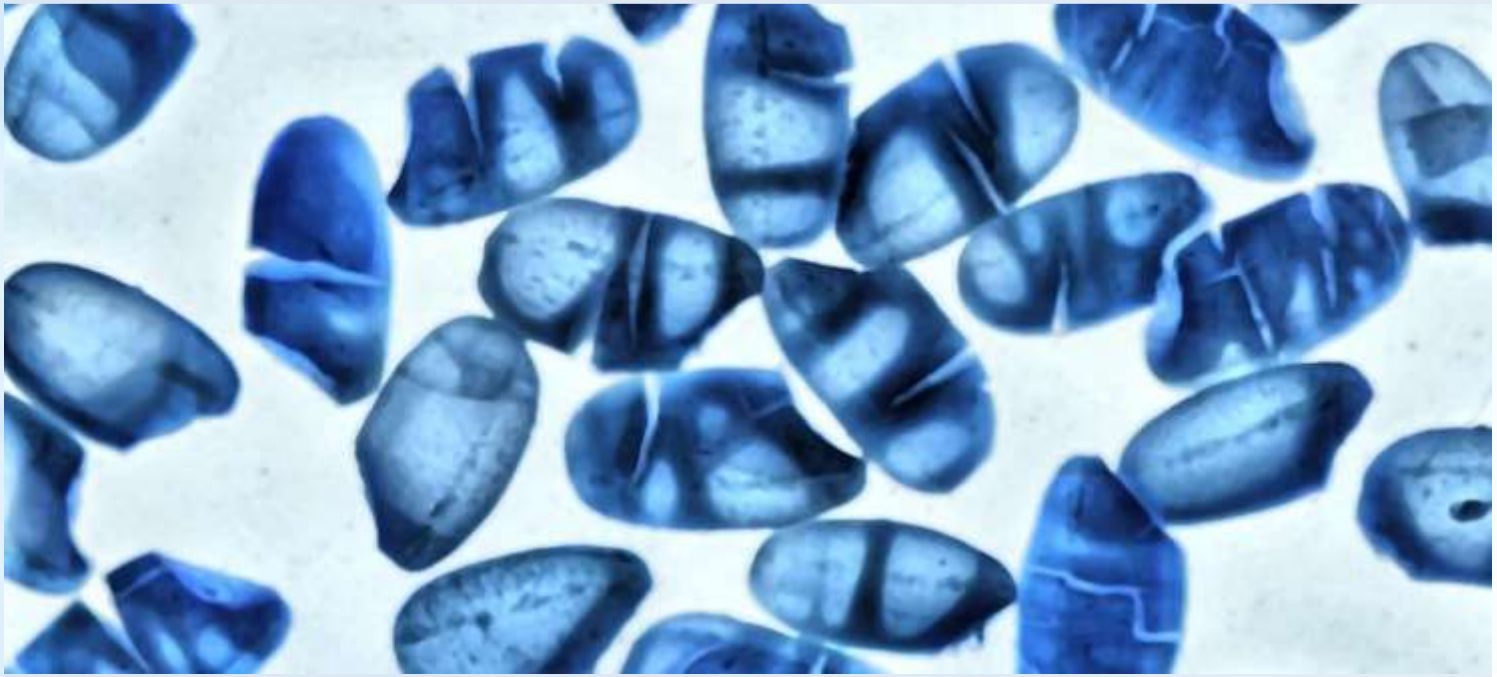
NSW GOVERNMENT Department of Primary Industries

Australian Rice PARTNERSHIP

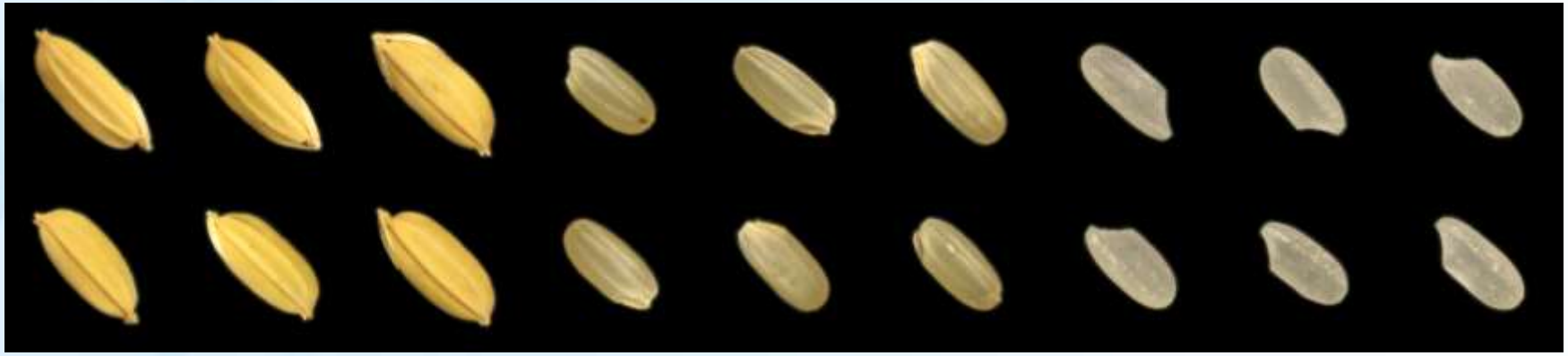
# Imaging and image analysis in rice quality



**Dr. Mark Talbot**
Researcher, Rice Quality
NSW DPI, Yanco Agricultural Institute

# Imaging and analysis in rice quality

- Integral to rice quality research
- Addressing gaps in our understanding of rice biology related to aspects of rice quality
- Knowledge and practical outcomes for industry



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# Imaging equipment

**Macro imaging** (2-10 times magnification)

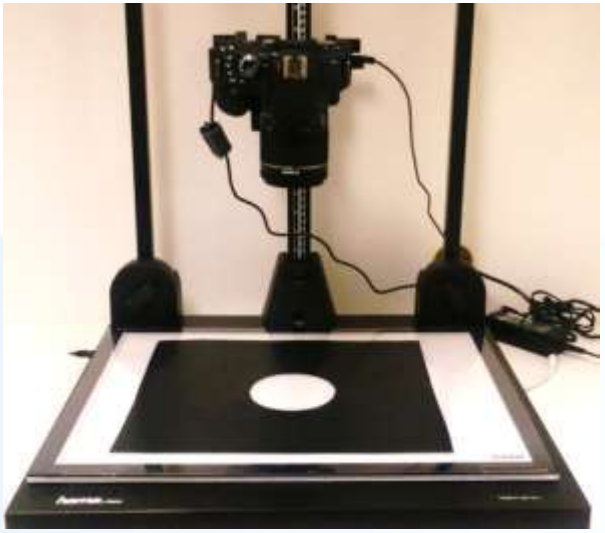
- Webacm
- Digital camera
- Scanner

**‘Micro’ imaging** (40 – 630 times magnification)

- Olympus BX63 ‘compound’ light microscope – white light, polarized light, fluorescence.

These options provide a flexible range of imaging modes for evaluating rice quality – choose the right tool for the right job!

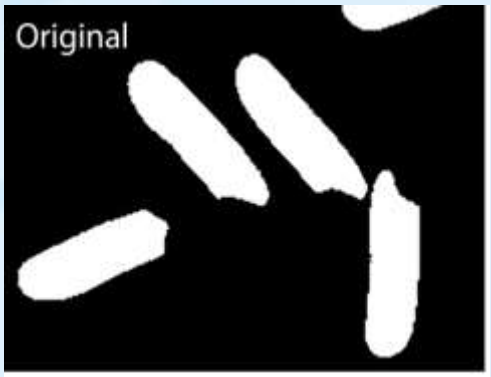
Quality imaging = quality results

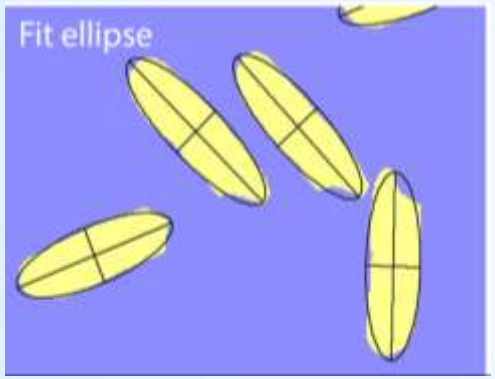


# Image analysis

- Brokens, colour, chalk, dimensions (length, width, area), cracks

- ImageJ – comprehensive, open source software designed for exploring different image analysis techniques, as well as a range of programming options (macros, scripts, plugins)





- ImageJ has ability to communicate with cameras – integrated imaging and analysis platform

- Objective, quantitative and ‘automatic’

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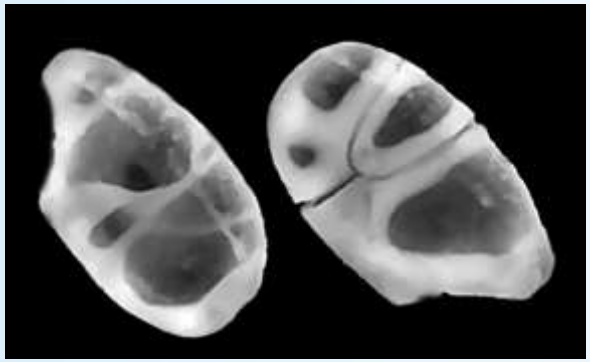
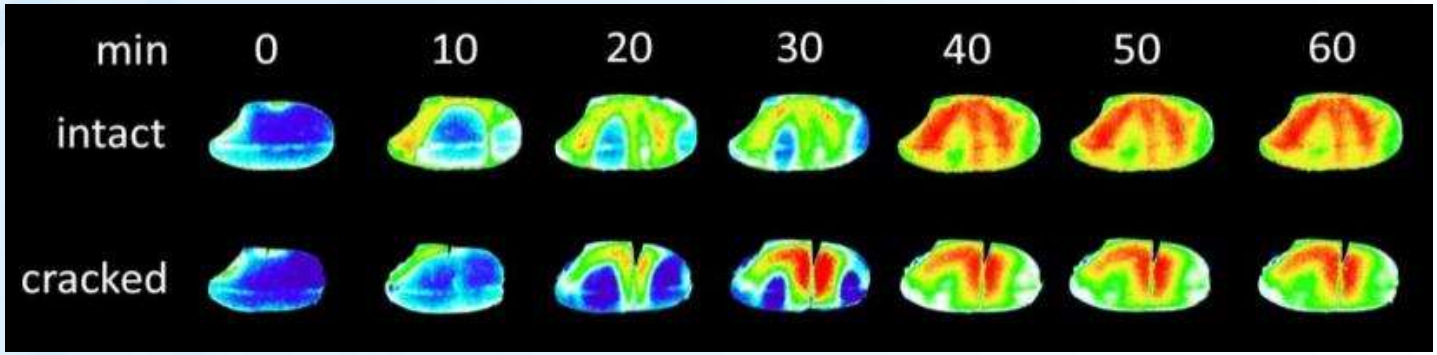
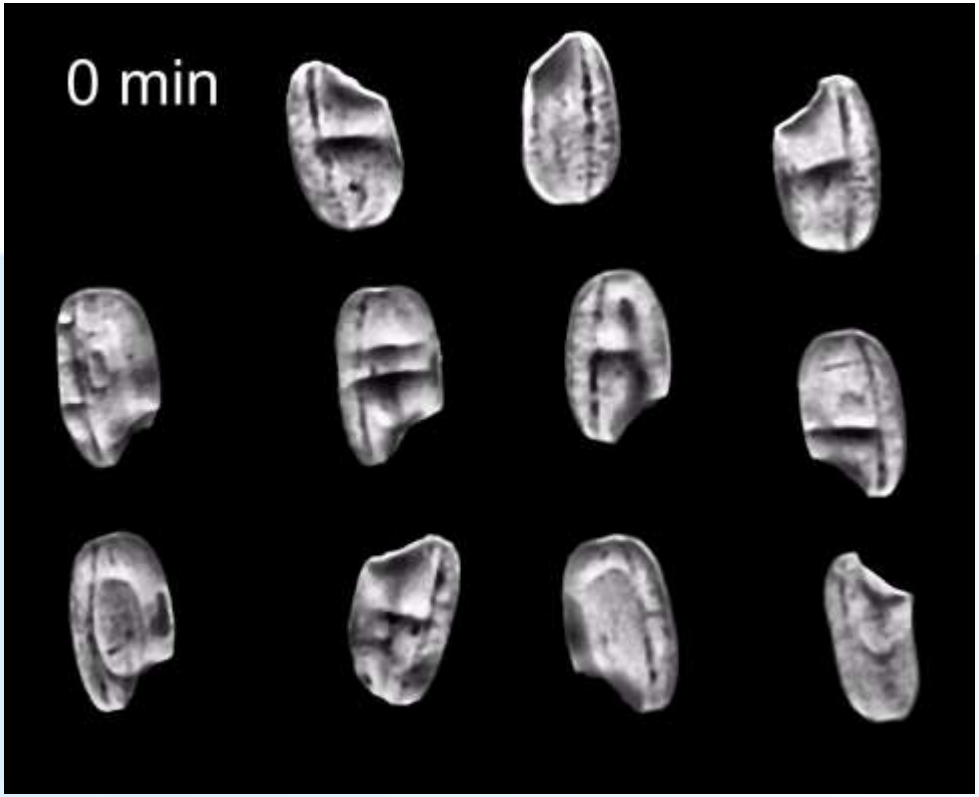
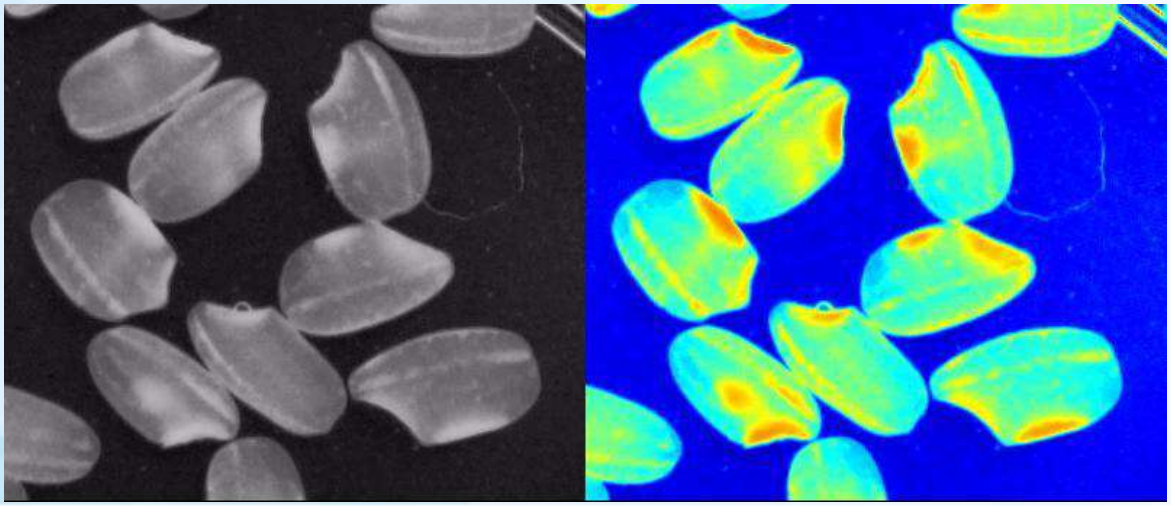
# Cracking during soaking of rice


Water absorption and cracking

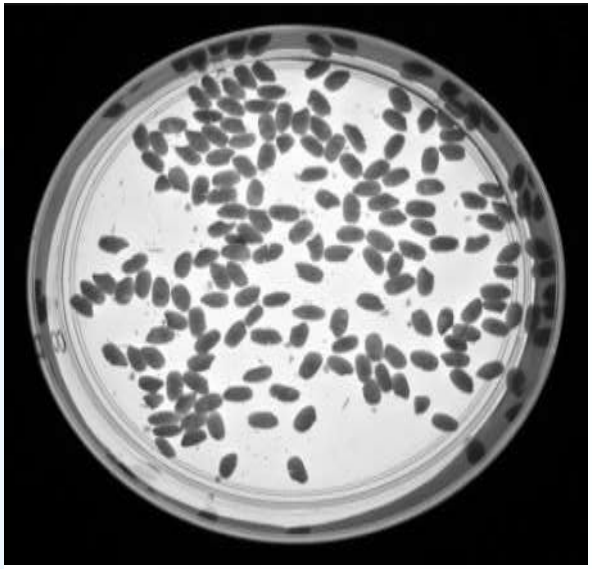




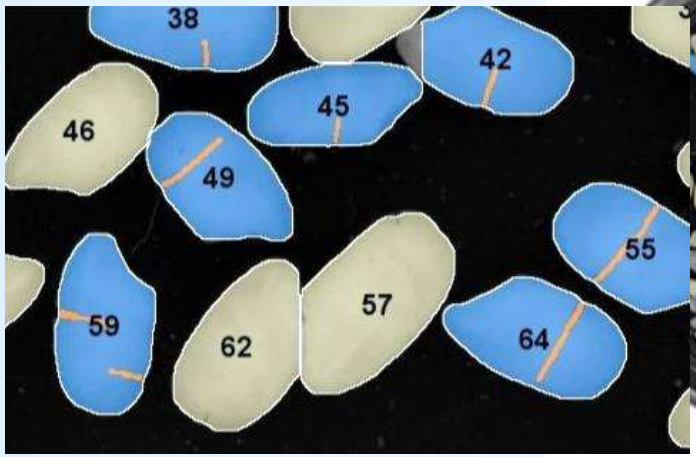

0 min



# Image analysis of cracks

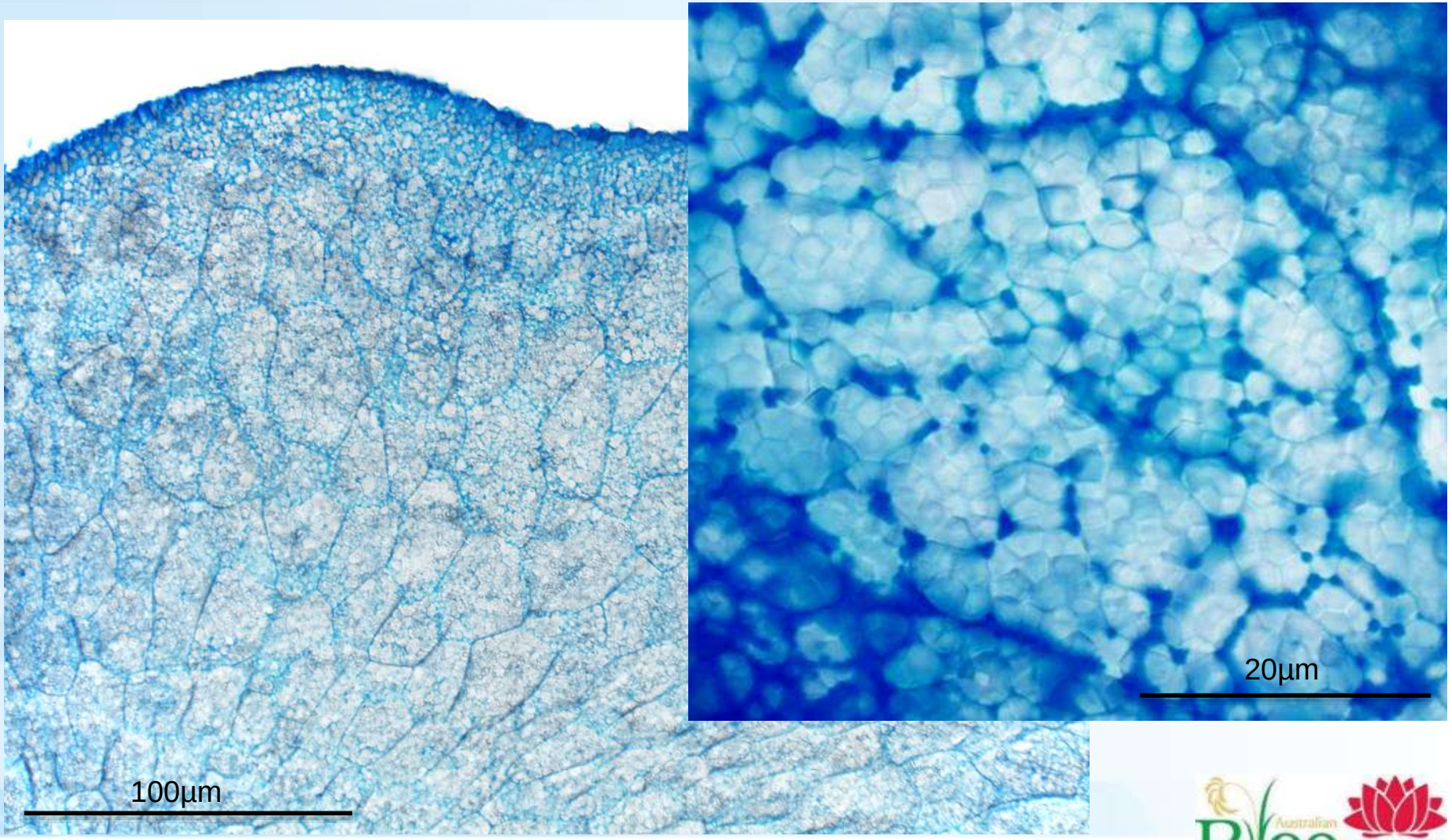



```
501     for (i=0 ; i<roiManager("count"); i++) {
502         selectWindow("Cracks with Hanasaki");
503         roiManager("select", i);
504         G=(i+1); //grain (ROI) number
505         run("Measure");
506         Gwidth = getResult("Minor", 0); //gro
507         run("Clear Results");
508         run("Analyze Particles...", "display'
509         H1=nResults; //number of Hanasaki wit
510         if (H1 > 0){
511             run("Summarize");
512             H1_length = getResult("Feret"); /
513             H1_Stdev = getResult("StdDev"); /
514         }
515         else if (H1 == 0){
516             H1_length = 0;
517             H1_Stdev = 0;
518         }
```

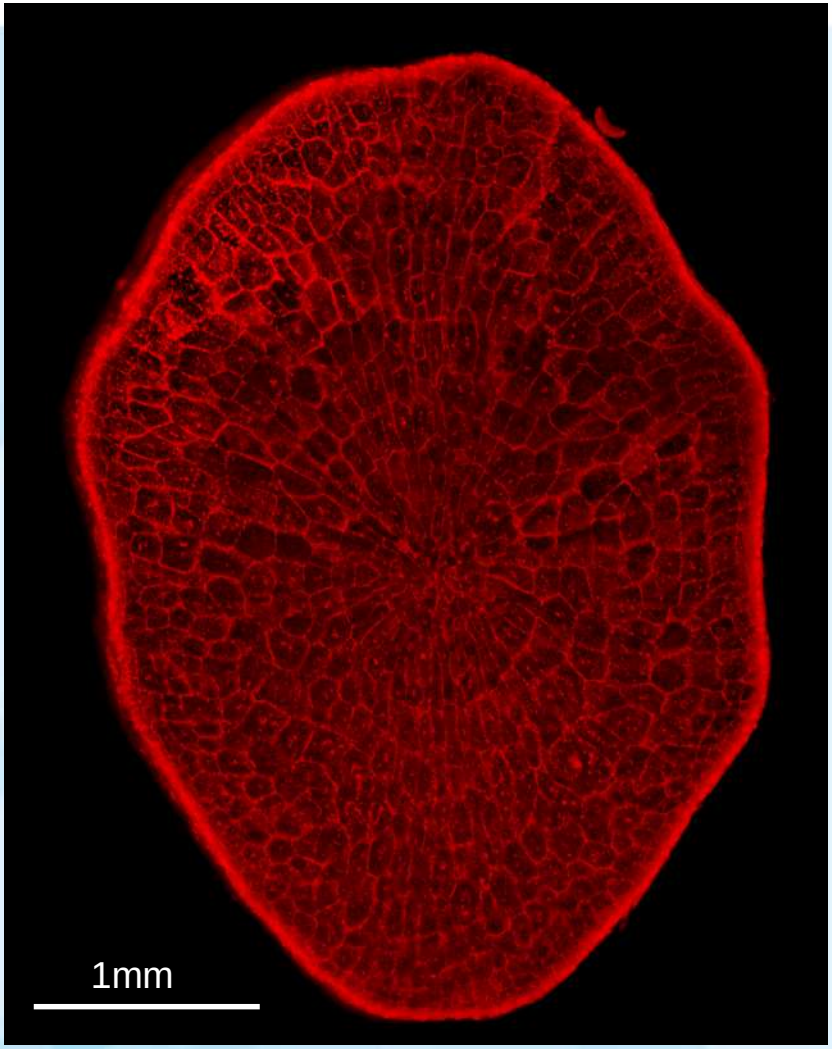



# Light microscopy - protein

Coomassie blue staining



# Light microscopy




Cell wall autofluorescence (phenolics)

# Acknowledgements

**Rice Breeders**

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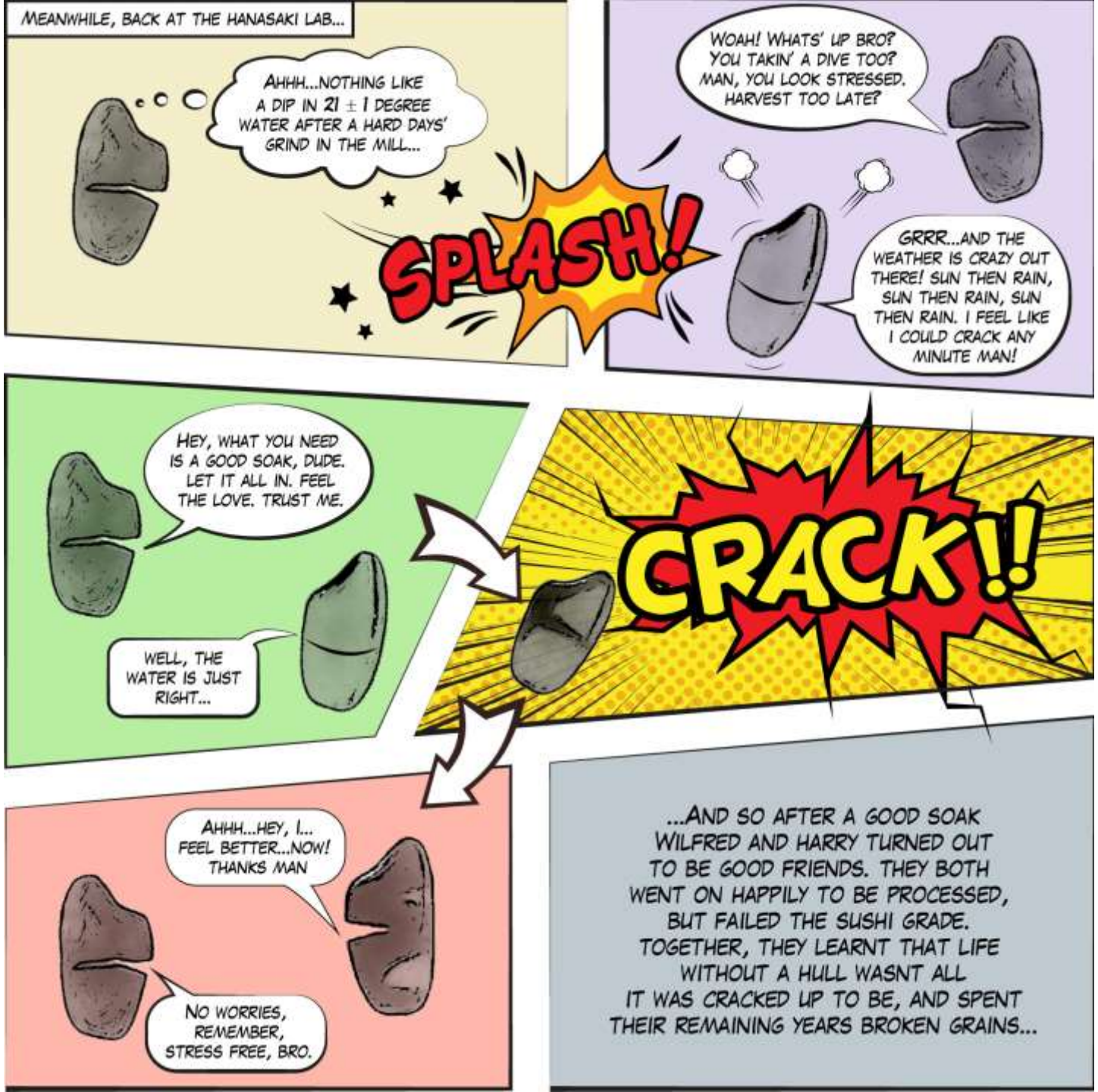
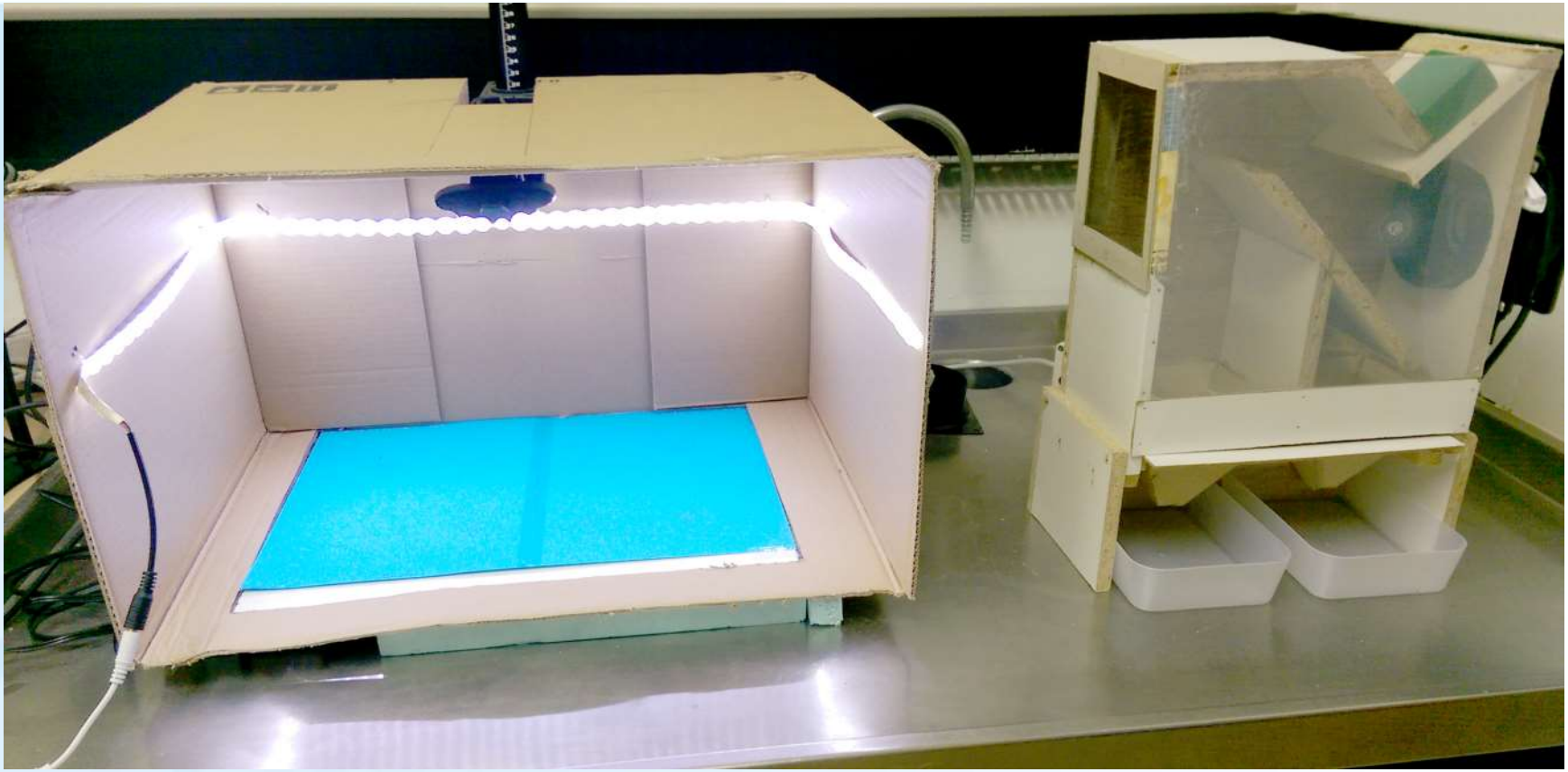
Dr Prakash Oli
Margrit Martin
Leanne Johnston
Yuki Sims

**Sunrice**

Andrew Valenta

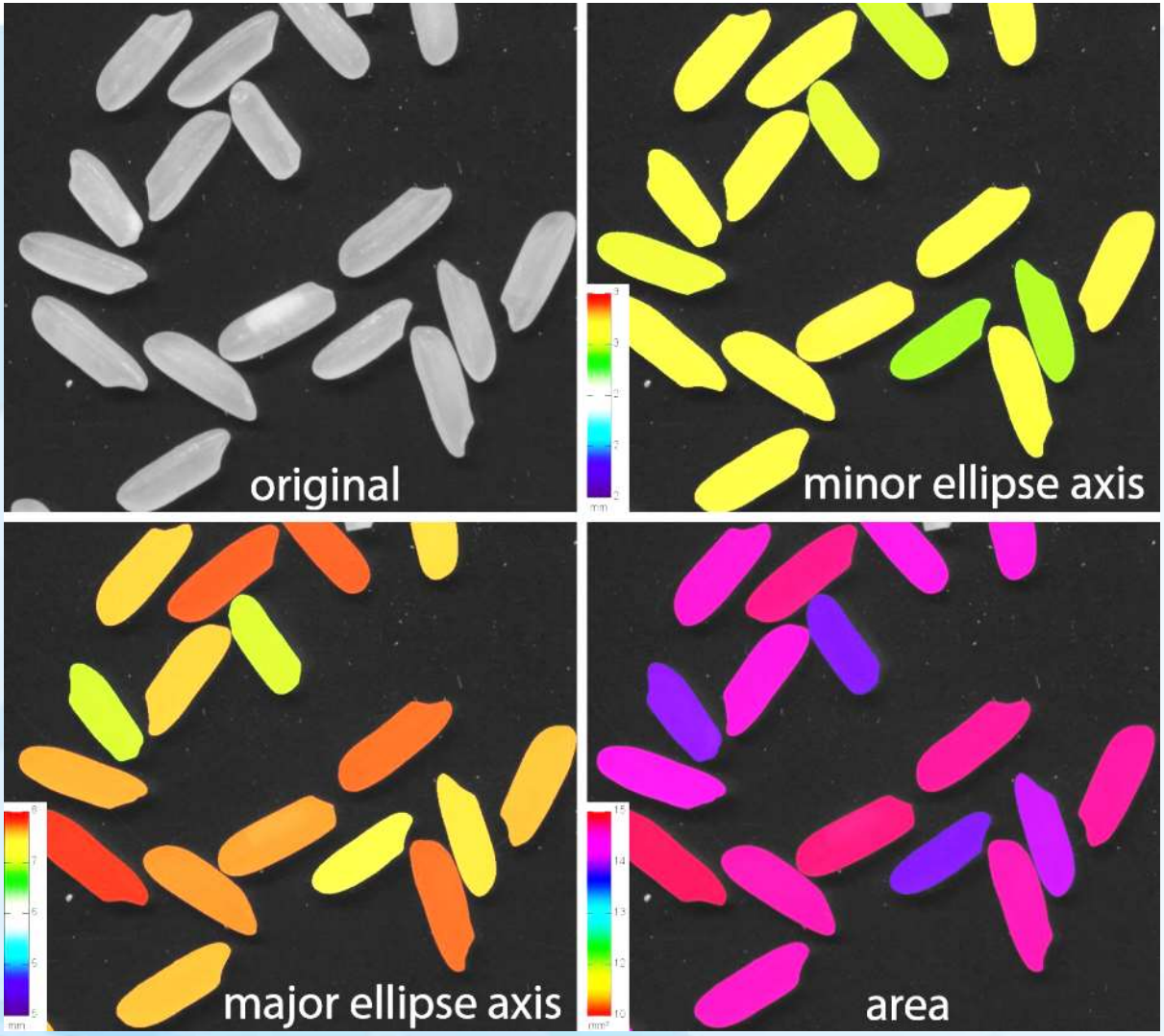

MEANWHILE, BACK AT THE HANASAKI LAB...
AHHH...NOTHING LIKE A DIP IN 21 ± 1 DEGREE WATER AFTER A HARD DAYS' GRIND IN THE MILL...
SPLASH!
WOAH! WHATS' UP BRO? YOU TAKIN' A DIVE TOO? MAN, YOU LOOK STRESSED. HARVEST TOO LATE?
GRRR...AND THE WEATHER IS CRAZY OUT THERE! SUN THEN RAIN, SUN THEN RAIN, SUN THEN RAIN. I FEEL LIKE I COULD CRACK ANY MINUTE MAN!
HEY, WHAT YOU NEED IS A GOOD SOAK, DUDE. LET IT ALL IN. FEEL THE LOVE. TRUST ME.
WELL, THE WATER IS JUST RIGHT...
CRACK!
AHHH...HEY, I... FEEL BETTER...NOW! THANKS MAN
NO WORRIES, REMEMBER, STRESS FREE, BRO.
...AND SO AFTER A GOOD SOAK WILFRED AND HARRY TURNED OUT TO BE GOOD FRIENDS. THEY BOTH WENT ON HAPPILY TO BE PROCESSED, BUT FAILED THE SUSHI GRADE. TOGETHER, THEY LEARNT THAT LIFE WITHOUT A HULL WASNT ALL IT WAS CRACKED UP TO BE, AND SPENT THEIR REMAINING YEARS BROKEN GRAINS...

# Imaging



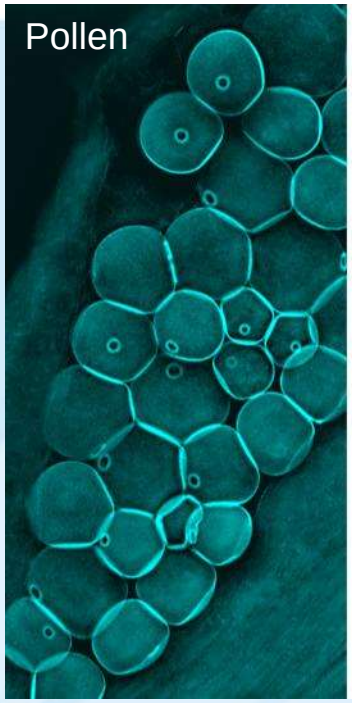
Percentage sterility of rice panicles

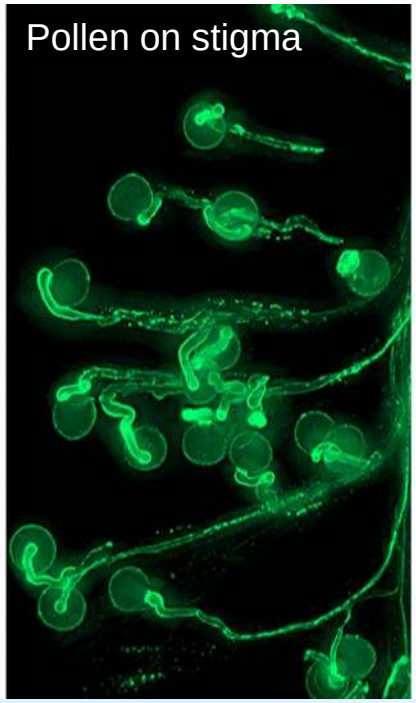
# Imaging and analysis




Grain dimensions (colour coded)

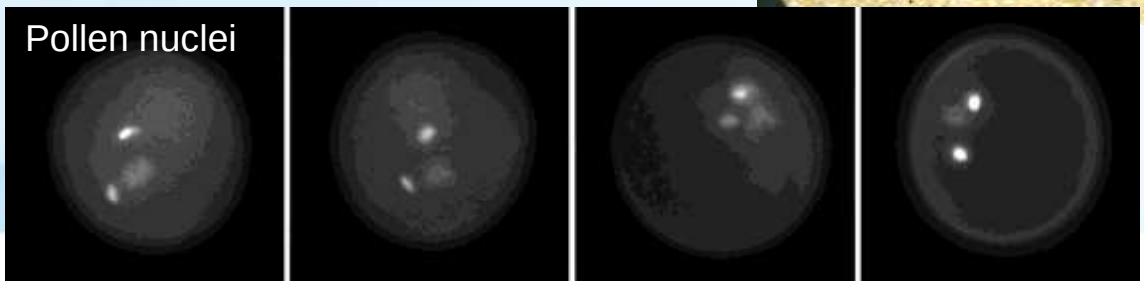
# Light microscopy





Pollen viability and fertilization efficiency in relation to cold tolerance

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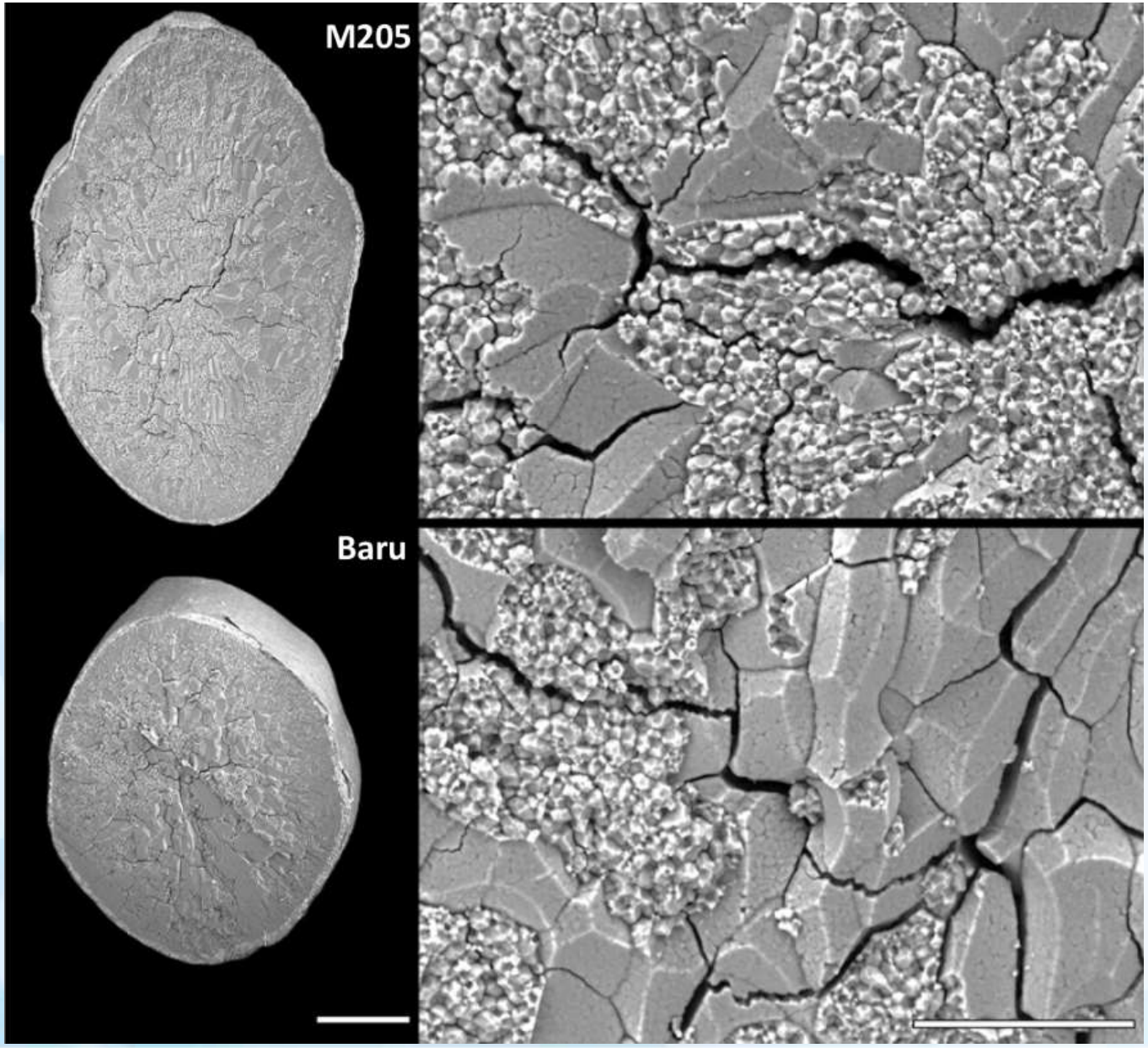
# Micro-CT rice grains




# Scanning Electron Microscopy

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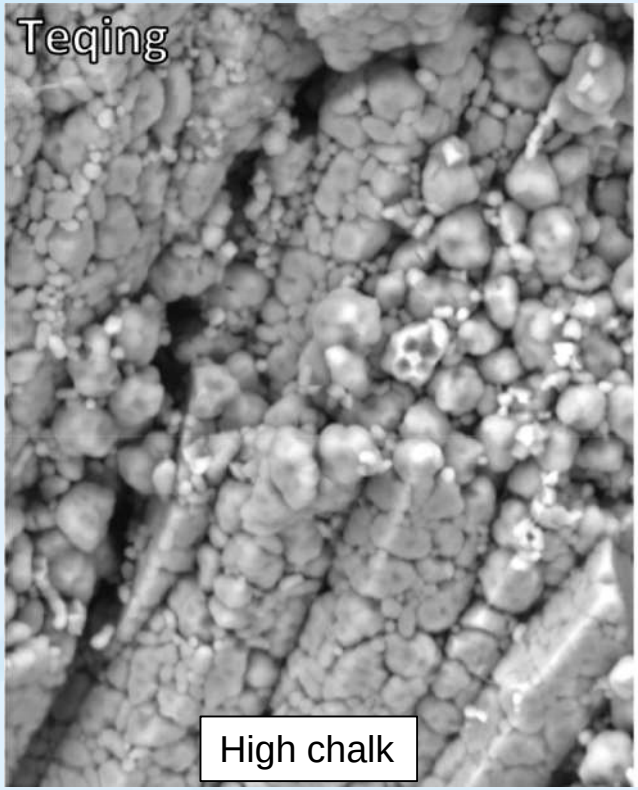
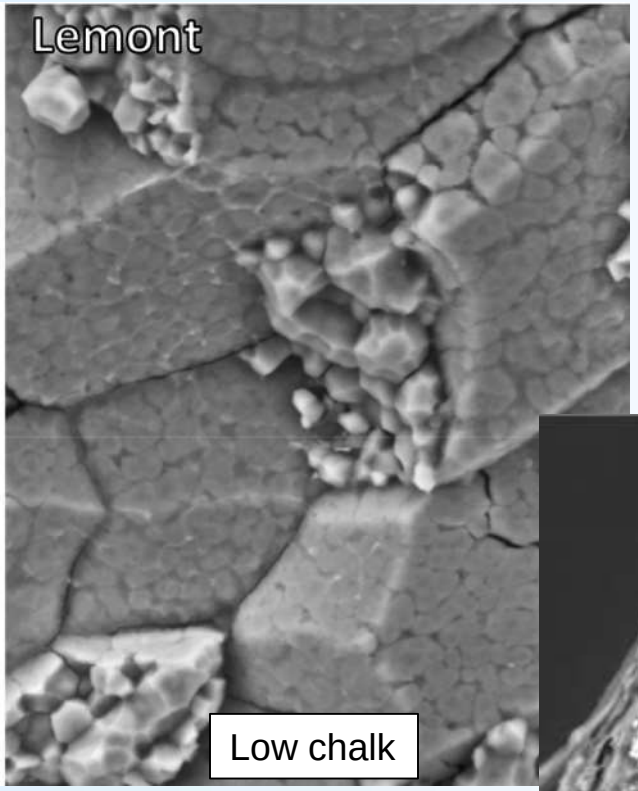
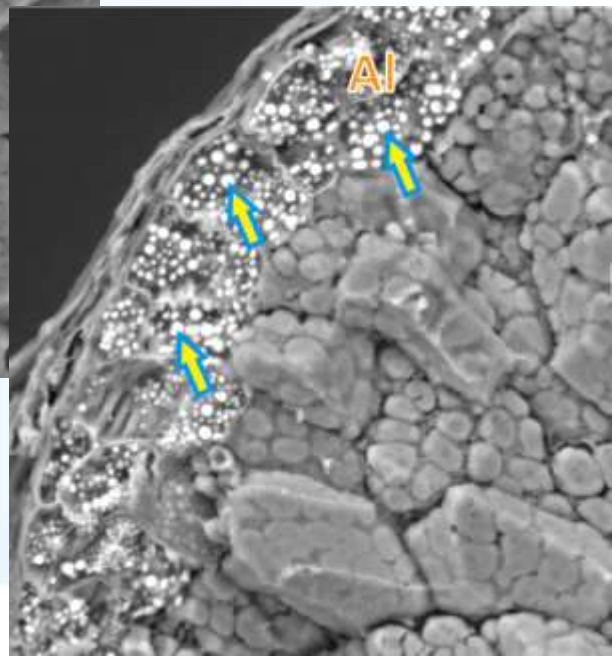
# Scanning Electron Microscopy



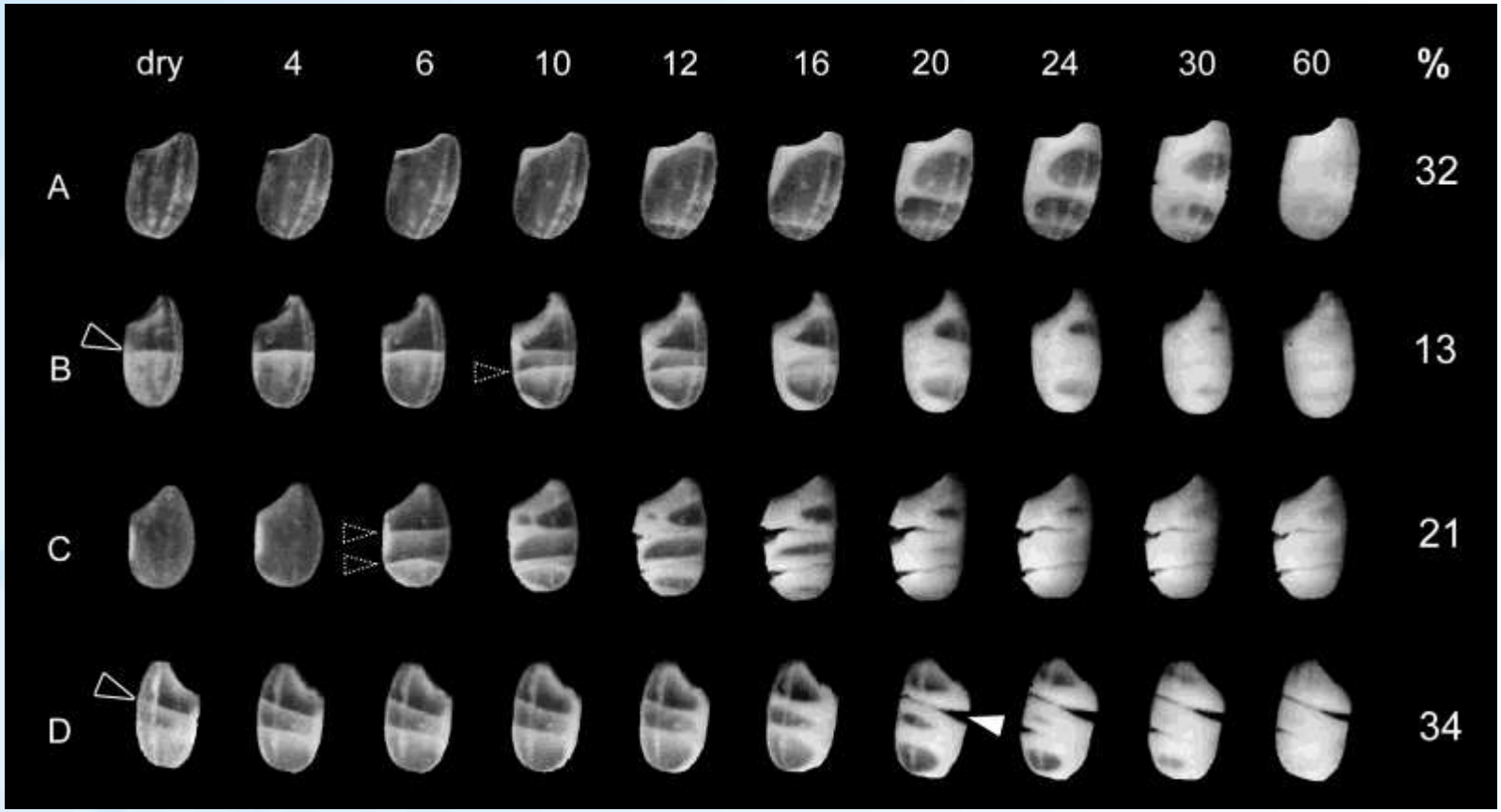



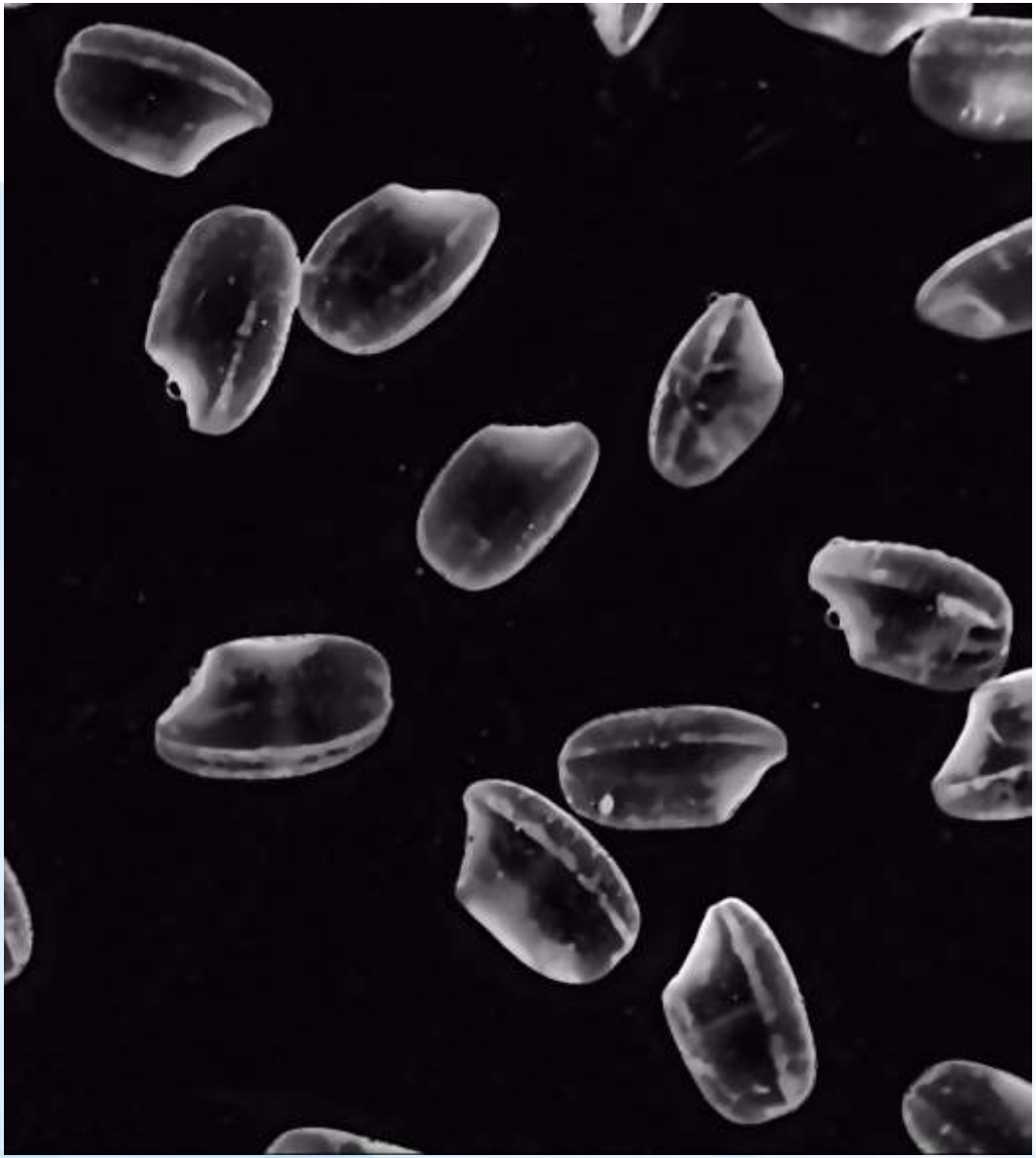

Starch and endosperm structure




Protein in aleurone layer

# Crack formation during soaking





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# Sectioning