SPECIAL MALTS AND NEW TWISTS IN MALT GRISTS

This article is based on a lecture presented to the 1997 Cambridge Meeting of the IOB and to the North Eastern Section, but additional material published by Dr. Maule in The Brewer [1] has been incorporated.

INTRODUCTION

A journalist asked a brewer from a major UK consortium: 'What is the distinguishing characteristics of your new lager brand?'. The brewer answered that the distinguishing of the new brand was that it had no distinguishing characteristics! Large volume keg beer and lager production in the 60s gave little room for inventive grist compositions. In the past two or three decades there has been a public reaction against such beers, which has coincided with a rise in the number of mini-breweries, each coming into the market with novel product portfolios. They tackle niche markets and local preferences and occasionally hit a winner with a beer that achieves national or even international reputation, e.g. Morlands' Old Speckled Hen or Asahi Dry Beer.

The smaller brewers have smaller mash tuns and can be more flexible and innovative in their approach. Many scoured the old recipe books from the days when most large country houses brewed their own beer. Such houses used locally available produce, hence the use of wheat, oats, rye, peas and beans, as well as barley. Maltsters do their best to supply such needs, though the order might be minimal. We are therefore re-inventing the wheel, learning how to malt and use the ingredients of our forebears, but also developing new roasted or crystal products from them.

It is perhaps timely to look at the range of possible ingredients and their properties, so more technically rational grists may be constructed, based more on science than on nostalgia.

Commonly Used Malts Made from Barley (Historical)

In the U.K. before 1680, when coke became available for kilning, most malts would have been coloured to some extent, perhaps resembling present day amber and brown malts. In those days malting and brewing were domestic activities and malt was dried over burning hardwood faggots with inadequate ventilation. Malts would therefore have been slightly smoky and would have been brown as a result of the combination of temperature and the presence of moisture due to condensation. Pale malts have been available only since 1680.

Roasted malt (black malt) was not widely available until 1817 when the cylindrical drum roaster with water sprays (to prevent auto combustion of the smouldering corns) was invented. At about the same time white malt was developed for the production of India Pale Ales. The maximum curing temperature was 65°C compared with 77-85°C for pale ale malt.

Crystal malt production methods were patented during 1840-50, but they did not become widely used until 1880. The full range of coloured malts (including crystal) was therefore in widespread use between 1880-1920. Use of some of them declined until there was a revival of interest in special malts in about 1980.

BREWING CEREALS

Some properties of brewing cereals are shown in Table1.

Barley will retain its premier position because of its grain size and adherent husk. It has been selectively bred for use over the past 100 years. The husk is required for tun filtration and its content is important for beer flavour and stability.

Oats have a tough fibrous adherent husk and so barley husk for fast run-off. Groats are husked oats and can be flaked and roasted slightly for flavour. Oats were used of necessity in the 2nd World War. The high fat content is no problem, being largely removed with the spent grain.

Rice is a major world cereal and could be used more than it is. Rice is small-grained and therefore is low-yielding in extract terms.

Sorghum replaced barley as main malt source in West Africa for production of clear beers.

Wheat, another major cereal, has a loose husk, which is not retained in malt.

Wheat malt gives softer flavours than barley malt, high extract yield, good head retention, and foam stability. Lack of husk limits its use in conventional tuns.

Rye is another small-grained cereal with little retained husk. This leads to rapid water absorption during steeping, and bed compaction during germination and kilning. It produces a distinct flavour. Rye is a major bread grain in Scandinavia and Eastern Europe. During the Middle Ages poorer people in England ate rye bread. (It is now an expensive speciality bread.)

Triticale is a cross between wheat and rye with a low fat content and often high protein. It is a lot plumper than rye and produces malts of high enzyme activity and high wort FAN and soluble nitrogen. It tends to produce hazy worts and it is susceptible to mould growth during germination.

GRIST TWISTERS - OLD AND NEW

Barley malt and its relatives are well known. Chocolate malt gives a softer flavour than black malt; amber malt a dry biscuity flavour; brown malt is used for a fall flavoured stout; crystal malts from pale caramel to dark crystal provide optimum reducing power per colour unit and nutty flavours as well as colour. Other special barley malts produced outside the roasting drum include Munich, Vienna, Brumalt and Acid malts. Comments about these and other adjuncts are given in the following: →

Munich malt: dark, malty, without bitter notes. Mildly stewed on kiln to give good reducing power and retained enzymes.

Vienna malt: copper coloured worts, used for 'Old Red' beers of West Flanders. Flavoursome, faint toffee aroma malt that can offset the 0.0. of low alcohol beers.

Brumalt: high protein, well steeped. Aeration stopped after 3.5 days of germination. Temperature reaches 45°C in 36 hours. Held for 18 hours. The high temperature stops embryo growth, but allows enzyme activity. High level of low MW sugars, amino-acids and peptides, but still enzymic (depending on kilning temperature).

Acid malts: made by encouraging the development of naturally present lactobacilli. Slow kilns with deep beds produce malt with a lower pH. Wort pH as low as 3.2. Counteract carbonates in mashing liquor and help promote mellow flavours.

Enzymic malts: British Patent GB 1173611 (for Dixon Malt Co. Ltd. and Enzymic Malt Co. Ltd.) describes how malt is first germinated to form rootlets and then subjected to anaerobic conditions (by excluding air or use of a gas such as nitrogen). Malts produced in this way are better known for their high content of amino-acids than for their residual enzymic activity.

Diastatic malts: used by grain whisky producers. These malts are produced from specific high alpha-amylase varieties and enzyme levels are maximised by cool, long germination and mild kilning.

Roasted barley: gives blackness and sharp acridity.

Roasted pearled barley: even blacker, but less acrid due to husk removal.

Wheat malt: bread flavours, enhanced foam. Can be used as 50-60% of the grist for wheat beers.

Wheat crystal: illustrates that caramel and crystal malts can be made from all cereals.

Roasted wheat flakes: soft, fresh bread-crust aromas. Spelt flakes: used in antiquity in the Middle East with green malt to make loaves, which were then broken up and used to make beer.

Roasted maize flakes: an experimental product that got no further than the roasting drum.

Roasted rye flakes: low colour adjunct similar to roasted wheat flakes but with different flavour notes.

Rye malt: different flavour to barley malt. Can be difficult to fine. Rye crystal gives toasted bread-crust flavours and red hues.

Triticale: similar to rye but bigger.

Oat malt: low colour. Extract only 232 dry. Low TSN and enzymes. Smooth mouthfeel, soft.

TABLE 1

CEREAL	% WORLD PRODUCTION	PROTEIN	FAT	CRUDE FIBRE	MINERAL	SOLUBLE CARBOHYDRATE
OATS –WHOLE	3	11.6	5.2	10.4	2.9	69.8
– GROATS	14.9	7.0	1.3	2.1	74.6	
RICE (PADDY)	25	9.1	2.2	10.2	7.2	71.2
BARLEY	10	11.8	1.8	5.3	3.1	78.1
SORGHUM	4	12.4	3.6	2.7	1.7	79.7
WHEAT	28	10.5	2.6	2.5	1.8	78.6
MAIZE	27	11.1	4.9	2.1	1.7	80.2
TRITICALE		15.0	1.7	2.6	2.0	78.7
RYE	1	13.4	1.8	2.1	2.6	80.1

Source: N.L. Kent, 'Technology of Cereals' - Pergamon Press, 3rd Edition, 1983, p.28

Roasted oat groats and flakes: two experimental products we are currently evaluating.

Ground roasted beans: beans and peas were used, unmalted in private breweries. Sambrook quotes use at 4% of the grist at Wrest.

Peated malt: produced for malt whisky, but might be used in very small quantities to simulate the smoky malts used in the past for porters and strong stouts. [Note: Some of the products mentioned in this section are experimental or have been produced only in small batches.]

NEW GENERATION GRISTS

I am very grateful to a number of brewers who have disclosed details of their malt grists and allowed me to describe them. Border Brewery is a close neighbour to Simpsons in Berwick-upon-Tweed and their use of special malts is relatively conservative. Special Bitter has 1.1% amber in the grist, whereas Old Kiln Ale and its bottled version Fame Island have 2.2% crystal and 2.2% amber with 0.3% chocolate to give a refreshing amber session beer (session beer: several beers consumed in a drinking session). Noggins Nog is a dark mild ale constructed on 7.3% crystal, 3.3% chocolate and 1.2% amber. Rampart at 4.8% ABV is a formidable draught beer aptly named after Berwick's medieval fortifications and has 1.7% amber malt. SOB is named after Andy Burrow's wife (Sheona Ord Burrows) and the grist contains 3.9% crystal, 3.7% amber, and 1% chocolate to give a red ale of woody dryness (a description of the ale, not the wife!).

Ushers have been representing the four seasons with Spring Fever featuring malted oats, Summer Madness containing wheat malt, and Autumn Frenzy rye malt, which together with the crystal malt used provides a rich ruby colour. The Oatmeal Stout of King & Barnes (K&B) is brewed using 9% unmalted pinhead oat grits, 5.5% chocolate, 3.5% brown, 3.5% crystal and 1.5% enzymic malt, this being a traditional recipe, except that copper sugars are all replaced by malt. The wheat mash of K&B has as much as 40% wheat malt in the grist, imparting a bready flavour, as well as 5% caramel malt and 5.5% lager malt. The beer is clear because the wheat is malted. Jigsaw is bottle-conditioned, wheat malt beer brewed for The Salopian Brewing Company Ltd. The malt grist comprises 50% wheat malt and high levels of crystal and chocolate malt, together with a small amount of malted oats. K&B's Rye Beer uses 33% of rye malt, imparting a distinctly grassy note, 7% of rye crystal (nutty, bitter) with 1% chocolate and 59% Pale Ale Malt. It is difficult to brew, but has proved extremely popular.

K&B's Corn Beer has a powerful 6.5% ABV with high PG and hoppiness. The grist contains 40% milled flaked maize, with Pale Malt.

Hook Norton's Haymaker, another seasonal beer (July, August), is a strong pale ale of distinctive taste, enhanced by additional hopping late in the boil. K&B's Crystal Malt Ale has as much as 15% crystal malt in the grist. HookNorton's Generation VI, brewed for the 6th generation of Clarke brewers, has 10% of amber for a biscuity flavour and uses First Gold dwarf hops. K&B's Amber Malt Ale has as much as 20% amber malt to give what they describe as a biscuity dry flavour. Young's Oregon owes much of its character to Oregon Fuggles hops; the malt grist is based on Maris Otter malt with crystal and amber. K&B's Brown Malt Ale contains 5% each of light brown and dark brown malts. Hook Norton's Double Stout has 5% each of black and brown malts in a recipe that was used up to 1918. Young's Double Chocolate refers to its use of chocolate malt and chocolate essence. Wychwood's Old Devil has 14% of amber for dryness and 76% pale malt.

Wychwood also make a Fiddler's Elbow using 8% wheat malt to give a softer palate for easy drinking and Black Wych with black malt.

This sample of beers shows extensive use of cereals other than barley - notably rye, oats, wheat and maize, and bold use of high percentages of amber malt, brown malt, and crystal malt. However, there was no use of Munich, Vienna or Brumalt malts, reflecting the fact that these new beers are based more on old British traditions, rather than barley malt orientated continental practices.

I have made no mention of the use of aromatics such as honey and ginger, orange zest and coriander (as used in Young's Wheat Beer, being added late in the copper), since they do not come within the scope of this talk. However, they were used in the past, some of them pre-15th century before hopped beers were established in Britain, and some are now being resurrected to provide distinctive aroma notes. Nethergate's Umbel based on coriander being a fine example.

Reference 1. Maule, P. "The Brewer", November 1996, 455-457.

WWW.SIMPSONSMALT.CO.UK

NEW KHS TECHNOLOGY CENTER OPENS IN DORTMUND

KHS has set up a new Technology Center at the company's headquarters in Dortmund.

The new Technology Center has a floor area of about 1,000 square meters spread over two stories, and is linked to an existing Training Center. Theoretical training courses and practical training on the 'nuts and bolts' therefore complement one another outstandingly. The cutting-edge communication systems are used and are linked directly to the KHS network.

Within the KHS Group, KHS in Dortmund is the competence center for cleaning and pasteurizing technology, conveyor technology, and for labeling and inspection technology. Appropriate equipment for these areas of activity can be found within the Technology Center. Whether rotary conveyor, a labeling machine equipped with different labeling modules, the functional bottle washer model, the empty bottle inspection machine, or the foreign substance inspector – everything is provided.

Customers from all over the world are invited by KHS to take part in comprehensive training programs in the new Technology Center. Particularly when new investments are made in complex KHS solutions, advance training of employees ensures high machine and system efficiency from the commissioning stage onward. The focus for KHS is to relay the maximum amount of information while giving individual attention to every single course participant. The plan is therefore to keep training groups small in order to maximize the benefit for each individual.

In the future, open events will be held in the Technology Center, and a list of these will be found in an events program designed especially to meet customer requirements. At the same time, it will be possible to hold individual training courses for individual companies in the beverage, food, and non-food sectors.

In addition to seminars aimed at special segments such as adhesive-pressure labeling, for example, courses are also offered that are designed to provide a general overview of a particular area.

An example of this is seminars, which explicitly present the full range of options offered by labeling technology today. The target group for these 'overview seminars' not only includes technicians – especially in the field of labeling technology – but also the staff responsible for marketing.

What is more, the Technology Center will also be a test center in the truest sense of the word. For example, if a company intends to introduce a new type of PET bottle into its product line, test runs can be carried out within the rotary conveyor relating to the conveying behavior, possible conveyor throughput, material stress, etc. If a new style label should be involved, the interaction of label, labeling machine, container, adhesive, etc. can easily be tested. Overall, everything that can be tested using existing machine technology can be tested at the Technology Center. This ensures that the company in the beverage, food, or non-food sector that has placed the order ultimately achieves maximum machine availability in practice with the highest quality processing results.

The Dortmund Technology Center complements the already existing technology center at KHS in Bad Kreuznach. Here, the focus is on the fields of rinsing, filling, and capping/seaming technology for bottles and cans, filtration, beverage blending technology, high gravity brewing systems, and flash pasteurizing and deaeration systems.

Practical training courses and theoretical know-how complement one another outstandingly in the new KHS Technology Center.

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