The Northern Craft Brewers

"We Live We Brew"

Beer Flavours: Malt

Ian Priddey

Water aside, the main ingredient in beer is malted barley, or malt. As beer evolved over the centuries Barley was found to be the best grain to make beer from. Malted Barley is arguably the ingredient that contributes most to the flavour of our beer, so let's have a closer look at this and other cereals that are commonly used in the production of beer.

Cereal grains contain starch which is used as a source of food for the initial growth of the new plant. This starch can also be used by yeast to produce alcohol but in order to do this the starch needs to be broken down into smaller sugars. To convert the grain into malt, it is soaked in water and allowed to germinate by controlling moisture and temperature until the maltster decides to end the process by drying the grain in a kiln. This produces malt with enzymes that are available to the brewer in the mash tun, which convert the starch into fermentable sugars.

The enzyme alpha amylase breaks the starch down into chains of 100 to 500 sugars, allowing the other main enzyme, beta amylase to bite off two sugars at a time, producing the disaccharide maltose, the main sugar in brewers' wort. The monosaccharides glucose and fructose, the disaccharide sucrose and the trisaccaride maltotriose are also present and all are fermentable by yeast. However, four or more sugars linked together are unfermentable by brewing yeasts and are called dextrins. Various factors in the mashing process favour one of the two enzymes; for example, a mashing temperature above 150 degrees F (65 degrees C) benefits the activity of alpha amylase but reduces beta amylase activity, producing a more dextrinous wort that is less fermentable and will have a higher level of unfermented sugars in the finished beer. This will produce a beer with more mouth feel, body and sweetness but less alcohol than for a beer with the same ingredients mashed at a lower temperature.

Malted barley dried and gently kilned at relatively low temperatures produces pale malt which is the main grain used in British real ales, indeed in a pale bitter or summer ale it may constitute 100% of the grain. Sometimes small brewers will state that they have used Maris Otter pale malt. Maris Otter was the first variety of barley developed specially for malting and almost went out of production with the introduction of newer varieties that were easier to grow and produced greater yields per acre. However, many brewers felt it produced a better beer with a rich, nutty character and tasting experiments have seemed to confirm a

preference for beer made with this variety. It is now widely used by small brewers of real ale who are prepared to pay a premium price for this variety.

If the germinated barley is kilned at a moderately high temperature whilst still moist, it is effectively stewed and the starch turns to sugars and caramelizes, to produce what is called crystal malt. This is the ingredient that was largely responsible for the flavour of the traditional English bitters of the last century (prior to the new generation of very pale bitters and summer or golden ales). Crystal malt was often used for 5 to 10% of the total grain and depending on amount gives increased colour towards copper, greater mouth feel and sweet, toasty, caramel flavours.

When the malt is dried and kilned at higher temperatures, up to 450 degrees F, it produces a range of malts from mild ale malt to chocolate and black malt. Chocolate has a rich roasted character, whilst black has a more burnt and acrid taste. They can be used in small percentages to make dark mild in place of the now uncommon mild ale malt, or be used to make porters and stouts. The Irish dry stout relies on the use of roast barley, which is unmalted barley kilned to a high temperature. It is a bit like black malt in flavour but gives more astringency, bitterness and a slightly drier character.

Other grains can be malted, the most common being wheat and rye. The Bavarian style of wheat beer will use 50 to 60% malted wheat, which gives a little less flavour but more head retention than barley malt. Rye malt contributes a nice nutty, spicy, oily character but needs to be used carefully as at above about 15% of the grain its oily nature can clog up the runoff from the mash tun in the brewery.

Unmalted grains and brewing sugars are usually called adjuncts and can be used in small amounts for specific desirable purposes. Draught Bass and Marston's Pedigree are thought to contain at least 10% sugar. Maize (corn) and rice are the most commonly used unmalted cereals, especially in the USA. Maize will add a little flavour and sweetness but rice has virtually no flavour and both will tend to lighten the malt character. My summer ale has nearly 17% of flaked maize but with plenty of hops makes a delightful refreshing summer drink. Alas the use of adjuncts can be abused and cheap supermarket lagers, especially in the USA, may contain over 50% adjuncts! Flaked barley can be used to aid head retention and give a grainy character but can contribute to a haze and has thus often been used in dark beers such as stouts. Oats give a slight oiliness and aid mouth feel but may damage head retention. As a general rule speciality malts and adjuncts are best kept to about 15% maximum of the total.

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Further developments of flavour occur when the wort collected from the mash tun is boiled in the copper. Particularly with the electric heating elements that are often used by small breweries, there is the likelihood of a degree of caramelization of sugars to give a burnt sugar, toffee-like character. Also the presence of water, high temperature, amino acids and sugars, results in the development of melanoidins in a complex series of changes and flavour developments known as the Maillard reaction, named after the French chemist. The brown pigments produced give lovely malty aromas that are similar to those produced in a freshly baked crusty loaf. Enjoy!