

Effect of Seed Size on Wheat Response to Sowing Depth



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Key Messages

- Sowing wheat 75mm deep compared to 40mm deep reduced crop establishment by up to 62% and wheat yield by up to 24%.
- Within the same variety small seed was much more sensitive to deep sowing than large seed.
- Corack and Mace were the least sensitive varieties to deep sowing in terms of yield.
- Growers should endeavour to use seed larger than 35 g/thousand seeds, especially if sowing into stressful conditions.

Aim

To test the interaction between wheat variety and seed size on the ability to emerge from deep sowing.

Background

There is a strong imperative to sow cereal crops early in WA. This often means sowing into drier than ideal seedbeds. Sometimes the soil surface is dry but there is moisture remaining from summer rain in soil deeper than the normal seeding depth. Deeper than normal sowing to place seed on this moisture can result in earlier crop establishment, but some wheat cultivars will emerge from depth better than others. Among other factors the ability to emerge from deep sowing is related to coleoptile length and seed size. There is also evidence for variation in tolerance to early water deficit, which may also be involved.

Trial Details

Property	Fitzsimons Farm, east Buntine		
Plot size & replication	10m × 1.54m x 4 replications		
Soil type	Sand over gravel		
Soil pH (CaCl₂)	0-10cm: 5.4	10-20cm: 4.4	20-30cm: 4.6
EC (dS/m)	0-10cm: 0.099		
Sowing date	29/05/2014		
Seeding rate	Various, calculated to give 120 plants/m ²		
Paddock rotation	2011: pasture, 2012: wheat, 2013: canola		
Fertiliser	29/05/2014: 80 kg/ha Macropro Plus banded (8 kg/ha N, 11 kg/ha P, 7 kg/ha K)		
Herbicides	28/05/2014: 2 L/ha Spray.Seed, 118 g/ha Sakura 30/06/2014: 670 mL/ha Velocity		
Growing Season Rainfall	180mm		

Results

Establishment

When sown at a normal depth of 40mm all varieties established close to the target 120plants/m² and seed size had no significant effect on establishment (Figure 1). When sown 75mm deep establishment was reduced by as little as 19% (for large Magenta) to as much as 63% (for small Wyalkatchem) compared to normal sowing depth. Small seed suffered a much greater reduction in establishment when sown deep than large seed (52% compared to 32%). There was considerable variation in seed size between varieties in each size class. Figure 2 shows how seed size influenced the effect of deep sowing on establishment. Therefore, seeds that are smaller than 35 g/thousand are much more sensitive to deep sowing.

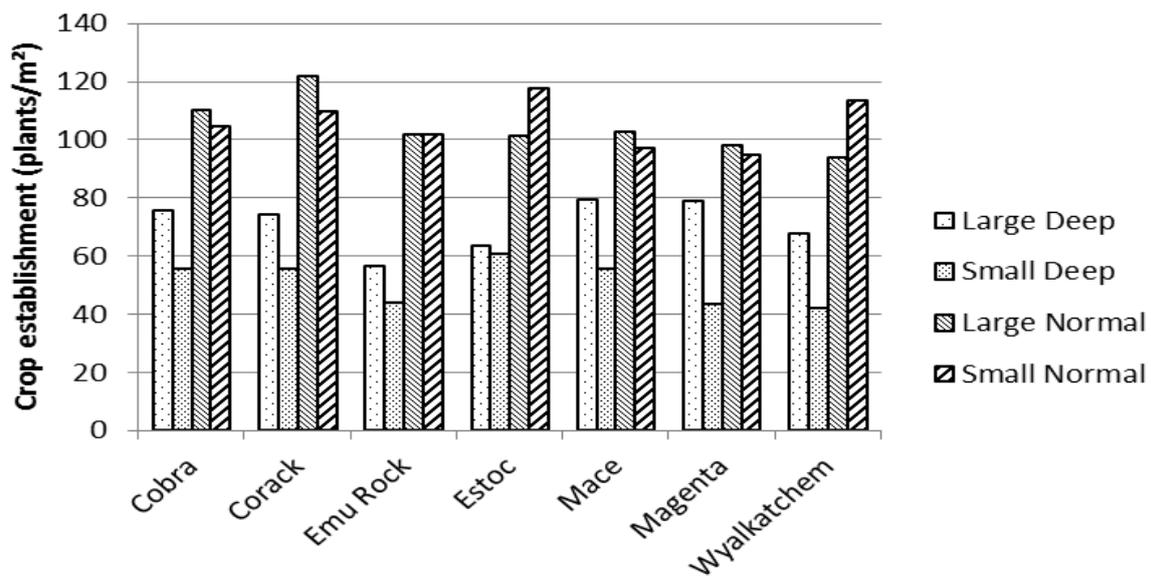


Figure 1: Establishment of seven wheat cultivars when sown using small or large seed 40mm (normal) or 75mm (deep), deep into moist soil.

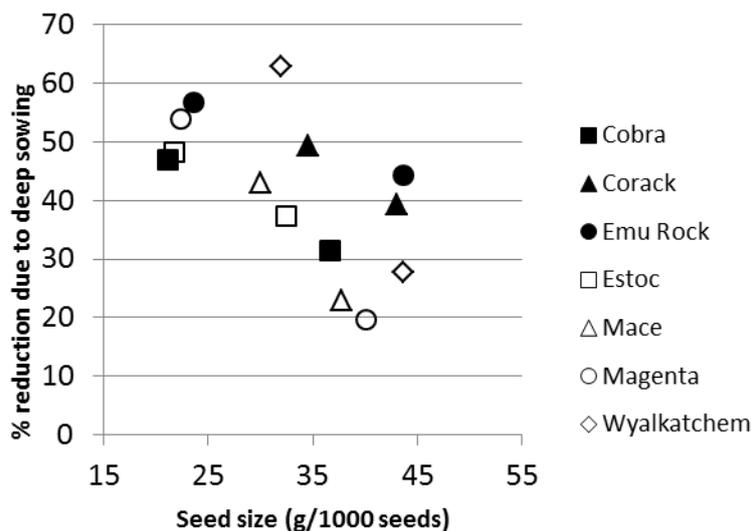


Figure 2: Influence of seed size on how much deep sowing reduces establishment of seven wheat varieties.

Growth and yield

While seed size did not affect establishment when sown at normal depth it did affect early crop growth and development. At the 5-leaf stage small-seeded Mace had 2.4 tillers compared to 3.1 for large seeded Mace, and two months after sowing NDVI (a measure of crop vigour) was 28% greater on normal depth plots sown with large seed than with small seed (Figure 3). The NDVI of large seed plots was 89% greater than small seed plots when sown deep. These early treatment differences carried through to grain yield. Deep sowing reduced grain yield by an average of 8% when using large seed, but by 16% using small seed. The yield of Mace and Corack was least sensitive to deep sowing (7.5% reduction) and that of Wyalkatchem was most sensitive (24% reduction). Corack was the highest yielding variety in the trial.

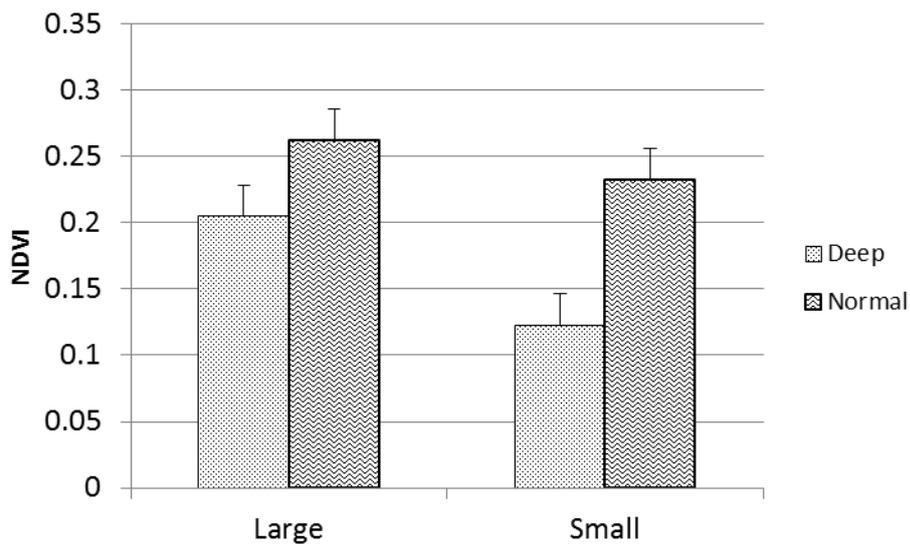


Figure 3: NDVI of wheat plots sown with small large seed at 40mm or 75mm deep on 24/07/2014.

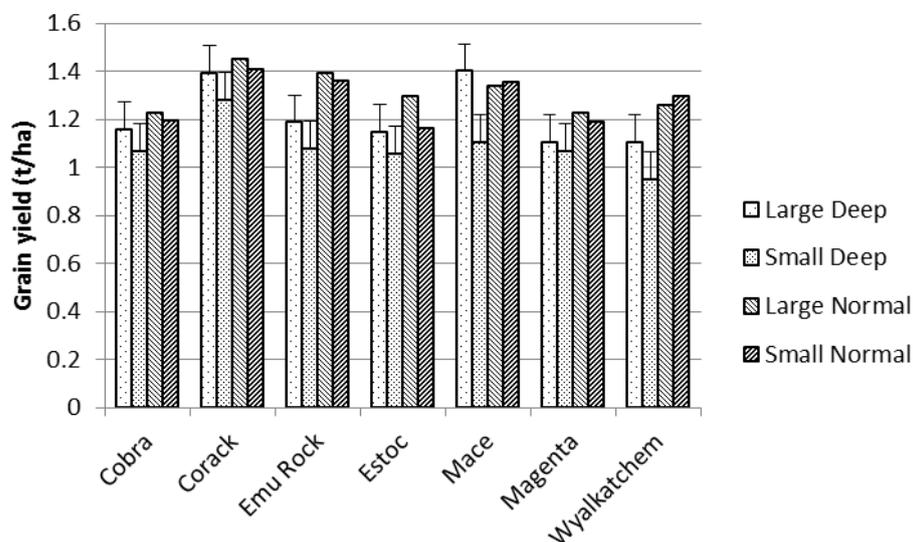


Figure 4: Grain yield of seven wheat varieties sown at 40mm or 75mm deep using small or large seed.

Comments

Deep sowing can reduce wheat crop establishment and wheat yield but is still a worthwhile strategy to achieve early sowing if there is moisture in the subsurface. Although this trial did not test that situation another, trial at Mullewa in 2014 did and found similar responses to variety as well as seed size. While there are varietal differences in how sensitive crop establishment is to deep sowing, seed size has a very large influence and can mask differences between varieties. The extra vigour of plots grown from large seed suggests it will be valuable in other stressful situations early in the life of the crop, such as early drought. Growers should use seed larger than 35 g/thousand seeds for sowing where possible and especially when sowing into a situation where the emerging crop might encounter some stress.

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