



Quality **QWCR** wheat facts

Aerate stored grain for market edge

If grain is cooled to 23°C within 70 days of harvest and held at that temperature, the processing quality of the flour produced should not change significantly for the remainder of a full storage year. If storage is at 20°C with moisture below 12.5% this also helps control insects and mould.

Aeration during storage helps maintain processing quality

Millers and bakers have long been concerned at the way flour processing properties deteriorate over the time the grain is stored. End users find they need to keep altering the blend of grains milled (the grist) to obtain the quality required, or to change the proportions of other ingredients used, to compensate for the change in flour quality. Managing these changes costs money in terms of staff time and ingredients.

To find out how to avoid this deterioration, Quality Wheat CRC and George Weston Food Laboratories have compared dough made from wheat stored at 35°C, 30°C, 20°C, 15°C and 4°C. Moisture was 12% (= approx. 60% Equilibrium Relative Humidity).

Dough properties were stable throughout a year's storage of the grain at 4°C, 15°C or 20°C. However, the quality of grain at 35°C only remained high for the first 70 days. The longer grain was stored at 30°C or 35°C, the more dough properties deteriorated. This is important for growers and bulk handlers to know, because grain is a good insulator, and when harvested at warmer temperatures will tend to remain warm if it is not aerated or cooled. It is realistic to achieve a temperature of 20°C with aeration, and this can hold flour properties constant for a full storage year between harvests. Once cooled, the grain's insulating ability helps keep the temperature low.

Significant changes, which determine how the flour must be treated to obtain optimum bread quality, became obvious after 140 days at 30°C or 35°C. The mixing time of the dough increased, it was less extensible and had higher resistance, and it produced loaves with reduced volume and softness. Reducing the oxygen concentration of the storage atmosphere (1% compared with 21% for storage in air) had no effect on the rate of change in flour quality.

With the assistance of the CSIRO Stored Grain Research Laboratory, this work is continuing, to determine what happens over a year at temperatures from 20°C–30°C, and to take into account the sort of variations you would expect in aerated and/or cooled storage. Preliminary calculations suggest the benefit to industry of aerating any grain to be stored longer than 70 days would greatly outweigh the cost.

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The industry partners of Quality Wheat CRC support aerated storage and are making it a requirement when setting domestic purchase contracts. The advantages include:

- a reduced need for quality testing if quality is more predictable following storage
- reduced need for pesticides and
- improved product specifications.

Storage on-farm

Increasingly, growers are storing grain on farm, whether for short, or for extended periods of time. This may be for seed, feed or harvest efficiency, and it can also be a way of adding value to the farm business, giving growers the option to sell some of their grain when prices are favourable. Grain must be maintained in peak condition, with little wastage due to inappropriate practices, if storage is to be worthwhile. Food safety standards of end users must also be met. There is a lot of scope to control critical levels through best practice grain storage and transport, and aeration is one of the key practices to adopt to meet these goals.

Through aeration, a grain bulk can be cooled and an even temperature maintained in the silo. Because insect development slows at temperatures less than 20°C, becoming negligible in most species below 15°C, aerating grain can reduce the need for protectants and subsequent residue levels.

Importantly, maintaining even temperatures will also prevent moisture migration which can otherwise lead to patches of damp and mouldy grain. For aeration to succeed, the temperature and moisture content of the air (measured as the wet bulb temperature on a hygrometer) must be lower than the equivalent wet bulb temperature of the grain. It is best to use aeration controllers which select suitable air and switch aeration fans on and off to achieve the most efficient cooling.

Resource for growers and advisers

With Orange Agricultural College, Quality Wheat CRC has produced a CD-ROM for growers, advisers and educators, offering the necessary information on storage management for maintenance of grain quality. In line with the QA principles, food safety issues in storage are dealt with on the CD, and a grain storage risk management process based on HACCP principles is promoted. Current RTCA competency standards are also listed to assist course design.

The CD-ROM, *Managing on-farm grain storage - Effective practices for the delivery of quality assured products*, is distributed by Grintec (ph. 07 4638 7677), Rural Connect (ph. 1800 110 044) and Agriculture NSW's Alexander College, Tocal (ph. 1800 025 520) at RRP \$35.00 plus postage and handling.

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