

Wine manufacturing processes in india



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INTRODUCTION

In India wine industry develop as a new emerging field. The consumption of wine in India is very large & have a great economy. Due new emerging field wine industry have a lot of opportunity & also have challenges to show your talent. Now in days servicing & drinking of wine become status symbol. The challenges come out due to different rules & taxation in each state of India. Each state government has their own rule & taxation policy for wine business. The challenge also still occurs due to Indian culture & tradition because servicing & drinking of wine assume as a western culture so marketing of wine in domestic region become a hard challenge. Cost & quality of wine firstly decide for business in domestic region.

In urban area people accepted the western culture & servicing of wine in parties & vocation become style statement but to develop wine market in rural area is a big challenge because rural people assume as a bad tradition to drink wine.

At the tourism places & multicity like Mumbai, Delhi, Kolkata, Karnataka, & Varanasi, Lucknow city in up many tourists comes & they wants to drink fine & good quality of wine so growth in tourism sector is correlated with growth of wine industry.

In current scenario due to accepting western culture & becoming style statement the market of alcoholic beverage changes globally. A lot of new market comes out & redefining distribution method & helping the wine market to reach the potential customer. In between last 10 year it has been seen that middle class people accepted the western culture & contribute into

the consumption of wine at a faster rate. Through the use of internet, television & cinema drinking of wine increase widely all over India.

Indian wine industry organizes many events & club to getting the coverage of media to reach the people & attract them for joining to the industry. This event organizes only for advertisement & attracts huge number of customer. The product offered by vintner to the customer from regular brand in minimum affordable price.

The growth rate of Indian market for wine industry is 25-30%. The researcher showing that 100 million people in next five year will be legally allowed to drink alcohol.

In biotechnology field manufacturing of wine is done by the biological tools such as microbes & bacteria. According to Indian market the cost of wine should be low & quality must be fine & this is the basic funda of biotechnology. The use of biological tools means to get brilliant quality & quality means fitness for purpose so for a biotechnologist wine industry has a great opportunity & good career.

WINE MANUFACTURING

Formation or manufacturing of wine is known as Vinification. Wine making process is ordinary categories into two groups one is still wine production i. e. without carbonation & other second is sparkling wine production i. e. with carbonation. The wine making technology is known as Oenology & wine maker is called Vintner.

RAW MATERIALS FOR WINE PRODUCTION

Grapes fruit, berries, apple & many other sugar rich fruit are raw material for wine production.

PROCESS OF WINE PRODUCTION

Quality of wine is decided by selection of grape fruits. Good quality of grape means good quality of wine. Minerals nutrient in soil, its ph, weather, & time of harvesting affects the quality of grape. Collectively these effects in the term of grape fruits are known as grape's terroir. Grapes are growing in vineyard. Harvesting i. e. picking of grape for wine production from vineyard is done by mechanical or by hand. Mechanical harvesting take short time & cover large area while hand harvesting take more time but the advantage of hand harvesting is that we can pick only ripe cluster of grape. Vitis vinifera species of grape is more preferable for wine production.

FORMULATION OF MUST OR PULP

Squeezing is next process after the selection of grape. Grape fruit squeeze normally by which the content of fruit release.

The releasing content of grape is called must or pulp. In the vine industry vine made at a large scale so far squeezing is done by crusher known as destemmer. For the manufacturing of red wine stem from the bunches of grapes removed because these stem contains high tannin and give an undesirable smell. These smell is due to 2-Methoxy-3-isopropyl pyrazine. The color of red wine comes from skin of grape. On viti fera vines are the exception. It contains malvidin 3, 5-Diglucoside anthocyanin which is a dark pigment.

White wine initiate without squeezing and avoid removing the skin. Avoid to removing skin is so for the flavor. Adding of potassium ion precipitate to the skin protein into the bitartrate which increases the pH of juice.

In the production of red wine grape fruits squeezed and dark skin left with must of grape for a long period to extract the desirable color of wine.

BASIC FERMENTATION

On the surface of grapes yeast are present in the white powdery form. These are the natural yeast and basic fermentation is done by natural yeast. In the basic fermentation one problem occur that some sugar of grape must remains unfermented. This unfermented sugar makes wine sweet so culture yeast are often added into yeast. Yeast ferments the sugar into alcohol and CO_2 . Temperature affects the rate of fermentation. For red wine production temperature should be 22-25 $^{\circ}\text{C}$ and for white wine 15-18 $^{\circ}\text{C}$. From one gram of sugar half gram of alcohol is produce so far to get 8% concentration of alcohol most should be contains 16% concentration of sugar. After Basic fermentation secondary or malolactic fermentation start. This process is done by lactic acid bacteria.

STABILIZATION OF WINE

There are two processes for stabilization or clarification of wine.

1. Cold Stabilization - This process is used for remove to tartrate crystal. This tartrate crystal is formed by adjoining of tartaric acid and potassium ion. This crystal appears as clear sand in the wine. These are known as wine crystal or wine diamond. For the separating of this crystal the temperature of wine decreases at the freezing level and put

it for one to two weeks. By this process crystal stick on the wall of the holding vessels. Wine is ejected from the vessels and crystal left behind it.

2. Heat Stabilization - For the removing of unstable protein from wine heat stabilization is done. Heat stabilization prevents the precipitation of this protein.

SECONDARY OR MALOLACTIC FERMENTATION

Lactic acid bacteria (LAB) are responsible for the malolactic fermentation. To shape the wine from the oxidation it kept in air lock system. Secondary fermentation takes places in large steel vessels. Wine also kept in oak barrel. For the desirable change in test, Wine put in to oak barrel. One is notable that use of LAB cans undesirable change in the flavor of wine which is undesirable. Types of lactic acid bacteria LAB—

1. Leconostoc
2. Pediococus
3. Lacttobasilus

These are gram +ve bacteria, Wine LAB are microaerophili i. e these bacteria can grow in low O₂ containing material. Due to their microaerophilic nature they catalyzes whole sugar, acid and other material present In container of wine that is not only at the surface of container,

SOURCE OF LAB

The main source of LAB is layer of grape fruit and grape leaves.

Contaminated equipment as like pumps, walves and storage container wooden barrels are also the source of LAB.

At the stage of alcoholic fermentation population of LAB decreases because yeast competes with this bacteria and form ethylalcohol and SO_2 . At the period of fermentation number of LAB increases rapidly and reaches up to 10^6 to 10^8 cell/ml. Generally leuconostoc grow in this condition and carry out malolactic fermentation but when pH of wine is high that is 3.5, pediococcus and lactobasillus also carry the malolactic fermentation.

When the pH of wine is more than 3.5 and sulpherdioxide level is insufficient fluff causing LAB develop into the wine and wine become bubble. After the malolactic fermentation wine should be preserved very carefully.

DIFFERENT WAY OF SPOILAGE (BUBBLING) OF WINE BY LAB

1. Sugar Fermentation - Malolactic fermentation done by LAB. LAB catalyzes to sugars like glucose and fructose into lactic acid and CH_3COOH . The vinegar like smell comes out due to acetic acid. This is the reason for bubbling of wine and takes places in must with fast fermentation or with high concentration of sugar in wine. Due to fermentation lactic and acetic acid decreases the pH of wine and resulting low growth of microorganism.
2. Glycerol Degradation - LAB catalyzes glycerol into lactic acid, acetic acid and acrolein. Due to presence of acrolein test of wine become bitter.
3. Tartaric Acid Fermentation - Tartaric acid are fermented into lactic acid, acetic acid % CO_2 by LAB. This is done at low acidity and high pH. This acidity further catalyzes and vinegar likes aroma and bad test.

4. Citric Acid Fermentation - Amount of citric acid decreases in wine at time of fermentation. This amount is depending on type of LAB and pH of wine.
5. Ropiness - Some specific genera of leuconostoc produces dextran slime and musilaginous substance and resulting wine appears oily and do not have high volatile acidity.

The very bad smelling of wine s due to lactic spoilage and known as mousy and geranium like aroma. The mousy aroma in wine is due to formation of acetyl tetrahydroxyridine. Lactobacillus is responsible for production of these compound.

Geranium like aroma in wine is produced by formation of 2-ethoxyhexa-3, 5-diene from the catalyzing of sorbic acid by the LAB. Presence of this compound, wine become undrinkable. To prevent this aroma from wine growth of LAB must be handled.

METHOD OF PREVENTION OF WINE SPOILAGE

For the prevention of wine spoilage 3 factors are responsible.

1. Composition of wine/must
2. Practices of vinification
3. Interrelationship with other organism

Composition of wine/must - The growth of LAB is affected by the pH of wine.

The Initiation and duration of malolactic fermentation is affected by the pH of wine. Growth of LAB and malolactic character is also determined by the pH of wine. According to researches malolactic fermentation decreases with increase in pH. The research report show that at pH 3. 15 malolactic

fermentation take 23. 4 weeks while at pH 3. 84. This process complete in 2 weeks. pH pf must also decide the type of LAB for malolactic fermentation. At below 3. 5 pH, malolactic fermentation is done by leuconostoc and at above 3. 5 pH pediococcus and lactobacillus carry out the malolactic fermentation.

Controlling the pH of wine is best method for preventing from spoiling.

For controlling the growth of harmful bacteria SulpherDioxide is uses. It's a very effective germicid. In wine sulpherdioxide exist as free or bound form. It affect the pH of wine. The free form of sulpherdioxide is increases by decreases in pH of wine, so maintaining low pH of wine is profitable. In forming sulpherdioxide which is most effective tool for controlling the LAB. Sulpherdioxide bound with certain carbonyl compound like acetyldehide. This form of sulpherdioxide is known as bound sulpherdioxide. When LAB catalyzes this carbonyl compound sulpherdioxide releasea and works as free sulpherdioxide. which restricted the growth of bacteria. The molecular sulpherdioxide at the concentration 0. 8ppm works very effectively to controlling the growth of LAB.

Lactobacillus trichods and alcoholic bacteria which contains 20% alcohol. pH and storage temperature of wine determine the tolerance of wine.

As before describe that due to microareophilic nature of LAB oxyzen does not require for the growth of LAB but the evidence show that small amount of oxyzen is require for well growth of LAB. Carbondioxide also influences growth of LAB.

PRACTICES OF VINIFICATION

Many condition like fruit condition, clarification, fermenting conditions, must treatment, lease contact, skin contact time(in case of red wine) and winery hygiene use for controlling of LAB,

Use of fresh clean and healthy fruits for wine making reduce the number of microbes. Sulphur dioxide is added at crushing time to reduce the high growth of LAB. The pH and acidity of wine can be adjusted by use of tartaric acid before fermentation.

At the time of stuck fermentation LAB fermented to sugar compound and increases the volatile acid level in wine. Before reaching at dryness of wine controlling of fermentation of wine is good method to preventing the growth of LAB. To put the fresh wine on the lease for a long time will be face down to malolactic fermentation. This is because of releasing nutrients by yeast and decreases carbon dioxide concentration. Clarification means filtration of wine with very fine approximate 45 micron membrane filter to reduce the growth of LAB.

INTER RELATIONSHIP WITH OTHER ORGANISM

At time of alcoholic fermentation the growth of LAB in wine decreases or LAB do not perform very well because of presence of yeast which inhibitory effect on the LAB. The factor that affect the performance of LAB is competition & consumption of nutrient by the yeast. Yeast is also form ethanol & SO₂ which are inhibitory compound for LAB.

Some other microorganism like Botrytis cineria & acetic acid bacteria activate function of LAB. Acetic acid bacteria show symbiosis with LAB. Many researches show that Bacteriophage are isolated from wine & ruin the LAB.

DIRECTION FOR WINE MAKER

Since LAB participate in malolactic fermentation & wine spoil aging both so for some key points are mentioned for vintner to control the LAB.

1. Always use fresh, healthy, & high acidic fruit.
2. Add few amount of SO₂ at time crushing of grape fruit.
3. Malolactic fermentation at the range of pH 3.3-3.5. This level of pH is most favorable for LAB to malolactic fermentation. Malolactic fermentation increases the pH so it is suggestible that ph of wine should be low by which after malolactic fermentation & wine attain desirable pH.
4. Low ethanol, low SO₂ & high temperature fermentation are favorable for malolactic fermentation.
5. Take precaution to avoid a stuck fermentation.

Fermentation by yeast

for improving wine quality selected yeast are preferred by wine maker.

Sacchromyces cerevisiae a commercial yeast are used for improving wine quality. Volatile thioles are uses for changing smell of wine at cold temperature.

New researches show that microbes present on the layer of grapes are varies from one vine yard to other vine yard. By the use of short amplicon sequencing technique(a dna sequencing technique) researcher determines

the varieties of unique microbes present on surface of grape in a vine yard. If microbes like yeast and bacteria are determine of a vine yard ten use of bacteria and yeast for fermentation of particular vine yard grape by which quality of wine can be improved.