Introduction

Timely sowing is one of the most important factors for success in western farming zones. Trials have shown in the past and will continue to show yield penalties for planting late. This was evident at Trangie this year, where there was a yield penalty (averaged across 36 varieties of wheat and 30 varieties of barley) of 18kg/ha/day for wheat, and 16kg/ha/day for barley after a late April sowing.

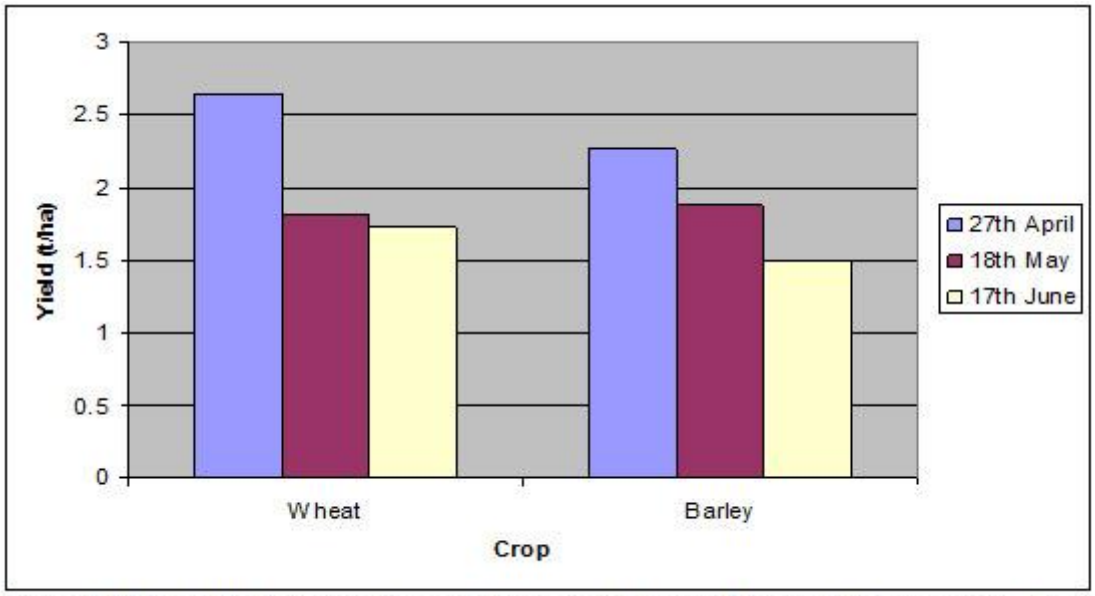

Figure 1: The effect of sow time on yield of wheat and barley at Trangie ARC, 2009

Despite of the obvious advantages early sowing may provide, obtaining an adequate crop establishment can be a challenge. There are a number of factors that may affect the ability of wheat and barley plants to emerge from the soil:

- Depth of sowing (especially in moisture seeking situations).
- Variety choice (coleoptile length).
- Seed treatments (especially fungicides).
- Soil moisture and temperature.
- Pre-emergent herbicides.
- High stubble residues.
- Seed quality.
- Soil condition (i.e. structure, including surface crusting).

The effects of the above factors on crop emergence are generally additive, so good crop establishment will be as a result of limiting exposure to as few of the negative factors as possible.

Coleoptile length

The function of the coleoptile is to protect the cereal shoot until it is emerged through the soil surface; however, where some of the factors described above are combined (e.g. deep sowing, fungicide on seed and a variety with inherently short coleoptile), the coleoptile length may be less than the depth of sowing. In this case, the emerging shoot is left to push the remainder of the way to the soil surface with establishment often being affected as a result.

Varietal choice, depth of sowing and seed treatments

Varietal choice, depth of sowing and seed treatments are the most common management factors that affect crop establishment. While varietal choice and seed treatment may directly affect coleoptile length, these two factors may combine with sowing depth to affect overall emergence.

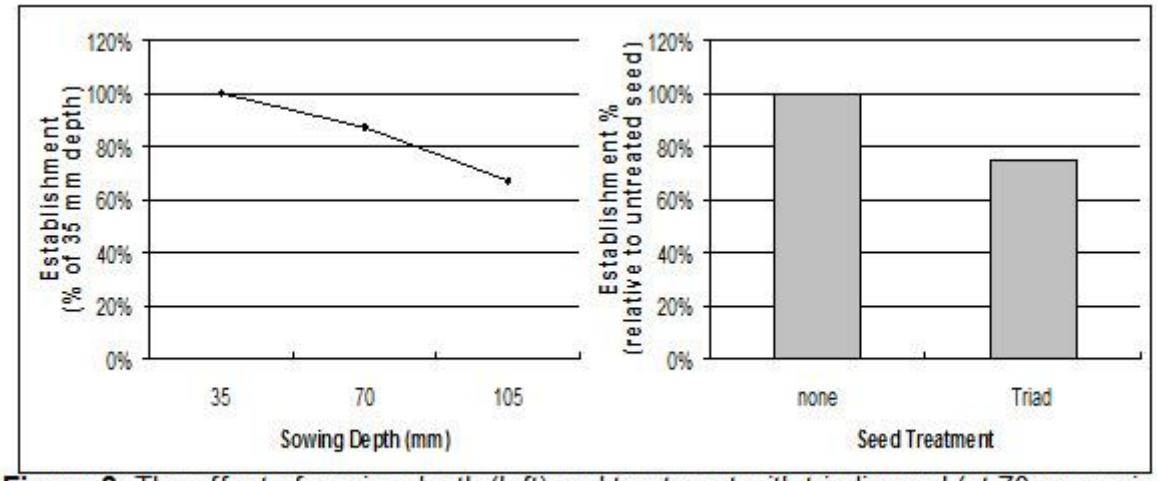

Figure 2: The effect of sowing depth (left) and treatment with triadimenol (at 70cm sowing depth) on emergence of wheat (12 varieties) at Coonamble 2009.

Figure 2 shows that emergence of wheat was reduced as a result of sowing deep and due to applying triadimenol to seed. When compared to the 70mm sow depth with no seed treatment, the reduced emergence as a result of applying triadimenol was similar to the effect of sowing seed at 105mm.

The ability of a fungicide such as triadimenol to reduce coleoptile length (and resulting crop emergence) is common for wheat and barley. Figure 3 shows the effect of triadimenol on the emergence of barley at Condobolin, in 2008 and 2009.

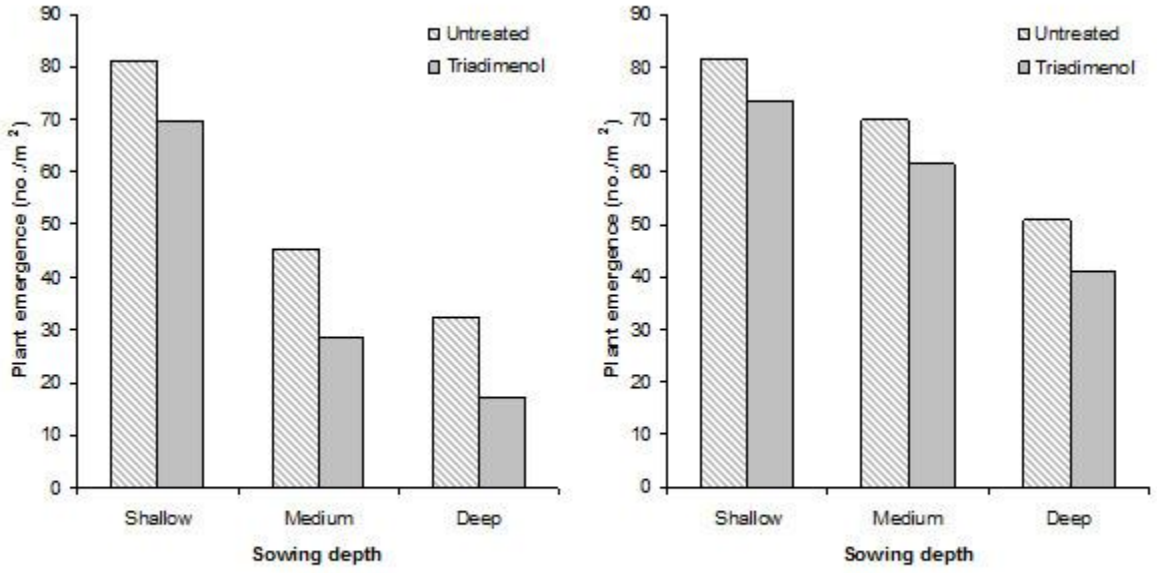

Figure 3: Plant emergence from untreated and triadimenol-treated seed, averaged over 12 varieties in 2008 and 2009

While triadimenol is the main fungicide implicated in reduced crop emergence, it is not the only fungicide that affects coleoptile length. Figure 4 shows the effect of some other commonly used fungicides on coleoptile length of barley. In general the standard treatments for smuts and bunts including tebuconazole (Raxil®), flutriafol (at 25g/L concentration, known as Vincit®) and triticonazole (Premis®) did not have a large impact on coleoptile length, while triadimenol (Baytan®) and flutriafol (at 100g/L, known as Armour®) reduced coleoptile length by approximately 25%.

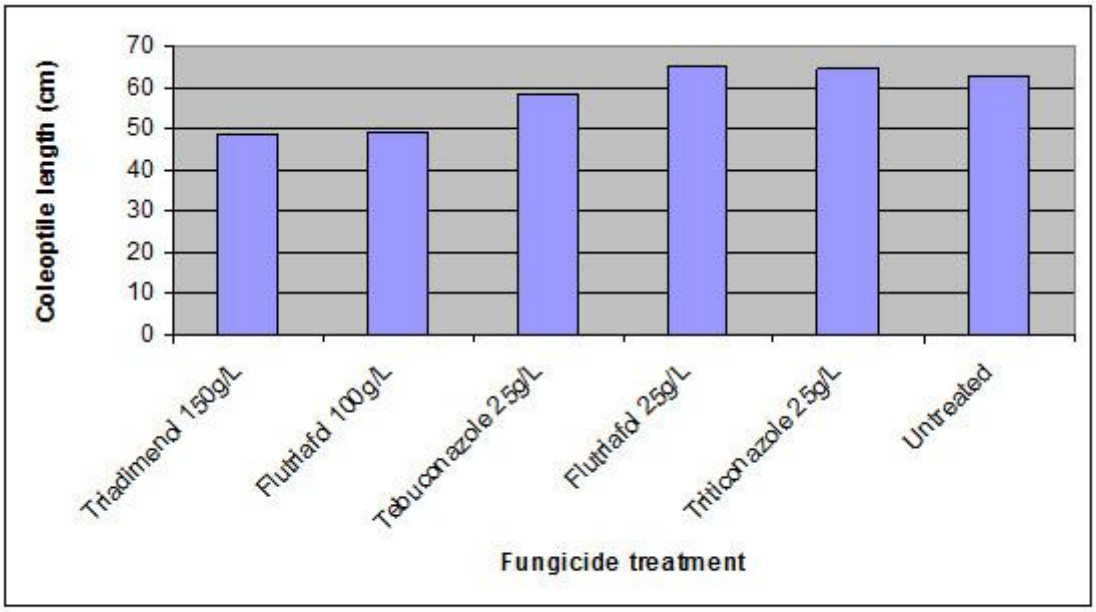

Figure 4: Coleoptile length of barley (10 varieties) as a result of fungicide treatment (from Platz *et al.* 1999)

Triadimenol and tebuconazole are ingredients in some seed treatments that incorporate the insecticide imidacloprid (e.g. Zorro®). It is likely that the fungicide component of these products will affect the coleoptile length to the same degree.

Some newer fungicides have less data available. One example is with Dividend®, which is a combination of difenoconazole and metalaxyl-m, which from anecdotal experience causes little reduction in coleoptile length.

Crop emergence may be affected by variety choice due to inherent differences in coleoptile length. EGA_Gregory has shown relatively poor emergence as a result of deep sowing. Figure 5 shows the emergence of EGA_Gregory from deep sowing relative to other commonly grown varieties. From other trials and anecdotal experience, Sunbri has a relatively short coleoptile, while
Sunvale and Crusader have relatively longer coleoptiles

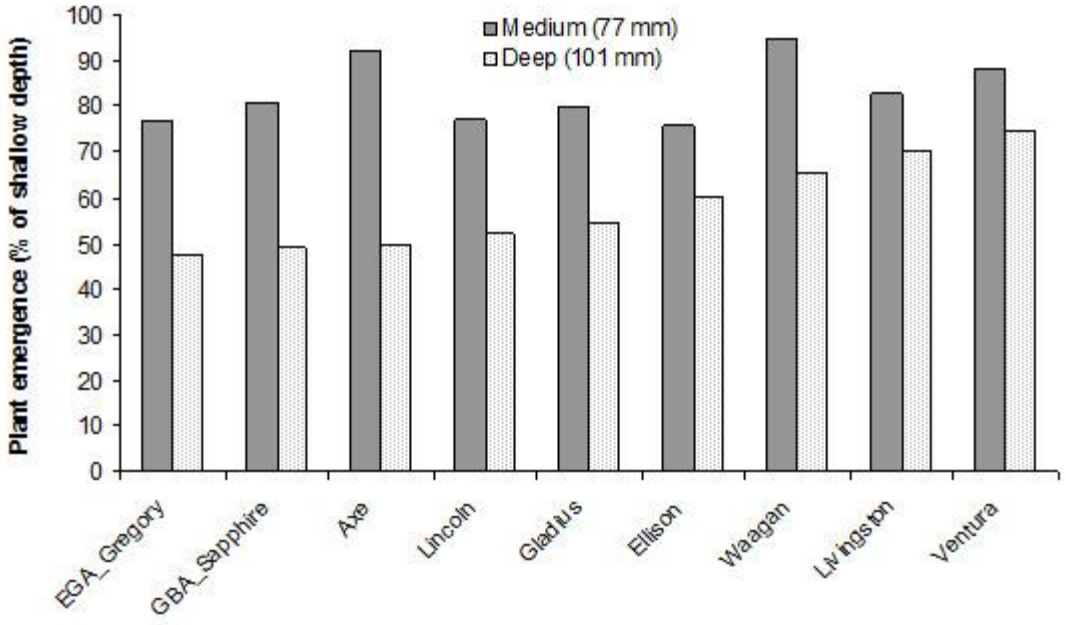

Figure 5: Wheat emergence from medium (77mm) and deep (101mm) sowing, shown as % of shallow (52mm) sowing, Condobolin 2009.

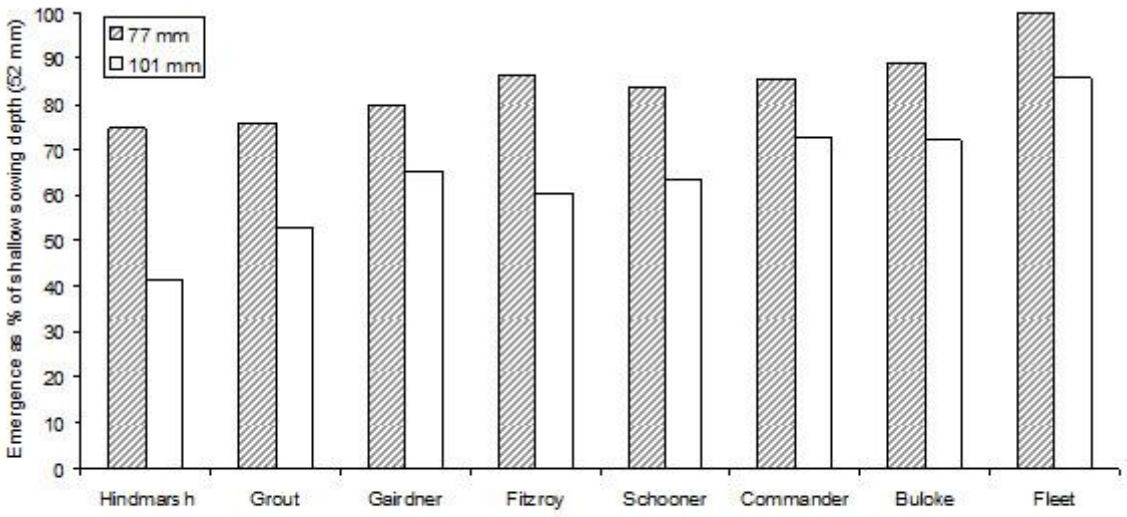

Figure 6: Plant emergence for medium (77 mm) and deep (101 mm) sowing, as a percentage of the emergence from shallow (52 mm) sowing, 2009

Seed quality

Seed size affects coleoptile length for both wheat and barley, both within and between varieties. Barley from the 2007 harvest at Condobolin was graded into three size classes (>2.5 mm, 2.2-2.5 mm, 1.8-2.2 mm) using slotted sieves. Figure 7 shows that plant emergence was greater for large seed for all varieties. With small seed, there were few differences among varieties. The response to seed size was greatest in Fleet, suggesting that part of its superior emergence is due to its inherently larger grain size.

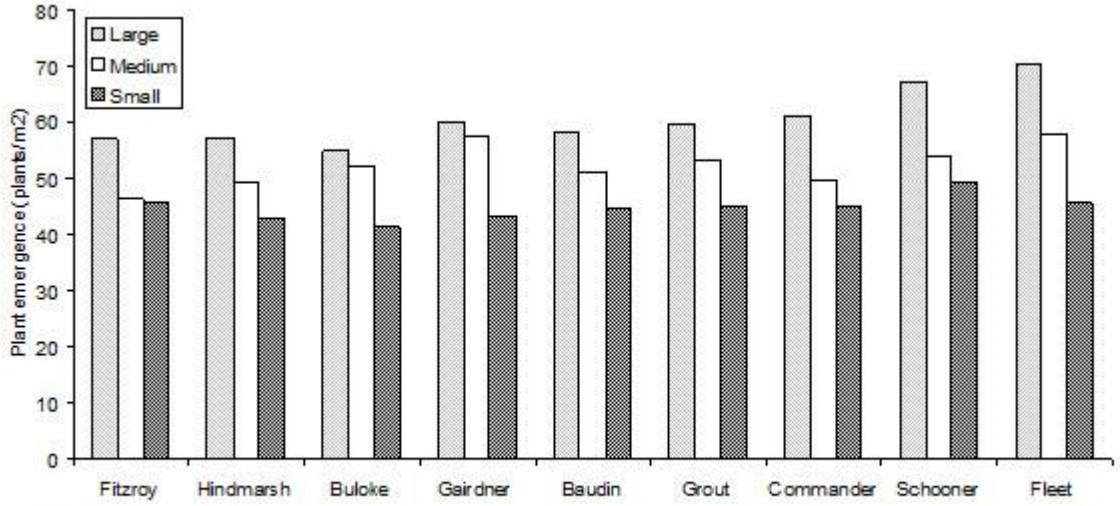

Figure 7: Plant emergence in response to seed size, averaged over three sowing depths, for untreated seed

Effect of crop establishment on yield

While a high establishment rate should be targeted, a low establishment rate does not necessarily equate to poorer yields. In fact, a relatively low but timely establishment as a result of moisture seeking will generally out-yield an excellent establishment sown late. Figure 8 shows a yield advantage for barley from an early deep sowing of 0.8t/ha over a late shallow sowing. The early sowing only had 57 plants per m², while the main sowing had 126 plants per m². Timeliness of sowing will have a more significant impact on yield than the percentage of plant emergence, providing the plant population across the paddock is even

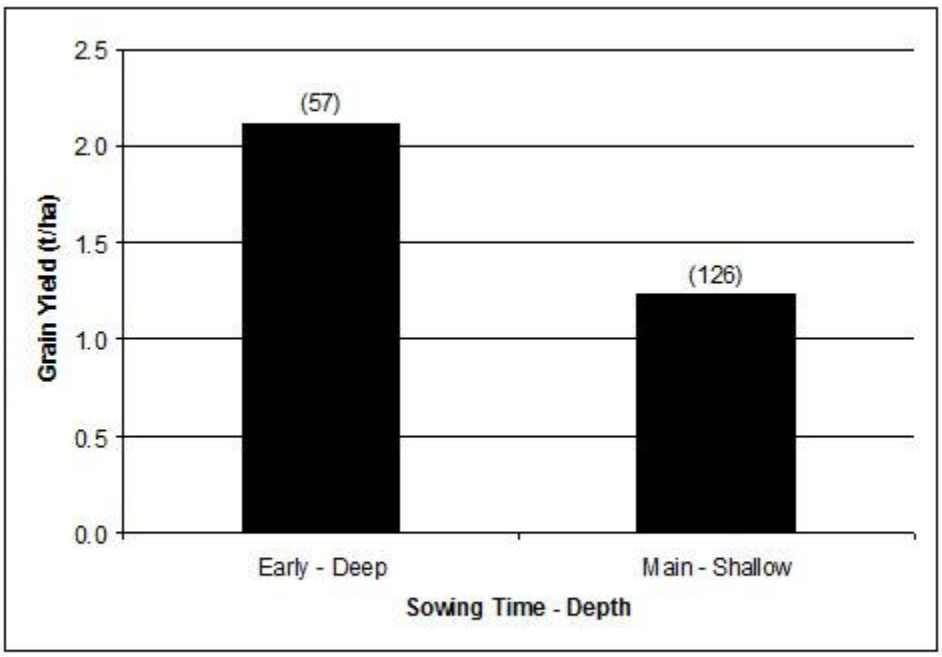

Figure 8: Yield of early deep sowing compared to a late shallow sowing at same seed rate. Resulting plant population per m² in brackets (2007).

Role of fungicides in western farming zones

While it is accepted that fungicides like triadimenol will reduce early infection of stripe rust, there appears little need for application of such fungicides to seed of wheat, especially in western environments. This is largely due to there being available a suite of varieties for which yield is generally not affected by stripe rust. Triadimenol may be useful where barley is a regular crop in the rotation due to its activity against scald and powdery mildew.

A fungicide for smut and bunt control is recommended in at least every second year, as the tolerance to these diseases in the grain of harvest samples is low.

Conclusion

Seed treatments and variety choice are two important factors that affect the coleoptile length of cereals. Other factors such as seed size and soil temperature may also combine to affect coleoptile length. These may combine with sowing depth to reduce overall crop emergence. Crop yield may or may not be affected, depending largely on the timeliness of sowing and the extent to which establishment is reduced. Sowing deep into moisture when required is recommended because of the importance of timely sowing; however, the chance of success will be improved with good variety choice and avoiding fungicides that reduce coleoptile length such as triadimenol

Reference

Platz GJ, Meldrum SI & Webb NA (1999) Chemical control of seed borne diseases in barley. Proceedings of Australian Barley Technical Symposium

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