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SUPPRESSING RHIZOCTONIA

Soil microbes can suppress rhizoctonia and other root diseases to some degree.

The number, type and activity of microbes determine this level of disease suppression in the soil, which in turn are determined by management.

In the long-term farming systems trial supported by the grain industry at Avon, disease suppression increased from low to high over a period of five to 10 years following a change to full stubble retention, limited grazing and higher nutrient inputs to meet crop demand.

These soils can now provide complete control of rhizoctonia and take-all.

Soils with high levels of disease suppression have also been identified on farms in SA and Victoria.

Farming systems that maximise the ability of soil to suppress root disease commonly produce above-average yields and include:

- intensive cropping to export N from the system
- stubble retention to provide a good supply of available carbon for microbes
- limited grazing, to maximise the amount of carbon entering the system
- limited or no cultivation, which means that more of the organic matter is retained in the soil.

The secret lies in building up the level of plant residues returned to the soil to provide biologically available carbon on which the soil organisms can thrive - increased carbon levels stimulate changes to the composition and activity of the soil microbial community that lead to increased disease suppression. It is really a matter of competition where the suppressive organisms feed on the rhizoctonia and other damaging root pathogens or just out-compete them for essential nutrients i.e. nitrogen.

But these “carbon benefits” can be cancelled out in the short term by excess available (soluble) nitrogen, particularly during the summer and early autumn.

Any practice that increases the amount of available N or reduces soil carbon levels can reduce the level of disease suppression provided by a soil.

Practices that can reduce disease suppression include growing legume pastures and green manures which are turned in, non-harvested crops, temperature/moisture combinations that favour N mineralisation, especially when paddocks are cultivated after summer/autumn rains, and regular removal of carbon inputs by burning of stubbles and pasture residues. In general, increased N levels for one year, do not have a large impact on reducing suppressive activity. It is where soil N levels are maintained over multiple seasons that the impact on disease is noticeable.

In 2004, very dry conditions from January to sowing contributed to higher than expected levels of rhizoctonia by reducing competitive microbial activity. Crop growth was further reduced by limited available N at sowing.

Good crop growth during the 2003 season had removed nearly all the available N by harvest and the dry summer/autumn conditions in 2004 provided little opportunity for N mineralisation or breakdown of the large stubble loads.

This meant little or no mineralisation of N ahead of sowing and incorporation of stubble during sowing led to soil and fertiliser N being tied up and unavailable to the next crop.

This, combined with the late start to the season, meant crops was sown into cold, N-deficient soils. The result was slow-growing plants susceptible to attack by rhizoctonia.

In wheat-on-wheat rotations, the same conditions also favoured yellow leaf spot and as the season developed the root disease and the foliar disease compounded each other and resulted in many disappointing crops.

In soils with high levels of suppression, disease was not a problem. Where suppression levels were low to moderate, the factors contributing to disease as outlined above outweighed the suppressive activity.

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