



Barley: The Essential Ingredient in Beer Making

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Barley (*Hordeum vulgare* L.) is the most widely grown cereal crop over broad environmental conditions and the world's fourth most important cereal crop after wheat, maize and rice. It can grow in a wide range of environments than any other cereals, including extremes of latitude, longitude and altitude. The crop requires around 12-15°C temperature during the growing period and around 30-32°C at maturity. Barley is a hardy crop more tolerant to drought, heat and salt-affected soils. *Hordeum vulgare* is the only cultivated species that has two distinct phenotype forms, viz. two-rowed and six-rowed types based on ear morphology. six-row barley has a higher protein content and is more suited for animal feed, two-row barley has a higher sugar content and is thus more commonly used for malt production.

Barley contributes significantly to the world's food supply as human food, malt products, and livestock feed. However, the barley crop may be considered relatively under-utilized with regard to its potential use as an ingredient in processed human foods. In the global context, only 2-5 percent of barley is used as human food, while nearly 25-30 per cent of the produce is consumed by the malting & brewing industry and 65-70 per cent is used for livestock feed purposes. Besides food and nutrition value, barley malt is also used in the distillation and brewing industry for preparing beer, whisky, malt vinegar, malted shakes, flavored malt energy drink (such as Horlicks, Maltova milo), baked products such as malt loaf and bagels. To determine the malting quality of barley, diastatic power, hot water extract, Kolbach index, β -glucan, protein content, starch content and malt friability are the major biochemical traits responsible for malting quality. For high malt yield, low protein (9-11 %) and low β -glucan content (< 4 %) and high starch content are required, while higher hot water extract and diastatic power are desirable.

WHY BARLEY FOR MALTING?

Malt is germinated cereal grain that has been made to germinate by soaking in water and is then halted from germinating further by drying with hot air, a process known as malting. Malted grain is used to make beer, whisky, malted milk, malt vinegar, confections such as Maltesers and Whoppers, flavored drinks such as Horlicks, Ovaltine and Milo, and some baked goods. Although any cereal grain may be converted to malt, barley is chiefly used.

- Barley is well-suited for beer making because of its unique composition. It contains high levels of starch, which is essential for converting into alcohol during the brewing process. The starch in barley is also highly fermentable, which means it can be easily broken down by yeast to produce alcohol and carbon dioxide.
- One of the critical factors that make barley an excellent choice for brewing is its husk. The husk is a fibrous outer layer that protects the barley kernel during growth. The husk serves a vital function in the brewing process by providing a natural filter bed. During the brewing process, the malted barley is crushed, mixed with water, and heated. This process causes the husk to open up and release its enzymes, which then convert the starch in the barley into sugar. The husk also helps to separate the solid material from the liquid, allowing for a clear and clean-tasting beer.
- Barley also contains a high level of enzymes, which are essential for breaking down the starch into sugar during the brewing process.

- ▶ Barley also contributes to the flavour and aroma of beer. When the grain is roasted, it produces a range of flavours, from sweet and nutty to toasty and caramelized. The intensity of the flavours depends on the level of roasting. For example, pale malt, which is lightly roasted, produces a sweet and nutty flavours, while dark malt, which is heavily roasted, produces a more robust, toasty flavour. The aroma of barley also contributes to the overall experience of beer. Different types of barley produce different aromas, such as biscuit, nutty, or even slightly fruity.

THE MALTING INDUSTRY IN INDIA

The malting industry in India has been growing steadily over the years, driven by the increasing demand for beer and other malted beverages in the country. India is one of the largest consumers of beer in the world, and the demand for malted barley has been steadily increasing as a result. The malting industry in the country is primarily cantered around the states of Punjab, Haryana, and Rajasthan, which are major barley-producing regions. These states account for a significant portion of India's barley production, and also have a well-established infrastructure for the production of malted barley. The Indian malting industry consists of both large-scale commercial malting companies and small-scale artisanal maltsters.

Despite the growth of the malting industry in India, there are also challenges facing the sector, including competition from other barley-producing countries and the need to address quality and consistency issues in the production of malted barley. However, with the increasing demand for beer and other malted beverages in the country, the future of the malting industry in India looks promising.

PROCESS OF MALTING IN BARLEY

The ancient method of malting barley was a relatively simple process that could be carried out by farmers and brewers using only basic

equipment. The process typically began by soaking the barley grains in water for several hours, until they had absorbed enough moisture to begin germinating. Once the grains had started to sprout, they were spread out in a thin layer on a flat surface, such as a wooden tray or a stone floor. The grains were then left to dry in the sun or in a warm, dry room, where they would continue to sprout and develop enzymes that would break down the starches in the grain. After a few days,

the malted barley was ready to be kilned, or dried, to stop the germination process and preserve the enzymes in the grain. This was typically done by heating the barley grains over a fire or in a wood-fired oven, until they were dry and crisp. The resulting malted barley could then be stored for later use in the production of beer, bread, or other food products. The ancient method of malting barley was a time-consuming process, but it was also relatively simple and easy to carry



out with the equipment that was available at the time.

For producing the high-quality malted barley, modern methods of malting barley involve sophisticated equipment and technology to speed up the efficiency and consistency of the malting process. However, the basic principles of malting remain the same. The controlled germination of grains that results in malt is initiated by adding moisture and is arrested by removing the moisture before the young plant grows out of its seed covering. The malting process itself consists of three stages: steeping, germination, and kilning.

Steeping: The barley grains are first cleaned to remove any impurities such as stones, dust, and other debris. The cleaned grains are then soaked in water to begin the steeping process, during which the grains absorb water and begin to sprout.

Germination: The soaked grains are spread out in a thin layer and allowed to germinate under controlled conditions of temperature, humidity, and airflow. The germination process typically takes several days, during which enzymes are produced that break down the starches in the barley into simpler sugars. In modern malting procedures, germination usually takes place in revolving drums or in tanks equipped with agitators. This process

has largely replaced floor malting, in which the moistened grain was spread on concrete floors and turned by shoveling.

Kilning: When the desired biological modification in the grain has been attained, the germination process is stopped by kilning. In this stage, the germinated grain, called green malt, is dried by currents of heated air entering through perforations in the floor of the kiln. The timing and heat intensity applied in kilning affect the malt's flavour and colour development.

After kilning, the malted barley is cleaned and sorted to remove any remaining impurities and ensure that only high-quality malted barley is used in the production of beer or other products. Throughout the malting process, quality control checks are performed to ensure that the malted barley meets the required specifications for colour, flavour, aroma, and enzymatic activity. The malted barley is then packaged in sealed bags or containers to protect it from moisture and other contaminants. It is typically stored in a cool, dry place until it is ready to be used in the production of beer or other products.

Modern methods of malting have significantly improved the quality and consistency of malted barley, which is essential in the production of high-quality beer and other malted beverages.

IMPROVING MALTING QUALITY OF BARLEY

Improving the quality of malted barley involves a combination of good agricultural practices, appropriate processing techniques, and quality control measures. The following are some key points that can be taken to improve the quality of malted barley:

➤ Selecting the suitable varieties: Different varieties of barley have different characteristics, and selecting the right variety can make a significant difference in the quality of the malted barley

produced. It is important to choose barley varieties that are well-suited to the local climate and soil conditions, and that have good yield potential and disease resistance.

➤ Harvesting at the right time is critical for producing high-quality barley. The grains should be harvested when they are fully ripe and dry, to ensure that the grains are mature and have a high starch content.

➤ The barley should be stored in appropriate

conditions to prevent spoilage and maintain its quality. It is important to store barley in a cool, dry place, and to protect it from moisture, pests, and other contaminants.

- The steeping process is critical for the production of high-quality malted barley. The water used for steeping should be of high quality, and the steeping process should be carefully monitored to ensure that the grains are soaked evenly and that the water is changed at the appropriate intervals.
- The process of germination should be carefully controlled to ensure that the malted barley has the desired colour, flavours and aroma.
- Throughout the malting process, quality control checks should be performed to ensure that the malted barley meets the required specifications for colour, flavours, aroma and enzymatic activity.

By implementing these steps, it is possible to improve the quality of malted barley and produce high-quality malt that can be used in the production of beer and other malted beverages. In addition, continuous research and development in the field of barley breeding and malting technology can further enhance the quality of malted barley.

