MALT

Barley Malt

R-200.00.001 [2016-03] Sampling Techniques

This is performed as for barley (MEBAK®-Method R-110.00.001 [2016-03]).

R-200.01.730 [2016-03] Visual Inspection

R-200.02.701 [2016-03] Odour

Desired condition: pure, fresh; more or less aromatic, depending on variety. A stale or acidic odour indicates moist, poor storage conditions. Only intentionally smoked malt should smell of smoke.

R-200.03.702 [2016-03] Flavour and Aroma

Desired condition:
pale malt: sweet, mealy
dark malt: aromatic

Burnt, coffee-like flavours result from excessively high kilning temperatures.

R-200.04.731 [2016-03] Colour and Lustre

Desired condition: uniform from pale to golden. A darker colour indicates excessively high kilning temperatures.
Lustre: Heavily polished malt shines. A matt grey, dull appearance is usually due to the presence of iron in the steep water.
Green, black or red spots especially around the embryo, in the ventral furrow or on the side of the kernel are a sign of a fungal infection. A reddish-violet colouration on the kernel is a sign of a *Fusarium* infection. This leads to over-modified grains and thus to an inhomogeneous malt. Malt of a strikingly pale

colour could have been sulphured. Striped kernels are the result of kilning with heating oil containing sulphur.

R-200.05.732 [2016-03] Degree of Contamination (Purity)

Malt should not contain:
crushed, mouldy or half-kernels, seeds from weeds and other cereals, dust, stones, remains of husks and seedlings.

R-200.06.730 [2016-03] Size and Shape of the Grains

refer to barley (MEBAK®-Method R-110.19.730 [2016-03])

R-200.07.733 [2016-03] Mycological Status

Identification of red kernels

Principle

Fusarium graminearum and *Fusarium culmorum* are suspected of contributing to primary gushing caused by malt. Furthermore, Fusaria produce mycotoxins which are subject to national and European statutory threshold values for cereal products. Current threshold values can be obtained from www.deutsches-bier.net or info@brauer-bund.de. *Fusarium* species produce a red dye which can lead to a conspicuous discolouration of the malt kernels. Since other moulds, besides Fusaria, are also capable of producing a red pigment, it is necessary to distinguish between the red kernels. If it is suspected, after the visual inspection, that the sample is contaminated with Fusarium this should be further examined by using one of the methods already described for barley MEBAK® Methods R-110.16.733 [2016-03] and R-110.17.733 [2016-03]. If a contamination with *Fusarium graminearum* or *Fusarium culmorum* is confirmed, then the mycotoxin content should be measured and a gushing test carried out for risk assessment.

References

1. L. Niessen, S. Donhauser, A. Weideneder, E. Geiger, H. Vogel, BWelt *37*, 1556, 1991
2. L. Niessen, S. Donhauser, A. Weideneder, E. Geiger, H. Vogel, BWelt *16/17*, 702, 1992
3. M. C. Hernández, B. Sacher, W. Back, BWelt *35*, 1385, 2000

Mechanical and physiological Tests

R-200.08.011 [2016-03] Sieving

This is performed as described for barley (MEBAK® Method R-110.22.011 [2016-03]), but without separating out the broken kernels.

Standard values

A minimum of 85 % for the first two fractions (2.8 and 2.5 mm).
The rejects should not exceed 1.0 %.

Precision

		r	R
Fractions I + II (Plump fraction)	84–98 %	− 0.215 × *m* + 22.5	0.4992 × *m* + 49.98
Rejects	0.5–2.5 %	0.423 × *m* + 0.327	0.803 × *m* + 0.283

m = mean

Remarks

According to A-EBC 4.22, broken kernels (< 3/4 of the kernel length) as well as foreign grains and foreign material should be removed and weighed separately.

References

1. A-EBC, 4.22

R-200.09.020 [2016-03] Thousand Grain Weight (EBC-Method)

This is performed as described for barley MEBAK®-Method R-110.23.020 [2016-03]).

Standard values

28−44 g for malt, air-dried
25−35 g for malt, dry matter
Dark malts have a lower thousand grain weight than pale malts produced from the same barley.

References

1. A-EBC, 4.4

R-200.10.020 [2016-03] Test Weight (Hectolitre Weight, HW)

Determination as described for barley (MEBAK® Method R-110.24.020 [2016-03]) except that the hectolitre weight is not taken from the table but rather determined by multiplying the weight of 1/4 litre by 400. It can also be used to estimate the volume required for storage and transport.

Standard values

48−62 kg for malt, air-dried

Remarks

It must be noted that the HW alone is not a dependable measure of quality, since both well-modified, heavy barley and poorly modified, ligh barley yield a high HW when measured. In the latter case, the barley was malted according to weight. Moisture content, degree of cleaning and polishing also influence the HW.

R-200.11.730 [2016-03] Sinker Test

Barley kernels sink in water, while malt kernels normally float due to air pockets. The number of floating kernels increases with greater acrospire development and corresponding degree of advanced malt modification.

Procedure

- fill four beakers with water; drop 25 malt kernels into each beaker
- stir with a glass rod, in order to dislodge any air bubbles adhering to the malt
- count the number of kernels that sank after both 3 min and 10 min; calculate the average of the two values

Standard values

The percentage of kernels of well-modified pale malt that sinks should be a maximum of 30–35 %; for dark malts, a maximum of 25–35 %.

Remarks

This method is only suitable for a rapid orientation regarding modification of the endosperm and the admixture of barley.

R-200.12.800 [2016-03] Endosperm characteristics – glassiness

The mealiness of malt can be judged by sectioning kernels longitudinally with a grain cutter (VLB Labo Tech GmbH, Seestr. 13, 13353 Berlin, Germany) especially when combined with the use of a stereo microscope. The percentage of mealy kernels in pale malt should be at least 95 % and the proportion of totally glassy kernels should not be more than 2 %.
If desired, average glassiness can be calculated: whole glassy kernels are assigned the value of 1, partly glassy kernels, a value of 0.5, and kernels with glassy tips, a value of 0.25. The sum yields the "average glassiness" of the sample.

References

1. H. J. Wellhoener, Der Brauereitechniker *15*, 133, 1963
2. Clerck, Bd. II, 547
3. Sch-W-N, Bd. I, 331

R-200.13.731 [2016-03] Endosperm characteristics – colour

Malt colour is differentiated as follows: pure white, yellowish, brown, overly dark kernels.

Desired condition

Pale malt: 97−98 % pure white kernels, no brown kernels
Dark malt: 80−85 % pure white kernels, 10–15 % yellowish, isolated brown kernels, but no overly dark kernels

Friability

Malt exhibiting low friability or excessive glassiness can cause problems during the lautering process, wort clarification, fermentation, beer clarification and filtration. However, crop year and barley variety are known to influence friability.

R-200.14.011 [2016-03] Friabilimeter (EBC-Method)

The friability of malt kernels is determined through an abrasive treatment in a device called a friabilimeter.
The method is suitable for all commercial malts produced using two-rowed summer barley and for samples taken during the malting process using this type of barley, as long as they are first dried to a specific moisture content. Due to its high husk content, malt produced using winter barley can yield results which vary from those of spring barley.

Principle

The malt is placed in a stainless steel wire sieve drum. For a designated time period, the kernels are pressed against the rotating wire sieve drum by a roller, whereby the friable portion of the malt breaks and falls through the sieve, while the glassy portion is retained in the drum.

Apparatus

Friabilimeter (Pfeuffer GmbH, Mess- und Prüfgeräte, Flugplatzstrasse 70, 97318 Kitzingen, Germany)
Balance, accurate to 0.01 g
Sortimat with 2.2 mm sieve (Pfeuffer GmbH, as above)
Stopwatch

Procedure

- place 50 ± 0.01 g of prepared malt into the wire sieve drum, switch device on and allow to run for 8 min
- empty the wire sieve drum and weigh the glassy portion accurately to 0.01 g (*A*)
- manually remove the wholly unmodified (completely glassy)

grains from this fraction and weigh accurately to 0.01 g (*B*)
- consider grains with > 3/4 glassiness as completely glassy
- determine which grains are partially unmodified (part glassy) using the 2.2 mm sieve
- for this purpose, place the whole of the unmodified fraction (including the wholly unmodified grains) from the friabilimeter drum onto the 2.2 mm sieve and shake for 60 s
- weigh accurately to 0.01 g all the grains and broken grains remaining on the sieve, designate them as partially unmodified (part glassy) (*C*)

Calculation

The degree of modification is expressed as friability or mealiness and is calculated as follows:

Friability (F) in % = 100 − (2 × *A*)

A = weight in g of the fraction remaining in the wire sieve drum

Wholly unmodified grains (WUG), (or totally glassy grains):

WUG in % = 2 × *B*

B = weight in g of the manually selected grains > 3/4 size

Partially unmodified grains (PUG), (or partly glassy grains):

PUG in % = 2 × *C*

C = weight of the portion remaining on the 2.2 mm sieve in g

Expression of results

Report friability with no decimal, completely unmodified and partially unmodified to one decimal place.

Precision

The following precision values can be found in publications [8]:

Friability/Mealiness	65–88 %	r	=	12 − 0.11 × *m*
		R	=	21.7 − 0.192 × *m*
Partially unmodified	2–21 %	r	=	0.44 + 0.193 × *m*
		R	=	0.48 + 0.613 × *m*
Wholly unmodified	1.5–11.3 %	r	=	0.153 + 0.349 × *m*
		R	=	0.725 + 0.531 × *m*
Friability/Mealiness	65–88 %	r	=	11.4 − 0.114 × *m*
		R	=	28 − 0.28 × *m*
Partially unmodified	2.4–21 %	r	=	0.40 + 0.16 × *m*
		R	=	−0.22 + 0.73 × *m*
Friability/Mealiness	60–90 %	r	=	15 − 0.14 × *m*
		R	=	22.6 − 0.28 × *m*
Partially unmodified	0.8–22 %	r	=	0.49 + 0.224 × *m*
		R	=	0.55 + 0.614 × *m*

m = mean

Standard values

Friability/Mealiness	> 80 %
Wholly unmodified grains	< 2.5 %

Remarks

Ensure that the wire sieve drum is thoroughly cleaned after every analysis. The moisture content of the sample should be between 3.5 and 5 %; lower or higher values can influence the result. Malt with a high husk content (certain types of winter barley) or malt with husks that have absorbed water during storage can exhibit variations in results. (Experience to date has shown that the device is not suitable for wheat malt).

The following points should be given special consideration:
- the drum should rotate for 8 min ± 5 s
- ensure that the roller can move freely
- check for wear on the rubber roller
- check and maintain the device according to the manufacturer's instructions

The device should be tested regularly with malt of a known friability.
In order to verify the results, master friabilimeters were installed at six institutes across Europe (Friabilimeter Calibration Network). These devices are tested using the EBC standard malt (supplier: IFBM, 7, Rue du Bois-de- la-Champelle, B.P. 267, 54512 Vandouevre Cedex, France) at six monthly intervals. Master friabilimeters exhibiting variations in results are sent to the manufacturer for testing. Individual machines can be tested using this standard malt.

References

1. L. Chapon, Tageszeitung für Brauerei 75, 160, 1978
2. K. F. Kretschmer, L. Chapon, BWiss 31, 274, 1978
3. L. Chapon, MB 32, 160, 1977
4. D. A. Thomas, J. Inst. Brew. 92, 65, 1986
5. E. D. Baxter, D. D. O`Farrell, J. Inst. Brew. 89, 210, 1983
6. P. A. Martin, I. C. Cantrell, J. Inst. Brew. 92, 367, 1986
7. M. Benard, MBWiss 45, 122, 1992
8. A-EBC, 4.15

R-200.15.733 [2016-03] Acrospire Development

The development of the acrospire provides an overview of the uniformity of the germination.

Procedure

Follow the procedure for barley (see MEBAK® Method R-110.37.600 [2016-03]).