Molds and Bacteria

Molds and bacteria or blighted kernels contribute to a number of problems. These result from poor growing conditions or improper storage. Such diseased kernels reduce the storage potential of the barley and lead to reduced or uneven germination. In addition, affected kernels result in off flavors or the presence of mycotoxins which are not acceptable in end products. Mold on kernels often grows vigorously during the malting process compounding these problems.

Sprouted or Chitted Barley

Rainfall just prior to harvest can result in the preharvest sprouting or germination of barley kernels. The presence of sprouted kernels reduces the ability and/or rate of germination during malting. Barley that has some sprout damage prior to harvest may or may not germinate again, but even if it does, it is at great risk to unexpectedly lose germination potential upon storage. Malting sprouted barley results in unevenly modified malt and low extract.

Damaged Kernels

Damaged kernels are the consequence of many different handling or environmental factors. In general, damaged kernels (eg. heat or frost damage) result in low germination or a reduction in germination vigor. Damaged kernels lead to lower malt extract, off flavors and reduced processing performance.

Foreign Material and Other Seeds

Foreign material and dockage increase shipping costs and grading losses. They are a direct loss to the purchaser and cause problems in storage and lead to excessive wear on processing equipment. Many seeds contain oils that result in foam stability problems and poor beer flavor.

Immature Kernels

Immature or green kernels tend to be thin with high protein and germinate erratically. They result in malt that is unevenly modified and produce grassy off flavors in the end product.

Fusarium (Scab)

Fusarium head blight is a fungal disease that attacks the barley kernel. The fungus enters the kernel, releasing enzymes that begin to breakdown the starches and proteins of the barley. In addition, Fusarium produces deoxynivalenol (DON), a mycotoxin that makes the barley unsuitable for malting and brewing. *Fusarium* produces other compounds that cause packaged beer to gush out of the bottle or can.

Ergot

Spores of the Ergot fungus enter the barley head during flowering and develop into a hard mass (sclerotia) replacing the barley kernel. The fungus produces alkaloids that are toxic to animals and humans.

Insects

Field and storage insects that feed on barley kernels expose the inner kernel resulting in accelerated water uptake and uneven modification. The presence of storage insects is unacceptable as they will infest other grain lots stored at handling facilities.

Desiccants, Protectants, & Dust Suppression

End users of malting barley will not knowingly purchase grain that has been produced using pre-harvest desiccants, grain storage protectants, or dust suppression oil treatments. Chemical residues can have a negative impact on malt processing and affect yeast growth during the brewing process. Oils have a negative impact on beer foam, beer stability and flavor.

Prepared by

American Malting Barley Association, Inc.
740 N. Plankinton Ave., Suite 830
Milwaukee, WI 53203
(414) 272-4640
http://www.AMBAinc.org

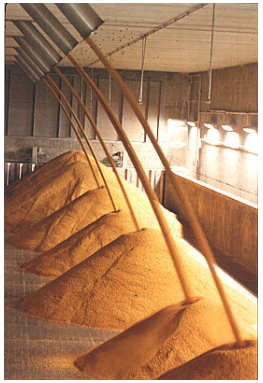
Malting Barley Quality Requirements

Barley is the heart and soul of beer and great beers are made from the highest quality barley.

Malting & Brewing

Premiums are paid for malting barley that is uniform and meets several quality specifications. These premiums reward growers that produce malting barley meeting these requirements. Specification thresholds vary based upon individual brewer requirements for the product that is being produced.

The malting process is a controlled germination of the barley kernel. It consists of three phases including steeping or soaking in water to bring kernels to 43% - 45% moisture, germination under cool, humid conditions, and drying or kilning to end the malting process. During the malting process, each kernel produces enzymes that break down seed proteins, carbohydrates, and other reserves. It is critical that conversion of these seed reserves (malt modification) take place in a balanced and uniform manner. During the brewing process, 78-82% of the reserves in the barley grain are extracted or dissolved in water and contribute to the final product. The percentage of 'extract' is critical to the brewer and is related to the quality of the malting barley and how that barley is malted. Extract contributes to the body, foam, and flavor of the final product. Each kernel in a batch of malt needs to be modified to the same extent. Uneven malt modification will result in processing problems in the brewery including malt milling, poor wort and beer filtration, hazes, poor yeast growth, and off flavors. Each brewer requires specific physical and chemical characteristics to meet their process and product needs. **Uniform malt production requires uniform, variety-preserved, malting barley.**



Variety

Brewers specify which malting barley varieties that they will use based upon their manufacturing processes and product lines. Experimental varieties are thoroughly tested in pilot and plant scale trials for their ability to consistently meet a wide range of brewers' specifications before they become recommended malting varieties. Malting barley varieties must be delivered in pure lots which are kept segregated by season and growing region as growing conditions can have a significant impact on how a given variety must be malted. The use of high quality certified seed is encouraged to help ensure varietal purity, increase crop health and reduce the presence of weed or other crop seed contamination. **To ensure proper malting and brewing processing, it is important that barley lots are not blended. Each variety contributes different processing and flavors attributes.**

Barley Quality

Quality specifications must be considered in the selection of barley for malting. Missing specifications result in a reduced value to the end user and such barley may garner reduced premiums.

Germination

Malting is a highly specialized germination process. The percentage of kernels germinating must be at least in the mid to upper 90s. Kernels that don't germinate vigorously can contribute to mold growth during malting or lead to problems associated with uneven germination and malt modification, such as reduced extract and poor filtration. **To meet brewers' specifications, malting barley varieties must germinate uniformly and rapidly.**

Kernel Plumpness

Plump barley kernels contain higher levels of starch and lower amounts of husk resulting in a higher percentage of extract. Thin barley kernels exhibit higher protein levels and also increase grading losses.

Protein

A moderate amount of protein is needed for good yeast nutrition, the development of desired enzyme levels, foam stability, and other end product characters. High protein in barley slows water uptake during malting and lowers the ability of the kernel to modify completely. If the protein is too high the amount of extract available to convert to beer will be reduced and beer hazes could form.

Blending of malting barley lots to meet protein or other quality specifications impacts processing. The kernels with low protein in such a blend will absorb water more rapidly than those with high protein and result in malt that is unevenly modified.

Skinned and Broken Kernels

The loss of the portions of the barley husk has a dramatic effect on the malting process. The husk regulates water uptake into the kernel and the loss of part of the hull leads to uneven modification of individual kernels as well as the malt as a whole. The husk is also important to protect the shoot during germination and if unprotected, could break off ending the malting process for that kernel. Skinned and broken kernels are more prone to fungal attack during storage or malting.

Moisture

Malting barley should be stored at 13.0% moisture or less with good air circulation. Inadequate storage conditions can lead to the migration of moisture to form "hot spots" in bins which cause heat damage and mold problems.