

Light Lagers and Malting

BJCP Example Exam Questions Session 1 – Technical Topic

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Purpose of this Document

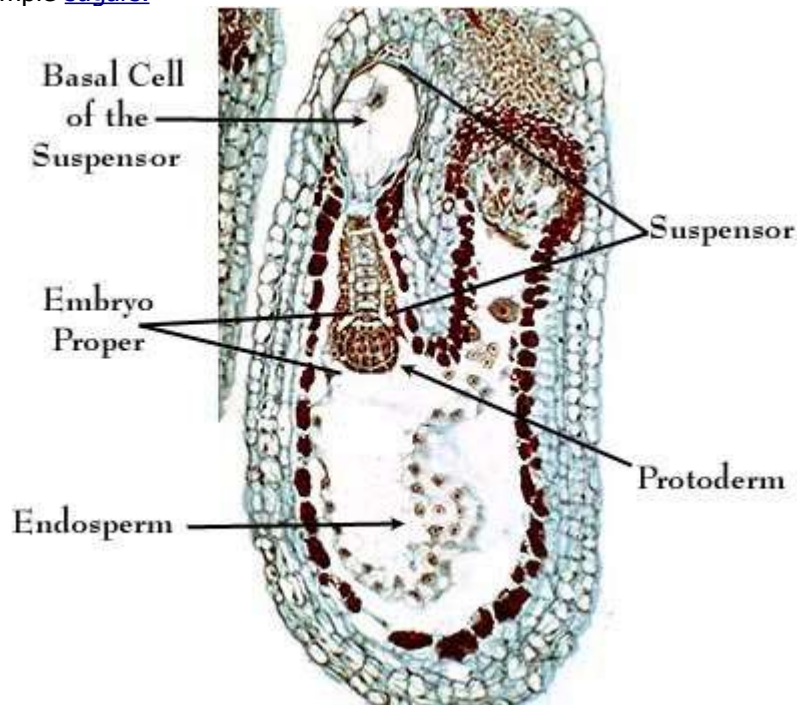
This document has been written as resource material for the BJCP study course, session 1, Light Lagers and Malting. In reality, it only covers the technical topic, Malting. It contains attempts at answering the example exam questions, T8 and T14.

Definitions

- acrosire [The sprout at the end of a seed when it begins to germinate; the plumule in germination](#)
- cellulose insoluble starch making up 5-10% of the malt by weight. Mashing at high temperatures and high pH can result in excessive tannin extraction. This is detrimental for beer (eg can lead to astringency).
- endosperm [nutritive tissue surrounding the embryo within seeds of flowering plants](#)
- hemicellulose A large [polysaccharide](#) which helps give structure to plant [cells](#). Along with [pectin](#), it forms an [amorphous](#) matrix in which [cellulose](#) fibrils from the plant [cell walls](#) are embedded. It has the chemical formula of $C_6H_{10}O_5$ and consists of a chain of D-xylose [sugar](#) units which has side chains of units of other sugars branching off it. Can be fully reduced to simple sugars in a thorough mash.
- hydrolytic an enzyme (formerly referred to as a ferment), which acts only in the presence of water, and which causes the substance acted upon to take up a molecule of water, resulting in the splitting of a chemical bond and often splitting one compound into two. Thus, diastase of malt, ptyalin of saliva, and boiling dilute sulphuric acid all convert starch by hydration into dextrin and sugar. Nearly all of the digestive enzymes are hydrolytic in their action. Since 1910 such an enzyme is usually referred to as a [{hydrolase}](#) or [{hydrolytic enzyme}](#). [1913 Webster +PJC]

polysaccharide

[any of a class of carbohydrates whose molecules contain chains of monosaccharide molecules](#), in other words, Any of many carbohydrates that are made up of chains of simple [sugars](#).



T8. part 1, Explain the malting process

The processes of malting and mashing convert the complex starches into sugars readily convertible by yeast. Other components of the grain such as protein are also undergo conversion. In addition, the specifics of the malting processing (eg degree of roasting) can be adjusted to achieve a distinctive flavour profile.

Malting is the precursor to brewing in priming the grain. It removes internal cell wall barriers, stimulates the production of diastatic enzymes (responsible for converting starch into malt extract), promotes flavour and colour development. [DeptAg WA]

The malting process involves three key processes, steeping, germination and kilning.

Steeping

Steeping starts the germination process as grain moisture is increased from 10 per cent to between 42 and 48 per cent. The process involves immersing grain in aerated water for five to eight hours at a time, with air rests (water is drained from grain) in between. [DeptAg WA]

During steeping (or soaking):

1. Many enzymes in the grains are either formed or activated. [NOO p113]
2. Starchy endosperm mass is solubilised to gummy polysaccharides. [NOO p113]

Germination

After steeping the grain is transferred from steeping tanks to germination boxes for root and shoot production. The endosperm, which is the energy source of the grain during early growth, also changes in structure in a process called modification. [DeptAg WA]

Diastatic enzyme production in the grain is controlled by manipulating humidity and the temperature of the germination bed.

Germination aims to maximise grain modification and minimise root and shoot growth. Excessive growth results in less malt extract.

During the germination (or sprouting) of the grains:

1. Hydrolitic enzymes inside the developing plant embryo increase and penetrate the endosperm reducing proteins and hemicellulose to soluble fractions. [NOO p113]
2. The degree of reduction of polysaccharides and protein is nearly proportional to the extent of the acrospire growth (which is arrested at the kilning stage). [NOO p113]

Kilning

When the barley shoot is about three quarters the length of the grain (about four days), germination is halted by kilning. Kilning dries the grain and promotes the development of colour and flavour.

Low temperatures are used to ensure the survival of diastatic enzymes required for the subsequent brewing process. This is followed by a progressive increase in temperature to bring about the flavour and colour changes. Malt kilned to high final temperatures produces darker coloured beers. [DeptAg WA]

The malt temperature is raised to 32C over 24 hours and then up to 49C to thoroughly dry it before roasting to minimise degradation of enzymes. [NOO p117]

The process of kilning:

1. Dries the malt.
2. Facilitates the removal of rootlets.
3. Results in lower mash pH.

T8 part 2 Identify the different types of malt and give reasons why they are made and their uses.

1. Lager – made for light coloured beers. Used as a base malt and has diastatic power to convert additional adjuncts. [Palm ch12]
2. Vienna and Munich – frequently used for Oktoberfest styles. Both have sufficient DP to convert themselves. Vienna is lighter and sweeter than Munich and is a principal ingredient of Bock beers. [Palm ch12]
3. Amber -
4. Biscuit – Lightly roasted malt is used to give beer a “bread and biscuits” flavour. Gives a deep amber colour to the beer. [Palm ch12]
5. Brown Malt
6. Crystal/Caramel – as seen in Drawing 1 these undergo a stewing process after malting which crystalizes the sugars. They come in a variety of colours from light to dark and are frequently found in ales. [Palm ch12]
7. Roasted - This is not actually a malt, but highly roasted plain barley. It has a dry, distinct coffee taste and is the signature flavour of Stouts. . [Palm ch12]

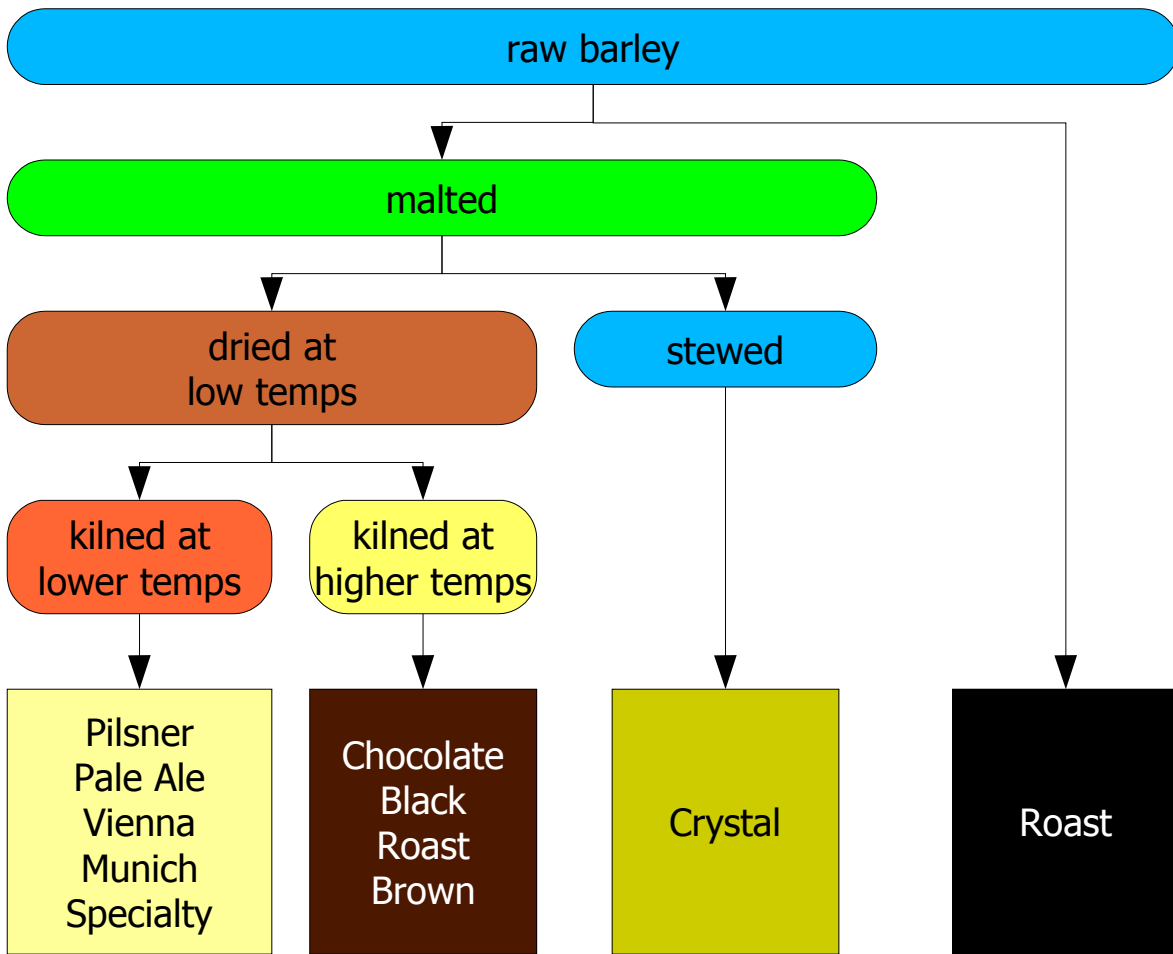
T14. Explain how the following grains are produced, and what effect each has on beer:

- a) Black Patent** - This is the blackest of the black. It must be used sparingly, generally less than a half pound per 5 gallons. It contributes a roasted charcoal flavor that can actually be quite unpleasant if used in excess. It is useful for contributing colour and/or setting a "limit" on the sweetness of other beer styles using a lot of caramel malt; one or two ounces is useful for this purpose.
- b) Chocolate malt** - Used in small amounts for brown ale and extensively in porters and stouts, this malt has a bittersweet chocolate flavour, pleasant roast character and contributes a deep ruby black colour.
- c) Dextrin malt** - Also known as American Carapils, this malt is used sparingly and contributes little colour but enhances the mouthfeel and perceived body of the beer. A common amount for a five gallon batch is 1/2 lb. Dextrin malt has no diastatic power. It must be mashed; if steeped it will contribute a lot of unconverted starch and cause starch haze.
- e) Roasted barley** - This is not actually a malt, but highly roasted plain barley. It has a dry, distinct coffee taste and is the signature flavour of Stouts. It has less of a charcoal "bite" to it than does Black Patent.
- f) Munich malt** - This malt has an **amber** colour and gives a very malty flavour. This malt has enough diastatic power to convert itself but is usually used in conjunction with a base malt for mashing. This malt is used for Oktoberfest-type beers and many others, including pale ales.

		kiln temp	comments	
Amer. Lager		55-82		
British Lager		94-105		
Cont. Lager		81	Dried very thoroughly before kilning.	
Dortmund lager		90-95		
Powells Pils		85	Beers made from Pilsner Malt are clean, full-bodied with light colour and toffee	[Pow]
Ale		95-105	Ale Malts are often used to balance higher hop levels.	[Pow]
Vienna		Higher than ale	A darker product with strong nutty and toffee flavours.	
			Beers made from Vienna Malt are golden to amber in colour.	[Pow]
Munich	stewed	100-110	Distinctive nutty flavour and aroma.	[Pow]
Amber		138-171	Used in production of dark, aromatic and full-bodied lagers, Marzen, Oktoberfest, Bock and Double Bock styles	[NOO p118]
Biscuit		180		[NOO p118]
Brown		110-130	Almost completely saccharified.	[NOO p119]
Crystal	stewed			
Caramel		215 quenched	Contribute nutty or burnt flavour.	[NOO p120]
chocolate		224-249 quenched	Contribute nutty or burnt flavour.	[NOO p120]
black				

Table 1 Kilning temperatures for different malts

Drawing 1 shows the relationship between families of barley based brewing ingredients. [Dan p21]



Drawing 1 Barley based brewing ingredients.

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