



Office Use Only

Project Code	
Project Type	

FINAL REPORT 2021

Applicants must read the *SAGIT Project Funding Guidelines 2021* prior to completing this form. These guidelines can be downloaded from www.sagit.com.au

Final reports must be emailed to admin@sagit.com.au as a Microsoft Word document in the format shown ***within 2 months*** after the completion of the Project Term.

PROJECT CODE	:	MSF218
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PROJECT TITLE	(10 words maximum)
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Investigating frost susceptibility in Clearfield varieties treated with imidazolinone herbicide

PROJECT DURATION

*These dates **must** be the same as those stated in the Funding Agreement*

Project Start date	8/5/2108
Project End date	30/6/2021

PROJECT SUPERVISOR CONTACT DETAILS

The project supervisor is the person responsible for the overall project

Title:	First Name:	Surname:
Ms	Tanja	Morgan
Organisation:		
Mallee Sustainable Farming Inc		

PROJECT REPORT

Provide clear description of the following:

Executive Summary (200 words maximum)

A few paragraphs covering what was discovered, written in a manner that is easily understood and relevant to SA growers. A number of key dot points should be included which can be used in SAGIT communication programs

This project set out to determine if Clearfield crop varieties were more susceptible to frost damage with and without imidazolinone herbicides. After three years the findings were that whilst some Clearfield varieties in some years had more frost damage this was not widespread and consistent across all Clearfield varieties and frost damage is likely more closely linked to the timing of the frost event occurring at a susceptible growth stage which could have been a few days different to the conventional varieties.

The greatest determinant of increased frost risk was early sowing. As the project investigated time of sowing there was a clear link to increased frost damage with the first time sowing in mid April therefore it appears frost damage risk is increased if wheat is sown prior to May in the Loxton region.

The observed issue of higher incidence of frost with the use of Clearfield varieties could be an outcome of management. Clearfield varieties are popular with growers as they provide opportunities for in crop weed control and are often sown earlier or as a dry sowing option, or on lighter soil types where brome grass is typically a problem and where frost damage can also be worse.

Lentils were only trialled over two years, but yields were maximised by accepting a higher level of frost damage in early sown crops rather than delay sowing to minimise frost damage.

Key dot points

- The outcomes of the 2020 trials were consistent with similar trials conducted in 2018 and 2019.
- On average there was no indication that varieties with the Clearfield trait or the application of Intervix® herbicide were more susceptible to frost damage.
- Observations that Clearfield crops are more susceptible to frost damage could be due to how they are managed in the farming system rather than the Clearfield gene.
- The greatest determinant of the level of floret sterility in cereal crops was time of sowing.
- High levels of floret sterility were observed in fast spring wheat varieties sown before the start of May.
- In lentils the highest grain yield was achieved with earlier sowing despite higher levels of frost damage while delayed sowing was a better approach in field peas.

Project Objectives

A concise statement of the aims of the project in outcome terms should be provided.

The project aims to answer the following questions:

- Does applying imidazolinone herbicide to Clearfield varieties impact on frost susceptibility?
- Does the timing and rate of the imidazolinone herbicide application impact on frost susceptibility?

Overall Performance

A concise statement indicating the extent to which the Project objectives were achieved, a list of personnel who participated in the Research Project including co-operators, and any difficulties encountered and the reasons for these difficulties.

This project was managed and extension activities coordinated by Tanja Morgan, MSF with research conducted by Michael Moodie Frontier Farming Systems and additional technical input at field days provided by consultants Jeff Braun, Mick Faulkner and researcher Kenton Porker.

The project met all KPI's despite some early challenges with changes to the project team at the beginning of the project and two very dry years in 2018 and 2019. As Tim March had left the University of Adelaide when the project started there was no support to help with the frost assessments at the site or technical oversight to help with the data analysis.

Michael Moodie worked with Frost Researcher Ben Biddulph DAFWA to develop a suitable protocol and trained his staff to assess frost induced sterility. Michael also absorbed the cost of the data analysis and outsourced this to Ray Correll, Rho Environmetrics.

When Tim March left the commitment to host the site at the Adelaide Uni frost site was also revoked leaving no opportunity to irrigate early time of sowing treatments. The first two years of the project, 2018 and 2019 were drought years and irrigation was required at the site for all TOS treatments. A variation was submitted to SAGIT to fund the cost of irrigation infrastructure and time to irrigate plots. In 2020 only the first TOS required irrigation.

The project had also planned to sow canola conventional and Clearfield as a comparison however Michael had found that cockatoos were damaging canola plots sown in isolation in trial plots. To reduce the risk of potential losses from birds the canola was replaced with lentils and field peas where Clearfield varieties were available in the final year as a comparison. Pulses are the more representative break crop in the Mallee with little area sown to canola therefore this change has resulted in more useful information for growers.

Key Performance Indicators (KPI)

Please indicate whether KPI's were achieved. The KPI's **must** be the same as those stated in the Application for Funding and a brief explanation provided as to how they were achieved or why they were not achieved.

KPI	Achieved (Y/N)	If not achieved, please state reason.
1	Sow and manage trial, collect samples and yield	Completed October 2018
2	Analyse trial data, develop compendium article of research results	Completed February 2019
3	Deliver frost data at annual field day/ MRU	Completed November 2018
4	Sow and manage trial, collect samples and yield	Completed November 2019
5	Analyse trial data, develop a compendium article of research results	Complete March 2020
6	Deliver frost data at annual field day/ MRU	Completed February 2020
7	Sow and manage trial, collect samples and yield	Completed May 2020
8	Analyse trial data, develop a compendium article of research results	Completed April 2021
9	Deliver frost data at annual field day/ MRU	Completed March 2021
10	Project final report	Completed April 2021

Technical Information (Not to exceed **three** pages)

Provide sufficient data and short clear statements of outcomes.

Please refer to the 2020 compendium article.

Supporting documents include – Report on Cereal Frost Trials 2018-2020 conducted at Loxton.

Conclusions Reached &/or Discoveries Made (Not to exceed **one** page)

Please provide concise statement of any conclusions reached &/or discoveries made.

The outcomes of the 2020 trials were consistent with similar trials conducted in 2018 and 2019.

The outcomes found instances where the varieties used in the Clearfield system were more affected by frost than the corresponding conventional varieties. However, these effects were not always consistent across varieties and in particular crops with Clearfield varieties of barley and lentils sometimes having less damage than the corresponding conventional options. On average there was no indication that varieties with the Clearfield trait or the application of Intervix® herbicide were more susceptible to frost damage.

The greatest determinant of the level of floret sterility in cereal crops was time of sowing.

Sowing wheat before the start of May resulted in the highest levels of frost damage which in turn negatively impacted grain yield. This impact was somewhat mitigated in 2020 by sowing

the combinations of Gladius – Kord or Trojan – Sherriff. These varieties were slightly slower in their development and therefore escaped significant floret sterility at TOS 2 (29th April).

Clearfield barley options were better suited to early sowing with Scope CL yields maximised when sown in mid-April and Spartacus CL yields maximised when sown from Anzac Day onwards.

Pulse crops were less affected by frost than cereal crops at this site in 2020, although early sowing did increase, the number of frosted pods in both lentils and field peas. For lentils, yields were maximised by accepting a higher level of frost damage in early sown crops rather than delay sowing to minimise frost damage. However, in field peas, delayed sowing improved grain yield, however this benefit may not have only been due to reduced frost damage but also be due to disease and other biotic and abiotic factors.

Intellectual Property

Please provide concise statement of any intellectual property generated and potential for commercialisation.

NA

Application / Communication of Results

A concise statement describing activities undertaken to communicate the results of the project to the grains industry. This should include:

- *Main findings of the project in a dot point form suitable for use in communications to farmers;*
- *A statement of potential industry impact*
- *Publications and extension articles delivered as part of the project; and,*
- *Suggested path to market for the results including barriers to adoption.*

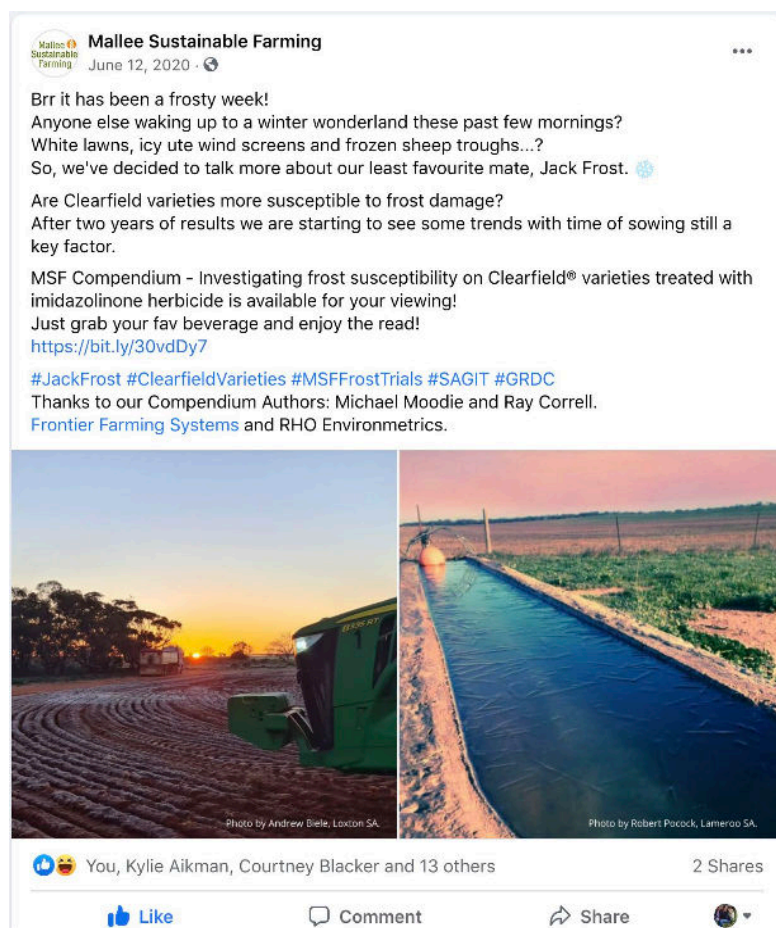
Note that SAGIT may directly extend information from Final reports to growers. If applicable, attach a list of published material.

Main project findings

- The outcomes of the 2020 trials were consistent with similar trials conducted in 2018 and 2019.
- On average there was no indication that varieties with the Clearfield trait or the application of Intervix® herbicide were more susceptible to frost damage.
- Observations that Clearfield crops are more susceptible to frost damage could be due to how they are managed in the farming system rather than the Clearfield gene.
- The greatest determinant of the level of floret sterility in cereal crops was time of sowing.
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- In lentils the highest grain yield was achieved with earlier sowing despite higher levels of frost damage while delayed sowing was a better approach in field peas.

MSF delivered 4 Mallee Research Updates in February where the frost research results from 2019 were presented – Paruna and Bowhill in SA and Nandaly and Lake Cullulleraine in VIC. There was a total of 126 participants at the Mallee Research Updates in 2020.

The results from the 2020 season have been discussed at MSF MRU events in February and March 2021. The latest compendium article has been completed and will be promoted via social media. All compendium articles will be available on MSF's website.



Mallee Sustainable Farming
June 12, 2020 · 🌐

Brrr it has been a frosty week!
Anyone else waking up to a winter wonderland these past few mornings?
White lawns, icy ute wind screens and frozen sheep troughs...?
So, we've decided to talk more about our least favourite mate, Jack Frost. ❄️

Are Clearfield varieties more susceptible to frost damage?
After two years of results we are starting to see some trends with time of sowing still a key factor.

MSF Compendium - Investigating frost susceptibility on Clearfield® varieties treated with imidazolinone herbicide is available for your viewing!
Just grab your fav beverage and enjoy the read!
<https://bit.ly/30vdDy7>

#JackFrost #ClearfieldVarieties #MSFFrostTrials #SAGIT #GRDC
Thanks to our Compendium Authors: Michael Moodie and Ray Correll.
[Frontier Farming Systems](#) and [RHO Environmetrics](#).

Photo by Andrew Siele, Loxton SA. Photo by Robert Pocock, Lameroo SA.

You, Kylie Aikman, Courtney Blacker and 13 others · 2 Shares

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2019 Compendium article

<https://msfp.org.au/investigating-frost-susceptibility-on-clearfield-varieties-treated-with-imidazolinone-herbicide/>

2020 Compendium article

Submitted with this final report.

The Loxton field day was held at the 2020 trial site where 45 people attended. As Michael Moodie was restricted from being near large groups and had to wear a mask due to SA Covid 19 regulations, Kenton Porker provided expert input at field days. Kenton gave an excellent presentation discussing crop phenology and the role of TOS and manipulating flowering time as frost avoidance strategies.

A 4-minute snapshot video of Kenton's presentation was captured and promoted on social media. The video can be seen at the following link.

[https://www.youtube.com/watch?v=gLzqGldhI28&list=PLtRHgaLykLvQDZjix\[GB\]smbRtbKk3-i0&index=3](https://www.youtube.com/watch?v=gLzqGldhI28&list=PLtRHgaLykLvQDZjix[GB]smbRtbKk3-i0&index=3)

Field Days and Mallee Research Updates summary

Over the life of the project the SAGIT frost project observations and results were communicated to growers at 3 Loxton field days attracting 145 attendees and 6 Mallee Research Updates attracting 195 attendees.

Technical presentations at Field days were presented by Jeff Braun in 2018, Mick Faulkner in 2019 and Kenton Porker in 2020. Michael Moodie presented results at all Mallee Research Updates.

Key extension themes

As Clearfield variety and imidazolinone herbicide had no significant impact on frost susceptibility the extension messages have promoted understanding optimal flowering window and selecting the correct TOS for crop type and phenology to ensure flowering can be achieved in the flowering window or flowering window can be deliberately spread to ensure that yield losses from frost damage can be minimized.

This has still been a very useful trial to demonstrate the complex topic of time of sowing and phenology and provided many opportunities for discussion with growers to talk through the implications of variety selection and decisions made at time of sowing.

Time has also been spent with growers discussing methods to measure minimum temperature in the field using temperature sensors.

POSSIBLE FUTURE WORK

Provide possible future directions for the research arising from the project including potential for further work and partnerships.

This project has helped answer the questions posed with respect to Clearfield varieties and the potential link to increased frost damage. There is no other work proposed.