Heat Stress and Frost Risk in Irrigated Wheat Crops

ICC GRDC Irrigated Update Moama

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Which is worse, frost damage or heat damage?
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Missing heads
Missing grains
Shrivelled grain
Up to 100% worst case loss
Often hard to tell when less than 15% loss
Complex with drought stress
Which is worse, frost damage or heat damage?

Head tipping
Cooked crop
stress
Loss of the 3rd, 4th or 5th grain in the floret
Complex with drought
Smaller or at worst shrivelled grain.
% loss? Rarely 100% but often hard to tell.
Why? Decreases the length of grain filling. Each 1°C over 30°C is 3 days less.
More importantly which is most likely, frost damage or heat damage?
2.2°C in here

0°C down here

1.5m high

?°C up here
What We Did

We chose 5 sowing dates starting at ANZAC Day and roughly every 10 days after that, 25th April, 10th May, 25th May, 10th June, 25th June

We “sowed” Janz wheat on those dates in the Yield Prophet® program that uses the APSIM model. Prewatered and 2x spring
It then gave us the average flowering period for wheat over a 100 years.

We decided to look at all frosts below +2°C
And at moderate to heavy frosts below 0°C
5 days before or 15 days after flowering

We decided to look at all heat stress above +30°C
And at moderate to harsh heat stress above +34°C
In the grain fill period 30 days after flowering.

We then counted the numbers of days historically where frost and heat at these temperatures and flowering dates could have affected the crop.

Death by Excel spreadsheet.
2 week period where the daily risk of either is less than 5%
Between 10-25 September
Negligible frost risk at normal sowing times.
% Chance of frost happening near flowering

Flowering date

% Chance
<2oC
<0oC
% Chance of heat shock during grain fill

Flowering date

% Chance

>30°C
>34°C

41532 41544 41556 41568 41580
In a nut shell

At Deniliquin

The chance of minor frost at the earliest sowing date was significant. The chance of moderate to major frosting is negligible at all times

Choosing sowing dates based on frost risk alone would seem to be unnecessary.

The chance of minor or worse heat shock is a very common even at the earliest sowing date. Becoming almost certain at later sowing dates
The chance of moderate to major heat shock is minor at the early sowing date but rises dramatically to almost certain at the later dates.

More attention to matching flowering windows to avoid heat is needed.
THANKYOU
<table>
<thead>
<tr>
<th>Deniliquen Flowering date</th>
<th>% Chance of a frost near flowering</th>
<th>Median No. days in years with frost</th>
<th>% Chance Range in No. of days</th>
<th>Median No. days in years at grain fill</th>
<th>% Chance Range in No. of days</th>
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