Deep ripping – is it ok on Sandy loams?

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Aim

To determine if deep ripping overcomes compaction and increases yield on a red sandy loam.

Background

Deep ripping to remove physical hardpans in the 10-40 cm zone of soil can be an effective amelioration to soil compaction if the soil type is responsive. The Butcher's suspect hardpans exist in some of their paddocks and have decided to investigate whether deep ripping will remove the hardpan and increase yield in a trial before using the method over the whole paddock.

Soil compaction is mainly caused by agricultural machinery traffic and is common on deep sandy soils or loamy sands. Compaction restricts root growth, reducing the plants ability to access water and nutrients (Jarvis R, 2000). The removal of this hardpan can significantly increase yield on light sandy soils however heavy soils are not always as responsive. Deep ripping can be a costly and time consuming operation therefore it is important to know whether the chosen soil type will respond to deep ripping (Jarvis. R, 2000).

The deep ripping for this trial was done before seeding using the Liebe Group's trial size deep ripper and funding from GRDC.

Trial Details

Property	Gary Butcher, Pithara
Plot size & replication	11.5m x 200m x 3 replicates
Soil type	Red sandy loam
Sowing date	8/06/10
Seeding rate	50kg Wylkatchem
Fertiliser	8/06/10 :45 kg/ha DAP xtra
Paddock rotation	2007= pasture, 2008=barley, 2009= wheat
Herbicides	8/06/10: 1.5 L/ha Glyphosate, 1.5L/ha Trifluron, 30 g/ha Unigran
Growing Season Rainfall	160mm

Results

Table 1: Average grain yield and quality with and without deep ripping on a sandy loam at Pithara.

Treatment	Yield (t/ha)	Hectolitre Weight	Protein (%)	Screenings (%)
Control	1.35	78.83	7.73	3.17
Deep ripped	1.37	79.35	7.9	4.50
L.S.D	*NS*	*NS*	*NS*	*NS*

Deep ripping did not increase yield in this trial. Nor did it have a significant effect on hectoliter weight, protein or screenings (Table 1). Plant tissue tests indicate that the deep ripped plots had 5% more zinc in tissue (data not shown). All other nutrients were present in equal and adequate amounts whether ripped or not, indicating deep ripping did not allow greater nutrient uptake, as sometimes occurs when a hard pan is removed.

When soil has a resistance greater than 2 MPa it is considered to restrict root growth. Therefore Figure 1 indicates that the site did indeed have a hardpan that was reduced by deep ripping in the 10-25 cm zone. While 2 MPa is the figure that is commonly used as an indicator of soil resistance that may restrict root growth, growth can be affected at 1.2 MPa depending on plant species, soil water content, structure and texture. The penetrometer readings themselves vary widely depending on soil conditions at time of testing and operator error. In some areas of the trial the soil resistance in the deep ripped plots was no different to the unripped area.

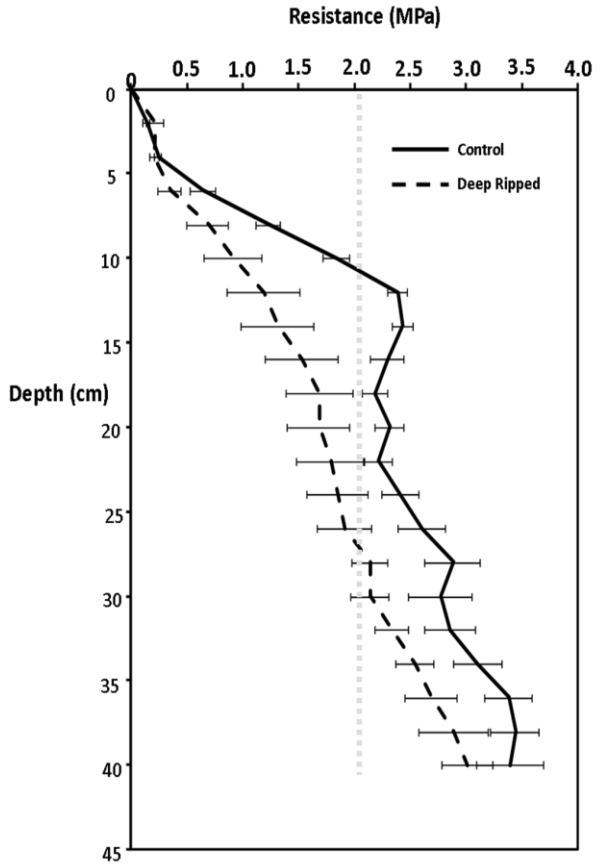

Figure 1: Soil compaction as measured with cone penetrometer 5 months after deep ripping had taken place in a sandy loam at Pithara. Root growth can be hindered above 2 megapascals (MPa).

Comments

Yield response to deep ripping is known to be very variable especially if rainfall is limited as was the case this year or the wrong soil type is chosen. Research indicated that deep ripping works well on light sandy soils but is not as responsive on medium textured soils (Jarvis, 2000). Is it possible that the soil type in this trial is not suited to deep ripping.

A more thorough assessment of the soil strength will be undertaken in 2011 including an assessment of the subsoil texture. The gradual increase in resistance with depth as shown in Figure 1 may be indicative of the soil texture becoming heavier with depth. Heavier textured soils hold more water for a given depth hence improving rooting depth and root growth rate using deep ripping is less critical than it is on deep sandy-textured soils where crop roots can grow several metres into the subsoil.

Acknowledgements

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References

Jarvis R (2000) Deep tillage. In 'The Wheat Book: Principles and Practice' (Eds. WK Anderson and JR Garlinge) pp 185-187. Department of Agriculture, Western Australia Bulletin 4443.

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