

# Choosing crop variety for dry sown wheat crops

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## Key messages

- At a cropping program level, production risks such as terminal water deficit, frost and high temperature damage can be managed tactically by choosing the wheat varieties sown.
- Variety choice for each sowing run should take account of the production risk of previously sown or emerged crop and modify schedule accordingly.
- Six opening rain scenarios were considered and Tactical Variety Choice (TVC) was better than or similar to pure Mace in all except the late break scenario (05 June) when 30% crop flowered four days after the optimum flowering window. The TVC was particularly risk averse in early break scenarios (before 05 May).

## Aims

There is no wheat variety specifically bred, recommended or identified for dry sowing conditions. However, tactical variety choice (TVC) can help manage some risks associated with dry seeding programs.

Major risks of dry seeding are poor crop establishment (emergence) and yield loss due to frost and terminal stresses of high temperature and water deficiency. There is currently no information about varietal differences in emergence in response to dry sowing. Frost and terminal hot and dry finishing conditions however, pose serious risks that can, to significant extent, be managed by appropriate variety choice. This is applicable to both dry and wet sown crops but uncertainty arising due to timing of opening rains and subsequent germination makes variety choice more difficult when crops are sown in dry soil.

Flowering Window and Flowering Spread are the two relevant concepts often recommended for managing these in-season risks of temperature and crop available water. They might look similar in the first place however, there is subtle difference in the way the two concepts protect yield and farmer profits. The flowering window is location and season specific and refers to the period (generally two weeks) that corresponds to the highest yielding flowering time for that location. The flowering window approach can be applied to a single paddock in isolation. Flowering spread is a buffering concept to mitigate the damaging effect of spring frosts and manage the trade-off with heat events. Flowering spread operates at the farm level and works on spreading risk across multiple flowering dates. Thus the two approaches are complimentary and both are necessary for a high yielding cropping program with minimised environmental risks. Many consultants and farmers aim to create a reasonable flowering spread around the mid-point of relevant flowering window. As mentioned above, this is a tedious exercise for dry sowing programs that is complicated by uncertainty of germination date of dry sown crops.

This paper aims to promote farmer confidence in dry seeding by providing a suggested framework for tactical variety choice for dry seeding programs and demonstrates that by using flowering predictions that a dry sown program can be designed that both flowers within the optimal window, as well as achieves a reasonable spread of flowering. We use Merredin as an example location. Other locations will have a different range of stresses and the optimal flowering window will differ, however, the concepts will remain relevant.

## Method

### *Proposed tactics for matching variety to sowing date in dry sown program*

On any given day the choice of variety to sow depends on sowing date, whether the season has broken, and the varieties previously sown.

1) Start with a long season variety in late April or early May.

2) Choice of variety for next Paddock would depend upon whether the previous lot has germinated or not. If the answer is 'Yes': You might need to sow more of long season variety (e.g. Yitpi) because the already germinated lot will flower close to mid-season variety (e.g. Mace) being sown now.

3) If the answer is 'No': You may not need to sow anymore of long season variety because the two lots will germinate at the same time. Rather, you should now include mid and short season varieties to tailor the desired spread.

Likewise, at every subsequent sowing run, dry or wet, one must consider when the previously sown (or emerged) crop is likely to flower in given seasonal scenario and then develop/modify schedule for remaining programme.

4) Overriding all this will be actual sowing date. If the end of sowing window has already passed for a given variety then move to an early flowering variety.

**What we did**

Six opening rain scenarios were assumed for Merredin and percentages of cropped area that flowered on each day were calculated. Within each scenario, two variety options were compared: Mace throughout vs TVC following the strategy described above.

Dates of opening rain for scenarios were: 21 April, 26 April, 05 May, 15 May, 25 May and 05 June.

Our focus here is solely on flowering date. Throughout this paper we have used four wheat varieties of differing duration to flowering: EGA Wedgetail (very long season), Yitpi (long season), Mace (mid season) and Cobra (short-mid season). Dates and varieties for different scenarios are shown in **Figure 1**. There may be newer varieties that are better suited to WA conditions however, they will have similar flowering dates.

For the sake of comparisons, it was assumed that sowing for all scenarios commenced on 21 April and equal number of hectares was sown on each sowing day until 10 June. In real world, there will be some missing dates but because of simultaneous germination of all dry sown runs and flowering date dependence upon date of emergence rather than sowing, tactics for matching of maturity types to sowing date will remain the same.

Flowering dates (median values over seasons) were looked up corresponding to the date of opening rains for the dry sown and from date of sowing for the wet sown crops from DM model predictions as displayed in Flower Power. Results were compiled at the program level.

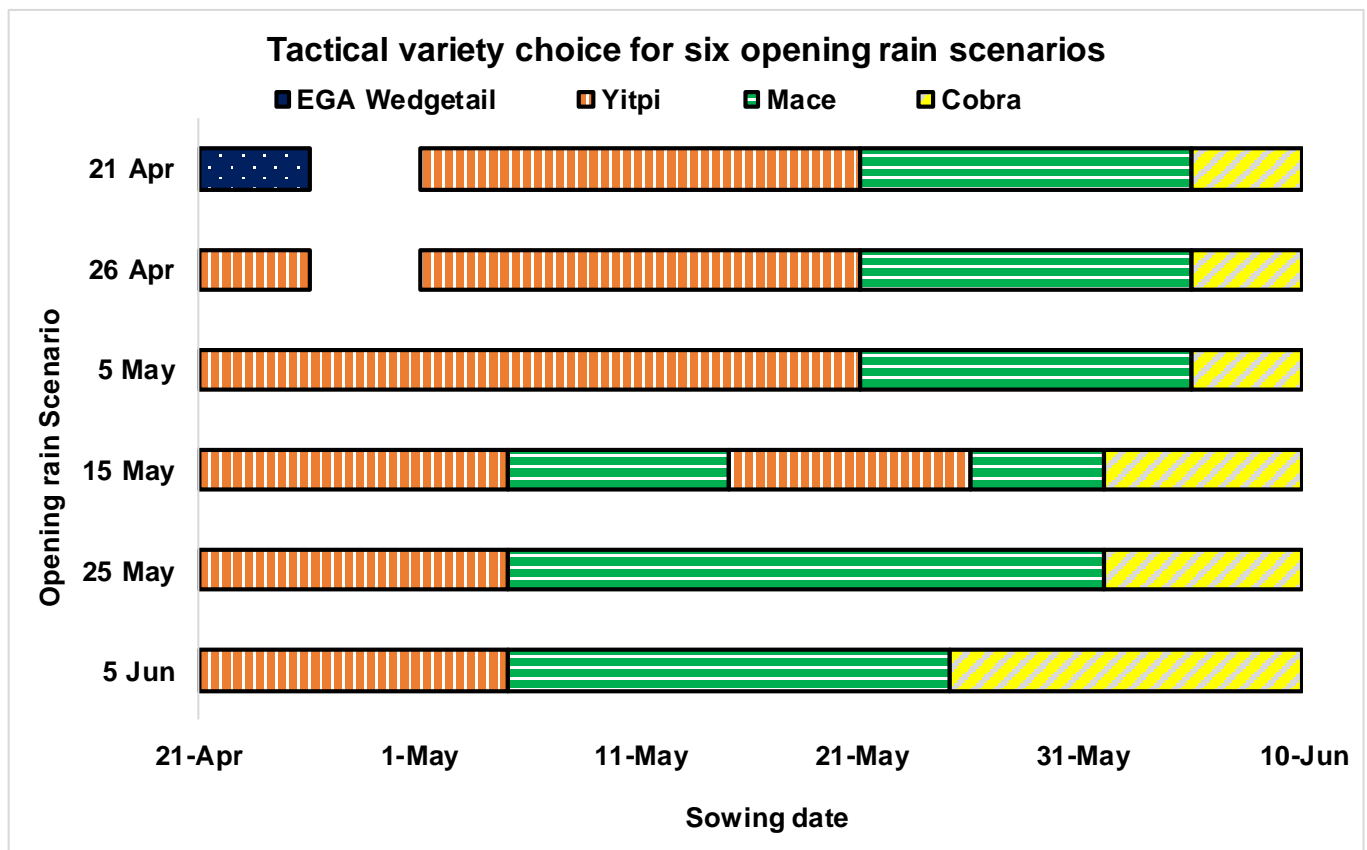


Figure 1. Variety chosen under the Tactical Variety Choice strategy for six opening rain scenarios in a dry seeding program at Merredin

**Results**

Comparison of Mace with TVC in the six scenarios is given in **Table 1**.

**Table 1. Percentage of crop area flowering on different dates for Mace vs Tactical Variety Choice strategy under six opening rain scenarios in a dry seeding program at Merredin**

Flowering date	Season break	Season break	Season break	Season break	Season break	Season break	Season break	Season break	Season break	Season break	Season break	Season break
	21 April	21 April	26 April	26 April	05 May	05 May	15 May	15 May	25 May	25 May	05 June	05 June
	Tactical Variety Choice	Mace	Tactical Variety Choice	Mace	Tactical Variety Choice	Mace	Tactical Variety Choice	Mace	Tactical Variety Choice	Mace	Tactical Variety Choice	Mace
25-Aug		3		3								
26-Aug												
27-Aug		3		3		29						
28-Aug		3		3		2						
29-Aug		3		3		2						
30-Aug		3		3		2						
31-Aug			11									
1-Sep		3		3		2						
2-Sep		5		5		4						
3-Sep		3		3		2						
4-Sep		3		3		2						
5-Sep	2	3	2	3		2						
6-Sep	5	3	4	3		2	20	49				
7-Sep	2	3	2	3		2		2				
8-Sep	2	5	2	5	29	4		4				
9-Sep	2		2		2							
10-Sep	5	5	4	5	4	4		4				
11-Sep	7	3	7	3	6	2		2				
12-Sep	2		2		2							
13-Sep	9	5	9	5	8	4		4				
14-Sep	9	5	9	5	8	4	29	4	41	69		
15-Sep	7	3	7	3	6	2	6	2	2	2		
16-Sep	7	5	7	5	6	4	6	4	4	4		
17-Sep	5	3	4	3	4	2	4	2	2	2		
18-Sep	5	3	4	3	4	2	4	2	2	2		
19-Sep	2	3	2	3	2	2	4	2	2	2		
20-Sep	2	3	2	3	2	2	4	2		2		
21-Sep	5	5	4	5	4	4	6	4	4	4		
22-Sep	2	3	2	3	2	2	6	2	31	2		
23-Sep	2	5	2	5	2	4	2	4	2	4	63	92
24-Sep	5	5	4	5	4	4	4	4	4	4	4	4
25-Sep	2	5	2	5	2	4	2	4	2	4	2	4
26-Sep	7		4		4		4		4		4	
27-Sep	2											
28-Sep												
29-Sep											27	

Percentage of cropped area flowering before the commencement of flowering window was much higher for Mace monoculture in comparison to when varieties were chosen tactically. It may be noted that EGA Wedgetail was not considered suitable for tactical variety choice and appeared in our table only when the big rain event was received as early as 21 April. For 05 June scenario, flowering spread was narrow and about a quarter of the TVC program flowered about four days after the target window.

Between Anzac day and 01 May, if we sow Yitpi it flowers 1-5 days before the window and if we sow Wedgetail, that flowers 3-5 days later. While it suggests that a WA suited variety flowering later than Yitpi but earlier than Wedgetail is needed to fill this gap, it might, in the meanwhile, be better to sow canola during these days and restart wheat with Yitpi after 01 May. Hence, considering the range of cultivars available in WA, it seemed prudent to 'not' sow wheat between 26 April to 01 May at Merredin.

### *Proportion of different varieties in the TVC*

Proportion of different varieties in the TVC is given in **Table 2**. Except for the 05 June opening rains scenario, more than 80% of the area was sown to mid season (Mace) and long season (Yitpi) varieties. Short season variety occupied about 1/3rd of the sown area in 05 June scenario. This is in line with the shortened length of available season although many growers would also consider paddock culling as arrival of rains is delayed past May end. Further, by this point in season, yield potential has already declined and our previous research has shown that varietal differences for yield are also reduced (Sharma et al 2008). Thus it was possible to cover most scenarios and find an appropriate mix of flowering dates with only three varieties of differing maturity.

**Table 2. Proportion of different varieties in the Tactical Variety Choice strategy in a dry sowing program at Merredin**

Variety	Opening rains 21 April	Opening rains 26 April	Opening rains 05 May	Opening rains 15 May	Opening rains 25 May	Opening rains 05 June
EGA Wedgetail	11	0	0	0	0	0
Yitpi	43	54	59	49	27	27
Mace	33	33	29	31	53	39
Cobra	13	13	12	20	20	33

### *Other varieties*

It may be noted that the varieties chosen in this paper were picked as examples of different maturity classes rather than yield potential or quality of the grain they produce. It will therefore be pertinent to substitute desired varieties for the similar maturity class in Figure 1 and double check the outcome using Flower Power. The Flower Power flowering prediction tool supports variety choice by determining the flowering time of varieties from a range of crop emergence dates.

### **Conclusion**

Cropping programs include a variety of crops sown on a wide range of sowing dates which will be exposed to a range of production risks including terminal water deficit, frost and high temperature during grain development. Using a tactical variety choice strategy, managers can successfully influence these risks by variety choice and the timing of crop emergence.

A TVC approach in most scenarios gave a more effective spread of flowering within the optimum flowering window compared with a simple approach of sowing all mid-season variety (Mace). Thus, by using a simple framework the risks of frost, heat and terminal drought can be managed at the program level even in a dry sown scenario.

### **Key words**

Dry sowing, flowering window, flowering spread, sowing window, early sowing

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