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Shiraz Pyment Mead: Production Process and its characterization

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ABSTRACT: Mead is Alcoholic refreshment made utilizing nectar as a base with diverse natural products, boundaries, and juice for distinctive smells, tastes, and flavours. Mead is delivered by maturation of nectar as a glucose source utilizing yeast. Mead and its prepare from nectar have ended up a unused and curiously field of ponder for the alcoholic industry primarily for Wine innovation due to their uniqueness, impossible to miss properties just like the taste of nectar, a squeeze of natural product flavours, smells, and whole development prepare. Mead encompasses an isolated and superior character within the liquor industry. Mead can give the leading elective for wine, brew, andlow alcohol content beverages in India. The current ponder proposes the generation of Mead with a flavour of Shiraz grapes by amalgamating multi-floral nectar (Nectar collected from diverse blossoms by nectar bees). This think about moreover proposes other parameters of the mead like expository parameters, tangible assessment, and other calculations.

KEYWORDS: Mead, Shiraz, Fermentation, S. Cerevisiae, Sensory Evaluation, Filtration, Racking, Fining.

I. INTRODUCTION

Mead is alcoholic refreshment considered as the most seasoned and the primary alcoholic drink devoured by people, maybe indeed some time recently wine. Apparently since nectar was as it were one most seasoned available sweetening specialist having fermentable sugar. On firmer ground, a few archaeologists and investigate claim that there are a few proofs and prove that generation dates back to 7000 BC a long time back. The primary bunch of mead certainly happened when water falls into an open pot of nectar and the wild yeast matured the blend. Ceramics vessels containing mixtures of mead, rice, and natural products with natural compounds of fermentation have been found in northern China; the primary known portrayal was found within the Rig-Veda and dates back to 1600 sometime recently Common Period. The long convention of mead utilization driven to the start of the term "honey-moon," since, in expansion to being tanked in extraordinary amounts at weddings, the newly hitched marries ordinarily had the work out of drinking mead or drink of nectar for one month after the ceremony, with the conviction that a child would be born after 9 months[1]. The most punctual narrative proposes that aged nectar refreshments were tanked in India a few 4000 a long time prior. In antiquated times, nectar and water mixture were to begin with permitted to age and after that served to modern guests or visitors. It has been described clearly that mead ought to be expended when entering a unused house for the primary time or after marriage when a bride enters her husband's house for the primary time. Mead could be a conventional alcoholic drink delivered from weakened nectar with water and fruit and fruit juice by alcoholic maturation by utilizing yeast containing liquor substance by volume from 4% to 15%. Nectar could be a actually sweet item delivered by a nectar bee by collecting nectar from distinctive blooms and handling it with the number of chemicals in a hive. Nectar is a mixture of complex carbohydrates and other minor substances like natural acids, different amino acids, minerals, proteins, vitamins, and lipids, etc. In nectar fructose and sucrose are for the most part the foremost copious source of basic sugar found in nectar and the mead fermentation prepare is longer than most alcoholic aging, where other sugars are present and in higher concentration. This maturation regularly takes a few months to complete, for the most part the time required for maturation is totally

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subordinate upon the sort of honey, yeast strain, natural product juice or herbs, and composition or concentration of nectar must. As the mead making is much antiquated thing, from those times diverse changes have been made in this region, to attain the wonderful smell, clear surface and reviving mouth feel. The development of the fabricating handle includes the thought of different variables including the disposal of debasements or silt, sorts of nectar, characteristics of honey, quality of juice or grapes, and simple availability of crude assets for large-scale production. For the most part, mead making handle aging or fermenter is in this way followed by a few unit operations, including sterilization, essential maturation, blending, degassing, racking, filtration, refinement, and last bottling. The upstream handle (USP) involves the planning of must with finalizing the introductory Brix and pH to induce fitting alcohol rates. Actuation of dry yeast and addition of yeast in must to induce greatest yield and item without off-flavour. Downstream handling (DSP) of mead normally encompasses racking, refinement, and filtration utilizing plate and outline channel and candle filter, for clear and without sedimented mead [2].

SHIRAZ GRAPES:

Syrah / Shiraz is the ruddy wine grape that rules the Northern Rhone Valley. Whereas Syrah is planted all over the world, at near to 70,000 hectares, more Syrah is planted in France, than in any other country. Syrah is the as it were ruddy grape permitted by AOC rules within the monikers of Cote Rotie and Withdrawal. In reality, it's the as it were red wine grape planted within the Northern Rhone Nowadays, Syrah is one of world's most prevalent and broadly planted ruddy wine grape varieties. Syrah grapes are a descendant of two antiquated varietals. It was made when Dureza, a dim cleaned berry was crossed with Mondeuse Blance, a white cleaned grape. This is often thought to have to begin with happened on the west bank of the Rhone. The disclosure of the Syrah grapes beginnings came from broad inquire about conducted at UC Davis. The inquire about was headed by Carole Meredith, who claims Lagier Meredith wines in Napa, which produces wine from Rhone assortments like Syrah Grapes. How long Syrah grapes have been in presence isn't known with any degree of precision. It's very conceivable the antiquated Romans planted the natural product in Vienne, which we know of as Cote Rotie nowadays. At the time, agreeing to compositions from Pliny the senior, the vines were called Allobrogica. Syrah could be a culminate for a wide and differing cluster of wine and nourishment pairings. Syrah is frequently the leading wine for all sorts of simmered, barbecued or smoked meat dishes like; duck, meat, veal, wiener, barbecued meats, grill and chicken dishes. Syrah based wines and amusement make a idealize wine and nourishment pairing.

II. MATERIALS AND METHODOLOGY

The 'Shiraz' mead was studied and performed. This then enriches the information through observations, records of temperature, measurements of weight and volume. PH, titratable acidity, Volatile acidity, Specific Gravity, Total sugar, ethanol content is evaluated according to standard AFNOR method. Microbial flora is used for characterization is the total flora and yeasts.

Yeast: In the wine and Mead industry, Lalvin D47 dry yeast is used generally and before adding dry yeast, yeast cells must be activated.

Nutrient Addition:

The addition of nutrients in fermentation is the process of providing a supplement to cells for their growth. The concentration of nutrients is completely depending on the conditions and stages of cells. Nutrient sources mainly provide nitrogen sources, carbon sources, and ion to cells [4][7]. Di-ammonium phosphate known as DAP contains both nitrogen and phosphate which are macro-nutrient for bacterial development. Inorganic nitrogen, for the most part within the shape of DAP, is mostly utilized as a supplement of nitrogen source to nitrogen insufficiency must. Wine or Mead products with tangible invigorating importance can influence to a changing degree by nutrient. Yeast extract consists of cell content without the cell walls. They are widely used as food additives and flavouring 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.

Manufacturing Process:

The manufacturing process of Shiraz mead is as follows - CIP of equipments, Crushing of Shiraz grapes, Yeast adding, Pressing , Nutrient addition, Fining, racking, filtration respectively. This process involves dilution of honey with water, Shiraz juice and Lalvin D47 yeast. The production begins with 7/3(v/v) dilution of honey with water and grapes juice. Finally after preparation of mead it is kept at cold temperature at 16^0C for 7 to 10 days. So, all micro-organisms will kill due to cold conditions. For this process we have used Grapes crusher, Grapes press, Plate and frame filter, Fermentation tank, ETP plant for waste water treatment, Hydrometer to measure specific gravity,

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treatment, Hydrometer for measure Specific gravity, PH meter for measure PH values, Refractometer to measure total solid sugar in mead.

III. RESULT AND DISCUSSION

Shiraz Mead:

The production of Shiraz Mead was performed as per the process described in materials and methodology. The product formation was done successfully at a given alcohol percentage. After production, we observed that the mead is completely clear, without any sediment and haziness. There is no off aroma and taste was detected at nose and tongue pallet.

Analysis of Shiraz Mead:

The successful production of Shiraz Mead measured was analysed by different parameters. Mead has an 11% ABV, determined by the initial brix value. From a batch of 1000 lit. We got 850 lit. of the product by eliminating all losses. It means we got a total of 15% of loss during production. Different parameters were also analysed, these include the growth curve of the organism, volatile acidity, titratable acidity, free SO_2. Some parameters are analysed on daily basis such as pH, brix, specific gravity

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 3.32 which is slightlyacidic

Reduction of Sugar/brix:

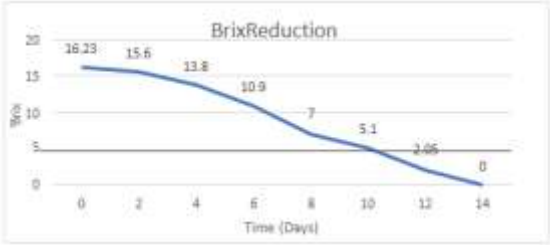

Figure 2: Reduction of Brix in Shiraz

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 two days brix reduction rate increased rapidly. For the first two days, brix was reduced only by 2^0 but, after brix reduced by 12^0 in 6 days. At end of the fermentation brix of mead showed 0, which means there is no fermentable sugar left in the mead. As the brix was down to below 10^0 B, we started to measure specific gravity.

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, the alcohol production rate was very as brix not reduced rapidly. After 2 to 4 days of fermentation, proper temperature and nutrient dosage were provided therefore, the rate of production alcohol increased. In the first 2 days, alcohol increased by only 0.4 % but after production increases 8.32% in 10 days. Production of alcohol is tentatively calculated by brixvalue.

Figure 3: Production of alcohol in Pinot Noir

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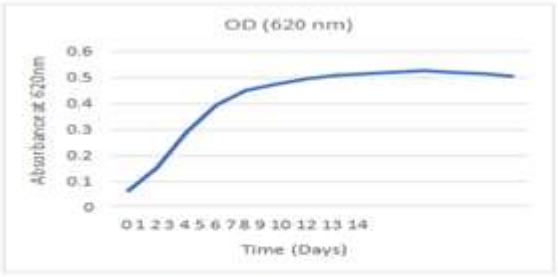

Figure 4: Growth Curve

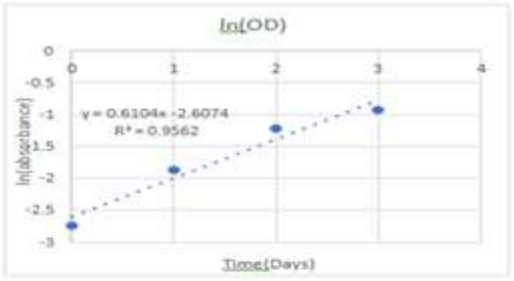

Figure 5: Linear Curve

Logarithmic phase for S. Cerevisiae was observed after 1 day of yeast pitching to the 8th day of fermentation. After the 7th-day cell's growth rate is slowly reduced. From the graph of ln (A620) and time (days), we got the equation of line y = 0.6104x – 2.6074 therefore, the slopeof line m= growth rate of S. Cerevisiae = 0.9562.

There are 3 other parameters of analytical test:
Titratable acidity: Titratable acidity of product mead was calculated at 3.77 g/l

$$\text{Titratable acidity} = \frac{\text{NofNaOH} \times \text{mlofNaOH} \times 7.5}{\text{mlofsample}}$$

Volatile acidity: Volatile acidity of the product was calculated at 0.18 g/l

$$\text{Volatile Acidity} = \frac{\text{NofNaOH} \times \text{mlofNaOH} \times 60}{\text{mlofdistillate}}$$

Free SO_2: Free SO_2 of mead adjusted to 30ppm
Free SO_2= (Final burette reading- Initial burette reading)

Table 1: Analytical Parameter of Shiraz Pyment

Time (day)	pH	Brix/SG	Titratable Acidity	Volatile acidity	Alcohol percentage
0	3.86	16.23	-	-	2.4
2	3.90	15.6	-	-	2.8
4	3.29	13.8	-	-	3.3
6	3.5	10.9	-	-	4.56
8	3.43	7	-	-	6.76
10	3.36	5.1	3.5	0.26	7.8
12	3.43	2.05/1008	3.64	0.16	9.98
14	3.32	0/1000	3.77	0.18	11.12

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IV. DISCUSSION:-

As we wanted to produce 1000 litres of Shiraz with 11% 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. This is achieved by the use of an airlock at the top of the tank. However, the 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. We have used Saccharomyces Cerevisiae 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. Dry yeast activation is done at 40 degrees Celsius while continuous stirring is done for up to 30 seconds. Then let kept sit the mixture for 10 to 15 minutes but not more than 15 minutes. After 15 minutes hydrated yeast is added to the must. Carefully controlled temperature because significant heat is liberated by the fermentation process and excessive rise in temperature can kill the yeast. Fermentation is done away from sunlight in a dark place because yeast thrives best in dark. The fermentation which has been described above is a fundamental process of mead making which is also called primary fermentation. However, fermentation occurs in malolactic fermentation which is also called secondary fermentation. It is caused by micro-organisms, lactic bacteria which break down malic acid into lactic acid & carbon dioxide is liberated in the reaction.

The formation of Sulfides and Mercaptans is considered a flaw in mead making. These sulfur-containing compounds usually originate with yeast, Sulfur is an essential element for yeast growth 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. Merceptans 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 Merceptans. Merceptans can be oxidized to disulfides when exposed to air. 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 mouth feel 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. Another flaw is failing to clear the wine; this problem can be solved by fining and filtering...We rectified all these flaws by maintaining the highest sterility of equipment and avoiding exposure of mead to air. The sensory analysis for both the mead was done. It was done by seeing; smelling & sipping evaluation. The Shiraz payment that we have produced was Clear & unsedimented. Clarity was checked by seeing how well light can transmit through wine, the light was very well transmitted through wine & by looking through the core and rim, we can use a flashlight if necessary. The color of Shiraz's payment was Ruby red. It was bitter. It shows the dryness and warmness of the mead on the tongue pallet. It shows pleasant aromas of grapes like berries and a pinch of honey on the nose. It was medium-bodied. The finish of this mead was medium-long. So 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

V. CONCLUSION

By performing the over ponder, we came to know that from the primary day of aging brix and PH diminishes day by day. Sugar content diminishes up to induce particular gravity of 1.000, which suggests there's no remaining sugar accessible for maturation. The rate of liquor is 11% ABV for Shiraz Pyment. These all values lie around in prerequisite of culminate Mead. So, able to conclude that Shiraz Mead was arranged on the 14th day of maturation.

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