



Bentonite Clay and Tillage to Improve Soil and Yield

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Key messages

- The mouldboard ploughed soil proved difficult to seed into and as a result crop germination was poor.
- Mouldboard ploughing reduced grass weeds by 50%.
- Bentonite clay had no effect on barley yield.

Aim

To determine if inclusion of Bentonite clay improves crop yields on sandy soils.

Background

Bentonite clay, also known as smectite, can be found near Watheroo and is used by home gardeners to increase water and nutrient holding capacity in sandy soils. This trial examines if 6 t/ha of Bentonite clay can improve water and nutrient holding capacity of agricultural soil sufficiently to increase crop yield. The 'A' grade Bentonite sourced from Watheroo costs \$130 per tonne and has 82% clay content.

Three methods of incorporating the Bentonite (mouldboard plough, deep ripping and tandem discs) were also compared.

Mouldboard ploughing involves a one-off inversion of the topsoil. The plough in this trial was able to invert the top 30cm of soil. Mouldboard ploughing can help in the control of weeds, burying water repellent topsoil, incorporating lime at depth as well as having a deep ripping effect. Cost of the operation is approximately \$100-150/ha (Davies et al, 2012). The deep ripping cost was \$50/ha and the tandem disc operation was \$40/ha.

Trial Details

Property	Manji Spring, Miling
Plot size & replication	50m x 20m not replicated
Soil type	Yellow sand
Soil pH (CaCl₂)	0-10cm: 6, 10-30 cm: 4.7
EC (dS/m)	0.04
Sowing date	08/05/13
Seeding rate	60 kg/ha Buloke barley
Soil amelioration	2011: Deep ripped 2012: 1.5 t/ha lime
Fertiliser	08/05/13: 75 kg/ha Mallee, 25 kg/ha MOP, 50 L/ha Flexi N 10/06/13: 30 L/ha Flexi N
Paddock rotation	2010: canola, 2011: wheat, 2012: wheat
Herbicides	08/05/13: 3 L/ha Trifluralin, 125 g/ha Metribuzin
Growing Season Rainfall	262mm

Results

This is a large scale farm demonstration which is not replicated. An improvement in soil type on the eastern side of the trial could be influencing results. Applying Bentonite clay did not alter barley yield

in the 2013 season. The trial will continue to be monitored in 2014 to see what the long term implications of this product are.

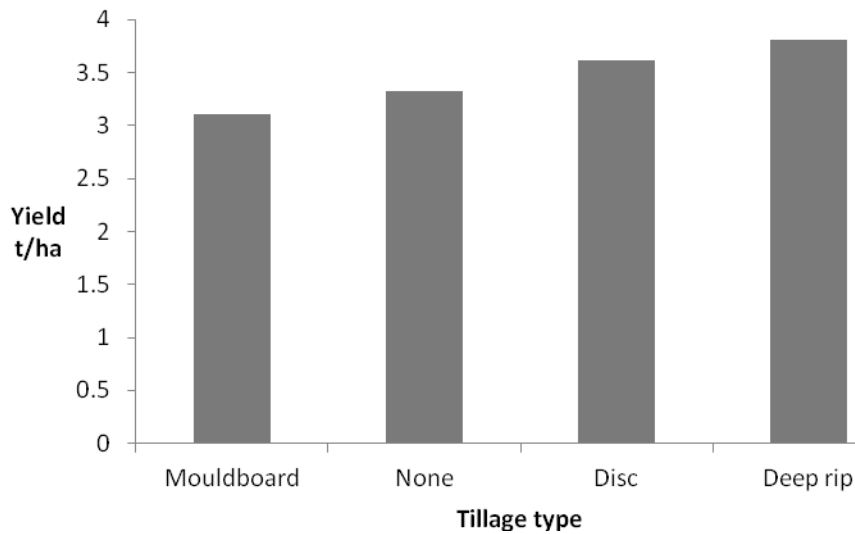


Figure 1: Impact of tillage type on barley yield at Miling 2013. Bentonite clay was found to have no significant impact on grain yield thus this data combines both the Bentonite and no Bentonite treatments.

Table 1: Yield and grain quality for Buloke barley at Miling 2013 after Bentonite clay was incorporated using three tillage methods: Mouldboard ploughing, deep ripping and tandem discs.

Treatment type	Yield (t/ha)	Hectolitre weight (kg/hl)	Screenings (%)	Protein (%)
Bentonite + Mouldboard	2.99	61	15	8.8
No Bentonite + Mouldboard	3.21	60	13	9.3
No Bentonite + Control	3.27	60	14	9.3
No Bentonite+ Tandem Disc	3.34	60	14	9.1
Bentonite + control	3.39	58	13	9.1
Bentonite + Deep ripped	3.57	61	13	9.0
Bentonite+ Tandem Disc	3.88	58	10	9.7
No Bentonite + Deep ripped	4.04	60	19	10.7

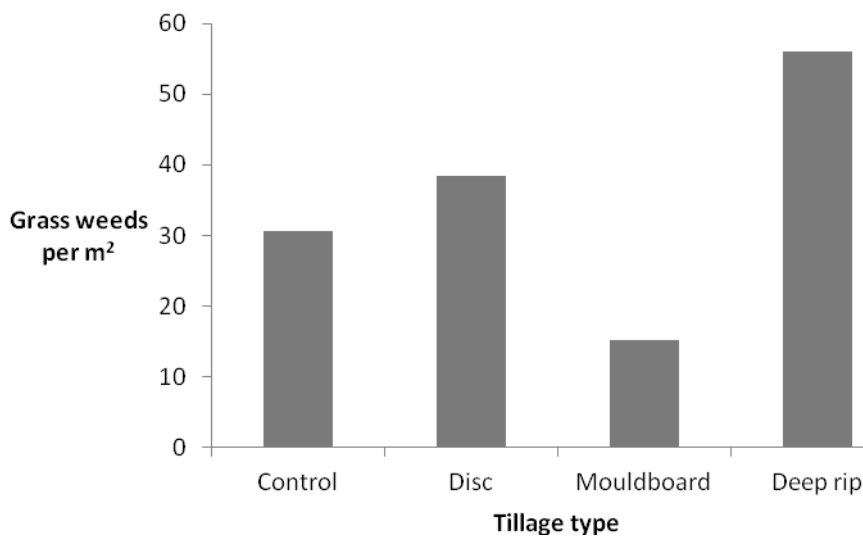


Figure 2: Grass weeds (ryegrass and brome grass) per m² observed in June 2013 after different tillage methods at Miling in 2013.

Comments & Observations

- The application of Bentonite clay has not changed yield or grain quality in the first year after its incorporation. It is suspected that 6 t/ha of Bentonite is not a sufficient rate to increase clay content in the soil to a level that changes yield. This is however, not a replicated trial and results could be influenced by a change in soil type.
- Mouldboard ploughing reduced barley yield due to difficulties in seeding into the loose ploughed soil. Seed was sown deeper than desired due to the use of a heavy air seeder. This resulted in a poor germination of the crop which, in turn, resulted in lower yields. Other experiences have shown that shallow working points or 'Agmor-type' seeding boots can reduce seeding depth issues
- The other tillage practices did not significantly alter yield or quality of grain.
- Less grass weeds were observed in the areas which had been mouldboard ploughed. The discing and deep ripping appeared to have stimulated a germination of grass weeds.
- The host farmer observed that barley growing within the mouldboard ploughed area did not appear as water stressed during the dry June as the deep ripped or untilled areas did.

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