Alternative Brewing Sugars

The bulk of the fermentable sugars in beer come from malts and malt extracts - that's what makes it beer. However, there are a number of other sugars that, when used in smaller quantities, can impart their own distinct characteristics to your brew. Here, we'll discuss the major alternative sugars, the effects they may have on the finished product, and the best ways to use them.

First, a little bit about sugar chemistry. Sugar is a simple carbohydrate. That is, it is a single molecule made up of some configuration of carbon, hydrogen and oxygen. Starches are complex carbohydrates, which means that they are made up of chains of sugar molecules bonded together. The breaking of these chains by various processes or enzymes converts the starches into their component sugars. The amylase enzyme in saliva is a good example of this. A common grade school science experiment is to take a saltine, place it in your mouth and chew it slowly 100 times. By the time you're done, you'll notice that the normal starchy, floury cracker taste has been replaced in part by a sweeter flavor. This is your saliva breaking down the starch chain into sugars.

The mashing process affects malted barley in the same way, which is how malt extracts are made. These extracts are composed primarily of a sugar called maltose. Chemically, maltose is one of five major types of sugars. Sucrose is the name for common table sugar, which is usually derived from beets or sugar cane. Fructose is the sweetest tasting of the sugars, and occurs naturally in fruit, and to a lesser degree in malt. Glucose and dextrose are molecularly the same, and most commonly sold as syrup and dry crystals, respectively. Finally, lactose is a sugar which is naturally present in milk. Fructose, dextrose and sucrose are all very easily and rapidly fermentable by beer yeast. Maltose is obviously fermentable as well, but the process takes somewhat longer, and lactose is not fermentable at all by normal beer yeasts alone. Certain wild yeasts can ferment lactose, and various enzymes can be introduced which will help beer yeast ferment it as well.

While there are a wide variety of sugars available to the homebrewer, it should be kept in mind that excessive use of any non-malt sugar will detract from its characteristic flavor and make your beer considerably less beer-like. In general, these sugars should not make up any more than 25% or so of the total sugar content of your wort. Some sugars also contribute strong flavors to your beer, or have other special considerations. These will be noted below.

Corn sugar: Dextrose: Probably the most common of the sugars we'll be discussing, corn sugar is made up almost entirely of glucose/dextrose. It will ferment completely, contributing more alcohol content than a similar amount of malt extract, and will lighten the body and flavor of the brew. Corn sugar will also ferment very rapidly, and will thus shorten the time your beer will need to spend fermenting. The most common use of corn sugar is as a priming sugar during the bottling process.

Table sugar: As mentioned previously, table sugar is 100% refined sucrose, derived from beets or sugar cane. Unlike malt extracts, which contain a variety of non-sugars and have a strong flavor component, table sugar is completely fermentable and will contribute no flavor at all to your beer. For this reason, its most common use is to boost the alcohol content of the finished brew. Impure or unrefined beet sugars should not be used, as they contribute flavors which are decidedly unpleasant (we're not making borscht here). Impure or unrefined cane sugar, such as cane syrup, sugar cane juice, or whole sugar cane can be used, but in large quantities will contribute a dry, cidery taste to your final product.

Malto-dextrin: Sold to homebrewers in powder form, malto-dextrin (corn syrup) is a combination of malt extract and dextrin, a complex sugar consisting of a chain of dextrose molecules. This chain cannot be broken by beer yeast without the assistance of enzymes, and so is often used commercially when brewers want to sweeten the finished beer. It also adds a little body and contributes to head retention, and many homebrewers I know will add about 250g of malto-dextrin to every beer they brew for these reasons alone. You will also find it as an ingredient on many "imitation" or "clone" recipes, which attempt to recreate the character of one commercially-produced beer or another.

Lactose: As mentioned earlier, lactose is not fermentable by normal beer yeasts. This means that its flavor will not change when it is used in beer. Lactose is the primary sugar in milk, and has a characteristic milky or creamy taste as a result. It is also the least sweet of all the sugars. It is most commonly used in certain varieties of stout, such as sweet stouts, milk stouts and cream stouts. Usually, about half a pound is enough for a five-gallon batch of any of these, although I have seen recipes that use as much as a full pound. Remember that, because it is not fermentable, lactose should be added above and beyond the normal complement of sugars in your beer. Some people prefer to add the lactose at the time of priming, although because of its non-fermentable nature, I fail to see what possible difference this could make.

Brown sugar: Table sugar is made by refining sugar cane syrup. When the refining process is complete, the stuff that has been removed is molasses. Brown sugar is simply cane syrup that has been incompletely refined. That is, the process was halted before all of the molasses was removed from the syrup. This means that, while brown sugar does possess similar characteristics to table sugar, it also retains some unfermentable sugars and other compounds which will lend their own characteristic flavor to your beer. Brown sugar is often used by homebrewers in stouts, alts and other dark beers that require a long fermentation, as it is difficult to ferment. Brown sugar should never be used for priming, as it distributes itself fairly unevenly, and can result in some beers being flat, while others explode in the bottle.

Molasses: As already discussed, molasses is made up of the byproducts of the refinement of cane syrup. As a result, about 25-40% of molasses is completely unfermentable. This means that, more so than any of the other sugars we'll be discussing here, molasses will contribute a very strong flavor to your brew. This flavor is not unpleasant, and actually goes quite well in some stouts, porters, and brown ales, but it is very potent. One cup will contribute a noticeable flavor to a 23 litres of beer, while more than 1.5 or 2 cups will threaten to overpower it. An excess of molasses will also add a large amount of body to your beer, making it heavy and undrinkable. Molasses should never be used as a priming sugar.

Sorghum: While it is often labeled "sorghum molasses", sorghum is not molasses. It is a syrup derived from the sorghum plant, and while its flavor is similar, it is unique in its own way and is slightly more fermentable. It can be used in somewhat larger quantities, but be conservative with it. Like molasses, do not use it for priming.

Rice syrup: Instead of being made from malted barley, rice syrup is made from malted rice. The resulting syrup has a high concentration of glucose, with smaller amounts of maltose and fructose. Unlike malt, rice has very little inherent flavor, and a beer heavy in rice syrup will have a lighter color and a lighter, crisper flavor. Most of the commercial American pilsners such as Budweiser use a significant quantity of rice syrup to brew their beer.

Maple syrup: I have personally never had the conjoins to brew a beer using maple syrup, although I can envision situations in which it might work very well. In Charlie Papazian's "New Complete Joy of Home Brewing", he advocates the use of at least 4 litres of maple syrup in a 23litre batch of beer. Most commercial store bought maple syrup is less than 5% actual maple syrup, the rest being made up of corn syrup. This is fairly cheap stuff, while pure maple syrup can be very expensive. Papazian doesn't make it clear which variety he's talking about, but if it's the latter, then, the amount seems high to me, and I can only imagine a very strongly maple-flavored brew as a result. Other recipes I've encountered utilizing maple syrup have used as little as 1Litre and I've never seen one that used more than 2 Litres. This range seems more reasonable to me, and if you're going to brew a maple-augmented beer, I'd suggest starting smaller and increasing the amount in future batches if it works well.

Honey: Honey is a very popular ingredient in beer, and rightfully so. It also has a number of special considerations which the other sugars we've discussed do not. Honey contains a variety of sugars, mostly glucose and fructose, but smaller amounts of maltose and sucrose as well. In addition to the sugars, honey is likely to contain other ingredients, which can include pollen, enzymes, wild yeast, beeswax and even tiny

fragments of the bees themselves. These will be present in greater concentrations in raw honey, which you might get at a roadside stand or farmer's market.
None of these are necessarily bad things, but honey should always be boiled for the full duration of your wort, at least 60 minutes, to neutralize any potentially harmful ingredients (harmful to your beer, not to you). Honey is very fermentable, and will lend a dry, crisp sweetness to your beer. It's a very tasty addition to Weiss beers, lagers, and lighter ales. 500g of honey is usually enough, and more than 1 Kg will detract noticeably from your beer's malty character. There are several types of honey available. The two most popular among homebrewers are clover honey, which has the most "traditional" honey flavor, and orange blossom honey, which contributes pleasant citrus undertones. Alfalfa honey is probably the lightest and least flavorful variety, making it popular for those who want to avoid the often saccharine finish that honey can lend to a beer. Some farms and markets may also sell wildflower honey, which has a light, flowery, almost herbal aroma and flavor which can be a wonderful complement to certain types of aromatic hops when used in pale ales and other light brews.

Belgian Candy Sugar (White and Brown): Generally we craft brewers tend to shy away from using sugar instead of malt. After all it wasn't originally used at all in the making of beer. And if we do use sugar, its dextrose in preference to sucrose (cane sugar). But for every rule there always seems to be an exception, and so it is in Belgium where sugar is as part of many beers as malt and hops. Anyone who eventually explores how to make these beers will come across the main sugar they use - candy sugar.Belgian made candy sugar, also known as 'inverted' sugar. The difference in Candy sugar is that it has already undergone the inversion process. This means that the yeast does not have to invert the sugar, resulting in a much stronger and quicker initial fermentation.

Inverted Sugar Syrup is a sucrose-based syrup, produced by splitting each sucrose disaccharide molecule into its component monomers, glucose and fructose. The splitting is achieved through the action of invertase (a glycoside hydrolase enzyme), or an acid. In practical terms, measured on equivalent dissolved weights, inverted syrups are sweeter than sucrose solutions. At equal concentrations, inverted sugar syrup has only 85% the sweetness of sucrose solution; in practice though, inverting a disaccharide (such as sucrose) effectively doubles the concentration of sugar molecules - this makes the resulting, inverted, syrup sweeter than the original sucrose solution.The glucose present in inverted sugar syrup is substantially more hygroscopic than sucrose. This means that the syrup lends longer-lasting moistness to products than when sucrose is used alone. It is likewise less prone to crystalisation and therefore valued especially by bakers, who refer to inverted sugar syrup as 'trimoline' or 'invert syrup'.The term 'inverted' is derived from the method of measuring the concentration of sugar syrup using a polarimeter. Plane polarised light, when passed through a sample of pure sucrose solution, is rotated to the right (optical rotation). As the solution is converted to a mixture of sucrose, fructose and glucose, the amount of rotation is reduced until (in a fully converted solution) the direction of rotation has changed (inverted) from right to left.That about covers the major types of sugars available for use by the homebrewer. There are many more sources of sugar in the world, of course, which you may wish to experiment with as time goes on. When experimenting with other sugars, it's best to do some research first. Look around and see if you can find other recipes which use it. The most important thing is that you're brewing what you like and having fun doing it

Inverting Sugar
Inverted sugar syrup can be easily made by adding roughly one gram of citric acid or ascorbic acid, per kilogram of sugar. Cream of tartar (one gram per kilogram) or fresh lemon juice (10 millilitres per kilogram) may also be used.The mixture is boiled for 20 minutes, and will convert enough of the sucrose to effectively prevent crystallization, without giving a noticeably sour taste. Invert sugar syrup may also be produced without the use of acids or enzymes by thermal means alone: two parts granulated sucrose and one part water simmered for five to seven minutes will convert a modest portion to invert sugar.All inverted sugar syrups are created from hydrolysing sucrose to glucose (dextrose) and fructose by heating a sucrose solution, then relying on time alone, with the catalytic properties of an acid or enzymes used to speed the reaction. Commercially prepared acid catalysed solutions are neutralised when the desired level of inversion is reached.All constituent sugars (sucrose, glucose and fructose) support fermentation, so invert sugar solutions may be fermented as readily as sucrose solutions.