



QWCRC Quality wheat facts

Frosted grain can make the grade

The widespread frosts of October 1998 caused large financial losses for thousands of growers across the southern and Western Australian wheatbelts. Frost damage can cause grain quality problems such as reduced grain size, poor flour extraction and refinement, weak physical dough properties and poorer baking results, but recent research shows that frost damaged grain need not incur the stigma of “feed quality only” nor attract the very large price discounts it invariably does.

When a grain crop is hit by frost, a proportion is damaged and the rest of the grain remains intact. This is because grain in a head of wheat can be at different stages of maturity. The more mature grain will not be affected by freezing, while the immature will suffer quite severely. By grading to remove the very small and pinched grain, it is possible to minimise downgrading and achieve a better return as the remaining grain can be used for normal processing.



Grading and testing

Samples were taken from three different 1998 crops of Prime Hard Janz wheat in the Wagga Wagga region of southern NSW. One was severely affected by frost, another was only lightly affected and there was a third, unfrosted sample to allow comparison to a normal Janz sample. A commercial grader equipped with an aspirator was used to remove the fine light component of the samples and produce bulk samples below 2 millimetres and above 2 mm in size. It was possible to grade even the very heavily frosted grain, removing the small and shrivelled grain and leaving large grain for quality testing. The small grain in each sample was found to have been “frozen in time”, leaving it with very high levels of alpha-amylase, the enzyme also present in rain-damaged grain.

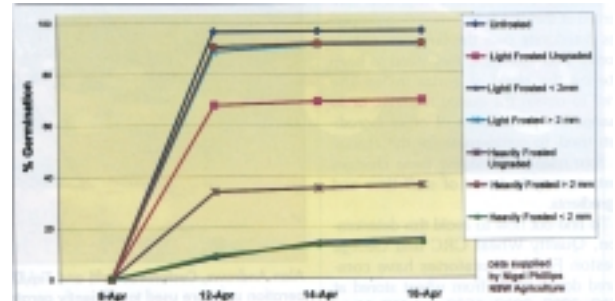
Grain tests								
	Test weight (kg/hl)	Kernel weight (grams)	Protein (%)	Falling Number (sec)	Flour Extraction (%)	Alpha amylase (mEu/g)	Ash	Flour Protein (%)
Unfrosted control	84.7	40.5	11.0	501	72.9	1.0	0.46	10.2
Ungraded light frost	77.3	34.6	13.6	407	65.4	53.5	0.43	12.7
Light frost < 2mm	64.5	26.2	13.6	241	46.4	198.5	0.59	12.4
Light frost > 2mm	83.1	41.9	13.6	505	72.6	12.5	0.46	12.7
Ungraded heavy frost	65.8	30.2	13.5	319	51.1	50.0	0.50	12.3
Heavy frost < 2mm	56.2	23.8	12.9	218	37.5	93.5	0.67	11.1
Heavy frost > 2mm	77.3	42.5	14.2	493	70.4	7.5	0.44	13.4

Grain protein content was similar to that of the large grain. After removing the small frosted grain, the large fraction behaved as well in tests as the unfrosted control. Test weights ranged from 56-85 kg per hl, grain size from 23.8-42.5 grams, screenings from 0.5-27.6%, falling numbers from 218-505 seconds and flour extraction from 51-73%. All the physical dough tests showed the grain greater than 2mm was equal to the expected level for Australian Prime Hard Janz of 13% protein. Extensibility of the large grained sample was greater than the unfrosted control, but its protein content was also higher.



Germination rates

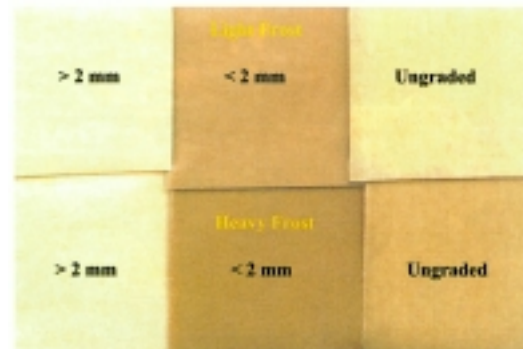
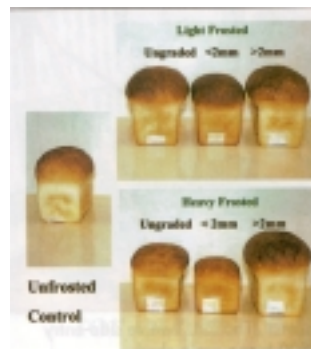
Germination of the ungraded samples was low, and only 35% of the grain below 2mm germinated, whether it came from the lightly or the heavily frosted sample. However, germination rates for the grain over 2mm in size were above 90% for both the lightly and the heavily frosted samples, so acceptable germination for frosted wheat is also achieved after grading.



Commercial grading results

Goodman Fielder Ltd, a domestic flour mill, purchased some frosted wheat and by using a gravity table, grader and aspirator obtained a recovery rate of 78% good quality grain which was able to be milled and the flour used for normal processing. By grading, the test weight improved from 64kg/hl to 77 kg/hl, the falling number from 142 to 376 seconds, and the grain weight (1000k) from 17.2 to 39 grams, making grading of frosted wheat a viable option for processors.

Baking quality and noodle sheets from lightly and heavily frosted Janz



Nutritional properties

When the ungraded samples were mixed with lucerne chaff (70 parts wheat to 30 parts lucerne) and fed to sheep, there was no major penalty, even with the frosted component comprising up to 80%. Producers may have to adjust their milling equipment to ensure the frosted grain is adequately processed.

Wheat	Unfrosted	Lightly frosted	Severely frosted
Digestibility (%)	82.7	82.1	80.4
Metabolisable energy (MJ/kg dry matter)	13.0	12.9	12.6

Economic assessment

With a typical purchase price of frosted grain of \$ 60/tonne, the cost of grading \$ 30/tonne, 25% pinched grain removed, sale price of large grain at \$100/tonne and sale price of pinched grain at \$ 60/tonne, the profit from the sale of grain comes to \$ 15/tonne (*J. Brennan, NSW Agriculture*).

*Acknowledgements: H. Allen, J. Pumpa, E. Richardson, A Kaiser, NSW Agriculture, Wagga Wagga .
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