddock in Take all levels. (DNA Take-all ratings are: <20 DNA/g of soil – below detection; 20 to 50 – low; 50 to 100 – high).

Rhizoctonia: - the average of the ten sites is 38.3 (DNA/g soil) with a co-efficient of variation of 43%. The tens sites ranged from 14 to 62 DNA/g of soil. Rhizoctonia ratings are: <20 DNA/g soil – below detection; 20 to 40 – low and 40 to 80 – medium. In this paddock the level of rhizoctonia ranged from below detectable levels to medium, indicating that the variability is quite high across a paddock which makes interpretation difficult.

Pratylenchus neglectus – the average for ten sites is 5 nematodes/g soil with a co-efficient of variation of 62%. The ten sites ranged from 1 to 11 nematodes/g of soil. P. neglectus ratings are: <1 nematode/g of soil – below detection; 1 to 6 – low; 6 to 18 – medium. In this paddock the level of P. neglectus ranged from below detectable levels to medium indicating that the variability in this disease is high across the paddock.

Soil N

Total available nitrogen, in kg/ha measured to a soil depth of 60cm, averaged 61kg of N/ha with a co-efficient of variation of 27%. The ten sites ranged from 37 kg/ha to 95 kg N/ha. For management purposes this level of variation is acceptable.

PRACTICAL IMPLICATIONS

The question of how many samples should be taken across a given size paddock has been hotly debated since the inception of soil sampling to determine fertiliser requirements and disease levels in the soil. This small trial goes some way to answering this question. In this case 10 locations were sampled across an area of approximately 15 hectares.

The co-efficient of variation is useful for assessing the likelihood that a meaningful result is obtainable. In agricultural systems with highly variable soil types and many influences on yield, a co-efficient of variation of 25% or less for a particular test indicates a relatively robust test. In this case the Take-all and soil Nitrate test fell within this category. For the Rhizoctonia and Pratylenchus tests the variability was higher and it was more difficult to come up with an interpretation for the whole paddock.