

X-ray technology points the way to reducing head loss in barley

For some South Australian growers, the risk of head loss in barley outweighs the potential returns of including it in a rotation.

Now, a three-year trial supported by SAGIT has investigated the problem and discovered several avenues with the potential to protect yields.

Plant scientist Associate Professor Matt Tucker from the University of Adelaide led a team of agronomists, geneticists and technicians who studied the nature of head loss caused by the barley stem breaking at the peduncle – typically within the first 3 centimetres immediately below the head.

The researchers studied the major barley varieties available to growers, planting Compass, Spartacus and Planet at sites in the South East, Murraylands, Mallee, Mid North and Yorke Peninsula.

“We wanted to look at the sensitivity of the different cultivars and assess the genetics to see if we could pinpoint traits that might indicate susceptibility or resilience to this type of head loss,” Associate Professor Tucker said.

“We also tested the efficiency of applying different plant growth regulators, then delayed harvest and scored the head loss for each cultivar.”

Real insights came when the team took sample peduncles back to Adelaide Microscopy at the University of Adelaide’s North Terrace Campus, and The Plant Accelerator® at the Waite Campus, and investigated them using X-ray Computed Tomography (CT) scanning.

“We looked at peduncles from cultivars that we knew were losing their heads and peduncles from the same cultivar that had been treated with growth regulator,” Associate Professor Tucker said.

“We found the plants that had been treated with growth regulator accumulated dense material inside the peduncle, which seemed to add strength and help retain the head. We hadn’t seen that before.

“Now we know what to look for in the peduncle, we’ve got a target that we can look for in different barley breeding lines to see if we can potentially select for that trait and develop a more robust genetic solution.”

In the meantime, the project has identified a number of practices growers can adopt now to minimise their head loss risk.

The most important is timely harvest, with the study showing each day of delay manifestly increased the rate of head loss. At all the trial sites, the best yields consistently came from harvesting on time.

However, applying a growth regulator at Growth Stage 37 will encourage some varieties to accumulate the dense tissue in the peduncle that Associate Professor Tucker and his team observed.

The application timing was found to be critical, and variety had a significant influence on the benefit.

“The growth regulator we used was Moddus Evo® (Triniexapac-Ethyl), which is registered for use to protect barley against head loss,” he said.

“It seemed to have the most benefit with Compass, while Spartacus is pretty resilient against head loss so there wasn’t much benefit, and Planet was similar with some variation depending on the growing environment.”

Associate Professor Tucker is now talking to barley breeders, most of whom list head loss in the top three problems they’re working to solve.

“Based on what we’ve learned, we want to bring strengthened stems to the breeding populations, test them in the environment and hopefully deliver improvements to growers in the not-too-distant future,” he said.

The results of this project are being furthered through:

- A new SAGIT investment to collect extra field data and assess new barley lines
- Pilot funding from the Australian Plant Phenomics Facility for X-ray CT scanning of peduncles (Project #0628)
- A two-year ARDC OzBarley project aimed at consolidating phenotypic data from a panel of Australian breeder-relevant cultivars.

A podcast has also been published on this research and is available at <https://sagit.com.au/podcasts> or wherever you listen to podcasts.

UA619 Revealing the basis for head-loss in barley and UA721 Revealing the basis for head loss in barley