# Investigating winter wheat varieties for increased yield production – West Kendenup trial.

Dan Fay, Research & Development Co-ordinator, SCF

In 2023 SCF was awarded a tender to investigate the productivity of various winter wheat varieties, to be sown on a broadscale within the high rainfall zone (HRZ) of WA, with investment from the Grains Research and Development Corporation (GRDC).

Winter wheat makes up a small yet growing proportion of wheat production in the Albany Port Zone as farmers seek out new varieties that are better suited to the unique environment that typifies the lower Great Southern region. Traditionally, spring varieties which have been bred for conditions more suited to the WA wheatbelt, Wimmera and central NSW, (shorter season length, medium rainfall, and hot dry finishes) have been grown in our region. However, the push to seed earlier, and take advantage of early rainfall within the Great Southern region has driven the desire to find longer season cultivars that will extend the growing season to take advantage of typically wet March/April conditions.

Mount Barker has a 31-year average rainfall of 38.5mm for March and 45.4mm for April (Silo Data). This provides ample plant available water for wheat to germinate. However, this is too early in the season for spring wheat to be sown, without the risk of frost damage, and low photothermal quotations limiting yield.

## SO, WHAT DRIVES WHEAT DEVELOPMENT? SPRINGS VS. WINTERS

The growth development of wheat from vegetative to reproductive stage is primarily driven by a photoperiod or vernalisation demand. As a rule, spring dominant varieties are driven by photoperiod while true winter wheats are driven by a vernalisation period. To put this simply, winter wheats require a cold weather accumulation period to move on from a vegetative state to a reproductive state, and spring wheats are triggered by available daylight.  This is why late sown spring wheat crops can progress rapidly.

Within these two groups (winter and spring wheats) there is a range of seasonal lengths, with both quick and slow spring wheats and quick and slow winter wheats.  To complicate things, two identical cultivars can develop differently under different geographical and climactic conditions.

The main difference between spring and winter wheat is that spring varieties, when sown at different times or in different years, are relatively flexible in their flowering date.  As a result of this, the seeding window and subsequent flowering window can be manipulated to target specific flowering dates to take advantage of maximum solar radiation and avoid frosts and heat stress. Winter wheats will remain in a vegetative state until their cold accumulation is complete. This means that they have a set period in which they will remain vegetative regardless of sowing date. Crucially it is this cold requirement that drives yield. The vernalisation period gives the plant time to tiller and build ample biomass, beyond what a spring wheat can, even when being grazed. This biomass is the key to driving grain yield.

The vernalisation requirement of winter wheats makes them an unviable option in climates where the growing season is short. If the season starts late and ends early, winter wheats will remain vegetative longer than desired, and will mature too late in the year, risking drought and heat stress, resulting in diminished yields and poor-quality grain. Although the lower Great Southern region can be prone to early cut offs to the season, the ability to seed wheat in late March/early April in most years makes winter wheats a viable option for growers in this region.

## AND WHAT DIFFERENTIATES WINTER WHEATS FROM EACH OTHER?

Two key things: How long the cold period requirement is for each cultivar, and what other genes affect the development, after the cold requirement has been satisfied. Research conducted by CSIRO found that in controlled lab experiments, all wheat genotypes (winter and spring) responded to an increase in photoperiod, while only winter varieties responded to an increased vernalisation period. Basically, winter wheats have two drivers that affect their development and spring wheats have one.

For most true winter wheats, the cold requirement is relatively similar, with RGT Accroc, DS Bennett and RGT Cesario all requiring a fairly similar vernalisation period, and what differentiates these cultivars can be the photoperiod driver that kicks in after the vernalisation requirement is met. This makes

it tricky to assess how cultivars will perform when transplanted to different environments. For example, the vernalisation requirement might be achieved in a very similar time period in Tasmania as it would in Mt Barker, however the plant available water (PAW), temperature and day length that crop finds itself in, after fulfilling vernalisation requirement, could be drastically different.

## 2023 WINTER WHEAT TRIAL

Currently most of the popular winter wheats grown in the Eastern States HRZ's are deemed too slow for our conditions if they cannot be seeded in late March and early April, and even then, they will be unlikely to be harvestable until January. There are quick winter wheats such as Illabo, but this does not seem to be a perfect fit for our environment as its vernalisation period is not long enough for early seeding, but generally too long for standard spring wheat seeding windows.

However, given wheats often react differently in differing environments, SCF set up a trial to examine how five winter wheat cultivars would perform in the APZ, when seeded alongside each other under the same management strategy.

The trial is hosted by the Slade family in West Kendenup and is a broadscale demonstration trial including the following cultivars:

- RGT Acrocc
- DS Bennett
- Illabo
- RGT Cesario
- Mohawk (early sown - 5 April)
- Mohawk (late sown - 12 May)

All cultivars were seeded at 80kg/ha. Each cultivar was seeded on the 5 April, excluding the late Mohawk which was seeded on the 12 May. These were then managed identically within the growing season with development stages being observed in order to determine both suitability and productivity of each cultivar within the region.

## RESULTS

### Plant Establishment

The plant establishment across each variety was relatively similar. This is encouraging given the trial was seeded into marginal PAW, and the paddock was prone to non-wetting. However, given these are winter wheats, plant establishment is not a great indicator of yield potential as it is the vernalisation period that is the key driver of tiller numbers. Head counts will be conducted at harvest to assess how many heads per m2 were produced for each variety.

*Table 1. Plant establishment as plants per m2 for 5 different winter wheat varieties sown at Mt Barker.*

| DS Bennett | RGT Accroc | Illabo | Mohawk Early | Mohawk late | RGT Cesario |
|---|---|---|---|---|---|
| 22.1 | 24.2 | 22 | 25.1 | 26.7 | 20.5 |

### Flowering dates

The flowering dates varied by 43 days from earliest maturing to the latest maturing variety. The quick winter wheats, Illabo and Mohawk, reached flowering around a month earlier than the traditional winter wheats.

Interestingly, research from the high rainfall regions of eastern Victoria would suggest RGT Accroc should be slower maturing than DS Bennett, however, this was not the case here. This highlights the importance of assessing cultivars under local conditions, and assessing how cultivars deal with differing levels of environmental stress.

*Table 2. Flowering dates for 6 varieties of winter wheat grown in Mt Barker.*

| RGT Accroc | DS Bennett | RGT Cesario | Illabo | Mowhawk Early | Mowhawk Late |
|---|---|---|---|---|---|
| 3 Oct | 9 Oct | 17 Oct | 8 Sept | 4 Sept | 22 Sept |

### Harvest

The trial will be harvested in late December/early January. Senescence date, head counts, yield, and grain quality will be measured at this time. It is hoped that this trial will provide critical and locally relevant data that highlights the productivity and adaptability of winter wheats to the high rainfall regions of WA.

GRDC GRAINS RESEARCH & DEVELOPMENT CORPORATION