



# Upstaged: Barley steals the salt-tolerance limelight

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ABOVE: The profile of barley as a salt-tolerant crop has been raised significantly with the unexpected outcomes of recent wheat trials. (Photo: Dr Ed Barrett-Lennard)

**B**y chance, Future Farm Industries CRC plant researchers are changing the way they think about salt-tolerant cereals and their development.

Department of Agriculture and Food Western Australia (DAFWA) Principal Research Officer Dr Ed Barrett-Lennard says the change is the result of a bit of ‘serendipity’ during a recent field experiment funded by the Future Farm Industries CRC and the Grains Research and Development Corporation (GRDC).

“During the past two years, we have conducted a proof-of-concept trial comparing the performance of the salt- and waterlogging-tolerant sea barleygrass/wheat amphiploid, with its wheat parent (cv. Westonia) and a barley cultivar (CM72),” Dr Barrett-Lennard said.

“Unexpectedly, the barley performed exceptionally well when waterlogging was not present – it had higher biomass production than either the wheat or the amphiploid.”

The two-year trial was carried out on the Lake Grace property of Michael Lloyd

former chairman of WA’s Saltland Pastures Association.

“The property varies widely in its salinity status and this gave us the opportunity to lay out a number of plots of different salinity over a reasonably short distance,” Dr Barrett-Lennard said.

“During this time we measured the salt concentrations in the soil solution at different soil depths on a monthly basis – a practice that is not usually performed in this type of trial.

“We discovered salt concentrations were highest at the start of the season, declined as salt was leached from the soil by winter rainfall, and then rose again at the end of the growing season as the soils dried out.”

According to Dr Barrett-Lennard, the findings raise the profile of barley as a salt-tolerant crop.

“We’ve always known that barley has the reputation for being more salt tolerant than wheat, but measuring the ongoing salt concentrations and witnessing the performance of the CM72 was a revelation,” Dr Barrett-Lennard said.

“We now have a far clearer picture of which traits are desirable for salt-tolerant cereals.”

These traits include:

- High salt-tolerance during germination and establishment
- High salt-tolerance during grain fill
- A short-growing season.

“By having a short growing season, say 100 days, the crop is done and dusted before salinity rises to a dangerous level again,” Dr Barrett-Lennard said.

“This was particularly evident when we harvested this year’s cereal trial during mid-November.

“In general, the yields of the longer-season cereals was low.

“Even at the relatively benign end of our salinity transects, our measurements revealed that by early October salt concentrations in the top 100-250 millimetres of soil had risen to about 70 per cent of the salinity of seawater.

“Under these conditions only the short season CM72 had reasonable yields.

“People’s first reaction when I mention growing cereals with a shorter growing season is that there may be a loss of yield due to the lack of tillering.

“But our suggestion is that we need to focus primarily on filling the head on the main culm and letting the grains in this part of the plant ripen and finish as fast as possible.”

## Insightful outcomes

Dr Barrett-Lennard said the past two years had revealed an interesting ‘set of insights’ for himself and his colleagues about the methods being currently used for salt-tolerance screening.

“During recent years there has been an increased focus on the screening of plants for salt tolerance in climate controlled glasshouses,” Dr Barrett-Lennard said.

“Although this approach does have practical advantages, our work suggests that glasshouse screenings need to be tightly linked with field screening that better represent the real world.”

“While work on the cultivar will continue, we remain committed to the development of a wheat amphiploid with better waterlogging and salinity tolerance.” 🌱

## More information

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## key points

- To be productive in saline areas, crops need to have high levels of salt-tolerance during germination and establishment as well as at seed fill
- Selecting plants with a short growing season is also beneficial as it enables plants to avoid the rise in salt concentrations that generally occurs at the end of the season as soil dries out
- Testing for salt-tolerance is best carried out using combinations of field and glasshouse screening.