BrewTimes™

DECEMBER 2021

Balaji Enzyme and Chemical Pvt Ltd

No. 106/107, A5/1, Parasnath Complex, Owali Gaon, Dapoda Road,
Bhiwandi - 421302 | +91-72-08124000
E-mail : info@becc.org.in | Web. : www.becc.org.in

Introducing BrewTimes :

We M/s Balaji Enzyme & Chemical Pvt Ltd, are pleased to bring to you our December 2021 month edition of BrewTimes.

In our expert section of BrewTimes we bring to you SHE (Safety, Health, and Environment) by Mr Bijay Bahadur. We also have our expert showcasing the art of making herbal brews.

Our association with M/s Bioneemtec India Pvt Ltd, is for R&D and they are our sample testing partners. We bring an opportunity for all our valuable customers and encourage them to utilise this association which will help them in testing their raw material and finished products quality standards.

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.

SABRO®

AROMA PROFILE

Sabro® imparts a strong and complex fruit flavor to beer. Sabro is a hop with robust brewing performance that consistently translates its distinct flavor to beer. Sabros **flavor** is notable for its complexity of fruity and citrus flavors, 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.

PEDIGREE

Sabro® brand HBC 438 was developed by the Hop Breeding Company and released in 2018. Sabros pedigree is the result of a unique cross pollination of YCR 123, a female neomexicanus hop.

Alpha Acids*	12.0 16.0%
Beta Acids	4.0 7.0%
Total Oil	2.5 3.5 ml/100g

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

KEY FLAVORS

Tangerine

Tropical Fruit
Stone Fruit

Coconut

TOTAL OIL COMPOSITION

Myrcene	40 55%
Caryophyllene	15 20%
Humulene	10 15%
Geraniol	1 3%
Farnesene	< 1%
Linalool	0 1%

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

SABRO®

SABRO® BEER VS. HOP ATTRIBUTES

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

PRESENTING

TALUS™

HBC 692

From the creators
of Sabro®, Mosaic®,
and Citra®

FLAVOR DESCRIPTION

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. With Talus, what you smell in the field is what you'll get in your glass.

PEDIGREE

Daughter of Sabro®
HBC 438 c.v. and
open pollination

TECH DATA

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

HOP BREEDING COMPANY
YAKIMA CHIEF RANCHES, L.L.C. · JOHN I. HAAS INC.

For more information,
visit www.hopbreeding.com
or email info@hopbreeding.com.

Safety, Health, and Environment (SHE) for Breweries

BIJAY BAHADUR

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

Introduction

Safety, Health, and Environment (SHE) are general and industry-specific examples of Good Industry Practice (GIP). The SHE guidelines can be applied as required by the respective policies and standards of the breweries. The SHE guidelines guide users on common SHE issues potentially applicable to all industry sectors.

The SHE guidelines contain the performance levels and measures generally considered achievable in new facilities by existing technology at reasonable costs. Application of the SHE Guidelines to existing facilities may involve the establishment of site-specific targets, with an appropriate timetable for achieving them.

The hazards and risks established for each brewery must tailor the applicability of the SHE guidelines. The results of an environmental assessment include site-specific variables, the assimilative capacity of the environment, and other brewery factors.

Applicability

The SHE guidelines for breweries cover beer production, from raw material storage to dispatching filled bottles, cans, kegs.

Brewery-Specific Impacts and Management

It provides SHE issues associated with breweries that occur during the operations phase, along with recommendations for the management. Recommendations for managing SHE issues common to most large industrial facilities during the construction and commissioning phases.

Environment

Environmental issues associated with the operation phase of breweries primarily include the following:

Energy consumption: Brewery processes are relatively intensive users of both electrical and thermal energy. Thermal energy is used to produce steam in boilers, which are primarily used for wort boiling and water heating in the brewhouse and the bottling hall. The process refrigeration system is typically the most significant single consumer of electrical energy, but the brewhouse, bottling hall, and wastewater treatment plant can account for substantial electricity demand. The consumption of specific is influenced by utility system and process design; however, site-specific variations can arise from differences in product recipe and packaging type, the incoming temperature to the brewery of the brewing water, and climatic variations.

By adopting general guidance for energy management suggested in the general SHE guidelines, may achieve a substantial amount of energy savings in the breweries, in addition to the following techniques which have particular relevance to breweries:

- Install energy and water meters to measure and control consumption throughout the facility.
- Develop a hot water balance for the entire brewery for heat recovery from production processes or utility systems to process or boil feed water.
- Recover heat from wort cooling to preheat water for mashing the next batch.
- Use a heat recovery system to condense vapors from the wort vessel.
- Use high-gravity brewing, where beer is produced at greater than sales strength and diluted to the finished beer alcohol content before packaging.
- Control and optimize evaporation in wort boiling will boil off 6 to 10 percent of the water.
- Ensure effective insulation of steam, hot water, refrigerant pipes, vessels, valves, flanges, brew kettles or parts of brew kettles, tunnel pasteurizers, and bottle washers.
- Limit the use of hot water, particularly overflow.
- Optimize heating of tunnel pasteurizers and consider pasteurization unit control.
- Use cogeneration/combined heat and power (CHP) – based utility systems.
- Optimize refrigeration system operations.
- Ensure that the pressure in the compressed air system is as low as possible.
- Optimize the operation of large electric motors.

Water consumption: High consumption of good-quality water is characteristic of beer brewing. More than 90% of beer is water, and an efficient brewery will use between 4–7 liters of water to produce 1 liter of beer. In addition to water for the product, breweries use water for heating and cooling, cleaning packaging vessels, production machinery and process areas, cleaning vehicles, and sanitary water. Water is also lost through wort boiling and with spent grains. Beer brewing requires large quantities of good-quality water.

Specific water consumption recommendations for brewery operations include the following:

- Limit water used in wort cooling to the volume needed for mashing.
- Allow the storage level of recovered water tanks to fluctuate, thereby using storage capacity.
- Maintaining full tanks may lead to overflow and waste.
- Replacing older bottle washers with new energy and water-efficient bottle washers.
- Installing automatic valve(s) to interrupt the water supply when there is a line stop.
- Promptly replacing worn and oversized rinsing nozzles.
- Controlling the rinsing water flow.
- Using freshwater for the last two rinsing nozzles only.
- Using recovered water from the bottle washers in the crate washer.
- Optimize cleaning-in-place (CIP) plants and procedures to avoid unnecessary losses of water and cleaning chemicals.
- Evaluate the feasibility of a closed-loop system for water used in the tunnel pasteurization process.
- Install a recirculation tank connected with the vacuum pumps used in the packaging processes, continuously supplied with water to replace water discharged with air.
- Recover water from process stages and reuse where possible.

Wastewater: The pollutant load of brewery effluent is primarily composed of organic material from process activities. Brewery processes also generate liquids such as the weak wort and residual beer that the brewery should reuse rather than entering the effluent stream. The primary sources of residual beer include process tanks, diatomaceous earth filters, pipes, beer rejected in the packaging area, returned beer, and broken bottles in the packaging area.

The management can take the following preventive measures to reduce the organic load of brewery effluent:

- Collect weak wort in a tank equipped with heating jackets and a slow-speed agitator for the next brew. It reduces the organic load in the wastewater, saving raw materials and conserving water. Weak wort collection is essential for high-gravity brewing.
- Undertake procedural improvements to reduce the amount of residual beer, such as the emptying of tanks, good housekeeping, and efficient monitoring systems.
- Avoid overfilling of fermenting vessels which causes loss of partially-fermented wort and yeast.
- Ensure sedimentation of caustics from the bottle washer.
- Collect and reuse rinsing water from the last cleaning in the first cleaning-in-place (CIP) cycle.

Process Wastewater Treatment

Flow and load adjustment, pH correction; sedimentation for suspended solids reduction using clarifiers; and biological treatment are the techniques for treating brewery process wastewater. Natural nutrient removal for the decrease in nitrogen and phosphorus and disinfection by chlorination is sometimes required. Dewatering and disposal of residuals; in some instances, composting or land application of wastewater treatment residuals of acceptable quality may be possible. May need additional engineering controls to contain and neutralize nuisance odors. The adoption of anaerobic biological treatment, followed by aeration, is increasingly adopted by breweries worldwide. This technique has the benefits of a much-reduced footprint, substantial electricity savings, and generation of biogas which can be used in boilers or for power generation.

Other Wastewater Streams

SHE guidelines guide the management of non-contaminated wastewater from utility operations, non-contaminated stormwater, and sanitary sewage. Contaminated streams will pass through the treatment system for brewery process wastewater.

Solid waste and by-products: Beer production results in various residues, such as spent grains, which have a commercial value and may be sold to the farmers (as cattle feed) as by-products. Recommended management measures to reduce solid waste production and increase by-product sales include:

- Optimal use of raw materials to increase yield and reduce the generation of solid and liquid waste, including:
    - Avoid poor-quality raw materials.
    - Optimize the milling of the grist.
    - Optimize lautering.
    - Optimize clarification through the use of a whirlpool.
    - Recover wort from the hot trub.
    - Recover beer from surplus yeast.
    - Collect and reuse residual beer.

- Where feasible, the commercial value of the waste streams should be exploited by:
    - Collect spent grains from mashing for sale as animal feed by-products.
    - Avoid discharge of hot trub into the sewer system.
    - Collect and reuse yeast from the fermentation process as a by-product.
    - Recycle the broken glass from returned bottles to produce new glass.
    - Dispose of label pulp generated from the washing of returned bottles. Where feasible, label pulp should be recycled or composted.
    - Utilize the sludge from the brewery wastewater treatment plant as an agricultural fertilizer or disposal in an appropriate landfill facility.

<u>Emissions to the air of odor and dust:</u> The most significant air emissions from breweries are odor and dust—emissions from combustion sources for energy production and boiler houses to be covered in the SHE guidelines.

Odor
The wort boiling process is the primary source of odor emissions from a brewery. Heat recovery systems should install to collect and condense the vapors and the recovered energy used in process or utility systems and reduce odor emissions during wort boiling.

Dust
The primary sources of dust emissions are the use and storage of grains, sugar, and kieselguhr. Cyclones and bag filters should install to collect and recover dust in the following manner:

- Dust generated from the unloading of raw materials and transport of malt and adjuncts should
- Convey to the mash, and adjunct kettle and the extract recovered.
- Dust arising from malt and adjuncts may use as animal feed.

Occupational Health and Safety (OHS)

Occupational health and safety issues and their prevention and control during the construction and commissioning of breweries need to incorporate in the SHE guidelines. Occupational health and safety hazards associated with brewery operations include:

a) *<u>Explosion Risk</u>*

Grain storage, milling, and transport operations present an explosion risk in the brewery areas due to the generation of organic dust. The following management measures should implement to reduce dust explosion hazards:

- Frequent sweeping controls dust accumulation and use dust extraction and recycling systems to remove dust from work areas.
- Provision of electrical grounding, spark detection and prevention, and, if necessary, quenching systems.
- Use of explosion-proof electrical motors, lights, switches, and connections in high-risk areas.
- Integrate explosion relief vents in facility design and construction.
- Eliminate external ignition sources.
- Implement a system of hot-work permits.
- Control of all smoking materials.
- Prohibition of cell phone use.

b) *<u>Exposure to chemical hazards</u>*

Refrigerant Leakage

Breweries often have large refrigeration systems, typically using ammonia refrigerant, which is toxic and can form explosive mixtures in the air. In a refrigeration system, adopt siting, design, maintenance, operation safety, and other guidance.

Asphyxiation

During fermentation and maturation processes, carbon dioxide so produced can be recovered, stored, and used in beer's carbonation. Excessive release of carbon dioxide gas or inadequate ventilation, particularly in confined or enclosed spaces such as fermentation and maturation rooms, can accumulate sufficient concentration to present asphyxiation risk. Appropriate safety measures should be developed based on a risk assessment and may include enhanced ventilation and the use of personal gas detectors in high-risk areas.

Exposure to other chemicals typically involves chemical-handling activities related to cleaning, disinfection, and maintenance of process areas, pipework, and vessels.

c) ***Physical Hazards***

Physical hazards include exposure to same-level fall hazards due to slippery conditions, the use of machines and tools, the handling of glass bottles, and collisions with internal transport equipment, such as forklift trucks. Mills, mixers, and conveyors are potential hazards and may catch fingers, hair, and clothing. Eye injuries are a particular risk prevalent in bottling operations. The SHE guidelines must include guiding general workplace conditions, including design and maintenance of working and walking surfaces to prevent slips and falls, machine safety, and guards, and the use of appropriate personal protective equipment (PPE).

Lifting, Carrying, Repetitive Work & Postures Injuries

Brewery activities that may expose workers to a risk of injury arising from heavy manual lifting and carrying (for example, handling bottles), repetitive work including packing and cleaning, and poor work postures caused by inadequate workstation and process activity design. The SHE guidelines must be present to recommend management to reduce these injuries.

Dust

Dust inhalation due to the handling of dry grains, yeast, and kieselguhr results in occupational health and safety risk. Follow the following SHE guidelines to mitigate the risk.

Pressurized Gas Systems

Brewery process activities involve pressurized gases, such as carbon dioxide (CO2), refrigerants, and compressed air. These gases present hazards arising from over pressurization and tank ruptures, frostbite from CO2, refrigerants, and physical injury due to mishandled or damaged cylinders and pipelines. SHE guidelines address the recommended measures for handling pressurized gas tanks and other fixtures.

d) ***Exposure to Noise and Vibrations***

Brewery workers are subjected to noise in raw materials, finished products, and process and utility machinery. SHE guidelines recommend using appropriate PPE for managing exposure to noise and vibration

.

Community Health and Safety

Community health and safety issues for breweries are familiar to those of other industrial facilities.

Product Safety Impacts and Management

Brewery operations should follow recognized food safety standards such as FSSAI consistent with Hazard Analysis and Critical Control Point (HACCP) principles and practice.

Performance Indicators and Monitoring

Environment

Emissions and Effluent Guidelines

Table 1 presents effluent guidelines for the brewing industries.

Table 1. Effluent levels for breweries

Pollutants	Units	Guideline Value
pH	-	6 – 9
BOD5	mg/l	30
COD	mg/l	250
Total nitrogen	mg/l	10
Total phosphorus	mg/l	2
Oil and grease	mg/l	10
Total suspended solids	mg/l	50
Temperature increase	°C	<3
Total coliform bacteria	MPN*/ 100 ml	400
Active Ingredients / Antibiotics	To be determined on a case-specific basis	

*MPN = Most Probable Number

Table 2. By-products and Waste Generation

Outputs per Unit of Product	Unit	Benchmark
By-products		
Spent Grains	kg/hl beer	16-19
Yeast		1.7 - 2.9
Kieselguhr		0.4 – 0.7
Liquid Wastes		
Liquid Effluents	hl/hl beer	3 – 6
Beer Loss	%	1 - 5

Guideline values for process emissions and effluents are indicative of good brewery practice. These guidelines are achievable under normal operating conditions inappropriately designed and used facilities by applying pollution prevention and control techniques. The environmental assessment should justify deviation from these levels in consideration of specific local brewery conditions.

SHE guidelines developed for combustion source emissions are associated with steam- and power-generation activities based on ambient considerations based on a total load of emissions.

Resource Use

Tables 2 and 3 provide examples of waste and by-product production and energy and water consumption indicators for efficient breweries.

Table 3. Energy and Water Consumption		
Outputs per Unit of Product	Unit	Benchmark
Energy		
Heat	MJ/hl	85–120
Electricity	kWh/hl	7.5–11.5
Total Energy	MJ/hl	100-160
Water		
Water consumption	hl/hl beer	4 - 7

Environmental Monitoring

The breweries should implement monitoring programs to address all identified activities and potentially significant environmental impacts during normal operations and upset conditions. Implement environmental monitoring activities based on direct or indirect emissions, effluents, and resource use applicable to the particular brewery. Trained individuals should analyze and review data at regular intervals and compare with the operating standards followed by necessary corrective action. SHE guidelines must provide additional guidance on applicable sampling and analytical methods for emissions and effluents.

Occupational Health and Safety

Occupational Health and Safety Guidelines

Occupational health and safety performance should evaluate the permissible exposure limits (PEL) published by India's Occupational Health and Safety legislation or other similar sources.

Accident and Fatality Rates

Brewery management should reduce the number of accidents among the workers (whether directly employed or contracted) to a rate of zero, especially accidents that could result in lost work time, different levels of disability, or even fatalities.

Occupational Health and Safety Monitoring

The brewery should monitor the working environment for occupational hazards. Monitoring should be a part of an occupational health and safety monitoring program. Facilities should also maintain a record of occupational accidents, diseases, and dangerous occurrences and accidents.

Identifying the Return on Investment (ROI) of SHE Compliance

We know that it is hard for the management to see the ROI when discussing SHE. It is easier to look at ROI when discussing brewing ingredients and physical objects such as tanks, bottling lines, and brewing vessels. If management does not understand SHE regulations or their importance, there are possibilities that the administration will ignore compliance. If the management does not take SHE compliance seriously, employees won't go down the line.

So, how does the management identify the ROI of SHE compliance? A focus on SHE can reduce costs in the long run. A focus on environmental compliance can reduce violations that result in fines. A focus on health and safety can reduce and prevent:

- The number, severity, and financial impacts of injuries
- Insurance and worker's compensation costs
- Equipment downtime and product lost
- A tarnished reputation with the customers

Conclusion

An investment in safety is an investment in the people, which will reward with higher productivity. We hope this guide has been helpful and that now we have some new insights to help ensure the safety of the employees.

SAURABH N. PERKAR

HEAD BREWER
B.TECH CHEMICAL ENGINEER
BREWMASTER
BROTHER BARLEY BREWING COMPANY

Effect of boil gravity on final IBU.

IBU (international bittering unit) is an important unit to measure bitterness of beer. IBU can be calculated by using value of alpha acid content of hop , utilization value and final volume of hopped wort after boiling.

Here weight of hops and it's alpha acid content and utilization value are directly proportional to IBU value. And final volume after boiling is inversely proportional to IBU value.

Now what is utilization decimal ? It's calculated as relation between gravity of wort the time individual hops are added and duration of hops boiled.

Why utilization value is important?

It's important to consider utilization value because change in boil gravity can affect iso-marization of alpha acid into iso alpha acid and ultimately affecting IBU of final wort.

Utilization value is directly proportional to boil gravity and duration of boil. It's independent of other factors like which hops are using and style of beer. It's solely depends on concentration of sugar and minerals in on going boiling of wort

OUR ASSOCIATES
Bioneemtec India Private Limited

THE ART OF MAKING HERBAL BREWS

Dr.M.Menaga (Microbiology)

Managing Director
Bioneemtec India Private Limited,
Women's Biotech Park , Chennai

"An alcoholic drink made from yeast-fermented malt flavored with hops" (Oxford Dictionary, n.d.).
When beer was first created, it was known to be sacred. The alcohol content was sometimes extremely high, oftentimes psychotropic, and contained many herbs (Buhner, 1998). Our ancestors used these fermented beverages in sacred ceremonies to communicate with their ancestors and to address physical, mental, and spiritual needs (McGovern, 2018). They would often reach altered states of consciousness in a safe space with guidance to work out their inner demons and to shapeshift into a more consciously elevated part of themselves and remove or prevent the hardening of their minds (McGovern, 2018).

Our ancestors believed that everything was alive and interconnected — from the rocks, plants, and trees to the yeasts that fermented these sacred ales. To them, ingesting these brews was as if they were ingesting the sacred essence from which is the divine (Buhner, 1998).

When making herbal beer, ancient people didn't have yeasts in packets they could buy at a store as we do. Instead, they collected wild yeasts by setting out a sweet offering for yeasts to come feast on. These wild yeasts were less controlled and tended to be more potent, much like all wild things. Our ancestors created a ceremony to prevent these wild yeasts from spoiling the brew. I can't help but believe that anytime you put that much intention into something, you are so much more likely to have a desirable outcome. These wild yeasts were protected and preserved in families as if they were a member of the family. So beloved, these wild yeasts were shared with a newly married couple so they could create their own strain to be passed down through their family.

Preparation of **SUMMER RED HERBAL SAISON**

Ingredients

- 1 cup **dried lemon balm** *(Melissa officinalis)*
- 3/4 cup **dried lemon verbena** *(Aloysia citrodora)*
- 1/2 cup **dried hibiscus** *(Hibiscus spp.)*
- 1/4 cup **dried linden** *(Tilia spp.)*
- 1 pound brown sugar
- Dry Yeast

Equipment:

- Big pot for boiling water
- 1-gallon glass carboy
- Airlock
- Beer bottles/caps
- Bottle capper
- Funnels
- Strainer
- Auto-siphon
- Hydrometer
- Sanitizer

Directions

- Sanitize all of your equipment with your sanitizer.
- Bring 1 gallon of water to a boil. Remove from heat. Add all of the herbs. Cover and steep for one hour. Strain and cool.
- Once cooled, add sugar and dissolve.
- Do a gravity reading and log it with the date and other brewing details for later reference.
- Pour your wort (otherwise known as a sweet infusion) into your carboy (or brewing vessel). (You should only fill to the base of the bottle's shoulder.)
- Add your yeast and put your airlock in place.
- Put your carboy in a dark, cool place around 68-70 degrees.
- Check daily to see its activity. Once it stops bubbling for a few days and is clear, give it a taste to see if the sweetness is gone. If so, do a gravity reading again to compare your alcohol reading to your original reading.
- Sanitize your beer bottles, caps, and auto siphon to prepare for bottling.
- Prime your beer bottles with 1/2 teaspoon of sugar prior to filling with your beer.
- Using your auto siphon, fill your bottles (being careful to not suck the residual yeast at the bottom of the carboy) until 2 inches of air space is left in the bottle.
- Cap, label, and store in the fridge.
- They will be ready to drink in a couple of weeks.

ENJOY!!

Wine Aroma and Flavor Compounds from the Fermentation

MANJUSHA NARSINENI

Alcohol Technologist

Yeast and bacteria are vital to the development of wine flavor. Many biosynthetic pathways, in wine yeast and malolactic bacteria, are responsible for the formation of wine aroma and flavor. Depending on their origin, wine aroma and flavor compounds can be named

- Varietal aromas (originating from the grapes)
- Fermentative aromas (originating during alcoholic and malolactic fermentations)
- Aging aromas (developed during the reductive or oxidative wine-aging that depends on storage conditions) .

Most of the wine aroma and flavor compounds are produced or released during wine fermentation due to microbial activities of Saccharomyces and non-Saccharomyces yeast.

A group of aroma compounds has been directly linked to specific varietal flavors and aromas in wines. Most of these compounds are present at low concentrations in both grapes and fermented wine. These aroma compounds are found in grapes in the form of non-odorant precursors that, due to the metabolic activity of Saccharomyces and non-Saccharomyces yeast during fermentation, are transformed to aromas and flavor that are of great relevance in the sensory perception of wines

During alcoholic fermentation, some yeast, mainly non-Saccharomyces yeasts, can release β-glucosidases that hydrolyze the glycosidic bonds of the odorless non-volatile glycoside linked forms of monoterpenes (geraniol, linalool, nerol, among others), releasing the odor compounds to the wine.

Volatile thiols that give Sauvignon blanc wines their characteristic aroma (bell pepper, black currant, grapefruit, and citrus peel) are not present in grape juice but occur in grape must as odorless, non-volatile, cysteine-bound conjugates. During fermentation, the wine yeasts are responsible for the cleaving of the thiol from the precursor.

However, the major groups of aromas and flavor compounds from the fermentative origin are **ethanol, higher alcohols or fusel alcohols, and esters**. The biosynthetic pathways responsible for the formation of higher alcohols, the Ehrlich pathway, or the enzymes responsible for the formation of esters, have been studied in wine yeasts .

Higher alcohols are derived from amino acid catabolism via a pathway that was first described by Ehrlich and later revised by Neubauer and Fromherz in 1911. Amino acids that are assimilated by the Ehrlich pathway (valine, leucine, isoleucine, methionine, and phenylalanine), present in grape must are metabolized by yeasts, sequentially, throughout the fermentation. shows the metabolism of phenylalanine with the production of 2-phenylethanol and, after oxidation of phenylacetaldehyde, the formation of phenylacetate. Both compounds possess a pleasant rose-like aroma/flavor.

The most important esters are synthetized by yeasts during alcoholic fermentation as a detoxification mechanism since they are less toxic than their correspondent alcohol or acidic precursors. Moreover, their synthesis serves as a mechanism for the regeneration of free CoA from its conjugates.

Esters that contribute to wine aroma, derived from fermentation, belong to two categories:

the **acetate esters** of higher alcohols and the **ethyl esters** of medium-chain fatty acids (MCFA).

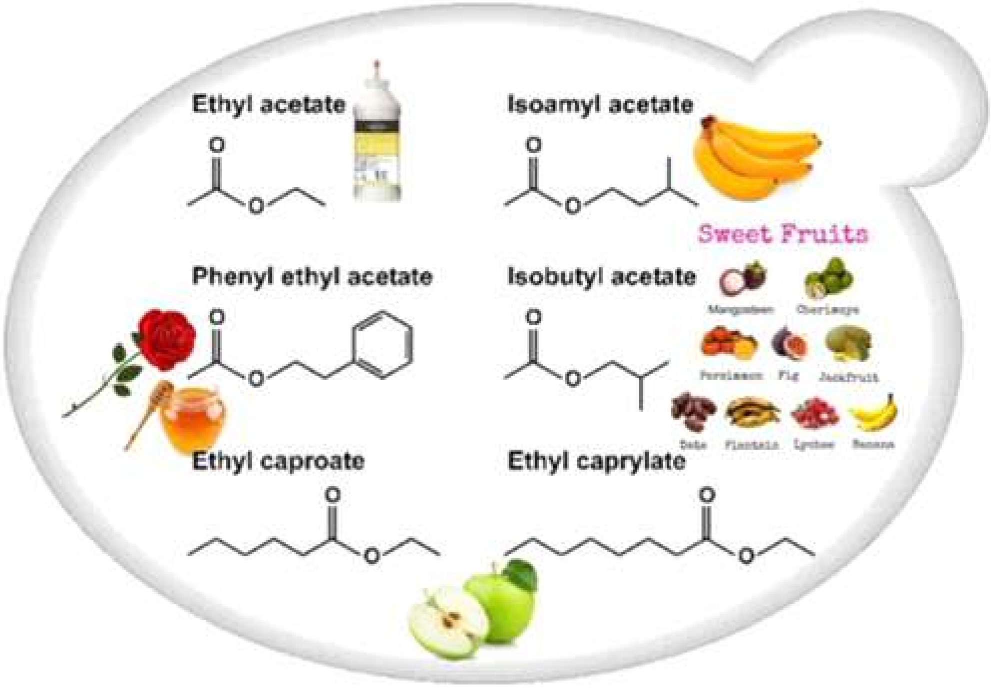
Acetate esters are formed inside the yeast cell, and in S. cerevisiae the reaction is metabolized by two alcohol acetyltransferases, AATase I and AATase II (encoded by genes ATF1 and ATF2 [35,38]). Eat1p is responsible for the production of acetate and propanoate esters [39,40]. Most medium-chain fatty acid ethyl ester biosynthesis during fermentation is catalyzed by two enzymes, Eht1p and Eeb1p.

Volatile fatty acids also contribute to the flavor and aroma of the wine. During yeast fermentation, **long-chain fatty acids** (LCFAs) are also formed via the fatty-acid synthesis pathway from acetyl-CoA in concentrations varying from ng/L to g/L . **Medium-chain fatty acids** (MCFAs (C6 to C12)) are produced primarily by yeasts as intermediates in the biosynthesis of LCFAs that are prematurely released from the fatty acid synthase complex. These acids directly contribute to the flavor of wine or serve as substrates that participate in the formation of ethyl acetates

The **sulfur-containing compounds** can be derived from the grape and the metabolic activities of yeast and bacteria. They can also occur due to the chemical reactions during the wine aging and storage and also due to environmental contamination. They can be formed by enzymatic mechanism as the products of metabolic and fermentative pathways whose substrates are both amino acids and some sulfur-containing pesticides.
When wine microorganisms metabolize these thiols, the sulfur compounds formed are considered off-flavors which convey negative notes such as cabbage, garlic, onion, rotten eggs, rubber, and sulfur to wines.

However, there are some volatile thiols that may confer enjoyable aromatic notes at trace levels, such as 4-mercapto-4-methylpentan-2-one (4MMP), 3-mercaptohexan-1-ol (3MH), already mentioned in, and 3-mercaptohexyl acetate (3MHA), important for the characterization of the typical Sauvignon Blanc wine aroma .

Finally, another important family of **aromatic compounds** present in wines are the **carbonyl compounds**. In this group we may include acetaldehyde, acrolein, ethyl carbamate, formaldehyde, and furfural. Several factors may contribute to the presence of carbonyl compounds in wines, including the fermentation of over-ripe grapes and increasing the maceration time, probably due to increased concentration of the precursors like amino acids and glucose in the must . Due to their carbonyl group, carbonyl compounds present a high reactivity with the nucleophile’s cellular constituents and may cause cell damage. So, these compounds are toxic, and their formation should be avoided.



Schematic representation of the most important wine esters: ethyl acetate (glue-like aroma), isoamyl acetate (banana aroma), 2-phenylethyl acetate (roses and honey aromas), isobutyl acetate (sweet-fruits aromas), and ethyl caproate and ethyl caprylate with a sour-apple aroma.

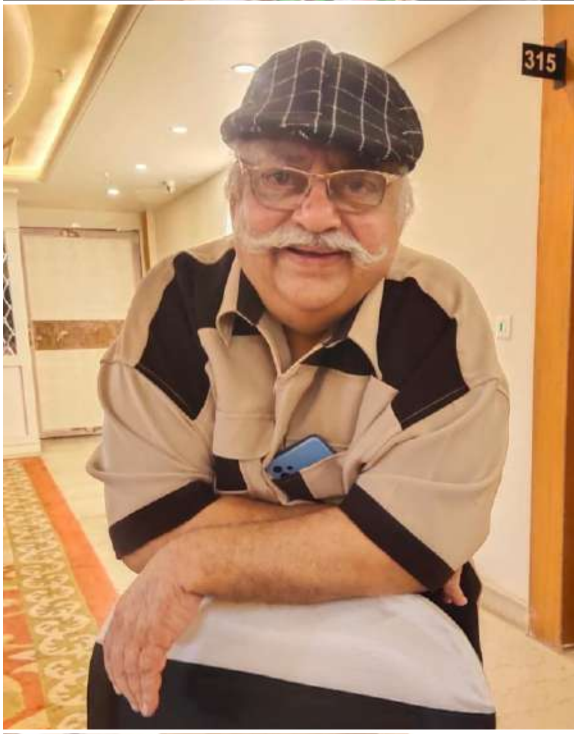
In wine/flavor development—color, aroma, mouthfeel, sound, and, ultimately, taste, altogether, these sensory perceptions are very complex. Wine contains many flavor and aroma-active compounds. Terpenes, methoxypyrazines, esters, ethanol and other alcohols and aldehydes impart distinct flavors and aromas (floral, pepper, fruit, woody and vinylic flavors, among others) to wine. The taste of wine can be described as sweet, sour, salty, umami, bitter, and, to a lesser extent, fat . These properties are the result of the presence of sugars, polyols, salts, polyphenols, flavonoid compounds, amino acids, and fatty acids. Compounds such as glycerol, polysaccharides, and mannoproteins contribute to the viscosity and mouthfeel of wines. grape anthocyanins contribute to the color, and ethanol, by sheer mass, also carries other alcohols along, promoting a mouth-warming effect .

NAGPUR WINE CLUB

NAGPUR WINE CLUB CELEBRATES INDIAN WINE DAY & 10TH ANNIVERSARY EVENT














REDMI NOTE 9 PRO
AI QUAD CAMERA


ONE TREE HILL
REDMI NOTE 9 PRO
AI QUAD CAMERA


REDMI NOTE 9 PRO
AI QUAD CAMERA


REDMI NOTE 9 PRO
AI QUAD CAMERA


REDMI NOTE 9 PRO
AI QUAD CAMERA


REDMI NOTE 9 PRO
AI QUAD CAMERA


REDMI NOTE 9 PRO
AI QUAD CAMERA


REDMI NOTE 9 PRO
AI QUAD CAMERA

PRODUCTION OF DEXTROSE MONOHYDRATE BY DOUBLE ENZYME HYDROLYSIS

Mr. GOPAL DHANDE

Dextrose monohydrate is the ultimate end product of double enzyme starch hydrolysis,and produced by crystallising dextrose monohydrate from 95 % DE syrup by blending (mixing) mother liquor in fresh 97 to 98 % DE syrup. The process of crystallisation allows only the dextrose to crystallise, leaving the other sugars still dissolved in the mother liquor. Dextrose monohydrate is less sweet than sucrose.

FLOW CHART

STARCH SLURRY

STARCH SLURRY PREPARATION
(solids 32 to 35%)
(pH 4.5 to 6.0 depending on enzyme used. pH increased by adding Sodium carbonate)

Steam ----- LIQUEFACTION (95 to 105°C)

DEXTRINIZATION (till complete starch free (D.E. should be 10 to 12% then pH to be maintained 4.7).
MUD CENTRIFUGE – seperation of protein, fiber and oil.

SACCHARIFICATION (65°C by fast cooling, pH maintained 4.5
by adding sodium carbonate then
saccharifying enzyme is added as per requirement).
Filter aid ---- PRIMARY FILTRATION – spent Filter aid.

Regenerating -- ION EXCHANGE --- Effluent.
Chemical.

Filter aid ---- SECONDARY FILTRATION --- spent filter aid.

EVAPORATION (pH, sulphur dioxide ppm & solids to be maintained as per customer requirement).
COOLING (43 to 45°c)

CRYSTALLISATION (Temperature fall from 43 to 45 °c to 32 to 30°c
while 'magma formation)

Washing with - CENTRIFUGE - mother deionised water. liquor seperation

DRYER

COOLING

SCREENING (30 mesh)

PACKAGING. (bags)

STARCH SLURRY - Refined starch slurry from hydrocyclone outlet having less than 0.3% protein, 0.5 ml/litre fiber had been transferred from starch plant.

STARCH SLURRY PREPARATION - Starch is collected in starch preparation tank. Solids of slurry is maintained 32 to 35% by adding D.M. or R.O. water(the reason for slurry having lower solids because initial viscosity of starch paste is very high, therefore by using lower starch solids, the viscosity of the paste is reduced to manageble proportions), pH slurry is maintained as per pH requirement of alpha amylase used for liquefaction, pH requirement of starch slurry depending on types of alpha amylase used for liquefaction I.e. 4.5 to 6.0,Sodium carbonate is used for pH increasing of starch slurry. After maintaining pH of starch slurry alpha amylase enzyme is added as per requirement 0.2 to 0.5/ MT of D.S. content of starch slurry.

LIQUEFACTION - After starch slurry preparation starch slurry passed through jet cooker with steam, temperature is maintained 95 to 105°C by adjusting steam pressure and passed through rentention coil and flash chember. In flash chember vapour exhausted in atmosphere from top of flash chember and gelatinized slurry is transferred to dextrinizer or holding columns for starch free. Liquefaction is the radom endo-hydrolysis of 1-4 bonds in the starch molecule by which starch is gelatinized and viscosity reduced.

DEXTRINIZATION - In dextrinizer gelatinized slurry hold till getting 10 to 12 % dextrose equivalent. In this process gelatinized slurry converted into dextrin so called as dextrinizaction.

MUD CENTRIFUGE - 10 to 12 D.E. syrup is passed through mud centrfuge after lowering pH 4.7 by adding acid. The object of this stage is to clean up the syrup by removing all precipitated protein resulting from the neutralisation, together with fine fibers, fats from the original starch before filtration. Capital investment of mud seperator is high as comparing to other filtration system used for filtration but mud centrifuge reduces further filtration load with less consumption of filter aid and ultimate reduction of solid waste, also which increases recovery of final products by 0.2 to 0.5%. and also seperated mud sold as a cattle feed.

SACCHARIFICATION - Temperature of clean up syrup is lowered 65°C by passing through heat exchanger. Then amyloglucosidase (AMG) enzyme is added as per doses of enzyme required and temperature is maintained 60 to 65°c till getting 97 to 98 % DE. 30 to 45 hrs is required for getting 97 to 98% DE, depending on enzyme dose is used.

After getting 97 to 98 % DE deactivation of enzyme is done by increasing temperature 80 to 85 °c. Also deactivation of enzyme is done lowering of pH 3.5 to 3.7 by adding acid but due to lowering pH slight inorganic load on ionexchange increases.

PRIMARY FILTRATION - for removing remaining insoluble impurities from syrup, syrup is passed through filter press pre coated by filter aid or rotary vaccum filter or pressure leaf filter. Spent filter aid is saperated as a waste.

ION EXCHANGE - Temperature of syrup is lowered upto 50°C for ion exchange treatment. Ion exchange having two columns of resins one is cation another is anion. Cation is regenerated with acid and anion is regenerated with sodium carbonate or sodium hydroxide. While regeneration and washing of both anion and cation lot of water is used. Water, acid and sodium carbonate used for regeneration is seperated as effluent. In ion exchange minerals and colour from syrup is removed.

SECONDARY FILTRATION - For secondary filtration again temperature of syrup increased 70 to 75°C for proper filtration and to avoid haziness of syrup. For removing remaining impurities from syrup precoated filter press or pressure leaf filter is used for filtration. Some companies used polish filter for clearing syrup.

EVAPORATION - After refining solids content of syrup is about 35 to 38%.

To evaporate syrup up to final solids, single effect, double effect, triple effect or multiple effect evaporators are used. To avoid colour formations of syrup, syrup evaporated under vacuum, of about 25 to 26 inches of mercury. Sulphur dioxide ppm 300 to 400 is maintained by adding Sulphur di oxide solution with the help of high pressure pump to avoid fermantation while crystalisation, which required 60 to 65 hrs. Also 4.5 pH of syrup is adjusted by adding sodium carbonate solution through high pressure dosing pump. For crystallisation solid of syrup is maintained 72 to 75 %. COOLER - 72 to 75 % solid syrup is passed through cooler or plate type heat exchanger for fast cooling upto 43 to 45° c and transferred to crystaliser for crystal formation.

CRYSTALLISER - To make crystalline dextrose monohydrate, 95 % DE cooled syrup of 43 - 45° c is pumped to series or batch type horizontal crystallisers. Each crystalliser has a water jacket and coil for cooling the syrup to 30° c. The syrup is cooled by water of 28 to 30° c water cooled(by cooling tower) upto 38°c and then by chill water of 0 to 2° c (chilled by chilling plant) till getting 30° c. Inside each crystalliser has a spiral ribbon agitator, which slowly rotates. Because the 95 % DE syrup is a supersaturated solution of dextrose, as the syrup cools, the dextrose monohydrate crystals come out of the solution to form a white mass similar to a coarse or gritty fondant. This mixture of dextrose monohydrate crystals referred to as " Magma". The slowly rotating agitator has two functions. First, it keeps the mixture of dextrose monohydrate crystals and syrup continuously moving, thereby preventing the formation of solid block (lumps) of dextrose monohydrate. The second function is to help in the cooling process by allowing warm syrup to come in contact with the cold water jacket and coil.

It is important that the operating conditions of the crystallisers are not changed. This means that the temperature regime of the crystallisers, the syrup composition, that is solids and dextrose monohydrate content, feeding the crystallisers and the residence time in the crystallisers does not vary. Any variation to any of these parameters can result in the production of dextrose monohydrate crystals with a variable size. This variation in crystal size will produce variations in the bulk density of the dextrose monohydrate, and ultimately will mean changing the size of the dextrose monohydrate bags. It will take 60 to 70 hrs for crystallisation. After complete magma formation, magma transferred to spiral ribbon agitated centrifuge feed box (tank) through conveyor. For next batch of crystalliser approx 15 to 20 % magma is kept for seedding.

CENTRIFUGE - Magma passes into a centrifuge, which separates the dextrose monohydrate crystals from magma and uncrystalised syrup i.e. mother liquor. Inner side of centrifuge basket stainless steel perforated screen and stainless steel mesh is provided to avoid come out fine crystals with uncrystalised syrup while separation and washing of crystals. The crystal are washed in the centrifuge to remove excess uncrystalised syrup called as wash water, and then the crystal discharged from centrifuge transferred to dryer feed hopper for drying, to reduce moisture of crystals from 13 - 14 % to 7.5 to 9.5 %. Also undried crystals(wet dextrose monohydrate) transferred to production of anhydrous dextrose production. And wash water and mother liquor recycled in next fresh syrup to reduce 95 % DE. After few cycles mother liquor seperated to sale as hydrol, or blended (mix) in liquid glucose.

DRYER - For drying of dextrose monohydrate flash dryer, fluid bed dryer and rotary dryers are used. Mainly in india most of the companies used flash dryer. Before dryer wet dextrose monohydrate are collected in hoper with spiral ribbon agitator to avoid lumps formation of wet dextrose monohydrate and continuous conveyeris used to feed wet dextrose monohydrate in dryer. The wet dextrose monohydrate conveyed into the flash dryer pipe, in the effect of high speed hot air flow(air heated by steam heat exchanger) rotating with along the hot pipe wall the rotating movement aggravates the continuous rolling of the wet dextrose monohydrate in the pipe which hot air and wet dextrose monohydrate fully contacted. Inlet temperature of hot air is maintained 95°c to 100°c by adjusting steam valve of heat exchanger. Dried dextrose monohydrate moisture is maintained 7.5 to 9.5 %.

COOLING - Dried dextrose monohydrate cooled by providing cool water of 15 to 18 °c in jacket of material conveying conveyer or cooled before pneumatically conveyed, with a flow of 'conditioned air to a silo before screening. Cooling of dextrose monohydrate is necessary to avoid lumps formation in storage. The reason why dextrose monohydrate forms lumps in storage is because of the air trapped in between the crystals. If the air contains too much moisture, then over a period of time, with changes in temperature, this moisture will condense to form a dilute film of syrup on the surface of dextrose monohydrate crystals. When the moist crystal faces come to contact with adjoining crystals, for example in a bag at the bottom of a pallet, the dilute film of syrup on the two surfaces acts like a cement, joining the crystals together, to form a solid lump. The smaller the crystals, the greater the surface area and points of contact, so greater will be the lump formation. Therefore, to a avoid lump formation, the air in between the crystals must have a dew point of 21°C, it will be a disaster.

SCREENING - Screening of dextrose monohydrate is done by rotary shifter or vibro shifter fitted with 30 mesh seive. Over size of mesh is separated and recycled in process by dissolving and under size is packed in bags for sale or stored in silo.

Also dextrose monohydrate is used for production Vitaminised Glucose - D and Flavoured - D.

PACKING - Packing of dextrose monohydrate is done in 50 kgs. HDPE bags with linear for sale.

WINE REPORT

KANCHAN SINGH

Chapter Head - South Delhi, India
Apex Wine Club India
1 November 2021, Monday

Viña Temprana Old Wines Tempranillo is a red wine variety from Campo De Borja in Northern Spain, Spain. This is a fruity wine with notes of raspberry and plum. It has a chocolate after-taste and is dry in texture. This makes an excellent combination with poultry and is recommended during monsoon.

CLIMATE CHANGE

DR. SEEMA MISHRA

Contemporary climate change is the result of increasing atmospheric greenhouse gas concentrations, which is caused primarily by combustion of fossil fuel (coal, oil, natural gas), and by deforestation, land use changes, and cement production. Such massive alteration of the global carbon cycle has only been possible because of the availability and deployment of advanced technologies, ranging in application from fossil fuel exploration, extraction, distribution, refining, and combustion in power plants and automobile engines and advanced farming practices. Livestock contributes to climate change both through the production of greenhouse gases and through destruction of carbon sinks such as rain-forests. According to the 2006 United Nations/FAO report, 18% of all greenhouse gas emissions found in the atmosphere are due to livestock. The raising of livestock and the land needed to feed them has resulted in the destruction of millions of acres of rainforest and as global demand for meat rises, so too will the demand for land.

BrewTimes™

Balaji Enzyme and Chemical Pvt Ltd

No. 106/107, A5/1, Parasnath Complex, Owali Gaon, Dapoda Road,
Bhiwandi - 421302 | +91-72-08124000
E-mail : info@becc.org.in | Web. : www.becc.org.in