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Scotland's Rural College

Managing spring malting barley to avoid physical defects

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Managing spring malting barley to avoid physical defects

Recognising the problems

Grain with a minimum of physical defects is required to produce a uniform malt of acceptable quality. Three defects put malting quality and premiums at risk: splitting, gape and skinning. These occur to different extents depending on variety choice, weather patterns during grain filling and, to a lesser extent, agronomic treatments.

Splitting is a crack through the outer grain tissues. Excessive grain filling or mechanical weakness - often along the ventral crease, but also at the side and back of grains - exposes the starchy endosperm.



Gape is a gap between the two husk tissues caused by poor husk development and/or excessive expansion. The endosperm remains intact.



Skinning is a loss of grip between the husk and the tissue overlying the endosperm. Causes include developmental factors, weather conditions and rough handling during combining or post-harvest.



Action:

- Evaluate the risk of splitting, gape and skinning in your own area by noting if problems have occurred in past years.
- Choose a variety suited to your intended market, which shows some degree of resistance to the defects most prevalent in your area.
- Avoid using excessive nitrogen.
- Correct nutrient and trace element deficiencies.
- Consider applying fungicides earlier than ideal for disease control to reduce the risks of splitting and skinning.
- Consider combine adjustments to reduce skinning and mechanical damage.

Splitting and skinning reduce malt production efficiency by adversely affecting germination and starch modification. Defective grains may be attacked by micro-organisms and affect brewery filtration. Splitting in the field causes pre-harvest conversion of starch to

sugar, reducing potential malt extract levels and spirit yield.

The industry has a low tolerance for splitting. Gape and skinning are tolerated at higher levels as long as there is no sign of mould in underlying tissues.

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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Table 1. Susceptibility to physical defects in Scottish spring barley varieties¹

Risk of defect	Splitting	Skinning
Low	Chalice, Prestige ² , Cocktail ²	Chalice, Decanter, Cocktail ² , Prestige ²
Low to moderate	Cellar	Optic
Moderate	Decanter, Optic, Prisma, Troon ²	Cellar, Chariot, Troon ²
High	Chariot	Prisma

¹ Data from various trials 2000 to 2003

² Limited information on new varieties

Causes of defects

Most current varieties exhibit defects to some degree, especially in adverse seasons. However, results show significant differences between spring varieties, with some consistency in ranking for splitting and skinning between seasons (Table 1).

Excessive grain filling increases splitting risk in both susceptible and 'resistant' varieties. Risk depends on both husk strength and physiological changes during grain filling and ripening. Thus some varieties are at more risk than others.

Adverse seasons impose environmental stress, over which a farmer has no control, on the growing crop (Table 2).

Stress during husk formation, ie from GS 31 (stem extension) to GS 59 (heading) followed by either long, cool, grain filling or repeated wetting

and drying increases the risk, especially if thousand grain weight is high.

Managing the crop

Good agronomic practice, eg remedying trace element deficiencies, can ameliorate some environmental stresses (Table 2).

Treatments that enhance grain filling or prolong canopy greenness increase the risk of splitting. Fungicide and nitrogen fertiliser usage should be considered carefully to reduce risks of physical defects. Abrasive combine settings should be avoided.

Table 2. Extent of farmer influence on risk factors

Factor	Farmer management
High soil nitrogen	Some
Trace element deficiencies	Some
Dry spring	No
Low spring sunshine	No
Stress during stem extension	Some
Long canopy duration	Some
Very long grain maturation	No
Repeated wetting/drying	No
Delayed harvest	Some

Summary

Careful management of spring malting barley is needed to minimise the risk of grain defects. Different varieties are susceptible to splitting, gape and skinning. Risks can be increased or decreased by weather and agronomic factors.

A three-year HGCA-funded project led by the Scottish Agricultural College in collaboration with the Scottish Crop Research Institute and ADAS aimed to analyse causes, suggest appropriate management strategies for farmers where possible and provide long-term guidance for plant breeders.

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