Ensuring good germination in malting barley

Causes of poor germination

Malting barley is purchased on the basis of a germinative capacity test, which takes place at delivery. Viability is ideally 100%.

Malting depends on high and predictable germination but this may be reduced for many reasons.

During crop growth grain may be damaged by extreme weather fluctuations resulting in splitting or gape, and possibly by use of fungicides, especially strobilurins, that delay straw maturity but not grain ripening.

Damage can also result from factors such as harvesting after optimum maturity, excessive abrasion during combining or insect or mite infestation. Fungi may damage the germs of grain stored at over 14.0-14.5% moisture content.

Even in the absence of fungal contamination, germination declines naturally more rapidly at higher moisture contents and temperature.

Problems for maltsters

Dormancy is a natural condition that prevents grain sprouting in the ear. ‘Water-sensitive’ grain will not germinate when exposed to a slight excess of water during steeping, an early stage of the malting process.

It is best to leave maltsters to manage both dormant and water-sensitive grain.

Percentage germination can change from harvest onwards. Dormancy break increases percentage germination but loss of viability decreases it.

Drying, cooling and storage

Drying and storage are crucial to ensuring good germination in malting barley.

- Ambient on-floor drying uses airflows of about 180 m³/h/t to dry grain in 10 days. Drying over too long a period may reduce germination and allow growth of moulds and formation of mycotoxins.

- Hot air drying is quicker but temperature control is critical. Maximum air temperature is 65°C at 20% mc, reducing by 1°C for every 1% rise in moisture content. However, grain temperature should never rise above 50°C. It is vital that grain should not be left in the dryer for too long and that airflow is adequate.

Dormancy breaks earlier in warm rather than cool grain. However, immediate cooling is necessary to reduce risks from insect pest infestation.

If you are unsure about any of the suggested actions, or want them interpreted for your local conditions, consult a professional agronomist.
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Cooling grain by blowing or sucking ambient air does not occur uniformly throughout a bulk. Cooling is not complete until every part of the bulk has been cooled. Modelling of worst-case scenarios can help in the design of improved cooling systems.

Minimising insect, mould and mycotoxin problems

Ideally malting barley is dried to about 13% moisture for long-term storage. This prevents Penicillium verrucosum growth and Ochratoxin A (OA) formation. Grain showing staining, weathering, odour or poor germination is rejected.

Safe storage times for malting barley can be related to risks, which are either primary - fungal growth or germination decline in the absence of mites, fungi or insects (Table 1), or secondary. The data for secondary risks - insects or mites (Table 2) show only where the secondary risk safe storage period is shorter than the primary risk period.

Handling and sampling

Damage during handling, eg skinning or broken grains, can impair germination. Abrasion and handling damage are most likely if the grain is at higher moisture content.

Many maltsters allow a maximum 2% broken grains. Emptying large floor stores using buckets on tractors increases damage.

Accurate assessment of the quality characteristics of a bulk demands representative sampling and testing.

Summary

To avoid rejection, malting barley loads should achieve 98% germination (97% until 2002). Many 2001 spring barley crops were rejected for poor germination.

Poor germination can result from several causes. This Topic Sheet mainly concerns post-harvest factors.

The aim is to help farmers achieve high germination in malting barley at harvest and to keep it during storage.

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Introductory guide to malting barley
The grain storage guide

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Table 1. Primary risks - approximate safe storage times in days

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Table 2. Secondary risks - approximate safe storage times in days*

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* Risk periods are based on days required for insects (I) or mites (M) to complete development from egg to adult.