

Inspecting grain for defects and impurities

Smell

When inspecting grain, note any unusual smells. A sweet or minty smell indicates mites; musty and fishy smells indicate moulds; chemical smells, eg cleaning fluids and diesel, can also occur.

If the grain is visibly mouldy or dusty, do not smell it. Moulds and grain dust can be harmful and cause respiratory problems.



Physical damage

Broken grains

Exposed endosperm, usually due to aggressive handling, provides potential sites for mould infections.

Broken grains are removed during the cleaning process and hence milling potential is reduced due to a lower yield of clean, white flour from each tonne purchased.



Sprouted grains

Germinated grains, caused by wet harvest conditions, will have very high levels of alpha-amylase. Even a few in a bulk can reduce Hagberg Falling Number to unacceptable values, resulting in rejection of milling wheat.



Lost embryos

Embryos may be damaged mechanically or by mites (as shown) or insects.

Damage by mites or insects may indicate poor storage.



Burnt grains/heat damage

Heat damage arises from localised 'hot spots' or excessive temperatures during drying.

Grains can range in colour from bronze to dark brown (charred).

Such wheat is unacceptable. Over-dried grain will have irreversibly damaged gluten.



Screenings

Unwanted non-cereal matter (eg chaff, straw, stones) that has no value to the miller and must be removed before milling. Stones can damage machinery; metal objects may cause sparks.

Large screenings

Straw, beans, unthreshed grain, sticks, stones, etc.



Small screenings

Broken grains, shrivelled grains, chaff, weed seeds and small straw pieces.



Mud and stones

Mud balls are a particular problem during wet harvests.

Stones can be picked up during combining, particularly when harvesting conditions are difficult.



Dust, chaff and fine soil

If dust is visible, do not smell it as grain dust can be harmful if inhaled and can cause respiratory problems.



Diseases

Fusarium

Pink moulds indicate possible *Fusarium* infection.

Some *Fusarium* fungi can produce mycotoxins that are toxic to humans and animals. Permitted mycotoxin levels are governed by legislation or trading specifications.



Mouldy grains

Dull looking, weathered grains indicate poor harvest conditions and may impair quality, eg wholemeal colour.

Dullness may be due to spores or moulds which are unacceptable to all users due to the risk of mycotoxin formation.

Spores present possible health hazards and must not be inhaled.



Ergot

The fruiting body of the fungus *Claviceps purpurea* affects grasses as well as rye, wheat and barley.

The inside of an ergot is grey/white, which distinguishes it from rodent droppings.

Ergot is toxic to humans and animals and so is unacceptable to any processor.



Bunt (*Tilletia tritici*)

Fragile grains, dark in colour. Part of the grain may have eroded.

Surface cracks may reveal black powdery spores within the endosperm. Bunt balls occur occasionally and spores give grains a dull look.

Infected grain has a pungent fishy smell, making it unacceptable for cereal products.



Blackpoint

As a response to infection the plant produces chemicals in the bran which vary from brown to black over the germ area.

Blackpoint is often associated with *Alternaria* infection but this is not the only cause. Some varieties are more prone to blackpoint than others.

Dark bran specks in flour can affect flour quality.



Pests

To check for insects, the whole of a laboratory sample should be inspected and sieved (typically using a 2mm mesh) and the material passing through the mesh examined thoroughly. This is especially important for grain going into storage.

Insect damage

This example shows weevil damage. Eggs are laid within the grain. Endosperm is eaten by the larvae inside the kernels.

Evidence of insects indicates poor storage and possibly local hot spots.

The presence of live insect pests is unacceptable to processors.



Orange blossom midge

Midges infest crops at flowering, laying eggs in empty florets.

The larvae attack immature grain, pierce the bran and inject enzymes into the grain. This can lead to water ingress and low Hagberg Falling Numbers.

Black areas indicate additional fungal infection.



Rodent droppings

Rodents directly damage grain and carry infection.

Rodents urinate on grain, posing a food safety risk.

Contaminated grain is unacceptable.



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HGCA is the cereals and oilseeds division of the Agriculture and Horticulture Development Board.

Weed seeds

Brome

25mm
Actual size



Black-grass

6mm
Actual size



Couch

7-14mm
Actual size



Wild oats

20-30mm
Actual size



Bindweed

3-4.5mm
Actual size



Cleavers

2-5mm
Actual size



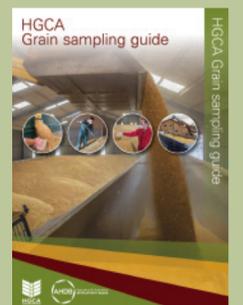
Brassica

2-3.5mm
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For best practice grain sampling and storage, consult the *HGCA Grain sampling guide* and the *HGCA Grain storage guide*, or go to:

www.hgca.com/grainsampling



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Physical damage

Broken grains

Exposed endosperm, usually due to aggressive handling, provides potential sites for mould infections.

Can cause processing problems. These include excessive water uptake and mushy steep with starch leaching into steep water.



Burnt grains/heat damage

Heat damage arises from localised 'hot spots' or excessive temperatures during drying.

Grains can range in colour from bronze to dark brown (charred).

Over-dried grains are unlikely to germinate and may affect beer or malt flavour.



Splitting

Cracks through outer grain tissues may arise from excessive expansion or mechanical weakness. Splits often occur along the ventral crease but can also occur on the side (lateral) and back (dorsal). Exposed endosperm is susceptible to mould attack.

Processing problems include excessive water uptake and mushy steep with starch leaching into steep water.



Skinning

A separation and loss of lemma and palea (husk). Causes include developmental factors, weather conditions, rough harvest and post-harvest handling. May lead to filtration problems due to loss of husk and hence malt production efficiency is likely to be reduced. Dust problems during handling may arise. More prevalent in spring varieties.



Gape

A gap between husk tissues (lemma and palea) due to poor development and/or excessive expansion. Endosperm remains intact.

Gape – a function of variety and environment – is not necessarily a defect unless associated with lateral splitting.



Lost embryos

Commonly caused by mechanical damage. Of no use for malting as the grain will not germinate.



Pre-germination (light)

Recognised by a swollen and raised germ area. Pre-germinated grains may not malt and hence will reduce malt yield.

Pre-germinated grains can be detected by laboratory testing.



Pre-germination (heavy)

Sprouted grains with visible rootlets will not malt and hence will reduce malt yield.



Discoloured grain

Dull looking, weathered grains indicate poor harvest conditions and may lead to quality problems.

Dullness can be due to spores or moulds.



Diseases

Fusarium

Pink moulds indicate possible *Fusarium* infection.

Some *Fusarium* fungi can produce mycotoxins that are toxic to humans and animals. Permitted mycotoxin levels are governed by legislation or trading specifications. May cause gushing of bottled beers.



Mouldy grains

May result from adverse growing, harvest or storage conditions. Quality may be impaired.

Dullness may be due to spores or moulds, which are unacceptable to all users due to the risk of mycotoxin forming.

 Spores present possible health hazards and must not be inhaled.



Ergot

The fruiting body of the fungus *Claviceps purpurea*, which affects grasses as well as rye, wheat and barley.

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Mud and stones

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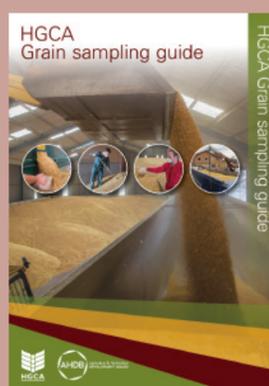
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Insect damage

This example shows weevil damage. Eggs are laid within the grain and the endosperm is eaten by the larvae.

Evidence of insects indicates poor storage and possibly local hot spots.

Severe infestations (as in this example) are unacceptable to processors.



Rodent droppings

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Rodents urinate on grain, posing a food safety risk.

Contaminated grain is unacceptable.



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