BrewTimes™

JUNE 2023

BALAJI ENZYME & CHEMICAL PVT LTD

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Introducing BrewTimes :

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

We are extremely proud to announce our association as the official Media Partners of "BIOFUEL EXPO 2023".

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.

Vitahop®

Increase profits in BIOETHANOL...naturally

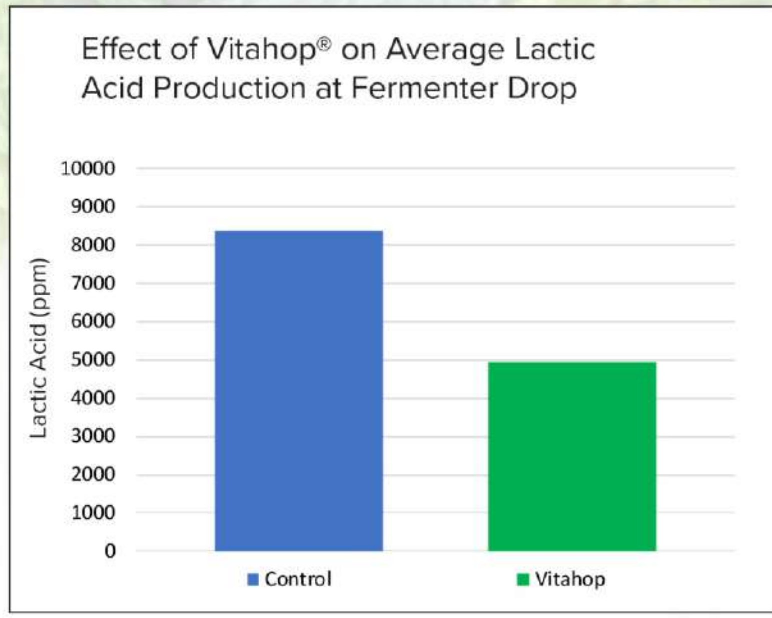
Vitahop® is a range of natural hop extracts, ideal for production of bioethanol from a range of raw material feedstocks, as they protect yeast from bacterial growth, and their acid by-products, during fermentation processes. When used as part of a planned process regime with regular additions, bacterial infections do not develop and spoil yeast fermentations.

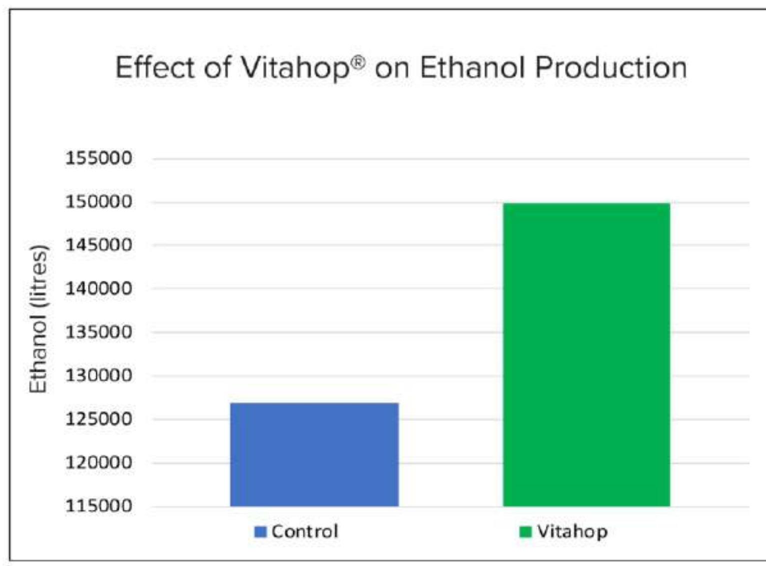
When infections do develop, they can quickly get out of control and disrupt production, potentially causing substantial losses and lost revenue. By controlling bacteria and preventing bacterial growth, catastrophic infections can be a thing of the past.

Vitahop® is used in both continuous and batch fermentations. It helps ensure healthy, vitalised yeast growth and during fermentation suppress gram positive bacteria. If bacteria are allowed to prosper, they will compete with and eventually inhibit the yeast, slowing fermentation sometimes to a complete stop, resulting in a "stuck" fermentation. Bacteria will also use up valuable feedstock producing organic acids such as lactic acid, further reducing ethanol yields. Prevent this happening with **Vitahop**®.

Key Benefits of Vitahop®

- Maintains optimum ethanol yields
- Ensures reliable fermentations
- Keeps yeast healthy
- Controls bacteria
- Demonstrated benefits in ethanol production plants worldwide
- Safe and natural, easy to use
- Safe DDGS for animal feed
- A natural alternative to antibiotics





Unpublished data BetaTec 2015

BetaTec is the first company worldwide specialising in the application of hops and hop-derived compounds for use in "beyond brewing" industries. Our product portfolio includes natural fermentation aids, antibacterials, flavours and functional ingredients. Our key business areas are alcohol, yeast and sugar production.
All BetaTec products are accompanied by on-site support, process optimisation and consulting.

Please contact our technical experts to learn how Vitahop® can help you sustain improved ethanol yields.

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Great Malvern, Worcestershire WR14 3SZ
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BetaTec® hop products

"Transforming your world with our natural hop solutions"

BetaStab® XL

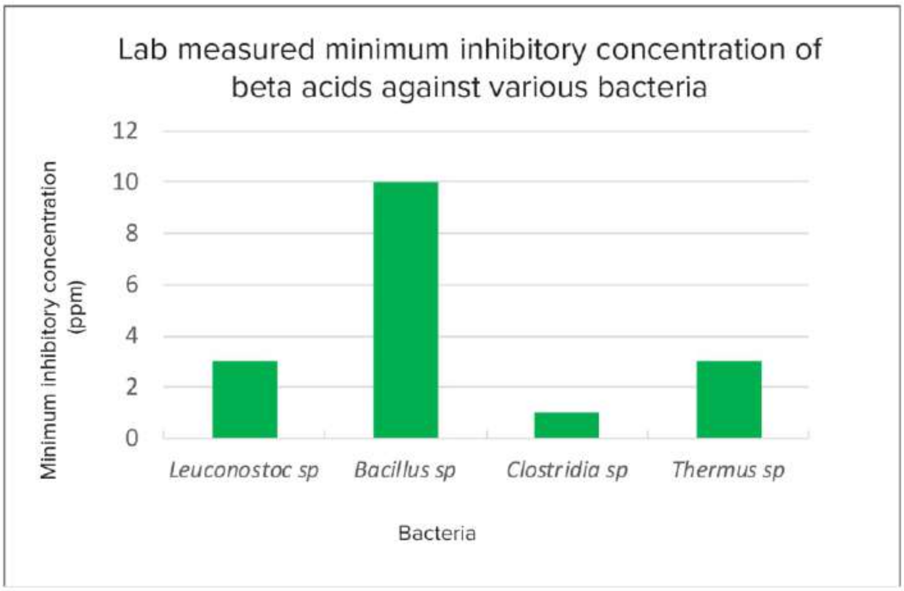
Reduce your sugar losses ...naturally

BetaStab® XL controls problematic Gram postive bacteria found in sugar extraction

Microbial sugar losses are a major problem in sugar production resulting in lower yields, increased processing problems and higher impurities such as lactic acid and dextran.

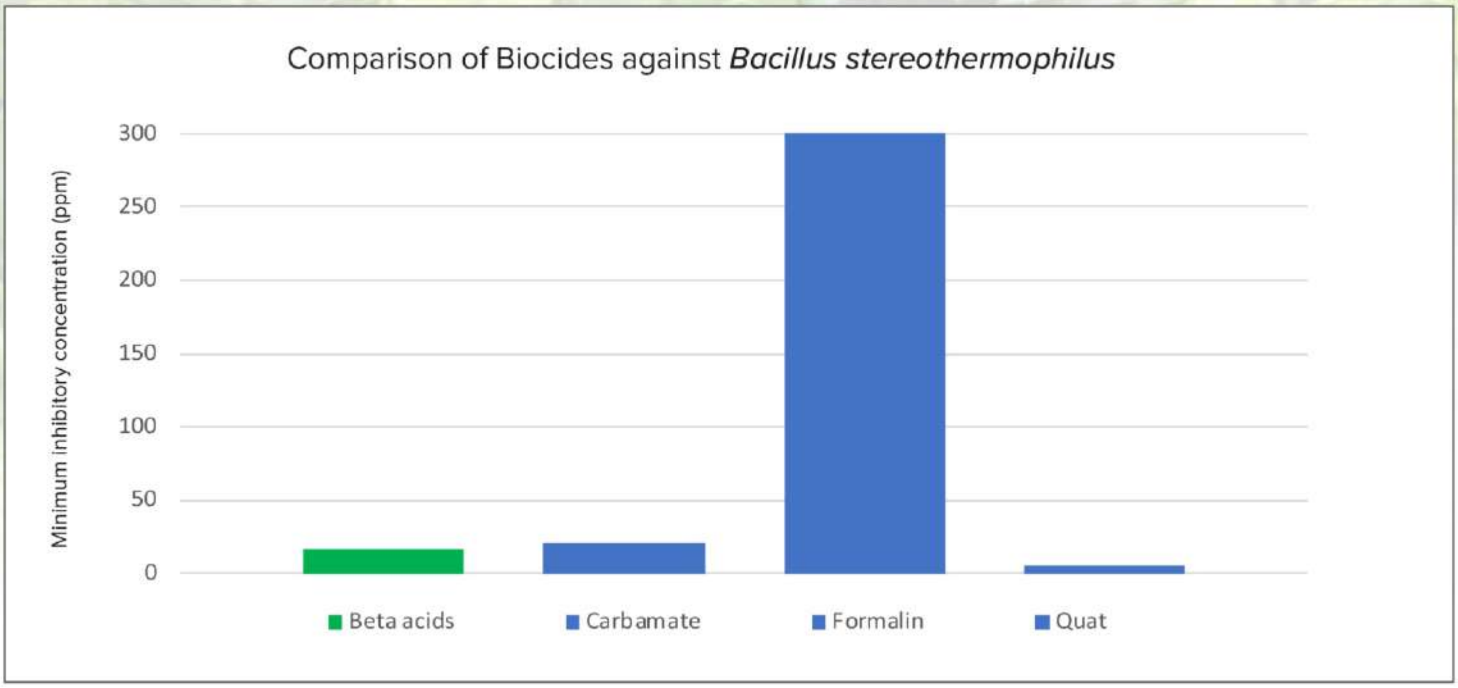
The hop product BetaStab® XL is a natural food processing aid. For more than 10 years it has proven effective at controlling bacteria in factories worldwide and is a cost effective alternative to synthetic biocides.

Our product can be applied during the production of sugar from either beet or cane. it is an aqueous solution of natural hop acids and is active over a wide range of temperatures and pH values.



Key advantages of BetaStab® XL

- **Active against bacterial contamination at ppm levels. Immediately stops bacterial growth**
- **Control of lactic acid, dextran and nitrite production**
- **Effective over a range of pH values and temperatures**
- **Demonstrated activity in sugar cane mills and sugar beet factories worldwide**
- **Cost effective alternative to synthetic biocides**
- **Can be used in thick juice storage, prolonging storage times**
- **Products are water based for ease of dosing**
- **Safe to handle and non-corrosive to equipment**
- **Coproducts suitable for animal feed**
- **Residues are beneficial for yeast and ethanol fermentation processes**



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BetaTec® hop products

"Transforming your world with our natural hop solutions"

BREWERY BY-PRODUCTS AND EFFLUENTS

BIJAY BAHADUR

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Introduction

Beer is about 95% water in composition; however, the amount of water used to produce a container of beer is far greater than the amount of water contained in the beer that is actually packaged and shipped out. Although water usage varies widely among breweries and is dependent upon specific processes and locations.

In addition to the water used in production, waste water generation and disposal presents another improvement opportunity for brewers. Most breweries discharge 70% of their incoming water as effluent. Effluent is defined as waste water that is generated and flows to the sewer system. In most cases, brewery effluent disposal costs are much higher than water supply costs.

Under present conditions and with the way water is being managed, we will run out of water long before we run out of fuel.

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Typical Brewery Water Use per Area

Department	Water Usage
Brew house	25%
Cellars	17%
Packaging	38%
Utilities	20%

Within a brewery, there are four main areas where water is used:

1. Brewhouse
2. Cellars
3. Packaging
4. Utilities

In addition, ancillary operations such as canteen and restrooms contribute to water usage.

Main Areas of Wastewater Generation

Source	Operation	Characteristics
Brewhouse		
Mash Tun	Rinsing	Cellulose, sugars, amino acids. ~3,000 ppm BOD
Lauter Tun	Rinsing	Cellulose, sugars, spent grain. SS ~3,000 ppm, BOD ~10,000 ppm
Spent Grain	Last running and washing	Cellulose, nitrogenous material. Very high in SS (~30,000 ppm). Up to 100,000 ppm BOD
Wort Kettle	Dewatering	Nitrogenous residue. BOD ~2,000 ppm
Whirlpool	Rinsing spent hops and hot trub	Proteins, sludge and wort. High in SS (~35,000 ppm). BOD ~85,000 ppm
Cellars		
Fermenters	Rinsing	Yeast SS ~6,000 ppm, BOD up to 100,000 ppm
Storage tanks	Rinsing	Beer, yeast, protein. High SS (~4,000 ppm). BOD ~80,000 ppm
Filtration	Cleaning, start up, end of filtration, leaks during filtration	Excessive SS (up to 60,000 ppm). Beer, yeast, proteins. BOD up to 135,000 ppm
Beer spills	Waste, flushing etc.	1,000 ppm BOD
Packaging		
Bottle washer	Discharges from bottle washer operation	High pH due to chemical used. Also high SS and BOD, especially through load of paper pulp.
Keg washer	Discharges from keg washing operations	Low in SS (~400 ppm). Higher BOD.
Utilities		
Miscellaneous	Discharged cleaning and sanitation materials. Floor washing, flushing water, boiler blow-down etc.	Relatively low on SS and BOD. Problem is pH due to chemicals being used.

In addition, ancillary operations such as offices, canteen and restrooms contribute to water usage.

Water awareness and conservation practices provide an effective mechanism for brewers to reach out into communities. Outreach efforts have a number of benefits, including building brand image and being recognized as an important part of the community.

In the process of brewing and packaging of beer, the generation of by-products and waste products is unavoidable. Technological advances and improved microbiological control have enabled the brewer to reduce product losses and to produce valuable by-products from materials that were previously considered waste products. Economic advantage derived from minimizing product losses or upgrading waste products to by-products.

Brewhouse Effluents

Effluents from the brewhouse discharged to the sewer include rinses from the various brewhouse vessels, CIP solutions, brew kettle vapor condensate, and liquor from wort clarification that is too turbid to include with the wort.

After runoff of wort to the kettle is completed, brewer's grain is allowed to drain while the free liquor is collected or sewered. Alternatively, the brewer's grain is immediately conveyed "as is" to the brewer's grain processing area. The exact procedure depends on brewing practice and on the wort clarification device used.

In a lauter tun, which is the most commonly used clarification device, free liquor is usually first drained to a separate holding vessel until this so-called sweet water becomes too turbid. At this point, it is diverted to the sewer. After it has drained to the sewer, the wet brewer's grain still contains about 77–81% moisture. After discharging the wet brewer's drain to a holding tank, the area under the false bottom is rinsed. The rinse water, which may contain a considerable amount of suspended solids, is flushed to the sewer.

Collection and recycling of sweet water is done to improve lautering efficiency. If the lautering efficiency is already high, such as in low-gravity brewing or when adequate time is available for lautering, the dissolved solids concentration of sweet water might be too low (less than 0.8 ^{0}P, for example) to be economically attractive. Other factors that may make recycling of sweet water unattractive are higher than normal concentrations of suspended solids and soluble b-glucans, which could impede runoff. Proper microbiological control of sweet water must be done if recycling is employed. If sweet water is not recycled, all free liquor from the lauter tun is sewered.

Different methods employed at various breweries cause the volume of recycled sweet water to vary from 0 to 6 hl for each 100 hl of final product. This sweet water may have an extract concentration ranging up to 3.0 ^{0}P.

It is estimated that the total volume of lauter tun effluent and rinses discharged to the sewer varies between 4 and 12 hl for each 100 hl of final product. The dissolved solids concentration in this effluent may vary from 0.4 to 3 ^{0}P whereas suspended solids concentration may range up to 1.0 weight %. For each 100 hl of final product, a typical brewery will discharge about 11.6 kg of dissolved solids and 3.9 kg of suspended solids to the sewer. The BOD of this effluent is approximately 10.1 kg.

Other brewhouse effluents are rinses and CIP solutions from brewhouse pipes and vessels. Heating surfaces in the kettle or in external boilers become quickly fouled by a build-up of proteinaceous material. These surfaces may require cleaning after every two brews. Similarly, wort coolers may be CIPed every 3 to 4 brews. Wort may also end up in brewhouse effluent through:

a) Entrainment by brew kettle vapors.
b) Purposely sewering wort to avoid brand mixing.
c) As part of hot wort trub that is not recycled or used as by-product.
d) By leakage and spillage.

Brewery Solid Wastes

The most cost-effective method for significantly reducing effluent load of brewery wastewater is to separate the solid wastes from the wastewater itself. The equipment necessary includes holding vessels, tanker trucks that can haul away the material, pumps, and dedicated piping or hoses for transfer. Typical solid wastes include spent grains, trub, spent yeast, diatomaceous earth slurry from filtration, and packing materials.

Spent Grains

Beer production results in a variety of residues, such as spent grains, which have a commercial value and can be sold as byproducts for livestock feed. The nutritional value of spent grain is much less than that of the same amount of dried barley, but the moisture makes it easily digestible by livestock.

Spent grains are used as a constituent of cattle food and the food value of 5 kg of moist spent grains is equivalent to 1 kg of barley, but they are bulky, and they soon begin to decompose, so they must be removed from the brewery promptly. The composition reported, on a dry weight basis are:

- Crude protein : 27%
- Fat : 6%-7%
- Ash : 4%-5%
- Crude fiber : 15%
- N-free extract : 46%.

The moisture content of spent grains varies widely depending on the wort separation system used. Thus, grains from a Strain master may contain 87%-90% moisture, and they are sloppy and are easy to pump, but they are so wet that liquid drains from them and they must be de-watered before removal. Water drains from grains with moisture contents above 80%. The draining are an excellent medium for unwanted microbes. Grains from lauter tuns can contain 75%-85% moisture and those from pressure filters contain as little as 50%-55%.

A range of other uses for spent grains has been proposed such as.

1. As a source of biogas and soil conditioner produced by anaerobic digestion.
2. Disposal by burning (giving heat).
3. As a source of secondary worts generated by acid or enzymic hydrolysis.
4. As a source of protein.
5. As a source of food-grade fiber.
6. As a basis for mushroom compost.
7. As a soil conditioner and organic fertilizer.
8. As a medium for growing earthworms to use in poultry food, and in fish food.

Trub

Trub is slurry consisting of wort, hop particles, and unstable colloidal proteins coagulated during the wort boiling.

The main component of the trub is coagulated proteinaceous material formed in the brewing kettle-some also develops during mashing. The amount of trub formed depends on many factors: protein content of the malt, the amount of protolysis during malting, kilning conditions, mashing schedule, polyphenol contents of malts and hops, method of boiling (internal vs. external calandria), length of boil, oxidation during kettle boil, and hopping method.

Trub is separated from wort by sedimentation in a conical bottom hot wort tank or in a whirlpool tank. Even in a whirlpool tank, the sediment still contains considerable wort and recovery of this wort can increase brewhouse yields from 0.6%7 to 1.5%.

Recovery of wort from trub is accomplished using a filter press, a vibrating screen, a centrifuge, or by recycling the trub to the top of the grains in a lauter tun prior to sparging. The latter method is simple, but has a disadvantageit can only be employed when the lauter tun is processing the same type of wort at the time of recycle. Recycling trub also has another disadvantage-it slows runoff and decreases the efficiency of wort extraction. Recovery of wort by means of a decanting centrifuge has been successful and has none of these disadvantages. A new method that is currently being developed is recovery of wort from trub by means of cross-flow filtration.

When wort recovered from trub is fed forward, it is important to control the level of residual suspended solids. An increase in wort suspended solids causes a more vigorous fermentation; the solids either serve as nucleation sites for CO_2 bubbles or yeast growth is stimulated by unsaturated lipids and zinc in trub solids.

Trub is generally mixed with brewer's grain. Both have similar amino acid content. Trub contains 30% digestible crude protein, which is about twice the level found in brewer's grain. The addition of trub to brewer's grain will therefore enhance its nutritional value. Trub may also be sold in mixtures with yeast and with centrifuge solids recovered from brewer's grain liquor. This type of mixture can have protein content close to that of soybean meal and may be an excellent liquid feed for swine.

Spent Yeast

In brewing, surplus yeast is recovered by natural sedimentation at the end of the fermentation and conditioning. Only part of the yeast can be reused as new production yeast. Spent yeast is very high in protein and B-vitamins, and may be given to livestock as a feeding supplement.

In typical lager fermentation, about 0.27 kg of surplus yeast solids is produced per hectoliter of product. These solids include pure yeast solids, beer solids, and trub solids. Brewer's condensed solubles are produced by concentrating press liquor and other carbohydrate-rich brewery waste streams; multiple effect evaporators are generally used for concentration. The product is blended with brewer's grain or is sold as a high-energy liquid feed ingredient, as a pellet binder, or as a feedstock for fermentation.

Diatomaceous Earth (DE) Slurry

Diatomaceous earth slurry from the filtration of beer also constitutes a very large category high in SS and BOD/COD. Different methods for regeneration are under development, but presently they are not capable of totally replacing new diatomaceous earth.

Packaging Materials

Other solid wastes include label pulp from the washing of returnable bottles, broken glass (cullet), cardboard, bottle caps, and wood that is usually disposed of at sanitary landfills.

General Characteristics of Brewery Wastewater

Breweries produce large quantity of highly polluting wastewater rich in organic substances. As the scale and production of the brewing industries increases, the amount of waste water increases substantially, resulting increasing pollution problems in the environment. Due to wide varieties in its strength (in terms of COD, BOD, and TSS), pH, and the amount of wastewater discharged, brewery waste water tends to be very difficult to treat. In view of this situation, there is a need to develop a technology which is capable of efficiently treating the increasing volumes and strength of waste water from the brewery.

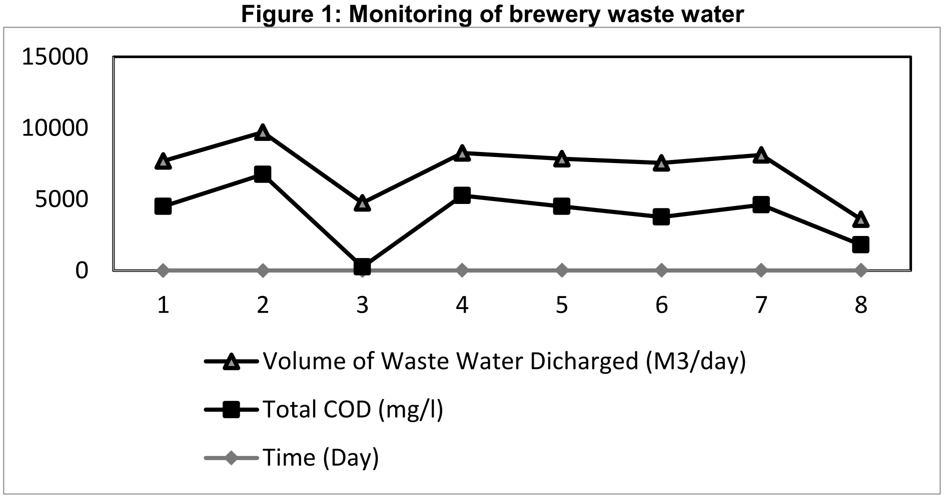
The waste water discharged from the breweries is generally a combined effluent comprising discharges from various sources within the brewery. The fermented liquor is the final product in the brewing process. Waste arises from the separation of grain residues, from spent-hops, hot and cold break and yeast from the fermented processes, from spillage, from possible spoilage of beer, from the fillers as well as from packaging and from washing waste water. The waste water production rates from the brewing and packaging departments vary independently of one another. While the packaging process produces a high flow, high pH, weak waste composed primarily of spilled beer and caustic cleaning solutions, the brewing produces a low flow, neutral pH and high strength alcoholcarbohydrate-protein waste.

A continuous monthly monitoring of the effluent from a brewery showed considerable variation in general waste water characteristics in terms of biochemical oxygen demand (BOD), chemical oxygen demand (COD), and solids concentration. As described in Table 1, total BOD varied from 87 mg/l to 6550 mg/l, and concentration of suspended solids from 16 mg/l to 1162 mg/l. The ratio of soluble BOD to total BOD was about 0.91, which implied that most of the biodegradable materials were in soluble forms. One important characteristic of brewery waste is its fluctuations in flow and quality at night and weekends, compared with average working day flow. The fluctuation in the quantities of waste water discharged from a brewery is depicted in Figure-1.

Table 1:The general characteristic of brewery waste water

Total BOD	41 – 4260 mg/l
Soluble BOD	34 – 3890 mg/l
Total COD	87 – 6550 mg/l
Soluble COD	37 – 4830 mg/l
Total Suspended Solids	16 – 1380 mg/l
Volatile Suspended Solids	11 – 1230 mg/l
pH	6.1 – 9.1

Figure 1: Monitoring of brewery waste water



The pH of the waste water from various processes within the brewery was neutralized in a pH tower within the brewery. This ensured that the pH did not change significantly. Since, brewery waste water has a poor buffering capacity; hydrolysis and anaerobic activity usually reduce the pH. The pH tends to drop from 10 to 4 within a day at room temperature, and it will drop from 10 to 5 within 3-4 days in a walk-in cooler at temperature approximately 4 ^{0}C. Due to preponderance of the carbonaceous matter it tends to be relatively short of nitrogen-nutrients. Slight seasonal temperature variations in the waste water ranged between 19 ^{0}C in the winter and 39 ^{0}C in the summer.

Brewery Waste Water Treatment

Due to its high organic content and high biodegradability, brewery waste water is ideally suited to biological treatment. All treatment methods basically involved the conversion by microorganisms of fairly complex stable/unstable organic compounds to CO_2 and water. Biological treatment results in the removal of BOD, the coagulation of non-settleable colloidal solids, and the stabilization of organic matter.

Conclusion:

A step-by-step study of the water cycle allows reducing significantly the water consumption. Making the water balance is useful to detect unknown water consumption, and is the basis for further optimization.

More practical common-sense methods are to develop to help reducing the water consumption in the beer manufacturing activities. This is known as “Water Scan Technique” which is based on theoretical frame work, but all start from a water balance of the brewery upon which ideas are gathered on how to manage the water system more efficiently, concentrating on reducing costs. Good housekeeping and opportunities for simple direct reuse should be the main attention points at this stage.

Finally, the remaining waste water can be including in an overall process scheme aiming at zero discharge of waste water. In practice, hardly any process is operated 100% continuously so that an influent with stable characteristics is not always possible.

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WHY CARBON DIOXIDE FIZZINESS IMPORTANCE IN BEER

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Introduction

Beer is one of the oldest and most popular alcoholic beverages in the world, with a history dating back thousands of years. Over the centuries, the brewing process has evolved and been refined, resulting in a wide variety of beer styles and flavors. One of the key factors that contribute to the taste and quality of beer is carbon dioxide (CO_2) fizziness. In this article, we will explore the importance of carbon dioxide fizziness in beer and its impact on the taste, aroma, appearance, and shelf life of the beverage.

Carbonation and Beer

Carbonation is the process of dissolving carbon dioxide gas in liquid, creating a sparkling or fizzy sensation. In beer, carbon dioxide is produced naturally during the fermentation process, as yeast converts sugar into alcohol and CO_2. Brewers can also artificially add carbon dioxide to beer to achieve a desired level of fizziness.

The level of carbonation in beer is typically measured in volumes of CO_2 per volume of beer (v/v). For example, a beer with a carbonation level of 2.5 v/v means that there are 2.5 volumes of CO_2 dissolved in one volume of beer. The ideal carbonation level for beer varies depending on the style and personal preference, but generally falls between 2.2 and 2.7 v/v.

Impact of Carbonation on Taste

Carbonation plays a significant role in the taste of beer, as it affects the perception of sweetness, bitterness, and overall balance. A beer with too much carbonation can taste overly fizzy or sharp, while a beer with too little carbonation can taste flat or dull. The ideal level of carbonation depends on the beer style and the brewer's intended flavor profile.

For example, German-style lagers are typically highly carbonated, which helps to accentuate their crisp and refreshing flavors. On the other hand, English-style ales are often less carbonated, which allows their malty and hoppy flavors to shine through. Belgian-style beers, known for their complex flavors and aromas, are often highly carbonated to balance the sweetness and acidity of the beer.

The carbonation level can also affect the perception of bitterness in beer. Carbon dioxide gas enhances the sensation of bitterness on the tongue, which can be beneficial for beers that have a strong hop character. However, too much carbonation can also make the beer taste overly bitter, masking other flavors and aromas.

Impact of Carbonation on Aroma

Carbon dioxide plays a critical role in releasing volatile compounds, such as hop oils, from the beer, which can enhance the aroma and overall drinking experience. When a beer is poured into a glass, the carbonation causes bubbles to rise to the surface, carrying aromas with them. This release of aroma is known as "headspace volatilization."

The headspace volatilization process is particularly important for beers that have a strong hop aroma, such as IPAs. Carbonation helps to release the hop oils from the beer, intensifying the aroma and providing a more enjoyable drinking experience. For example, a beer with low carbonation may have a muted hop aroma, while a beer with high carbonation may have an overpowering hop aroma.

Carbon dioxide can also contribute to the formation of esters and other aroma compounds during fermentation. These compounds can create fruity or floral aromas in the beer, adding complexity and depth to the flavor profile.

Impact of Carbonation on Appearance

Carbonation can also impact the appearance of beer, particularly the formation of the beer's head. A beer with high levels of carbonation will typically have a thick and foamy head, which can add to the visual appeal of the beer. The head of the beer can also provide clues about the quality of the beer, such as whether it was properly carbon.

HOP OIL (HOP ESSENTIAL OIL) OR HOP TERPENES? WHAT'S THE DIFFERENCE?

AKSHAT JAIN

Business Development Manager-Craft Brewing

Essential oils have become relatively familiar to most of us thanks to a booming aromatherapy industry. You may know that essential oils are concentrates that carry the "essence" of the plant to you in the form of a strong characteristic smell.

"Lavender essential oil" , for example, smells like lavender flowers and can be used to promote a sense of calm. The essential oil of hops – or hop oil – smells like fresh hop cones.

But what are terpenes then?

In the world of beer and brewing, terpene talk is on the rise because of the commercialization of specific hop terpenes in liquid form. These concentrates can now be used in addition to, or in place of, dry hopping to affect the hoppiness of the beer.

With terpene names like linalool, myrcene and caryophyllene, it's easy to get turned around as to what you should really be focusing on when it comes to dry hopping or adding terpenes.

Let's take a look at hop oil and hop terpenes to understand the difference between these two aspects of hops and how they are used in making great beer.

What is hop oil?

Hop oil (also known as hop essential oil) is derived from the hop cones, or flowers, of the hop plant, much the way lavender essential oil is derived from lavender flowers. These essential oils generate the familiar aroma and taste related to the hoppy characteristics of beer.

Because these oils are derived from the whole hop cones, they represent the unique and complex combination of chemicals (known as terpenes) that produce the distinct waves of scent for that type of hops.

For example, when BC Cascade is described as "citrus, spicy and floral" that is the aroma of the hop essential oils, or "total hop oil", for this variety. Each one of those dominant scents is created by one or more specific hop terpenes found in the BC Cascade hop plant. These terpenes interact with one another creating the nuanced aroma for BC Cascade.

What are the "Total Oils" of a hop variety?

The term “total oil” reflects the amount of essential hop oil present in a given hop variety. This may range from 0.5 to 4% of the hop cone. Total oil content can be impacted by hop variety, growing location, and other factors. The higher the total oil value, the more aroma potential the hop variety has.

However, just knowing the amount of total oil alone does not tell you what the dominant scent or flavor of that hop variety will be. To understand what to expect from a specific hop, you need to know which aromas are dominant in the variety.
In the past, this scent description work was done primarily by people with sensitive noses and a gift for describing aromas. Today, thanks in a large part to the advancements made with cannabis, hop aromas can now be described by their terpene content.

By knowing which terpenes dominate in the total hop oil, you can make better choices on how and when to add that hops to your brew and create the hop-forward beer you’ve been chasing.

Hops with the highest total oils include:

1. Idaho Gem
2. Organic Centennial
3. BC Comet

What Are Hop Terpenes?

If hop essential oil is the total aroma profile of a hop variety, then hop terpenes are the specific chemicals found naturally in the hop plant that create the components of those aromas and flavors. A terpene is a plant chemical that has been isolated, purified and liquified to create an extract that is associated with one signature aroma of that plant.

Because hop varieties that are used for making beer are indeed “types of hops” – aka they are all types of Humulus lupulus – they all share the same basic list of terpenes that are common to the species.

What makes one hop variety stand out from another is the amount of each terpene, and the combination of dominant terpenes, that create the unique flavor and aroma profile.

Take Linalool For Example

The terpene “linalool” is a naturally occurring component of hops which creates a fresh, sweet floral aroma. It is also a dominant component of lavender. Researchers are still determining how the linalool terpene differs when it is purified from hops compared to lavender, cannabis or other plants. In other words, the source plant of the terpene may be important to its performance in beer . . . . . or not. But either way, the use of terpenes in beer is on the rise.

Some hop varieties, whether through breeding or happy wild accident, may contain a unique terpene component, or terpene combination, that imparts something quite different from the normal array of hops on the market.

Check out Idaho Gem as one such happy wild accident, with its unique red berry aroma!

Source:https://hoohhops.com

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BIOFUEL EXPO 2023

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1. WORLD ENVIRONMENT EXPO (WEE 2023)
2. GREEN INDIA AWARDS 2023
3. ALL INDIA MAYOR'S SUMMIT 2023
4. INDIA BIOFUEL MEET 2023

EXHIBITORS PROFILE

- Biofuel (Biodiesel, Ethanol, Biogas, Biomass, Green Hydrogen) Manufacturers
- Biofuel Plant's Equipment's & Machine Manufacturers
- Biofuel Manufacturing Technologies
- Bio Refinery (Ethanol/Biofuel) Units
- Steam Turbine, Air Compressor Manufacturers
- Fabricators & Consultants
- Research & Development Organization
- Government Institutions
- EPC Solution Company for Bio Ethanol Industries.
- EPC Machinery for Bio Ethanol Plant Manufacturers
- Beer, Malt, Wine, Carbonated Drink, Starch, Alcohol Grain and Molasses, Malt Sprits Whiskey process, Distillery and Liquor Plant Machinery.
- EPC solution for Grain Unloading and Milling Section & Grain Processing Machinery
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A Future Energy Business Platform

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To--

From ____

Sachin Mogal

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

RED WINEMAKING AND MALOLACTIC FERMENTATION

Introduction

MLF is an important step in red winemaking that results in softer, less acidic wines. The interaction of bacteria and yeast during alcohol fermentation (AF) and/or MLF has a direct effect on the growth and malolactic activity of lactic acid bacteria (LAB).

Diversity of malolactic starter cultures for red wine

Malolactic fermentation (MLF), also known as secondary fermentation or malolactic deacidification, is the enzymatic decarboxylation of dicarboxylic L-malic acid to monocarboxylic L-lactic acid. This process usually occurs after the primary alcoholic fermentation (AF) of wine, but it can also happen concurrently. This conversion can happen naturally due to indigenous lactic acid bacteria (LAB) or it can be induced by a commercial starter culture. Because of its ability to tolerate the harsh physiochemical properties of wine after AF, Oenococcus oeni is the main bacterial species responsible for carrying out this biochemical stage. However, certain Lactobacillus and Pediococcus strains can also initiate and/or contribute to this process.

Key parameters for a successful MLF in red wine

Composition of red wine/must

The main wine compositional factors that determine the success of MLF are alcohol, pH, temperature and sulfur dioxide (SO2) concentration. Before proceeding with inoculation of MLF, it is recommended to measure these parameters and make adjustments where possible.

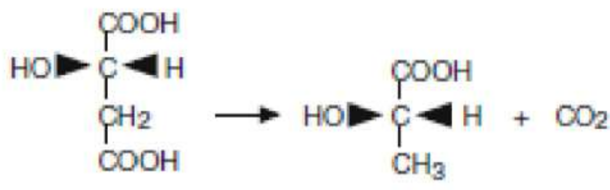
Favourable and unfavourable wine conditions for the conduct of MLF in red wine

Parameter	Favourable	Unfavourable
Ethanol (%v/v)	<14	>16
Temperature (°C)	18 – 22	<16, >25
pH	3.3 – 3.5	<3.3
Total SO_2 (mg/L)	<30	>40

MLF strain selection criteria for red wines

1. Bacteria strain high alcohol tolerance

2. Yeast-bacteria compatibility



L-Malic Acid L-Lactic Acid

Conversion of malic acid to lactic acid by malolactic fermentation

Benefits of Malolactic fermentation

- The primary role of malolactic fermentation is to deacidify wine
- Making the mouthfeel seem smoother and adding potential complexity in the flavor and aroma of the wine.
- Making a wine "microbiologically stable"
- Enhances the body and flavor persistence of wine

SEVEN KEY POINTS TO PERFORM OPTIMAL ETHANOL FERMENTATION

RAGHAVENDRA SHARAN SINGH

Sales & Technical Manager
(Alcohol Industry)

Introduction

Producing industrial ethanol requires careful attention to detail and a thorough understanding of the fermentation process. Optimal ethanol fermentation can be achieved through various optimization factors: choice of the yeast, fine tuning of process parameters, contamination control, and so on.

1. Selecting the right yeast strain

Different yeast strains have different abilities to ferment various types of feedstocks. It is important to **choose a yeast strain that is adapted** to the raw materials – corn, sugar beet, cassava, rice, sugarcane, lignocellulose, etc. the geography, and the process of an ethanol plant. This is one first step that has a major impact on the industrial ethanol production process.

2. Mastering rehydration

With the use of dry yeast, **a suitable rehydration is essential** for optimal ethanol fermentation. Underestimating the rehydration step is taking the risk to decrease yeast cells viability, and thus end up with incomplete fermentations. Yeast should be rehydrated in **5 to 10 times its volume of water:** 100kg of yeast should be rehydrated in 500kg to 1 tonne of water. **Temperature must also be carefully controlled** to be around 35°C±5 (around 95°F) during rehydration, to preserve yeast membranes. A gentle stirring for 15-30 min is also recommended.

3. Optimizing propagation to reach optimal ethanol fermentation

Propagation conditions should allow a **maximum amount of yeast to be produced**, to ensure optimal ethanol fermentation performances once pitched. To reach the right quantity and quality of yeast the exponential growth phase, the pitching rate should be between 0.25kg and 1kg of yeast par cubic meter of propagator (depending on the yeast strain and the process) and **the growth should be exponential** (to ensure non limited growth). The goal here would be to reach **at least 250 million yeast per mL** in exponential phase.

4. Setting up the proper environment for optimal ethanol fermentation

Performing optimal ethanol fermentation goes through **providing the yeast with the right environment** to ferment sugars. Different parameters can be optimized to avoid fermentation stress:

- Maintaining a **consistent and ideal temperature** throughout the fermentation process, between 30 and 35°C – going up to 40°C with the right robustness of the yeast.

- **Optimizing the pH** – between 4.0 to 5.5. Working with a pH in the high side of range contributes to decrease the toxicity of acetic acid, as in the case of substrates rich in acetic acid (which pKa is 4.76). It can be applied when contamination is under control because the higher the pH is, the more bacteria can grow.

The case of very high temperatures in India

Indian summers can get very hot, hotter than the recommended temperatures for fermentation processes. **Managing fermentation under higher temperatures** is even more difficult because it is a crucial parameter. Various parameters can be optimized to maintain ideal temperatures throughout the fermentation process, such as:

- Maintaining **cooling towers efficiency**, by ensuring equipment is in good operating conditions and by supplying cold water into them.
- **Investing in chillers**, to maintains optimal temperatures and counteracts heat from the fermenting yeast & surrounding climate.
- Adjusting the **level of nitrogen supplementation** and its dosing time during fermentation, to limit metabolic heat of the yeast.

5. Ensuring proper yeast nutrition

Yeasts require a **variety of nutrients** in order to grow and efficiently ferment feedstocks: nitrogen, phosphorus, vitamins, and minerals. It is important to **<u>provide the proper ratio of bioavailable nutrients</u>** to ensure that the yeast can **grow and ferment efficiently**. Nutrition deficiencies can result in lower yields, slower fermentation rates, or even incomplete fermentations.

6. Preventing biological stress from contamination

Contamination can happen during fermentation, causing biological stress to the yeasts. **Minimizing contamination** with a smart choice of process parameters – pH, temperature, etc. – will decrease the bacteria growth rate. Another manner of reducing contamination goes through **maintaining a clean and sanitary fermentation environment**. Performing optimal cleaning in place (CIP), properly sterilizing equipment and fermenters, and using proper hygiene practices is the most efficient way of minimizing contaminations.

7. Targeting high gravity

Targeting the highest ethanol titer, through **high gravity fermentation** minimizes water consumption, CO_2 emissions and energy costs at distillation, increasing **ethanol fermentation's economic viability**. Carrying out high gravity fermentations requires, among other conditions, an optimized propagation and faster yeast kinetics.

The case of SSF processes

In the case of **simultaneous saccharification & fermentation (SSF)** processes, releasing too much or enough sugar can either limit yeast kinetics or increase osmotic pressure; resulting in both cases in low ethanol production performance. Fine tuning enzyme addition, and well as ensuring a good match between hydrolysis kinetics and yeast kinetics will allow optimal ethanol productivity and yield.

How does BECPL technical support team helps our partners to perform optimal ethanol fermentations and maximize their profitability?

our technical team assesses our partner's plant performances through data collection: how much industrial ethanol is produced per day (KLPD), total fermentation cycle time, pre-fermenter to fermenter ratio, yeast dosing, gravity, etc. Our market knowledge and expertise at local scale enables us to identify bottlenecks, preventing our partners to perform optimal ethanol fermentations.

The team harnesses important information through data-mining and specific statistical tools to identify the tracks of improvements.

To address the identified issues, we provide tailor-made technical programs. We then support implementation of the solutions through teamwork with the customer solution team & production section. This support can go from optimizing propagation, via maximizing specific growth-rate of the yeast, to improving supplied air quality, limiting fermentation stresses, and many other parameters optimization.

Conclusion

Overall, performing the most optimal ethanol fermentation is important for **maximizing efficiency, yield, and quality** while minimizing environmental impact. This happens when carefully considering the variety of factors cited above. **Taking into account the whole production process** and performing all necessary adjustments when producing industrial ethanol limits yeast stresses and favorizes consistent and efficient fermentations, thus improving plant profitability.

Ref. No: C/2023/057 18th May,2023

<u>All Member Distilleries, Technical Experts, Technology Providers and other Stake Holders.</u>

<u>SUB: AIDA's Proposed National Technical Seminar and Exhibition – on 23rd & 24th June, 2023 at Hotel The Capitol, 3, Raj Bhavan Road, Vasanth Nagar, Bengaluru, Karnataka 560001, Ph:080-22281234, Mob: 9036014223.</u>

We are glad to inform all Members and Distilleries including Grain Based Distilleries / Dual Feed based and upcoming distilleries, that it has been decided to hold next 2day National Technical Seminar cum Exhibition on 23rd -24th June,2023 at Bengaluru.

In this connection we therefore, request all members and interested Distilleries to kindly block their Dairies and make it a point to positively attend the seminar, as various utterly important Technical and commercial Subject matters shall be discussed & presented during the seminar concerning Ethanol and alcohol etc. based on primarily Grains & Corn including rice, maize and sorghum etc. As increasing the Ethanol production is the hottest subject today with the Government of India, we seek points and topics of discussions from all members at the earliest so that Technology Providers could be requested to make their presentation accordingly on the desired important subjects.

Please note this is in pursuance to the discussions and suggestions which came forth during the High-fly "**Maize to Ethanol**" seminar arranged by the MOCA, F&PD in collaboration with AIDA and raised important matters regarding Ethanol Production primarily from Maize in addition to Rice & Damaged Food Grains (DFG) as well as the production and availability of DDGS. Maize is being strongly added to feed stock list as it will give boost to farmers income and other stake holders in increasing production of Maize and Sorghum etc.

Please let us have your points and suggestions as requested at the earliest. The details about the Programme & Venue etc. shall be informed shortly.

With thanks

V.N. RAINA
(Director General – AIDA)

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SPARKLING WINE

MAMTA BHARDWAJA

Business Development Manager (Wine Industry)

Sparkling wines are enjoyed all around the world. It is the wine of celebration. The sound of a popping cork indicates that there is something to celebrate.

Sparkling wines go through two fermentations: first to convert the grape juice into still wine without bubbles that are called a base wine and second to turn the base wine into bubbly wine. The second fermentation is done by adding yeast and sugar to the base wine. That added yeasts convert the added sugar into alcohol and carbon dioxide (CO_2) bubbles.

When yeasts convert sugar into alcohol, carbon dioxide is a natural by-product. If fermentation takes place in a closed container, that prevents this carbon dioxide from escaping into the air. So, that Co2 gets trapped in the wine in the form of bubbles.

The longer and slower the wine-making process (secondary fermentation) the more complex and expensive the sparkling wine will be.

There are many variations but most sparkling wines are produced in one of two ways.

1. Secondary fermentation in a tank.

2. Secondary fermentation in a bottle.

Tank Fermentation

This is the most efficient and quick way of making sparkling wine.

For secondary fermentation large, closed, pressurized tanks are used.

This method is called the bulk method or tank method or cuve close (meaning closed tank in French), or Charmat method.

Sparkling wines made in the Charmat (pronounced shar mah) method are usually the least expensive. That is because they are usually made in large quantities and they are ready for sale soon after harvest. The whole process can take just a few weeks. Also, the grapes used in this method are less expensive than the Pinot Noir and Chardonnay typically used in the traditional or champagne method.

Tank-fermented sparkling wines are fruitier than traditionally made sparkling wine because in tank fermentation the route from grapes to wine is shorter and direct.

To get more fruity and fresh sparkling wine most winemakers use this method.

A popular example of tank-fermented sparkling wine is Asti from Italy.

Bottle fermentation

Bottle fermentation is the traditional method of making sparkling wines. Secondary fermentation is carried out in individual bottles in which the wine is later sold. The technique of conducting the second fermentation in the bottle is called the classic or traditional method in Europe; in the United States, it is called as champagne method or methode champenoise.

Champagne has been made in this way for over 300 years and, according to French regulations, can be made in no other way. Many other French sparkling wines produced outside of the Champagne region use the same process but are allowed to use the term cremant in their names rather than champagne.

Bottle fermentation is an elaborate process in which every single bottle becomes an individual fermentation tank. Including the aging time at the winery before the wine is sold; this process requires a minimum of fifteen months and usually takes three years or more. Invariably, bottle-fermented sparkling wines are more expensive than tank-fermented sparkling wines.

Bottle-fermented wines are less fruity than tank-fermented sparkling wines.

Chemical changes that take place as the wine develops diminish the fruitiness of wine and contribute to some aromas and flavors such as toastiness, nuttiness, caramel, and yeastiness.

Also, the texture of the wine is changed it becomes smooth and creamy. Also, the bubble becomes tinier and less aggressive in the mouth as compared to tank-fermented bubbly.

You’ll notice that Champagne bottles are incredibly thick and strong - the glass needs to withstand the very high pressure that builds up due to the dissolved Co2.

Enjoy your glass of bubbly wine.

Cheers!!!

HERBAL KOMBUCHA ➞ A FRUITY FITNESS DRINK

PRIYANSHI SHARMA

The word Kombucha was derived from a Japanese word which means keep tea. Here, the word keep refers to "a large brown sea weed which used as a source of various salts. It is characterized by a mixture of bacteria and yeast (Scoby) which taste like a fruity flavor drink. It tastes different from a normal tea. It is prepared by the process of fermentation. Once the fermentation is done then the result of this process is the essential ingredient of the tea like tannins and antioxidant etc. which is also considered as untouched.

The more ingredients are also released like various enzymes, organic acids and vitamins.

This drink contains bioactive food components which are not considered as nutritious but still include many health benefits:

➢ Boost our Immune system
➢ Helps in the process of Digestion
➢ Ward off high blood pressure and heart disease
➢ As fermentation make probiotics which helps to cure diarrhea and irritable bowel syndrome.
➢ Considered good for Gut health

Why kombucha is considered as a magical drink to cure number of diseases?

Once a time, A Korean Doctor whose name Kombu was appointed to the Imperial Court. He was appointed to provide the treatment to the Japanese Emperor who was suffering from stomach pain, Kombu [Doctor] healed the emperor with this mysterious drink and cured his pain.

Hence, this story made the success of this drink

Source: Webind.com/diet.com

FLAVOURS AND VARITIES

1. Coffee Kombucha
2. Fruit Kombucha
3. Hops kombucha
4. Wine kombucha
5. Turmeric Kombucha

WINE REPORT

KANCHAN SINGH

Chapter Head - South Delhi, India
Apex Wine Club India
1 May 2023, Monday

The sales volume of Rosé wine in India grew by 73% between 2016 and 2020. Besides, Rosé wine is the second most popular type of wine among wine consumers in India. Rosé wine is in demand especially among young wine consumers in India.

Rosé wine is ideal for summer, as it is associated with warm weather and outdoor activities. It is now consumed throughout the year, as wine consumers discover its versatility and appeal.

Rosé wine uses a diverse range of red grape varieties, such as Grenache, Syrah, Pinot Noir, Sangiovese, and Zinfandel. It can be made in a variety of styles and colour shades, from dry and crisp to sweet and fruity.

BrewTimes™

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