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# Production Method of Mead: Chardonnay Pyment

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**Abstract -** *Mead is an Alcoholic beverage made using honey as a base with different fruits, barriers, and juice for different aroma, taste, and flavors. Mead is produced by fermentation of honey as a glucose source using yeast. Mead and its process from honey have become a new and interesting field of study for the alcoholic industry mainly for Wine technology due to their uniqueness, peculiar properties like the taste of honey, a pinch of fruit flavors, aromas, and whole maturation process. Mead has a separate and peerless identity in the alcohol industry. Mead can provide the best alternative for wine, beer, and low alcohol content beverages in India. The current study proposes the production of Mead* with *a flavor of Pinot Noir and Chardonnay grapes by amalgamating multi-floral honey (Honey collected from different flowers by honey bees). This study also proposes other parameters of the mead like analytical parameters, sensory evaluation, and other calculations*

***Key Words*: Mead, Chardonnay, Fermentation, *S. Cerevisiae*, Acidity, Filtration, Sensory evaluation**

## 1. INTRODUCTION

Mead may be an ancient alcoholic drink made from diluted honey with water and fruit and fruit crush by alcoholic fermentation by exploitation yeast containing alcohol content by volume from four-dimensional to fifteen. Honey may be a naturally sweet product made by a honey bee by aggregation nectar from completely different flowers and process it with the number of enzymes in a very hive. Honey may be a mixture of advanced carbohydrates and different minor substances like organic acids, completely different amino acids, minerals, proteins, vitamins, and lipids, etc.[1]. In honey laevulose and plant product area unit typically the foremost rife supply of easy sugar found in honey and also the mead fermentation method is longer than most alcoholic fermentation, wherever different sugars area unit gift and in higher concentration. As the mead creating is way ancient factor, from those times completely different changes are created during this space, to realize the pleasant aroma, clear texture and refreshing mouthfeel. the event of the producing method involves the contemplation of assorted factors together with the elimination of impurities or sediments, sorts of honey, characteristics of honey, quality of juice or grapes, and simple accessibility of raw resources for large-scale production. The upstream method (USP) involves the preparation of should with finalizing the initial Brix and pH to urge acceptable alcohol percentages. Activation of dry yeast and addition of yeast in should to urge most yield and products while not off-flavor. Downstream process (DSP) of mead ordinarily encompasses wrenching, purification, and filtration exploitation plate and frame filter and candle filter, for clear and while not sedimented mead. Sometimes due to the high sugar content, low pH, and low mineral content of honey, mead production may be a long method, usually taking many months. There are different types of mead depend on alcohol percentage and ingredient of must (mixture of honey, water, and juice). A week or having less than 10% alcohol content mead is called Hydromel. Mead having 10% to 14 % alcohol content called standard Mead. Show mead is produced only by honey plus water mixture fermentation. Pyment is a fermented beverage made by a mixture of grape juice, honey, and water or from a blend of grape wine and mead after fermentation. It has a distinct grape wine character, acidity, tannin, and other grapes characteristics, but the honey character should balance the fruity flavors.

Even though the mead is perhaps the first or oldest fermented drink in the world, produced mainly in an empirical way, its production has difficulty in recent years, partially due to the low scientific progress in this field. Even though there is not much scientific information related to composition and concentration of honey-must, fermentations, it is generally accepted that the improvement of mead quality includes the development of adequate additive formulations, controlling temp., activation of yeast, and the optimization of the fermentation conditions[2].

### 1.1 Chardonnay

Chardonnay is the sector's maximum famous white wine, and for accurate reason. It's crafted from green-skinned Chardonnay grapes that adapt to a whole lot of climates. The range originated in the Burgundy wine place of eastern France, one of the signature vintage global Chardonnay wine developing regions is Chablis, France. Climates much like that of Chablis are predominantly cool, thus giving Chardonnay wine a distinctly leaner feel. however, is now grown anyplace wine is produced, from England to New Zealand. The grapes right here also are referred to as Aubaine and Beaunois. In general, Chardonnay is thought to be a noticeably dry, medium-bodied white wine emanating fresh, crisp notes of pear, guava, lemon-peel and apple. Chardonnay is a grape range with many advantages. It is the wines themselves that might be easy to grow in a variety of soils. Grapes may be made into almost any type

of wine, from sparkling wine to dry, semi-sweet. The grapes right here also are referred to as Aubaine and Beaunois. Regardless of the style, the wines made through Chardonnay, medium Low (oaked heat climate) – Medium High (unoaked cool climate). In many old-world areas, mainly in France, Chardonnay is usually elderly with little to no oak gift for the duration of the getting old process[3]. Conversely in lots of new global areas, mainly in Central and Northern California, oak is used appreciably to result in butteries, vanilla and custard-esque flavor. Closer to the contemporary-day day, the phylloxera virus almost absolutely wiped out Gouais Blanc. Chardonnay survived, and was taken overseas as one of the main New World grape varietals, transported by immigrants with a mind to set up wineries in Australia and the Americas, with a fast-transferring price of fulfilment which typified New World wine manufacturing from then on. All in all, Chardonnay is what vintners need it to be. This distinctly flexible, superbly fashionable and acidic grape has stimulated the sector of wine over many centuries, lending finesse to Champagne and balance to plenty of other white blends you spot today. The wines made with grapes harvested at extraordinary times replicate the antique climate, that's every other aspect[4].

## 2. MATERIALS AND METHOD

The "Chardonnay Pyment" mead manufacturing process in the Nashik area. The then enriches the information through observations, records (temperature, duration), measurements (weight, volume), and interviews with operators. PH, titratable acidity, volatile acidity, soluble solids content, reducing sugar and total sugar, and ethanol content are evaluated according to the standard AFNOR method. The microbial flora used for characterization is the total flora and yeasts. In the wine or mead industry, dry yeast is mainly Lalvin D47 used. Before adding dry yeast, the yeast cells must be activated[5].

### 2.1 Nutrient:

Di-ammonium phosphate known as DAP contains both nitrogen and phosphate which are macro-nutrient for bacterial growth. Inorganic nitrogen, generally in the form of DAP, is mostly used as a supplement of nitrogen source to nitrogen deficiency must. Wine or Mead products with sensory healthful significance can affect to a varying degree by nutrient. Yeast extract consists of cell content without the cell walls. They are widely used as food additives and flavoring to food. Yeast extract is the perfect organic nitrogen source and a carbon source for wine yeast during alcoholic fermentation. Magnesium chloride is mostly used as a source of magnesium ion to cells for their growth.

### 2.2 Manufacturing Processes

The diagnosis of "Chardonnay Pyment" process allows establishing the manufacturing diagram below (Figure 1). The method of preparation of "Chardonnay Pyment" consists of dilution of the honey with water, Chardonnay grape juice and Lalvin D47 dry yeast and nutrition. The production of the mead begins with a 7/3 (v/v) dilution of the honey with water and grapes juice. Finally, this must (honey + juice) is stored at cold temperature (16°C) for a fermentation and maturation stage of 7 to 10 days.

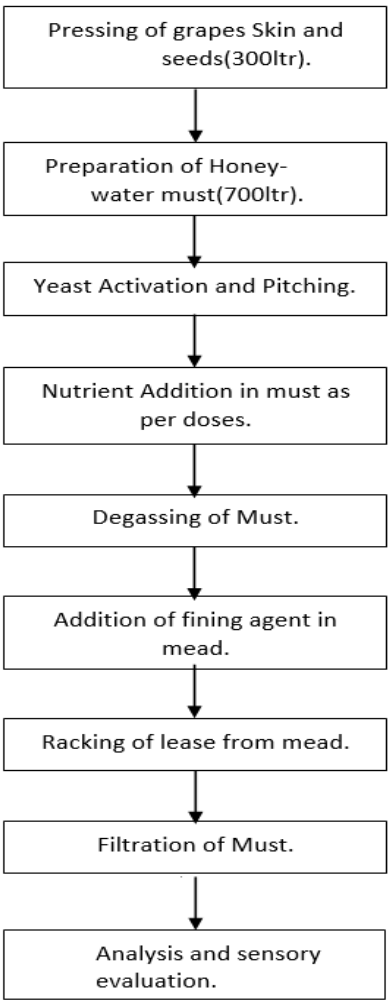


*Figure 1: Manufacturing process*

## 3. RESULT AND DISCUSSION

The creation of Chardonnay Pyment was proceeded according to the interaction depicted in materials and method. The product formation was done effectively at a given alcohol content. After creation, we saw that the mead is totally clear, with no silt and dimness. There is no

off fragrance and taste was recognized at nose and tongue bed.

### 3.1 Analysis of Mead:

The successful production of Chardonnay Pyment measured was analyzed by different parameters. Mead has a 7% ABV, determined by the initial brix value. From the batch of 1000 ltr. We got 850 ltr of the product by eliminating all losses. It means we got a total of 15% of loss during production. Different parameters were also analyzed; these include the growth curve of the organism, volatile acidity, titratable acidity, free SO2. Some parameters are analyzed on daily basis such as pH, brix, specific gravity.

*Table 1: Analytical values of Mead*

| Time (day) | pH | Brix | Titrable acidity | Volatile acidity | Alcohol % |
|---|---|---|---|---|---|
| 0 | 3.54 | 13.77 | - | - | 0 |
| 1 | 3.45 | 13 | - | - | 0.45 |
| 3 | 3.25 | 10.9 | - | - | 2.24 |
| 5 | 3.26 | 7.21 | 2.48 | 0.12 | 4.16 |
| 7 | 3.23 | 1 | 3.017 | 0.13 | 6.98 |

*Table 2: Physicochemical and biochemical characteristics of honey*

| Analyzes | Honey |
|---|---|
| Soluble dry matter (g/100g) | 80.01 |
| pH | 4.06 |
| Titratable acidity (g tartaric acid/100 g) | 1.57 |
| Total sugars (g/100 g) | 89.71 |
| Reducing sugars (g/100 g) | 80.58 |

### 3.2 Variation in pH

For the production of mead or wine, pH should be always in acidic condition. If the pH of wine or mead is not acidic or less acidic then, other micro-organisms also start to grow in mead and it directly affects the quality of mead. From the start to the end of the batch pH of the mead was maintain in-between range of 3 to 4. The final pH of the mead was 3.23 which is slightly acidic.

### 3.3 Reduction of Brix

Total sugar present in the must is measured in terms of brix by using a hand refractometer. In the initial stage, brix reduction was slowly and alcohol production was rate also slow because, after the addition of yeast cells goes in aerobic fermentation first to increase their cell count. After one day, brix reduction rate increased rapidly. For the first day, the brix was reduced only by $1^0$ but, after the brix reduced by $12^0$ in 6 days. At end of the fermentation brix of mead showed 1, which means there is some fermentable sugar left in mead because this mead comes in the off-dry or sweet mead category. As the brix was down to below 100 brix, we started to measure specific gravity.

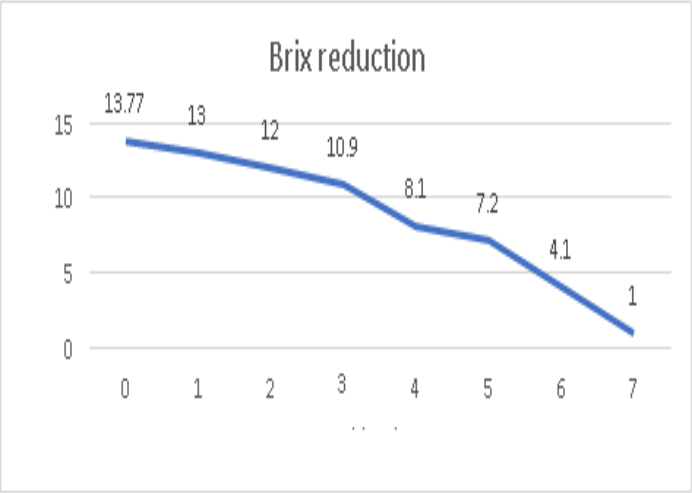


*Figure 2: Reduction of Brix*

### 3.4 Production of Alcohol

Production of alcohol was depending on the rate of reduction of brix, pH, and temperature. As brix was started to reduce rapidly it means, the anaerobic process was started and the production of alcohol was also started. In the initial stage of fermentation alcohol production rate was much reduced rapidly. After 0 to 2 days of fermentation, proper temperature and nutrient dosage were provided therefore, the rate of production alcohol increased. On the first day, alcohol increased by only 0.45% but after production increases 6% in 5 to 6 days. Production of alcohol is tentatively calculated by brix value.

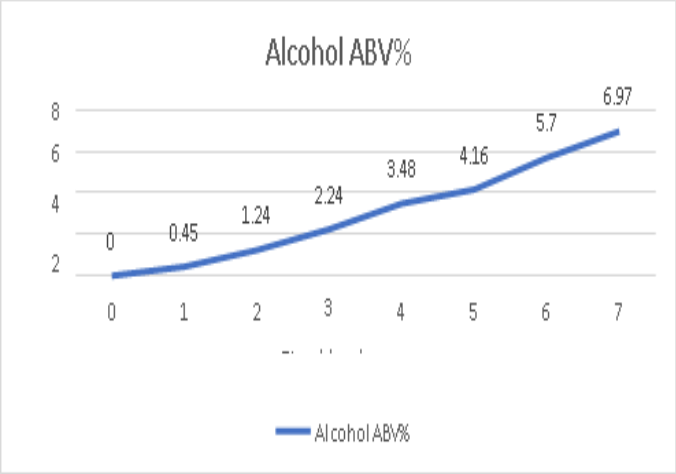


*Figure 3:Rate of Production of Alcohol*

### 3.5 Growth Curve of Yeast

Logarithmic phase for *S. Cerevisiae* was observed after 1 day of yeast pitching to 6th day of fermentation. After the 6th-day cell's growth rate is slowly reduced. From the graph of ln (A620) and time (days), we got the equation of line y = 0.0354x – 0.7791 therefore, the slope of line m= growth rate of *S. Cerevisiae* = 0.9885.

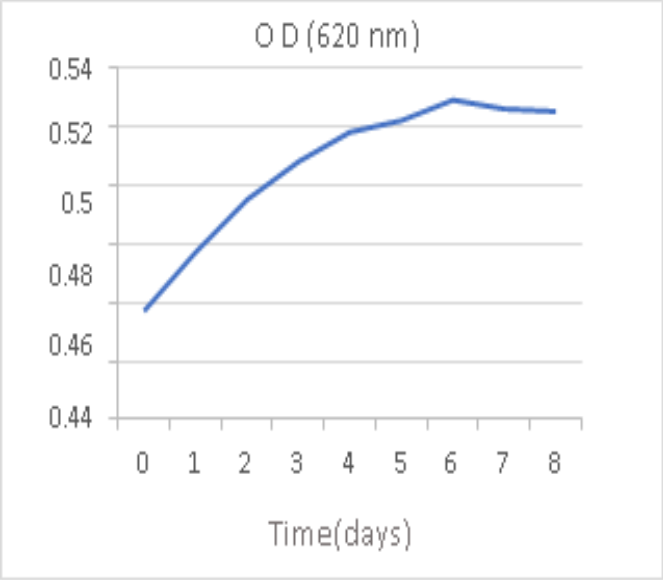


*Figure 4: Growth Curve*

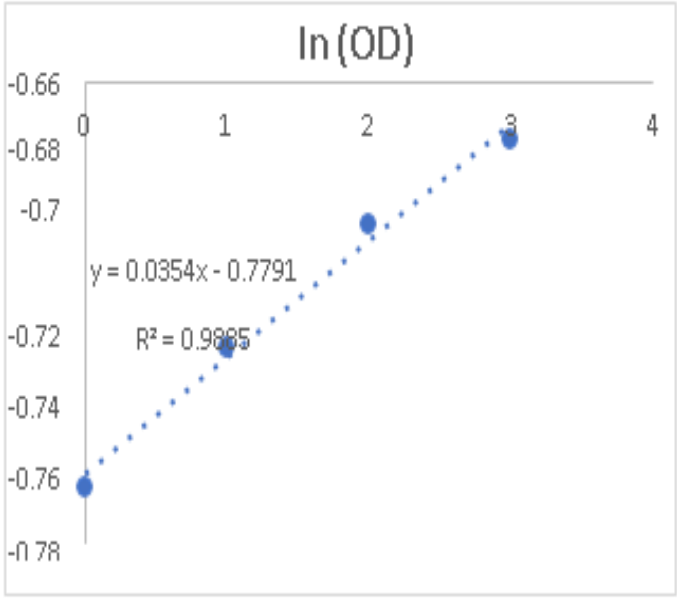


*Figure 5: Linear Curve*

## 4. DISCUSSION

As decided to produce 1000 liters of Chardonnay Pyment with 7% ABV. We first calculated the initial cumulative brix of mead. There was no compensation factor to be considered i.e.no extra sugar to be added which is for aerobic fermentation. Then we calculated how much honey must be added. Its volume, Brix & how much honey in kg needs to add are calculated. To produce an alcoholic beverage, it is essential that fermentation occurs in anaerobic conditions, the breakdown of sugar into carbon dioxide and ethyl alcohol by yeast only occurs in anaerobic conditions i.e., with the exclusion of air. If air is freely available to yeast the chemical changes process further so that the end products are water and carbon dioxide and no alcohol. air is not excluded immediately yeast is added to must because the presence of air initially helps the yeast grow quickly. This leads to producing anaerobic conditions

Used strain of Saccharomyces Cerevisiae was Lalvin D47 yeast strain for the fermentation which is considered as genuine wine yeast for fermentation. Also, the temperature at which fermentation occurs is important. If conditions are too warm fermentation will become very vigorous causing frothing and possible overflow from the tank. This excessive turbulent activity also causes aromatic volatile substances to be lost which is undesirable. On the other hand, a steady cool temperature is best but the temperature must not be too cold otherwise fermentation will stop so the temperature is maintained. Fermentation is done away from sunlight in a dark place because yeast thrives best in dark.

The formation of Sulfides and Mercaptans is considered a flaw in mead making. These sulfur-containing compounds

usually originate with yeast, Sulfur is an important element for growth of yeast available as sulfate in grape juice, Sulfur is reduced to hydrogen sulfide and utilized in the production of protein and vitamin within yeast cells. High or low fermentation rates, low nitrogen, low vitamin, high or low fermentation temperature, too much SO2 presence of elemental sulfur, the concentration of yeast available nitrogen (YAN) can all cause H2 S formation. To reduce elemental sulfur, sulfur sprays should not occur less than 30 days before harvest. Mercaptans and disulfides have several sources combination of H2S and alcohol via acetaldehyde, exposure to light. By reducing H2S formation we will also reduce the risk of forming Mercaptans. To avoid such flaws, after fermentation when H2S alone is present, aeration and splashing may dissipate the odor. However, aeration of wine that contains Merceptans may cause the formation of sulfides. If H2 S persists it is necessary to treat the wine with copper. Treatment of wines with copper sulfate is common practice to remove H2S and Mercaptans. Copper sulfate is commonly added to the wine. Copper should not be added until fermentation is complete. Although Merceptans can react with copper, disulfides do not. So, it is necessary to reduce disulfides back to Mercaptans, this is done by adding ascorbic acid. Another strategy is lees management. Lees can precipitate within 24 hrs. after completing the alcoholic fermentation led to the formation of sulfides and Mercaptans so they should be separated. Light lees do not precipitate after 24 hrs. may be useful in mouthfeel and texture. If sulfide aromas develop while on light lees, racking and aeration of wine yeast lees act as a fining agent. This way we rectified all the flaws in the mead[6].

## 5. SENSORY EVALUATION

Chardonnay mead were tasted by a panel of 10 trained mead judges using a descriptive sensory evaluation method. The sensory analysis of mead was done. It was done by seeing; smelling & sipping evaluation. Chardonnay Pyment was also Clear & unsedimented. Clarity was checked by tipping glass 45-degree angle away from us, looking through the core& looking towards the edge of the mead. Chardonnay was light-bodied. It shows an herbaceous and refreshing aroma at the nose. It was slightly bitter. The finish of this mead was short. So, both the mead fits into all parameters and rules given by the government and excise department also fits into limit values like PH concentration, alcohol content, and sulfur content. Chardonnay Pyment after completion of overall fermentation, PH of mead range from 3.54. It means mead is more acidic. There is a complete reduction of brix from 16.5 $^{0}$B brix to 1.000 specific gravity. As fermentation was going on alcohol content was increased with respect to a decrease in the brix. At the end of fermentation, the mead becomes acidic and slightly dry. And also, all aromas and tastes are detected on the nose and tongue pallet[7].

## CONCLUSION

By performing the above study, we came to know that from the first day of fermentation brix and PH decreases day by day. Sugar content decreases up to get specific gravity of 1.000, which means there is no residual sugar available for fermentation. The percentage of alcohol is 7% ABV for Chardonnay Pyment. These all values lie approximately in requirement of perfect Mead. So, we can conclude that and CHARDONNAY Mead was prepared on the 7th day of fermentation. As honey composition varies, mead producers must take this into account when adding supplements to create optimal fermentation process.

The present study's aim was to evaluate the potential of the nutritive enhancement of honey-must within the scope of the improvement of mead's fermentation performance. The differences in fermentation parameters, aroma composition, and sensory perception of meads fermented at different temperatures and nutrient addition schedules show how the choice of production processes can impact final mead quality.

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