

WHAT IS BARLEY CAP?

Coordinated Agricultural Project for Barley



The Barley Coordinated Agricultural Project (CAP) is a community effort of 30 scientists from 19 institutions focused on identifying molecular markers that will dramatically speed up breeding efforts to improve barley for food, feed and brewing.

Although most cereal grains can be used in brewing, brewers discovered hundreds of years ago that barley is really the grain of choice for making malt and beer. Next to water, malted barley is the major ingredient in beer, contributing sugars for fermentation and most of the color, flavor and foam.

US Brewers produce over 6 billion gallons of beer each year, requiring over 4 billion lbs of malted barley. The production by U.S. barley growers is essential to supply this industry.

WHAT GOES INTO MY BEER?

On average a single 12 oz serving requires:

- 72 oz water
- 0.0700 lb malted barley
- 0.0260 lb unmalted rice or corn
- 0.0003 lb hops



One bushel of barley produces approximately 565 12 oz beers

QUALITY FACTORS USED IN MALTING BARLEY PURCHASE

Malting barley probably undergoes more quality tests than any other field crop. However, for purchase only a few tests can be used to predict malting and brewing quality.

Kernel Plumpness: Barley kernels are ~65% starch, which is converted during brewing to fermentable sugars and finally alcohol. Plump kernels have more starch and thus more fermentable extract needed to brew beer.



Protein Content: Barley kernels are typically 10-13% protein – some of which is important for yeast nutrition during fermentation and some for beer color, flavor and foam. Maltsters and brewers generally have upper limits on protein content depending on their process. As protein content increases, the proportion of starch/fermentable extract decreases, causing economic losses to brewers. High protein can also cause processing problems, like formation of too much color.

Germination: Malting depends on controlled germination. If grain does not germinate, necessary biochemical changes do not take place, reducing the amount of fermentable extract. Poor germination also causes problems in brewing, like poor beer filtration.



Variety: Barley varieties are developed specifically for malting and brewing – each with its own characteristics. Different brewers prefer different varieties or blends of varieties for their products.

Damaged Kernels: Many types of kernel damage can occur, often greatly influenced by environment. Examples include immature, sprouted, skinned or broken kernels or the presence of mold or vomitoxin. The presence of mold or vomitoxin, immature kernels, sprouted, or skinned and broken kernels. Damage can reduce germination, ultimately resulting in problems during the brewing process, or off-flavors. In addition, some molds produce toxins that must not end up in beer.

WHAT IS BARLEY CAP DOING?

Malting quality is a complex trait. The genetic complexity and the expensive laboratory procedures required to measure malting quality make it an excellent target for Marker-Assisted Selection (MAS). With MAS, genetic markers close to malting traits act like biochemical flags providing fast and easy identification of traits important to barley breeders. Identification of markers for malting quality will speed release of new varieties bred for specific malt attributes.

MALTING & BREWING PROCESS

MALTING

Cleaning/Sizing

Grain is cleaned to remove foreign material. Barley may be sized into different kernel fractions, since size impacts malting time.

Steeping

Grain is soaked in water for 1 to 2 days to promote rapid and uniform germination.

Germination

The steeped grain is germinated for 4-5 days. During this time enzymes are produced and structure of grain endosperm changes into a form more suitable for brewing.

Kilning

Grain is dried to low moisture. During final high temperature stages, malt colors and flavors develop.

BREWING

Mashing

Malt is extracted by combining with water and heat, and malt enzymes convert starch to sugars. Under ideal conditions 79-81% of malt is extracted. Sometimes a portion of malt is replaced with unmalted rice or corn.

Lautering/Filtration

Extract is separated from insoluble grain during filtration.

Boiling

Extract is boiled for about 1 hour. Hops are added to impart some bitterness and flavor.

Fermentation

Yeast is added to extract. Fermentation takes place for about a week.

Aging and Packaging

Beer is further cooled, aged for several weeks, filtered, carbonated and packaged.