An update on the nematode threat in cotton

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**AT A GLANCE…**

Reniform nematode is an important pest in cotton production in Central Queensland. High populations of reniform were present at depth after cotton, particularly at 30–70 cm, confirming that reniform survive deep in the soil profile.

Planting a non-host such as sorghum or corn is a good strategy to reduce populations of reniform nematode at depth.

The Come Clean Go Clean principles of good farm hygiene are just as important for limiting the spread of reniform nematodes as they are for other soil-borne pathogens.

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The reniform nematode (*Rotylenchulus reniformis*) has a worldwide distribution and is an important pest of cotton causing losses in both yield and quality. In 2012 in the US, reniform nematode caused estimated losses of 58,503 tonnes (268,698 bales). In Australia, reniform nematode has been documented in horticultural crops in and north of Bundaberg. In Central Queensland, this pest has been recorded to be widespread in cotton crops in the Dawson Valley, causing yield losses of up to 40 per cent. The nematode is also present in a small number of fields in Emerald.

Infected cotton plants produce fewer and smaller bolls, resulting in lower harvestable yields. Nematodes need live root structures to survive so they will not kill the plant but rather will steal away the growth or the flowering ability of the plant. To manage this pest, the idea is to reduce the numbers in the soil so that the nematode does not steal enough to have an economic impact on yield.

**Effect of population density on cotton yield**

Trials suggest that when post-harvest populations after cotton are approximately 850 reniform per 200 ml of soil, yield loss can be 10 per cent or more (Figure 1). It may be necessary to rotate with a non-host for one or two seasons to reduce populations of the nematode sufficiently to support profitable cotton.

**Reducing soil populations with non-host varieties**

No cotton cultivars are commercially available that have resistance to reniform nematode. But rotation to resistant or non-host crops has the potential to contribute to the management of reniform nematode. In Israel, a 90 per cent reduction of reniform was recorded when corn was the rotation crop. To investigate the potential of non-hosts to reduce the population density of reniform nematode, a replicated strip trial is being conducted over two seasons on Peter French’s farm ‘Nandina’ in Theodore (see photo).

Crops being investigated are a sorghum plant with biofumigation properties, grain sorghum, and two corn varieties. These four non-hosts significantly reduced nematode populations in the trials; with reductions of 98 per cent compared with cotton in the top 15 cm of soil post-harvest (Table 1). The trial has been over-sown with cotton this season and each plot will be assessed for yield and reniform population to assess the effect of previous crop on the following cotton crop.

**FIGURE 1: The relationship between post-harvest reniform population density and cotton yield**

![Non-host rotation trial in Theodore.](image-url)
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Population dynamics

For successful management of this pest it is essential to understand the spatial distribution patterns influencing the presence and abundance of the nematode and the factors driving such distribution. With the assistance of Damien Erbacher (Dawson Ag Consulting), soil cores to a depth of 100 cm were taken from each replicate treatment in the non-host rotation trial 50 metres in from the tail drain and head ditch ends of the field. Each soil core was divided into three lengths consisting of 0–30 cm, 30–70 cm and 70–100 cm. Nematodes were extracted from each soil sample and counted. The data collected provided information on the influence of crop on vertical distribution of reniform nematode at the end of the season.

The population densities observed after each crop behaved as expected, based on the known host suitability of the crops. Reniform nematodes were found at very high population densities under cotton at harvest at all sampling depths (Figure 2), concurring with other reports that populations of the nematode are deep in the soil. The highest average population under cotton was 11,399 per 200 ml of soil at a depth of 30–70 cm (Figure 2).

Other researchers found higher densities of reniform nematodes at depths below 30 cm, concluding that this nematode did not follow the root system. In their studies, vertical changes in soil texture were limited and assumed to not be a factor affecting changes in population density. Other researchers have suggested that populations of reniform nematode are correlated to sand or silt content of soil. To ascertain if there is any relationship between reniform population and soil texture, soils collected from the trial block will be analysed.

Rotating with a non-host crop significantly reduced population densities of reniform at all soil depths measured compared to cotton (Figure 2). Data to date indicates that a post-harvest population of 850 reniform per 200 ml in the top 15 cm of soil correlates to a 10 per cent reduction in yield. Planting a non-host reduced the population in the top 30 cm below this threshold value; but populations greater than 1000 reniform per 200 ml soil were present 30–70 cm deep in the soil profile. It is possible that recolonisation of the planting zone could occur by drawing upon this population reservoir from deeper soil layers.

Other researchers have shown that a single rotation may only suppress nematode populations and that economic thresholds can be reached again by the end of the next cotton crop. Two successive rotations with a non-host crop are therefore recommended for improved production sustainability in such circumstances. The influence of two successive rotations with a non-host on soil populations of reniform at depth will be investigated in future trials.

The Come Clean Go Clean principles of good farm hygiene are just as important for limiting the spread of reniform nematodes as they are for other soil-borne pathogens. Unaided populations will not disperse more than a few metres each season so rapid spread on and between farms will be as a result of water or soil movement via implements, vehicles etc. Eradication of an established population is generally not viable, so the best management approach is prevention.

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Thanks to J. Cobon and T. Kirkpatrick for information used in the article. For more information on Come Clean Go Clean principles, visit www.farmbiosecurity.com.au