



The Northern Craft Brewers

“We Live We Brew”



Beer Flavours: Yeast

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Is yeast a beer flavour? Well if you get the dregs from the bottom of a bottle conditioned beer or cask, or one which has not settled out, or been disturbed, then yes it clearly (or perhaps that should be hazily) gives the beer a yeasty flavour. But in a well-served beer there should be little if any yeast present, nevertheless it is the yeast that was the complex chemical factory that turned the water, malt and hops into a range of flavourful compounds making it the key factor in determining beer flavours. In previous articles, we have explored some of the major ones already, such as diacetyl and acetaldehyde, so this time I want to look at yeast in general terms and some of the other flavours that it contributes to our beer.

Yeast is a single celled fungus and arguably the oldest domesticated organism, having been used for over 4,000 years in the production of alcoholic drinks and breads. But it was not until 1680 that Antoinen van Leeuwenhoek made the first microscopic observation of yeast cells, although it was not then considered to be a living organism. In 1836 Cagniard de Latour identified it as a live organism and in 1857, Louis Pasteur proved that alcoholic fermentation was conducted by live yeast and not a chemical catalyst.

There are thousands of species of yeast but the one we are interested in is *Saccharomyces cerevisiae*, the one used in the production of beer and bread. I once experimented, making a beer with a bread yeast and it was drinkable if reluctant to clear and somewhat “bready” rather than clean with predominant flavours of malt and hops. I have not tried to make bread with a beer yeast strain, but as they are slower in the production of carbon dioxide the likely result will be a solid flat loaf more suitable for use as a brick! In the past it was thought that the yeasts used in the production of lager were a separate species but they are now considered as different strains of *S. Cerevisiae*.

The national collection of yeast cultures in Norwich has over 3,400 strains and Wyeast in America had 18 ale, 16 Belgium/wheat beer yeasts and 11 lager yeast strains available for craft brewers to use when this article was first written in 2010, no doubt more now.

Mangrove Jack’s Craft Series has a range of dried yeasts suitable for specific styles and NCB members have been experimenting with some of these in 2016. Brewlab in Sunderland will also supply yeast strains to brewers, but aimed more at commercial producers than home brewers.

The main difference between ale and lager strains is the temperature range at which they will ferment, ales working best at 10 to 25 degrees Celsius, lagers best at 7 to 15 degrees, although the conditioning or lagering stage may be down to just a few degrees above



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freezing. Another difference is that most lager strains will ferment a wider range sugars, trisaccharides such as melibiose and other minor sugars, which ale strains will not. A big factor in the flavours produced is the temperature of the fermentation. A lager yeast fermented warm at around 20 to 25 degrees will produce an ale-like beer, indeed this is the technique behind Anchor Steam Beer from San Francisco.

So is the choice of yeast strain really important? Many brewers would argue that it is and contributes greatly to their house style. Nowhere is this more evident than in the spontaneously fermented Belgium Lambic beers, where *Brettanomyces* species, wild yeasts and bacteria play a role in the fermentation. I am happy to use the Nottingham ale yeast strain for nearly all my beers, as it ferments most of the sugars, giving a clean dry beer and settles out well. But if I want a Bavarian style wheat beer, even using 50% wheat and German hops will not give the required flavour, without using a special wheat beer strain that is known to produce high levels of fruity (banana) and spicy (clove) flavours. A recent batch was split into two and fermented with Wilko Gervin English ale yeast (I believe this to be Nottingham ale based on a previous experiment) and Mangrove Jack's M20 Bavarian Wheat. The Gervin produced a pleasant ale; the M20 produced a Bavarian wheat beer!

Certain strains of yeast create phenolic compounds by converting mildly flavoured phenolics in malt to stronger flavoured constituents, such as Ferulic acid being converted to 4-vinyl guaiacol, which has a clove like flavour. Other phenolic compounds can be off flavours however, giving medicinal or TCP antiseptic aromas. Another way of producing this is a reaction between chlorine based sanitizers and certain plastics, so beware if you are using bleach to clean and sterilise plastic equipment used in brewing – although I have not had a problem with using one teaspoon of thin, non-perfumed bleach in a gallon of water for siphon tubing (my primary fermenter is stainless steel and I use glass carboys for secondary fermentation).

Fruity flavours are esters and are what contribute much of the ale-like characteristics to ales, including wheat beers. There are hundreds known in beer and common flavours are of banana, pear and strawberry. The banana flavour in Bavarian wheat beers is from isoamyl acetate. Yeast strains vary widely in their ability to produce esters and higher fermentation temperatures promote their production.

Fusel oils or higher alcohols are volatile oily liquids produced by yeast, mainly at high fermentation temperatures, with some strains producing up to three times that of others. They combine with esters and contribute to flowery, fruity and solvent like aromatic flavours, whilst giving a warming effect on the pallet. Unfortunately, excessive amounts



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contribute to hangovers, thirst and in large amounts are poisonous. Along with poor ingredients and lack of sanitation, high fermentation temperatures are in my opinion the third factor responsible for poor quality home brewed beer, so don't ferment at too high a temperature for your chosen yeast.

Dimethyl sulphide or DMS, is present in malt and produced by yeast and bacteria. It may range from 10 to 70 parts per billion and has a flavour threshold of 30ppb. It is an accepted flavour component in lagers but generally considered a fault in ales. The flavour is of sweet corn or cooked vegetables, like cabbage and green beans. Other sulphurous compounds contribute to beer flavour such as hydrogen sulphide (rotten eggs) and mercaptans (see the MBT/Light Struck article). Sulphur compounds can come from a variety of sources, including the water – think of the “Burton snatch” in a well-kept pint of Marston's Pedigree. Like the yeast extract Marmite, you probably love it or hate it! Having grown up in the West Midlands I can tolerate a fair amount of sulphur before I notice it, or find it objectionable.

Fatty acids are minor constituents of wort but increase during fermentation giving goaty, soapy, fatty flavours, more commonly associated with lager strains producing Caprylic acid.

Organic acids such as acetic, citric, lactic, malic, pyruvic and succinic give a sour or salty character and their concentration increases during fermentation and may progress onto spoiling the beer if their concentration gets too high as a result of wild yeast and bacterial infection (see acidity article).