Phosphorus from stubble to soil

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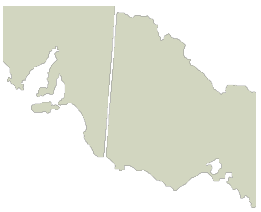

Why was the project done?

Growers are interested to know whether they should be accounting for phosphorus (P) in their stubble as a source of P for subsequent crops. Phosphorus within stubble can be released directly to soil as soluble P or decomposed by microorganisms and released back into the soil through mineralisation. The chemical composition of P in crop stubble may play an important role in the rate of stubble P release.

The aims of this project were to:

1) Better understand the P forms in crop stubble and their fate in soil
2) Measure the supply of P in a crop that has come from stubble P

How was the project done?

An initial survey of stubble samples collected from the Mallee and Mid-North was conducted to estimate the amount (kg/ha) of P in stubble. Subsequent experiments were a combination of laboratory, glasshouse and field work over three years.

Detailed analysis of P forms in crop stubble was determined for a range of cereal and pulse crops using a technique called solution ^{31}P NMR spectroscopy. A glasshouse experiment measured the effect of stubble size (straw or chaff) and placement (surface or below surface) on the release of stubble P. The fate of P within the stubble was traced allowing the movement of P from the stubble into the subsequent crop and soil P pools in the soil examined.

Key messages

- Cereal and legume stubble sampled at grain harvest from the Mallee and Mid-North over three seasons contained 1-5 kg P/ha.
- On average 50% of the total stubble P was water soluble and potentially available to plant roots and microorganisms.
- Within 80 days of application to the soil a significant amount of stubble P was released into soil and taken up by the subsequent wheat crop.
- Across four stubble treatments which included, slashed stubble, incorporated stubble and fine chaff (ie. remaining from Harrington Seed Destructor), the proportion of wheat P derived from stubble ranged from 9-16%.
- On average 50% of the stubble added in the incorporated stubble treatment was measured in the plant and available soil P pools, compared to 20% for the two surface stubble treatments.

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