BrewTimes™

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Balaji Enzyme and Chemical Pvt Ltd

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Introducing BrewTimes :

We M/s Balaji Enzyme & Chemical Pvt Ltd, are pleased to bring to you our January 2023 month edition of BrewTimes.

It's the end of the year and we would like to Thank our readers/contributors for a successful and eventful year. We would also like to take this opportunity to wish all our readers and valuable customers a Merry Christmas and Happy New Year !!

We would like to use this platform to introduce our association with BetaTec, UK for their natural solutions for ethanol recovery in grain and molasses distilleries. The product is revolutionary and unlike any in the market is 100% natural and antibiotics free. Vitahop series of products helps in ensuring optimum yield and keeps the yeast healthy all naturally.

We are extremely proud of announcing our association with IIT Bombay Research Park. We have begun a journey together to work on sustainable, reliable and innovative solutions for the Food and Beverage Industry.

About Our Company :

We M/s Balaji Enzyme & Chemical Pvt Ltd are a leading supplier of Enzymes, Filter aid, Yeast, Hops, Processing aids, Clarifiers and food fortification products to breweries, distilleries, malt extract industry, starch industry, juice and beverage industry, and other food industry.

UNITED STATES

HBC 1134 c.v.

An American hop bred specifically for modern lagers - HBC 1134 c.v. provides the classic noble flavors of floral (rose), woody aromatic (pine), herbal, and citrus (lemon, slight grapefruit), along with excellent agronomics, storage stability, and bitterness quality.

FLORAL

WOODY AROMATIC

CITRUS

Rose, pine, lemon, slight grapefruit.

Alpha (%)	9.8-12.5
Beta (%)	3-4.5
Cohumulone (% of Alpha Acids)	20-30
Total Oil (ml/100g)	1.8-3
Myrcene (% of Total Oil)	–
Humulene (% of Total Oil)	–
Caryophyllene (% of Total Oil)	–
Farnesene (% of Total Oil)	–
Linalool (% of Total Oil)	–
Total Polyphenols (%)	–

UNITED STATES

VISTA

Previously named USDA Elite Line 074, Vista is the newest variety of hop produced by the USDA's public breeding program. A half-sister of TriplePearl, descended from Perle and open pollination, Vista advanced through the USDA's rigorous screening trials due to its vigorous, beneficial agronomics and unique flavor qualities.

CITRUS

SWEET FRUIT

HERBAL

Tangerine, tropical fruits, melon, green tea, and a pear note.

Alpha (%)	11-12
Beta (%)	4-5
Cohumulone (% of Alpha Acids)	–
Total Oil (ml/100g)	1.0-2.0
Myrcene (% of Total Oil)	–
Humulene (% of Total Oil)	–
Caryophyllene (% of Total Oil)	–
Farnesene (% of Total Oil)	–
Linalool (% of Total Oil)	–
Total Polyphenols (%)	–

BRU-1™

HAAS® | BARTH-HAAS GROUP

BRU-1 is notable for its distinct sweet fruit aroma that is often described as pineapple. When used as a whirlpool or dry hop addition, BRU-1 delivers the aroma of freshly cut pineapple and green fruits. BRU-1 is synergistic with other hops creating a depth of fruit flavor. BRU-1 has also been shown to improve haze stability in certain beer styles.

PEDIGREE

BRU-1 was developed through open pollination at Brulotte Farms in Toppenish, WA.

RECOMMENDED BEER STYLES

Wheat Ale, Golden Ale, American style lagers, Pale Ales, India Pale Lager (IPL), India Pale Ale (IPA), Session IPA, New England IPA, Hazy IPA, Imperial IPA.

KEY FLAVORS

Pineapple

Pear, Apple

Fresh Cut Grass

Alpha Acids*	13.0 15.0%
Beta Acids	8.0 10.0%
Total Oil	1.5 2.0 ml/100g

*Alpha acids are determined by conductometric titration (EBC 7.4) in Europe; by spectrophotometric (ASBC Hops-6) in USA

TOTAL OIL COMPOSITION

Myrcene	50 55%
Humulene	7 8%
Caryophyllene	9 11%
Farnesene	0 1%
Geraniol	0 1%
Linalool	0 1%

Oil composition determined by Gas Chromatography (ASBC Hops-17, EBC 7.1.2)

BRU-1 BEER VS. HOP ATTRIBUTES

The beer was a Pale Ale style beer dry hopped with 1.5 lb/bbl of BRU-1 pellets.
Samples were evaluated by the Haas trained panel, and scored on a scale of 0 to 10.

TALUS® HBC 692 c.v.

HAAS® | BarthHaas®

AROMA PROFILE

TALUS® delivers big aromas of pink grapefruit, citrus rinds, dried roses, pine resin, tropical fruits and sage. These unique and impactful aromas remain throughout the brewing process.

PEDIGREE

TALUS® is a daughter of Sabro® HBC 438 c.v. and the result of open pollination.

RECOMMENDED BEER STYLES

Wheat Ale, Golden Ale, American style lagers, Pale Ales, India Pale Lager (IPL), India Pale Ale (IPA), Session IPA, New England IPA, Imperial IPA.

KEY FLAVORS

Pink Grapefruit | Dried Roses | Pine, Resin

Alpha Acids*	8.1 9.5%
Beta Acids	8.3 10.2%
Total Oil	2.0 2.7 ml/100g

*Alpha acids are determined by conductometric titration (EBC 7.4) in Europe; by spectrophotometric (ASBC Hops-6) in USA

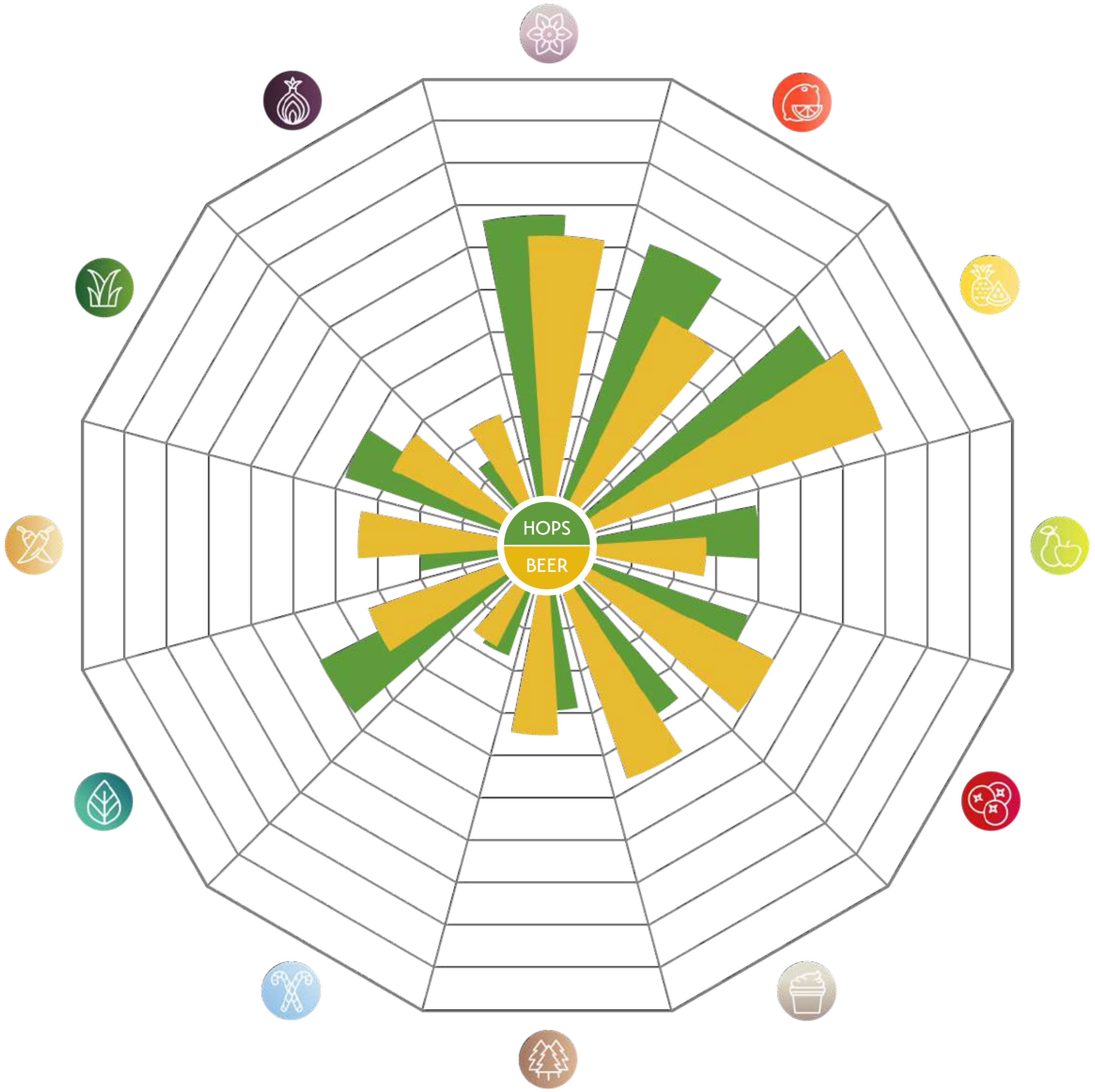
TOTAL OIL COMPOSITION

Myrcene	40 50%
Humulene	16 21%
Caryophyllene	9 13%
Geraniol	1 3%
Farnesene	0 1%
Linalool	0 1%
Cohum (%)	34 39%
HSI (post Kiln)	0.198 0.229

Oil composition determined by Gas Chromatography (ASBC Hops-17, EBC 7.1.2)

TALUS® HBC 692 c.v.

TALUS® BEER VS. HOP ATTRIBUTES



The beer was a Pale Ale style beer dry hopped with 1.5 lb/bbl of TALUS® pellets.
Samples were evaluated by the HAAS trained panel, and scored on a scale of 0 to 10.

UNITED STATES

HBC 522 c.v.

HBC 522 c.v. is an experimental hop cultivar first bred by the Hop Breeding Company (HBC) in 2006. It is a cross between a female Columbus and an experimental male 986-2 c.v. HBC 522 c.v. has been described as similar to Centennial and Cascade, with a mix of floral, citrus (especially orange and grapefruit), and pine needles.

CITRUS FLORAL WOODY AROMATIC

Bitter orange, grapefruit, jasmine, pine needles.

Alpha (%)	9.5-12
Beta (%)	4.5-5.5
Cohumulone (% of Alpha Acids)	22-26
Total Oil (ml/100g)	1.4-2.3
Myrcene (% of Total Oil)	36.9
Humulene (% of Total Oil)	13.2
Caryophyllene (% of Total Oil)	8.44
Farnesene (% of Total Oil)	0.52
Linalool (% of Total Oil)	0.64
Total Polyphenols (%)	–

UNITED STATES

HBC 586 c.v.

HBC 586 c.v. is an experimental hop cultivar developed by the Hop Breeding Company (HBC). It was bred via a hybrid pollination of two experimental hop varieties. When used as a whirlpool addition or dry-hop addition, HBC 586 c.v. delivers a large medley of fruit flavors associated with tropical fruits. The fruity flavors of HBC 586 c.v. has been described as mango, guava, lychee, citrus, with slight sulfur and herbal notes. Many find HBC 586 c.v. to have fruit flavors that are special and new to the world of hops.

SWEET FRUIT · BERRY & CURRANT · SPICY · CITRUS

Fruit salad, mango, lychee, berries, fresh-cut pepper, mandarin orange.

Alpha (%)	12.0-13.0
Beta (%)	7.5-8.5
Cohumulone (% of Alpha Acids)	38-41
Total Oil (ml/100g)	1.2-2.5
Myrcene (% of Total Oil)	40-50
Humulene (% of Total Oil)	14-22
Caryophyllene (% of Total Oil)	7-15
Farnesene (% of Total Oil)	0-1
Linalool (% of Total Oil)	0-1
Total Polyphenols (%)	–

HBC 630 c.v.

HBC 630 c.v. is an experimental hop cultivar developed by the Hop Breeding Company (HBC). It was bred from a 2008 cross between two experimental hop varieties. HBC 630 c.v. is complex and fruity, with sweet fruit (cherry) and berry (raspberry) character. In addition, sweet candy-like esters and lactones combine to give creamy notes of banana and peaches.

SWEET FRUIT

BERRY & CURRANT

CREAM CARAMEL

Cherry, banana, peach, raspberry jam, crème caramel, coconut.

Alpha (%)	13.6-14.0
Beta (%)	5.6-6.3
Cohumulone (% of Alpha Acids)	22-26
Total Oil (ml/100g)	2.5-3.0
Myrcene (% of Total Oil)	–
Humulene (% of Total Oil)	–
Caryophyllene (% of Total Oil)	–
Farnesene (% of Total Oil)	–
Linalool (% of Total Oil)	–
Total Polyphenols (%)	–

UNITED STATES

HBC 638 c.v.

HBC 638 c.v. is both familiar and exciting at the same time. This new variety combines the classic characteristics of hops like Centennial – bright citrus, fresh flowers, and a touch of stone fruit – with a modern tropical punch of mango, pineapple, banana, cherry, strawberry, and cantaloupe.

SWEET FRUIT

CITRUS

BERRY & CURRANT

Mango, pineapple, cherry, peach, lemon, orange, strawberry.

Alpha (%)	12-16
Beta (%)	3-6
Cohumulone (% of Alpha Acids)	28.5-30.5
Total Oil (ml/100g)	1.7-3.0
Myrcene (% of Total Oil)	33-38
Humulene (% of Total Oil)	15-20
Caryophyllene (% of Total Oil)	11-15
Farnesene (% of Total Oil)	< 1
Linalool (% of Total Oil)	0.2-0.5
Total Polyphenols (%)	–

HBC 1019 c.v.

HBC 1019 c.v. is an experimental variety bred by the Hop Breeding Company (HBC). It arose from a 2016 cross between two HBC developmental varieties. Agronomically, it is a high yielding cultivar with a desirable early harvest window. HBC 1019 c.v. has a potent but pleasing mix of citrus, tropical and stone fruits. With notes of coconut, Valencia oranges, caramelized bananas, peaches, and honeydew melon, HBC 1019 c.v. is reminiscent of dark rum and daiquiris.

SWEET FRUIT

CITRUS

CREAM CARAMEL

Honeydew melon, peaches, tropical fruit, candy, coconut, orange.

Alpha (%)	10-12
Beta (%)	8-9
Cohumulone (% of Alpha Acids)	22-24
Total Oil (ml/100g)	1.3-2.2
Myrcene (% of Total Oil)	38.9
Humulene (% of Total Oil)	10.6
Caryophyllene (% of Total Oil)	7.2
Farnesene (% of Total Oil)	0.4
Linalool (% of Total Oil)	0.5
Total Polyphenols (%)	–

UNITED STATES

SABRO®

HBC 438 c.v.

Sabro® HBC 438 c.v. was developed by the Hop Breeding Company (HBC) and released in 2018. Her pedigree is the result of a unique cross pollination of YCR 123 c.v., a female *neomexicanus* hop. Sabro imparts a strong and complex fruit flavor to beer. Its flavor is notable for its complexity of fruity and citrus attributes, including distinct tangerine, coconut, tropical and stone fruit. In addition, there is a pronounced cream character and secondary flavors of vanilla, cedar, dill, and mint.

CITRUS

SWEET FRUIT

CREAM CARAMEL

Tangerine, tropical fruit, stone fruit, coconut.

Alpha (%)	12.0-16.0
Beta (%)	4.0-7.0
Cohumulone (% of Alpha Acids)	–
Total Oil (ml/100g)	2.5-3.5
Myrcene (% of Total Oil)	40-55
Humulene (% of Total Oil)	10-15
Caryophyllene (% of Total Oil)	15-20
Farnesene (% of Total Oil)	<1
Linalool (% of Total Oil)	0-1
Total Polyphenols (%)	–

ADJUNCTS

BIJAY BAHADUR

B.Sc. (Hons.); B.Tech. (Gold Medallist); PGDEE; FIE; Chartered Engineer (India) PE (ECI); LMIIChE; LMAFST (I)

Introduction

A brewing adjunct is defined as “any carbohydrate source other than malted barley which contributes sugars to the wort”. A wide range of materials fall within this definition and, in this chapter, attention will be directed to three areas: (a) solid unmalted raw materials usually processed within the brewhouse, (b) liquid adjuncts usually added to the kettle and some specialty products used for priming, and (c) malted cereals other than barley, such as wheat and sorghum (Table 1). Adjuncts are usually considered nonmalt sources of fermentable sugars. They typically contribute no enzyme activity and little or no soluble nitrogen and are less expensive than malt. It is also sometimes stated that adjuncts do not contribute flavor to the finished product; however, it will be discussed later that, in many beers, this is not really the case.

Table 1: Brewing Adjuncts and Their Preparation Processes, in Increasing Complexity

Basic raw cereal	: barley, wheat
Raw grits	: corn (maize), rice, sorghum
Flaked	: corn, rice, barley, oats
Torrified/micronized	: corn, barley, wheat
Flour/starch	: corn, wheat, rice, potato, cassava, soya, sorghum
Syrup	: corn, wheat, barley, potato, sucrose
Malted cereals other than barley	: wheat, oats, rye, sorghum

Purpose of using Adjunct:

The use of adjuncts in brewing recipes has become common since the early 1900s for the two practical reasons, which are:

1. To reduce the size of the protein fragments in all-malt beers so that they would not become turbid.
2. Beer drinkers’ preferences have favored the lighter palate of beers with lower malt usage.
3. Cost reduction (Economy) e.g., reduces malt cost (some adjunct provides cheap extract), increase brewing capacity and energy savings, reduces demand of mashing equipment and aids high gravity brewing.
4. Change beer characteristics e.g., change color, foam or flavor.

Types of Brewing Adjunct:

- Basic Raw Cereal : Barley, Wheat
- Raw Grits : Corn (maize), Rice, Sorghum
- Flaked : Corn, Rice, Barley, Oats
- Torrefied/Micronized : Corn, Barley, Wheat
- Flour/Starch : Corn, Wheat, Rice, Potato, Cassava, Soya, Sorghum
- Liquid : Glucose Syrups, Sucrose Syrups, Invert Sugars, Malt Extract, Caramel, Priming Sugar
- Malted Cereals Other than Barley : Wheat, Oats, Rye, Sorghum

Adjuncts Provide:

1. Starch - provides cheap extract
2. Protein - some adjunct dilutes protein level which effect on beer stability e.g. wheat glycoprotein stabilizes foam, wheat gluten effect on filtration problems.
3. Beta-glucans, pentosans - Barley highest, sorghum lowest but not full story – sorghum beta-glucan is highly soluble and so filtration difficulties.
4. Lipids - some adjunct contribute more fat which cause of "stale" flavours, cause of foam collapse.
5. Inorganic materials - e.g., Zn, Cu, Ca, Mg, Fe, P and S. May have meaning as growth factor of some yeast- strains, but balance is important.
6. Color - some adjuncts can be used to improve beer color.

A great deal of effort has been expended to improve the performance of various adjuncts and to examine their contribution to the characteristics of the finished beer. In general, corn tends to give a fuller flavor to beers than wheat, which imparts certain dryness. Barley will give a stronger harsher flavor. Both wheat and barley adjuncts can considerably improve head retention (foam). Rice will also give a very characteristic flavor to beer.

The overall brewing value of an adjunct may be expressed by the following equation:

Brewing value = Extract + Contribution to beer quality - Brewing costs

The major benefit is extract.

In India, current use of nonmalt adjuncts averages about 30-35% of total brewing materials employed, excluding hops. The most commonly used adjunct materials are corn (maize), rice, barley, and sugars and syrups. Following materials that are used as unmalted brewery adjuncts: yellow corn grits, refined corn starch, rice, sorghum, barley, wheat, wheat starch, cane and beet sugar (sucrose), rye, oats, potatoes, tapioca (cassava), and triticale. In addition, processed adjuncts include corn, wheat and barley syrups, torrified cereals, cereal flakes, and micronized.

Corn Grits

Corn grits are the most widely used adjunct. They are produced by dry milling yellow corn. The milling process removes the hull and outer layers of the endosperm along with the oil-rich germ, leaving behind almost pure endosperm fragments. These fragments are further milled and classified according to brewers' specifications. Corn grits produce a slightly lower extract than other unprocessed adjuncts and contain higher levels of protein and fat. The gelatinization temperature range for corn grits (62 to 74 ^{0}C) is slightly lower than that of rice grits (64 to 78 ^{0}C).

Extract yields from flaked grits, flake micronized grits, and corn grits have been highest for the flaked and micronized flaked grits and slightly higher fermentability.

After reviewing the composition of worts and beers prepared with a variety of adjuncts, it has been found that a carbohydrate profile similar to an all-malt wort can be achieved with either 20% rice or 20% corn grits, although levels of sucrose and fructose decline as the adjunct level increases. Corn grits at the 30% level produce a volatile aroma compound similar to that of an all-malt beer. Wort protein, peptides, free amino acids, and nucleic acid derivatives decline in proportion to adjunct level. The amino acid profile of wort is not affected by a particular adjunct but by its level in the mash. High adjunct ratios lead to higher levels of diacetyl and related compounds at the end of fermentation. However, with the appropriate post-fermentation processing, these levels return to normal after aging.

Rice

Rice is currently the second most-widely used adjunct material. On an extract basis; it is approximately 25% more expensive than corn grits. Brewer's rice is a by-product of the edible rice-milling industry. Hulls are removed from paddy rice and this brown rice is then dry milled to remove the bran, aleurone layers, and germ. The objective of rice milling is to completely remove these fractions with a minimal amount of damage to the starchy endosperm, resulting in whole kernels for domestic consumption. However, up to 30% of the kernels are fractured in the milling process. The broken pieces (broken) are considered esthetically undesirable for domestic use and are sold to brewers at a price considerably less than the whole kernel or mill-run rice price. Rice is preferred by some brewers because of its lower oil content compared to corn grits. Rice has a very neutral aroma and flavor, and when converted properly in the brewhouse, yields a light, clean-tasting beer.

The quality of brewer's rice can be judged by several factors, including cleanliness, gelatinization temperature, mash viscosity, mash aroma, moisture, oil, and ash and protein content. Rice should be free of seeds and extraneous matter. Insect or mold damage should not be tolerated, as these indicate improper storage or handling conditions. It has been reported that rancidity in rice oil can be a problem, but with modern storage techniques this is a negligible factor. Laboratory mashes of rice samples should be conducted regularly and they should gelatinize and liquefy in a standard manner and should be clean and free from undesirable odors and tastes.

Not all varieties of rice are acceptable brewing varieties. Rice has a relatively high gelatinization temperature and is extremely viscous prior to liquefaction in the cereal cooker. Many rice varieties will not liquefy properly and are impossible to pump from the cooker to the mash mixer whereas other varieties liquefy well in the cooker during a 15-min boil. Both amylose and liquid content of rice varies with the variety and the cultivation conditions, thus selection of suitable grades is important. Rice liquefies more easily the finer the particle grind, and particles less than 2 mm are considered adequate. Handling of rice is relatively easy, as the broken contain little dust and flow easily through standard hopper bottoms and conveyoring equipment. Rice is milled in fixed roller mills. There is no difficulty in making the rice mash slurry at 64 to 78 ^{0}C, although it is a common practice to mash and hold at 36 to 42 ^{0}C as a protein rest. As with all cereal cooker operations, whatever the starch source, 5 to 10% of the malt grist is added to the cooker because the malt enzymes (amylases and proteinases) are essential for the partial liquefaction necessary to render the cooker mash fluid enough for pumping. Atmospheric boiling is required for gelatinization. Some brewers pressure cooks at 112 ^{0}C.

If properly converted, rice adjunct usage does not create runoff problems. As previously discussed, the extract is slightly lower in soluble nitrogen than corn grits.

Barley

Unmalted barley is an obvious adjunct for use in brewing. However, the raw grain is abrasive and difficult to mill, scattering to yield too high a percentage of fine material which gives problems during lautering. These difficulties disappear if the grain is conditioned to 18 to 20% moisture prior to milling although this process has not been widely employed in brewing.

In the past, barley has normally been partially gelatinized before use. The barley is gelatinized either by mild pressure cooking or by steaming at atmospheric pressure followed by passage of the hot grits through rollers held at approximately 85 ^{0}C. Finally, the moisture content of the flakes is reduced to 8 to 10%. This process of pre-gelatinization can also be applied to corn. Pre-gelatinization of barley affects the ease of extraction of β-glucan during mashing and, hence, the β-glucan content of the wort. Prolonged steaming prior to rolling the barley produces a product which produces higher viscosity sweet worts. This can be controlled by measuring the viscosity of a cold-water extract of the flaked barley, which is a good indication of the extent of the steaming process. Barley starch is more readily hydrolyzed than corn or rice starch. Barley may be de-husked before use to increase extract yields, but this may lead to runoff difficulties because the husk provides material for filter bed formation. In the same way, fine grinding improves extraction efficiency but also leads to slow runoff. If significant proportions of barley are used in the mash, malt with sufficient enzyme activity is required. Use of barley leads to a reduction in wort nitrogen content and decreased wort and beer color. No difficulties have been reported in fermentation. Foam stability is usually improved because of lower levels of proteolysis. However, a major difficulty associated with brewing with high levels of unmalted barley can be the increase in wort viscosity and runoff times caused by the incomplete degradation of β-glucans. Mashing at 65 ^{0}C quickly destroys the malt β-glucanase activity. Suggestions to alleviate these problems have included pretreatment of the barley with β-glucanase and the use of a temperature-stable β-glucanase in the mash.

Raw (feed) barley can also be employed as an adjunct, and as high as 50% barley in the grist has been employed in some breweries in Australia. Use of raw barley requires significant modification to the brewing process. For reasons already discussed, conventional roller milling cannot be employed; consequently, hammer mills are necessary. This high level of malt replacement usually results in insufficient malt enzymes for the necessary hydrolysis of the starch, protein, and β-glucans. Consequently, a malt-replacement enzyme system is employed to compensate for the reduced level of malt enzymes. A number of such enzyme systems have been developed and are usually a mixture of β-amylase, protease, and β-glucanase, which are obtained from microbial sources such as Bacillus subtilis.

In barley brewing, it is possible to approximate the starch hydrolysis profile and the degree of fermentability of 100% malt worts. This is possible by substituting malt with barley at levels of 50% (extract basis) and by controlling the main mash schedule (enzyme concentration, time, and temperature). Barley worts have been found to contain less fructose, sucrose, glucose, and maltotriose but more maltose than malt worts. No anomalies or difficulties in fermentation and aging have been noted. Most breweries can employ their normal fermentation and aging technology for barley brewing. In general, no significant difference in organoleptic properties between barley beers and 100% malt beers have been observed. A harshness of barley beers can be avoided by lowering the pH of the wort to 4.9 prior to boiling.

It would appear that, with the aid of microbial enzymes, today's brewer can increase the level of unmalted raw barley. It is to their economic advantage to do so and, at the same time, obtain the desired beer quality.

Sorghum

Sorghum is the fifth most-widely grown cereal crop in the world; only wheat, corn, rice, and barley are produced in greater quantities. Africa is a major source of sorghum as is Central America. Sorghum is the traditional raw material in Africa for the production of local top-fermenting beers that are known by various names. These beers are produced without hops; they are slightly sour in taste, and consumed unfiltered, mainly in rural regions.

The U.S. brewing industry employed sorghum as an adjunct in 1943 when brewing materials were scarce. Unfortunately, sorghum was cracked and only partially dehulled and degerminated; consequently, brewers obtained poor yields and bitter-tasting beers plus a number of other quality problems. Modern milling techniques and better purification methods have changed the situation. Today, sorghum brewer's grits are considered by many to be of comparable quality to the best corn and rice grits.

In Africa and Mexico, brewers are using an appreciable and a continuously increasing percentage of brewer's grits and, in most cases, producing beer of acceptable quality.

In the brewing process, the dried sorghum is screened to remove extraneous material. The whole grain is then fed into a series of de-hullers that produce two product streams. In one of these streams, the husks and embryonic material constituting some 48% of the original sorghum are removed and this fraction, together with the initial screenings, is sold as a by-product. The second stream, consisting of peeled sorghum together with a small amount of husk material is then passed through an aspirator in which the husk is removed. The purified pearled sorghum, now representing 47% of the original cereal processed, is milled to give 12% of the original material as flour and 35% as sorghum grits. Both of these components are used as brewing adjuncts contributing up to 45% of the total wort extract.

The chemical composition of sorghum grain is very similar to corn. Both grains contain starch consisting of 75% amylopectin and 25% amylose. Starch granules are similar in range, shape, and size. On an average, sorghum starch granules are slightly larger - 15 mm compared to 10 mm for corn. Sorghum starch has a higher gelatinization temperature (68 to 76 ^{0}C) than corn starch (62 to 68 ^{0}C). In the brewhouse, sorghum brewer's grits perform within acceptable limits. No special handling or cooking techniques are required. 5% malt in the cooking mash is sufficient. Conversion of starch occurs within the mashing time allowed. The beers produced are fully equivalent in chemical analysis, flavor, and stability to beers produced with other adjuncts. Finally, in many areas (e.g., Africa and Central America) sorghum offers the lowest-cost source of available fermentable sugar.

Refined Corn Starch

Refined corn starch is by far the purest starch available to the brewer. It is a product of the wet-milling industry. It has not found widespread use because its price is higher relative to corn grits and brewer's rice and it is difficult to handle. An obvious drawback for refilled starch usage is handling. The starch powder is extremely fine, with 96% passing through a 200-mesh screen. It must be contained in well-grounded lines and tanks to prevent explosions resulting from static electricity sparks produced during conveying. The starch bridges easily and is nearly impossible to flow from tanks unless they have special fluidizing bottoms.

Refilled corn starch can be utilized as the total adjunct or can be mixed with rice or corn grits at the option of the brewer. The gelatinization and liquefaction of the starch proceeds at lower temperatures than rice or grits, but is not sufficiently different to preclude its use as a blend with either. As a total adjunct, care must be taken to prevent sticking on the cooker bottom.

Refilled starch can easily be liquefied by the same process utilized for rice. The resultant extract cannot be organoleptically or chemically differentiated from an all-rice extract. Brewhouse yield can be increased 1 to 2% by the use of refilled starch in place of rice. There are no runoff problems. Fermentations tend to attenuate better, while colloidal stability is unaffected. Beer flavor is not affected, except that the beer is considered slightly thinner, because of higher attenuation limits.

Wheat Starch

Refined wheat starch is not presently attractive because of its high price compared with the more readily available adjuncts. Chemically, wheat starch is very similar to refilled corn starch. An advantage is that its gelatinization temperature is similar to malt gelatinization and could be added directly to the malt mash; however, 10% higher brewhouse yields can be obtained by cooking in a conventional adjunct cooker. Lautering times are reported to run up to 10% longer than with corn grits.

Wheat starch has the same conveying and handling problems as refined corn starch. Slurrying should take place below 52 ^{0}C to prevent lumping. The cooker temperature should not exceed 98 ^{0}C, as the starch foams badly upon boiling.

Wheat starch is somewhat higher in β-glucans and it is suggested that the cooker mash, with 10% of the malt added, stand at 48 ^{0}C for 30 min prior to the 66 ^{0}C rise to give the β-glucanase time to break down the β-glucans at its optimal temperature. This procedure results in little or no runoff problems.

The beer is quite comparable to the beer brewed with corn grits in analysis and flavor. Should wheat starch be available at prices competitive to other adjuncts, it would be a perfectly suitable adjunct.

Torrified Cereals

Torrification is a process by which cereal grains are subjected to heat at 260 ^{0}C and rapidly expanded or popped. This process renders the starch pre-gelatinized and thereby eliminates the cooking step in the brewhouse. It also denatures a major portion of the protein in the kernel such that the wort soluble protein is only 10% of the total.

Both barley and wheat are potential materials for torrification and for use as torrified adjuncts. The chemical analyses are quite similar for both. The torrified products have about 1.4% wort-soluble protein and could allow the use of lower-protein malts or higher adjunct levels, while maintaining soluble protein similar to worts produced with lower soluble protein adjuncts. Fat content is slightly higher than for other adjuncts, but again this would be negated in the final wort by using higher adjunct levels.

There are no handlings or dust problems associated with the use of torrified cereals. It is possible to blend the torrified products with malt. They can then be ground simultaneously and mashed-in together. However, higher yields are found by cooking the torrified product separately at 71 to 77 ^{0}C, prior to addition to the malt mash.

The use of torrified cereals leads to increased lauter grain bed depth and to slight runoff penalties. Torrified barley seems to be more refractory than torrified wheat in this respect. Particle size and mill setting are critical; large particle size leads to poor yield and too fine a grind leads to runoff problems. Because of its expanded nature, the torrified cereals absorb more water than other adjuncts and, especially in the case of torrified barley, higher ratios of water to cereal must be used. The flavor of beer produced with torrified adjuncts is reported to be unchanged, and one could easily conclude that if torrified cereals become economically competitive with other adjuncts they would be employed as an alternate adjunct source.

Liquid Adjuncts

The major liquid adjuncts used in brewing are glucose syrups, cane sugar syrups, and invert sugar syrups. Glucose is the commonly used name for dextrose, but the glucose syrups used in brewing are in fact solutions of a large range of sugars and will contain, in varying proportions depending upon the method of manufacture, dextrose, maltose, maltotriose, malto-tetraose, and larger dextrins.

Cane sugar syrups contain sucrose derived from sugar cane and sometimes, depending upon the grade, small quantities of invert sugar. Invert syrups, as the name suggests, are solutions of invert sugar - a mixture of glucose and fructose. Invert sugar is produced, in nature and commercially, by the hydrolysis of sucrose which, together with glucose and fructose, occurs abundantly in nature. Commercially, sucrose is extracted from sugar cane or beet, and glucose syrups are usually manufactured from starch derived from corn or wheat grains.

Glucose syrups have been available since the mid-1950s. They were originally produced by straight acid conversion of starch to a 64 to 68 DE range (The degree of starch conversion is usually expressed as "Dextrose Equivalent" or DE. This is a measure of the reducing power of the solution, expressed as dextrose in dry solids). The brewer's main concern is that the apparent extract of the finished beer should not change with the addition of the liquid adjunct, that is, the syrup has to be approximately 20% non-fermentable. The high level of glucose became a concern with the use of liquid adjuncts.

Table 2: Sugar Spectrum (%) of First- and Second-Generation Liquid Adjunct (Acid and Acid/Enzyme Converted, Carbon Refined), Third-Generation Liquid Adjunct (Enzyme/Enzyme Converted, Ion Exchanged) Compared to All-Malt Wort

	Liquid Adjunct (First-Generation)	Liquid Adjunct (Second-Generation)	Liquid Adjunct (Third-Generation)	All-Malt Wort
Glucose	65	40	5	8
Maltose	10	28	55	54
Maltotriose	5	12	20	15
Dextrin	20	20	20	23

Conversion of starch with the aid of an acid produces predominantly glucose as the hydrolysis product. When brewer's yeast is exposed to high concentrations of glucose, a phenomenon referred to as the "glucose effect" may be experienced, this can result in sluggish and "hung" fermentation.

Malt from Cereals Other than Barley

Although the principal cereal employed as the raw material for malt is barley, a number of other cereals are used including wheat, oats, rye, and sorghum.

Wheat Malt

Wheat malt is used in the production of some special types of beer, such as Berlin Weiss beer, in which it may constitute 75% of the grist, but only to a limited extent in ordinary beers. The limited use of wheat malt is mainly due to the difficulty experienced in malting the naked grain without damage to the exposed acrospires. As a result, much of the wheat malt made has been under modified. However, the absence of the husk tends to result in a high extract. Wheat malt gives beer outstandingly good head retention.

Oats and Rye Malt

Malted oats are used to a limited extent and in some stouts are blended with barley malt. Malted rye does not seem to be used today although some 50 years ago it was used in specialty beers. Unmalted rye is sometimes used for vinegar brewing and also for certain distilled beverages (e.g., Canadian rye whiskey).

Sorghum

The use of unmalted sorghum has already been stated above. A relatively recent development in the use of sorghum in brewing is as malt. For many years in southern Africa, malted sorghum has been used to brew a traditional alcoholic beverage of the region, known as sorghum or opaque beer. Sorghum beer is characterized by its sour taste - it is flavored by lactic acid produced by bacterial fermentation and is not hopped. Sorghum beer is of moderate alcohol content (approximately 3% w/w) and the opaque appearance is due, in part, to incomplete hydrolysis of starch during mashing. The presence of high levels of complex carbohydrates in sorghum beer makes it a nutritious beverage as well as an alcoholic drink.

Malted sorghum differs in many aspects from barley malt, particularly in terms of the properties of its starch and diastatic enzymes (Table 3). Sorghum malt starch has a gelatinizing temperature in the range of 64 to 68 ^{0}C, some 10 ^{0}C higher than that of barley malt starch. The total diastatic activity of sorghum malt is less than half that of barley. This is probably because of the low β-amylase activity of sorghum malt. However, the α-amylase activity of sorghum malt is slightly higher than barley malt.

The development of sorghum for use as malt in conventional beer (ales, lagers, and stouts) production is in the process of rapid development. This development has been accelerated by the large foreign debt crisis in developing tropical countries, which has made it increasingly difficult for them to import either barley or barley malt for their existing breweries. For example, the government of Nigeria prohibited the import of barley malt since 1988. In order to reduce this economic difficulty, considerable research into local raw materials has been conducted (especially sorghum), not only for their use as adjuncts, but also as a complete replacement for barley malt. As a result of these research efforts, as much as 30% of the sorghum harvest in Africa is being used for malting and brewing.

Table 3: Comparison between Sorghum and BarleytMal

	Sorghum Malt	Barley Malt
Starch gelatinization (^{0}C)	64-68	55-59
Diastatic power	19	53
β-Amylase activity (%)	18	100
α-Amylase activity (%)	110	100

There is general agreement that the “white” sorghum types are more suitable than the “red” types because of their lower content of polyphenols. During the malting of sorghum, the pattern of endosperm enzyme breakdown is different from that of malting barley. For example, although malting sorghum grains develop significant levels of endo-β-1,3-glucanase and pentosan enzymes, production of the cell wall-degrading endo-β- 1,3:1,4-glucanase enzyme is significantly lower than the levels found in malting barley. Also, as previously discussed, sorghum has a lower enzyme complement, especially β-amylase and endo-β-glucanases, and even with the addition of these enzymes exogenously, starch extracts comparable with barley malt are rarely obtained. Whereas mashing of barley malt at 65 ^{0}C allows both starch gelatinization and enzyme solubilization of starch to occur simultaneously, mashing of sorghum malt at this temperature fails to gelatinize its starch, and despite high b-amylase activity, starch solubilization and extract development are still inadequate. Finally, the use of sorghum for lager and stout beer brewing will alter its taste and consequently, in many parts of Africa, the consumer has become acclimatized to a different type of beer.

Conclusions

The use of unmalted carbohydrates or adjuncts in brewing is widespread, except in those countries that adhere to the German purity law. In most countries, there is one or two dominant adjuncts and these are usually the cheapest suitable carbon source. In Africa, corn remains the most popular adjunct; however, sorghum use (as an adjunct and malt) is increasing. Although developments in the use of brewing adjuncts have been relatively stable for a number of years, the advent of "new-generation" syrups (produced principally, but not exclusively, from corn) is currently having a great impact on some parts of the brewing industry. Biotechnological advances such as wet milling, immobilized thermo-tolerant enzyme systems, and ion exchange downstream-processing techniques permit the production of syrup with virtually any carbohydrate profile. At the present time, syrups are available that allow the brewer to introduce them at any level without changing the carbohydrate profile of the wort. The future will see the commercial ability to separate and isolate individual sugars according to their molecular weight and, subsequently, produce blended syrup of any sugar profile.

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Understanding hop oil compounds from different hops and how it can affect final beer aroma and flavor.

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Hops an important ingredient in beer production as we all know is responsible for different aliphatic and aromatic compound's in final beer. Depending on method of its use during brewing process can lead to some pleasant aroma and flavor for mostly hop forward beers. To understand how we can study and use it for better beer profile we will have a look at data of oil compounds in hops ml/100gm.

We will consider chinook and citra hops which are used for primary bitterness and whirlpool/dry hopping respectively.

As data shared by hop manufacturers we will have a look at some most important oil compounds in above mentioned hops.

- Farnesene : this oil compound is primarily responsible for green apple odour in final beer. Chinook have 0.27 and citra have 0.085 ml/100gm.

- Caryophyllene : if used with lower utilization trying not to evaporate much of this oil can give black pepper kind of smell to final beer. Chinook and citra consist of 8.532 and 5.882 ml/100gm respectively.

- Humulene : a primary compound which is responsible for bitterness in beer. A strong cannabis smell is observed if used intensely during dry hopping. Chinook consists 18.103 and citra 9.494 ml/100gm. So if someone have dared to try to use Chinook apart from boil addition during brewing process can understand the difference provided by mentioned above oil composition.

- Myrcene : known as beta- myrcene also is responsible for peppery and balsam aroma generally Categoried as spicy, earthy and mushy. In Chinook 36.8 and citra 63.317 ml/100gm of myrcene is detected. Now the brewers who always consider citra hops for dry hopping can understand this difference.

- Limonene : it's an aliphatic compound mostly responsible for orange kind of fragrance if used at dry hopping only. Bittering hop like Chinook consist of 0.163ml/100gm and citra have 0.231ml/100gm of this oil compound.

- Geraniol : this oil compound is associated with providing sweet rose and citrus aroma and waxy flavor. Most of it can't be lost because of higher flash point. 0.585 and 0.319 ml/100gm are found in Chinook and citra hops.

Above are some example of hop oil compounds which together gives a complex aroma profile to beer. And isolating one specific oil for use is next to impossible during brewing process as every oil compund have different flash point. And if we want to look at total oil so for Chinook is 1.869 ml/100gm and for citra is 2.66 ml/100gm. So if we want to target any aroma profile can have a look at hop oil compounds while considering any hops of choice for boil, whirlpool and dry hopping addition.

But one more thing we have to keep in our mind that complete extraction of above mentioned oil are highly depends on utilization during boil, whirlpool and dry hopping. As mentioned earlier also that every oil have different flash point of it's own. And some oil extraction can affect by ph value also.

So as we came to know why different oil compounds and it's composition are important for us. We can play with average total oil provided by different hops in our brews. As sadly we brewers in microbrewery are limited by resources to identify final oil composition in final beer. So this approach can help us creating some unique aroma profile for our beer.

Brewer World Announces The 2nd Edition of BW Conclave 2023

Mark your calendars!! The **2nd Edition of Brewer World Conclave** is all set to happen on **23-24-25 February 2023** at **Karnataka Trade Promotion Organisation**, Whitefield Industrial Area, Bengaluru.

After successfully hosting and executing the 1st edition of the Brewer World Conclave 2022, Brewer World is all set to host the exclusive industry show, a three-day B2B expo, conference, and awards for the beer and brewing industry professionals.

BW Expo

The expo aims to host 75+ exhibitors showcasing the newest technologies, goods, tools, and services accessible to Indian brewers, both established and up-and-coming. The exhibitors would have the chance to interact, network, and conduct business with possible clients that included OEMs, project consultants, production/commercial beer producers, and craft/microbreweries.

BW Conference

The conference will feature more than 35+ speakers who will be sharing their insights and experiences with other beer industry professionals. There will be panel discussions on subjects like:

- How to set up a brewery?
- Brewing Beers with local ingredients
- Dos and Don'ts while brewing
- Running a successful Taproom
- Beer and Taxation and many more

The conference intends to provide our visitors with prospects and possibilities in the business. The conference will start at 10 am and will be followed by some engrossing workshops.

The Beer of India Awards 2023

The objective of the awards ceremony, which Brewer World designed, is to honour excellence in beers made throughout India through a blind-tasting judging procedure. The judges choose the prizes based on the following criteria: colour, aroma flavour, mouth feel, and overall impression. The judges select the best beers that are sincere, distinctive, and adhere to the 2015 BJCP Style Guidelines.

Get your visitor passes today. Register here

About the Organisers

Brewer World is created for beer enthusiasts to participate, interact, and contribute content, thereby belonging to a beer community and receiving the latest news and updates on the latest beer market trends.

To know more, you may visit: www.brewer-world.com

HOPS FOR THE HOLIDAYS: A BRIEF HISTORY OF HOLIDAY BEER

AKSHAT JAIN

Business Development Manager-Craft Brewing

When most Americans turn on their TVs during the holiday season, they're inundated with Christmas ads pushing toys for kids, tools for dads, and jewelry for moms (or the ever ubiquitous Lexus commercials we all love to hate). But recently, beer brands have sought to capitalize on the holiday season by promoting their wares, such as Budweiser and their famous Clydesdales. While just a holiday commercial, Budweiser highlights a growing number of people who associate Christmas with beer.

The tradition of beer as a holiday drink dates back, like many other beer-related things, to the Vikings. As Serious Eat's Beer History blogger Lisa Grimm notes in her piece on beer history, the Vikings drank to their gods during their Jul celebrations (the Scandinavian Yuletide season) on December 21.

Beer drinking around Christmas time was so important to Scandinavian culture that even when Christianity became the official religion of Norway, King Haakon I required that all households brew a Jul beer each year. Failure to do so would result in a fine, and after three years of no beer farm owners could lose their land.

While Christmas beers have taken on many forms over the years, one of the most aggressive marketers of their Christmas brew is Stella Artois. Stella, which was originally brewed as a Christmas beer starting in 1926, was, as Grimm explains, "a nod to the storied Christmas star," and named after Stella's head brewer from the 18th century, Sebastianus Artois, who took over the brewery in 1708.

As Philly Beer Scene notes, the modern day concept of a Christmas beer — one that is strong, malty, and spiced (such as the examples below) — was popularized in the British brewing tradition. Burton Ales, which were traditionally strong and malty, fell out of favor at times, but were always a go-to during the long winter months in England.

Indeed, here in America when most people think of Christmas beer they often tend towards dark, malty, and spiced. Here are a few examples of Christmas beer (and one special set of beers for those that celebrate Chanukah):

Great Lakes Brewing Company Christmas Ale: Folks from the Midwest who have made their way east clamor for this beer each Christmas season (even those who traditionally aren't a fan of this style). That's for good reason; this beer is Christmas in a bottle. Brewed with a beautiful malty base and hints of sweetness, Great Lakes brewmasters also add in ginger, honey and cinnamon, while lightly hopping with the slightly spicy Cascade and Mt. Hood hops.

Sam Adams Old Fezziwig Ale: One of the first Christmas beers I ever had the pleasure of tasting came in Sam Adams' winter variety pack and had this wonderfully Christmas-themed name, Old Fezziwig. To this day, I associate Christmas beers with Old Fezziwig (and even brewed a clone this year for family and friends). Similar to Great Lakes' offering, Old Fezziwig has a sweet malty base, but adds in a good amount of chocolate malt to provide a chocolaty sweetness.

Hopping in the traditional Sam Adams way of using noble German hops, this beer uses Hallertau and Tettnang for a pleasant spiciness, and also adds in ginger, orange peel, and cinnamon.

Anderson Valley Winter Solstice Ale: Another beer I drank early on in my drinking career, Anderson Valley Solstice has a strong delicious sweetness that cuts through early on. As the beer warms, the sweetness mellows into the beer and the Northern Brewer and Liberty hops add an assertive bite.

Sierra Nevada Celebration Ale: Taking Christmas beer in a radically different direction, Sierra Nevada does what it does best and provides drinkers with a fresh hop IPA in their Celebration Ale. Using Cascade, Centennial, and Chinook hops, this fresh hop beer is a go-to for many who may burn out their palates on the dark malty stuff. Fresh hops are clean in flavor and provide the drinker with the freshest tasting hops from the previous season.

Schmaltz Brewing Company's The Hannukah Menorah Pack: For those who don't celebrate Christmas, or who want to provide a little variety to their beer lineup, grab a Menorah Pack from Schmaltz Brewing Company. There is a beer for each night of Chanukah, candles, and an empty beer bottle that can be used to light the candles on the other beers (aka the shamash). While the beers themselves are hit or miss, the novelty of the pack brings me back year after year.

While I hope this holiday season brings joy and happiness into all your lives, I also hope it brings some beer to your lips. Cold winter nights or celebrations with family and friends are the perfect times to drink a warm and toasty beer and relax during this wonderful season.

Salvatore Colleluori is a political writer by day and a homebrewer and beer enthusiast by night. He holds a degree in Political Science from the George Washington University and enjoys reading about alcohol, history, and foreign relations. He is also an avid music lover, specifically jazz and the Grateful Dead.

Source:warontherocks.com

INTRODUCTION TO SAKE

ESHANT BHARDWAJ

Business Development Executive, BECC

What is Sake

Sake is an alcoholic beverage made from rice through fermentation and filtration. For fermentation of sake, rice koji, a kind of fungi grown on rice is used. Sake has been made for 1000 years all over the Japanese islands. There are about 1500 sake makers producing their unique sake with different regional tastes.

What does sake taste like and go well with?

Generally, alcoholic content in sake is about 15% (v/v), which is little higher than wine. Extract is an indicator of sweetness and taste of sake varies from dry to sweet. Acidity of sake is generally lower than wine but higher than beer

Sweet or Dry?

Many sake bottles show nihonshudo on their labels. It is a scientific measurement of density and sometimes reffered as sake meter value (SMV). Higher nihonshudo means lower density and corresponds to a drier taste, through acidity,aroma and alcohol content also affect how sweet or dry the sake tastes.

Types of Sake

There are many types of sake and the differences mainly depend on the brewing methods.

1. Ginjo-shu: Specially refined sake made from highly polished rice with special techniques. It has mild taste with fruity flavours such as apple, melon, banana etc
2. Junmai-shu: Sake made only from rice and rice koji
3. Honjozo-shu: Sake made from rice, rice koji and limited volumes of neutral alcohol. It has well balances taste and flavour
4. Unpasteurized Sake: Generally sake is pasteurized twice, unpasteurized sake is not heat-sterilized at all and features fresh flavours
5. Cloudy Sake (nigori-sake): Coarsely filtered sake. It is soft and pleasant on the tongue.
6. Sparkling Sake: It is popular right now, some of them contain lower alcohol than standard sake does
7. Long aged sake: It has special flavors and mellow taste and has its own cateogary of sake.

How to store sake?

High temperature and light deteriorate the flavour of sake. So dark and cool places like a wine cellar are desirable to store sake. It is generally recommended to consume sake within 1 year after bottling. Once a bottle is opened, it should be tightly closed, kept in a cool place and consumed soon (generally within a month)

Source: nrib.go.jp

MALTO DEXTRINE (MDP)

RUPAK KUMAR CHATTERJEE

Yamuna Nagar (Haryana)

This is process from "Broken Rice"

1. Grinding after removal of dust and foreign materials, after getting the powder of broken rice, dissolve in water as per requirements of solid then adding of enzyme and addition chemicals. Then pass through jet cooking system through dextrin column,
2. Analytical testing like starchfree and (D.E) Dextose equivalent.
3. <u>First filter:</u> separation of "Gluten"
4. <u>Second filter:</u> Bleaching with activated carbon
5. <u>Iopnex change:</u> Purification of organic and inorganic materials and all impurities through cation & Anion
6. <u>Third filteration:</u> Bleaching with activated carbon
7. <u>Evaporation:</u> Here evaporating upto 55% to 58% solid then feed to dryer.
8. <u>Dryer:</u> initial feed solid is 55-58% to dry powder ,moisture normally 4% or as per requirement by maintain bulk density & acidity

9. **<u>Final Product Packing:</u>**
    1. In HDPE bags with inside liner
    2. Paper bags
    3. Wieght net. 25kgs/bag

Maltodextrine easily digestible which are completely soluble in water, milk and other any liquid foods

10. **<u>Applications:</u>**
    - Dairy Industry
    - Baby foods
    - Fruit drinks
    - Bakery industries etc

11. Gluten: It's bye-product of Maltodextrine. It is used as animal foods & poultry firms

Methods to produce Liquid and Gaseous fuels from Biomass

Sachin Mogal

Technical Manager (Alcohol), Balaji Enzyme and Chemical Pvt ltd

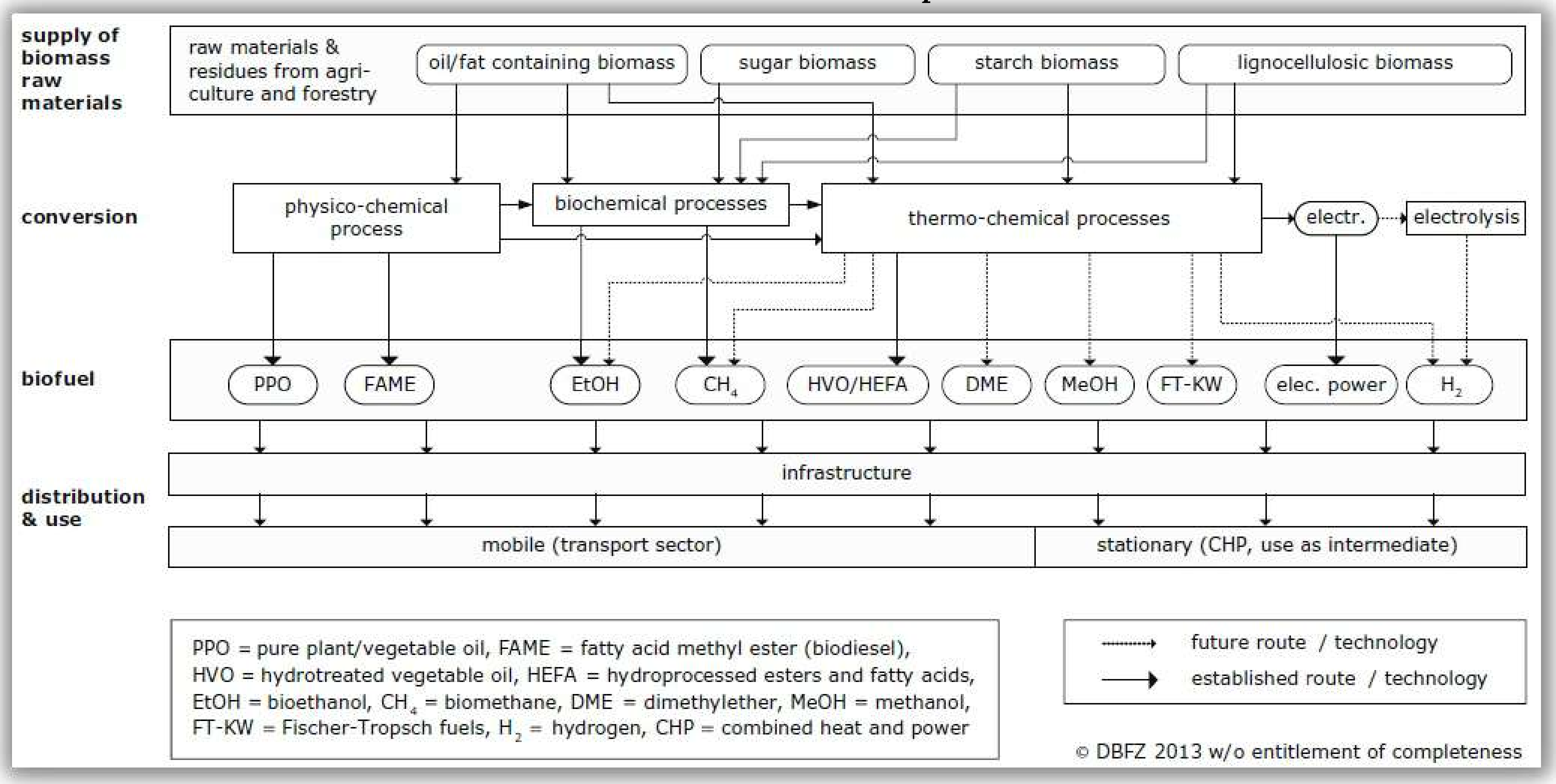
The goal of biomass conversion is to produce fuels with clearly defined fuel characteristics that meet specified fuel quality standards. There are three major pathways to consider depending on the method of biomass conversion; all of them are part of specific overall concepts with varying degrees of technological complexity and flexibility.

Physical-chemical conversion: Typically, these reactions take place at low temperatures and pressures. They involve the generation and conversion of biomasses rich in oil and fat into triglyceride biomass (such as fatty acids and oils from plants and animals). In order to produce biodiesel or fatty acid methyl ester, these raw ingredients are processed further with alcohols via catalysed trans-/esterification (FAME). It is incorporated with diesel or used in pure form in cars that have been modified.

Biochemical Conversion : Microorganisms are used in these processes to convert biomass (usually sugar and starch fractions) into liquid and gaseous fuels. Bioethanol, for example, is created by fermenting sugars derived from starch and sugar biomass. It can be used in pure form in specially adapted vehicles or blended with gasoline, as long as the fuel specifications are met. Another method is to use biogas produced by anaerobic treatment of biogas substrates, which is then upgraded to biomethane and fed into the natural gas grid, where it can be used in natural gas vehicles. Both of these recent developments involve the use of specialised treatment processes (hydrolysis via thermal processes or enzymes) that successfully break down lignocellulosic biomasses and release sugars, which can then be fermented into alcohol or methane.

Thermo-chemical Conversion: These processes use high temperatures and pressure levels to convert biomass (usually lignocellulosic fractions) into different products (i.e. depending on process conditions, usually into solid, liquid, and gaseous fractions) that can be either upgraded or further processed, e.g. via gasification. Conversion into a raw gas, which is then treated and conditioned into a synthetic gas primarily composed of carbon monoxide and hydrogen, is part of the gasification process chain. This gas can be converted into various types of liquid and gaseous fuels using various fuel synthesis and upgrading technologies.

Overview of biofuel options



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WHY MEAD IS THE ANCIENT DRINK EVERYONE'S TALKING ABOUT AGAIN

VASHNAVI WAKHRE

Learn more about the ancient honey wine that's having a resurgence in the spirits industry.

Mead may very well be the world's oldest alcoholic beverage. Evidence of its production can be traced back to 6,500 to 7,000 B.C. in Northern China, certainly well before beer and grape wine was ever created. The drink of ancient kings and royalty, mead was considered by Grecians of the Golden Age to be 'ambrosia' or 'Nectar of the Gods.' Modern-day mead makers use some of the same methods as their ancient counterparts. Here is why you should give the ancient drink a try now.

What is mead?

The explanation is simple—grapes make wine, grains make beer, apples make cider, and fermented honey makes mead. Honey can stay preserved for hundreds of years, so to force the fermentation process, mead makers blend it with water to create a yeast-friendly environment. After the yeast is added, it begins to consume the sugars, altering the honey and water mixture into an alcoholic beverage.

There are different styles of mead—still, carbonated, or sparkling, and sweet, semisweet, or dry. Other ingredients can be combined with the honey, water, and yeast mix. Each mix can have a different name. For example, when spices are added to the brew, the mead is called Metheglin-style. Combinations with fruit are called Melomel. Certain countries have developed their own styles, like the low-alcohol by volume (ABV) Finnish version called Sima that's flavored with lemon, or the Ethiopian Tej that uses the bark of the Gesho shrub.

Alcohol content varies widely across mead. Kenneth Jenkinson, Mead Magistrate of the Savannah Bee Company, serves different versions to curious customers. "Mead varies a lot in taste, in fact, it's the most variable of all alcohols. It can taste like beer, wine, or ginger ale. It can range from dry to sweet and be carbonated or non-carbonated. It can have between 3 percent and 20 percent alcohol."

Is mead better for you than wine?

Throughout history, mead was used medicinally, even thought to be magical and to provide immortality. "Mead is considered healthier than beer and wine because it's made with honey, which is easier for the body to metabolize, and you get the nutritional benefits of honey itself," Jenkinson says. Honey has natural antiseptic and antibacterial qualities.

Be mindful, however, that while honey can be beneficial in many ways, it also packs a lot of sugar. Just two ounces of mead can have more than 300 calories and 40 grams of carbohydrates. For comparison, two ounces of red table wine has about 48 calories and only 1.48 grams of carbs.

Certainly, reducing the alcohol by volume content of your cocktails is better for your health. While mead comes in a low-ABV version, red wine normally has somewhere around 14 to 15 perent alcohol and white wine around 11 to 13 percent alcohol in the United States.

With so many flavor combinations and presentations, there is a version of mead for everyone. Because the honey-based beverage has been enjoyed in almost every culture, it's certainly worth trying!

BECPL TEAM AT DRINK TECH INDIA 2022

WINE REPORT

KANCHAN SINGH

Chapter Head - South Delhi, India
Apex Wine Club India
1 December 2022, Thursday

The global wine market size accounted for USD 489.3 billion in the year 2021 and it is estimated to reach a market size of USD 825.5 billion by 2030, with a compound annual growth rate (CAGR) of 6.1 per cent from 2022 to 2030.

The Europe wine market revenue gathered about 45 per cent market share in 2021. Asia-Pacific wine market will record a CAGR of 8 per cent from 2022 to 2030. Notably, the table wine segment acquired around 80 per cent of the overall market share in 2021.

The wine market growth factors include growing urban inclination for exotic wine, increasing demand for alcoholic beverages, and rising consumer socialisation with liquors.

BrewTimes™

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