iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 14 **Issue:** V **Month of publication:** May 2026

DOI: https://doi.org/10.22214/ijraset.2026.82979

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 14 Issue V May 2026- Available at www.ijraset.com

Formulation and Sensory Profiling of Mahua Based Liquor with Natural Flavour Infusion

Ajay Durge[1], Dr. Prashant Watkar[2], Harshal Shende[3], Harsh Chaple[4], Abhishek Meshram[5]
[1, 2]*Assistant Professor, Department of Food Technology, BIT Ballarpur, Maharashtra*
[3, 4, 5]*Research Scholar, Department of Food Technology, BIT Ballarpur, Maharashtra*

Abstract: ***Mahua (Madhuca longifolia) is an important forest resource traditionally used by tribal communities in India for the preparation of indigenous alcoholic beverages. Mahua flowers are rich in natural fermentable sugars, minerals, vitamins, and bioactive compounds, making them highly suitable for fermentation and alcohol production. The present study focused on the formulation and sensory profiling of Mahua-based liquor infused with natural fennel flavour using controlled fermentation and distillation techniques. The objective of the research was to improve the sensory quality, flavour profile, and overall acceptability of traditional Mahua liquor.***

Six different formulations were prepared using varying concentrations of Mahua flowers, fennel seeds, sugar, and water. Fermentation was carried out under controlled temperature conditions for 7–10 days, followed by distillation using a laboratory distillation unit. Sensory evaluation was conducted using a 9-point hedonic scale based on parameters such as taste, aroma, colour, mouthfeel, appearance, and overall acceptability. Physicochemical properties including alcohol content, methanol concentration, pH, acidity, total sugar, and total dissolved solids were also analyzed. Microbial analysis was performed to evaluate product safety and shelf stability.

The results indicated that natural fennel flavour infusion significantly improved the aroma and flavour characteristics of Mahua liquor. Among all formulations, Trial 5 showed the highest sensory acceptance with balanced sweetness, pleasant aroma, smooth mouthfeel, and acceptable alcohol concentration. commercial potential.

Keywords: Mahua flower, Machuca longifolia, Fermentation, Distillation, Fennel seeds, Natural flavour infusion, Traditional alcoholic beverage, Sensory evaluation, Physicochemical analysis, Microbial analysis, Tribal beverage, Alcohol production.

I. INTRODUCTION

Traditional fermented beverages have been consumed for centuries due to their nutritional, medicinal, cultural, and social importance. In India, Mahua-based liquor is one of the oldest indigenous alcoholic beverages traditionally prepared and consumed by tribal communities in various forest regions. Mahua (*Madhuca longifolia*) belongs to the family Sapotaceae and is widely distributed in central and eastern parts of India. The flowers of Mahua are rich in natural fermentable sugars such as glucose, fructose, and sucrose, making them highly suitable for fermentation and alcohol production. In addition to sugars, Mahua flowers also contain proteins, vitamins, minerals, flavonoids, tannins, phenolic compounds, and antioxidants that contribute to their nutritional and medicinal value.

Traditionally, Mahua liquor is prepared through spontaneous fermentation followed by local distillation methods. Although the beverage is culturally significant, traditional processing techniques often result in inconsistent quality, undesirable flavour, poor aroma, microbial contamination, and variations in alcohol concentration. In some cases, improper distillation practices may also lead to the formation of harmful compounds such as methanol. Therefore, scientific standardization of fermentation and distillation processes is essential to improve product quality, safety, and consumer acceptability.

In recent years, there has been increasing interest in the development of naturally flavoured alcoholic beverages with improved sensory characteristics. Natural flavour infusion has become an effective method for enhancing aroma, taste, and overall beverage quality. Fennel seeds (*Foeniculum vulgare*) are widely known for their pleasant aroma and medicinal properties.

Therefore, the present study was undertaken to formulate and evaluate Mahua-based liquor with natural fennel flavour infusion using controlled fermentation and distillation techniques. The research focused on sensory profiling, physicochemical analysis, and microbial evaluation of the developed beverage in order to determine its quality, safety, and commercial potential. Development of scientifically standardized Mahua liquor with natural flavour infusion may also support commercialization of indigenous beverages while preserving traditional knowledge and cultural identity.

©IJRASET: All Rights are Reserved

II. MATERIAL & METHODOLOGY

This chapter contains all the materials and methodology followed to prepare and test the product. The test methods for testing raw materials and products are also discussed. Research work was carried out at the Department of Food Technology, Ballarpur Institute of Technology, Dr. Babasaheb Ambedkar Technological University, Lonare

A. Materials Required For Research Study

1) Weighing machine
2) Measuring cylinder
3) Glass reagent bottle
4) Erlenmeyer flask (conical flask)
5) Glass funnel o Distillation unit

a) Weighing Machine: A weighing machine is used to measure the weight of ingredients accurately during product preparation and analysis.
b) Measuring Cylinder: A measuring cylinder is used for measuring the volume of liquids such as water and fermented samples.
c) Glass Reagent Bottle: A glass reagent bottle is used for storing chemicals, fermented liquid, and distilled samples safely.
d) Erlenmeyer Flask (Conical Flask): A conical flask is used for mixing, heating, and preparing fermentation solutions in laboratory experiments.
e) Glass Funnel: A glass funnel is used for transferring and filtering liquids during sample preparation and distillation.
f) Distillation Unit: A distillation unit is used to separate alcohol and flavour compounds from fermented Mahua liquid through heating and condensation.

Table: Ingredients Used

Ingredients	Quantity
Mahua Flower	500 g
Fennel Seeds	200 g
Sugar	250 g
Water	1.5 L

B. Selection of row Material

The following investigations will be conducted on the Mahua flower (Machuca longifolia) and fennel seeds (Foeniculum vulgare Mill.) that were selected as the main ingredients for the study.

C. Selection of row Material

1) Collection

Dried Mahua flower (Madhuca longifolia) and fennel seeds (Foeniculum vulgare Mill.) have been collected from Chandrapur district, Maharashtra. for the preparation of the respective flours used in the study.





©IJRASET: All Rights are Reserved | SJ Impact Factor 7.538 | ISRA Journal Impact Factor 7.894 |

2) Preparation of Mahua flower:

a) Fermentation

Fermentation of mahua brandy begins by soaking dried mahua flowers in water to extract their natural sugars and aromatic compounds. Sugar is often added to increase the fermentable solids, and the mixture is allowed to undergo spontaneous fermentation driven by indigenous microorganisms present on the flower surface. These natural microbes utilize the available sugars and gradually convert them into ethanol, carbon dioxide, and various flavor-active compounds over a period of 5- 7 days at temperatures around 25–30 °C. During this process, mild acidification occurs through the activity of native lactic acid bacteria, which helps stabilize the fermenting mash and contributes to the development of characteristic floral and fruity notes. As fermentation progresses, the sugar content decreases, the alcohol level rises, and the mash develops the distinctive aroma typical of mahua-based beverages. Once fermentation is complete, the alcoholic mash is distilled to produce mahua brandy, with the fermentation stage playing a crucial role in determining the final flavor, complexity, and quality of the distilled spirit.

III. RESULT & DISCUSSION

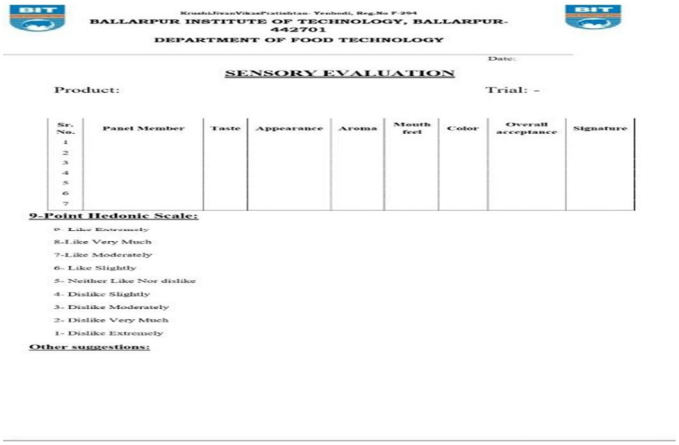
A. Sensory Analysis

1) A 9 Pointer hedonic scale was used to do sensory analysis.

2) 6 different samples of different proportions were prepared.

3) 7 panelists gave their different judgments over the parameters.

4) Parameter for sensory analysis – Taste, Appearance, Aroma, Mouth feel, Colour, and overall acceptance.



BALLARPUR INSTITUTE OF TECHNOLOGY, BALLARPUR- 442701
DEPARTMENT OF FOOD TECHNOLOGY

Date:

SENSORY EVALUATION

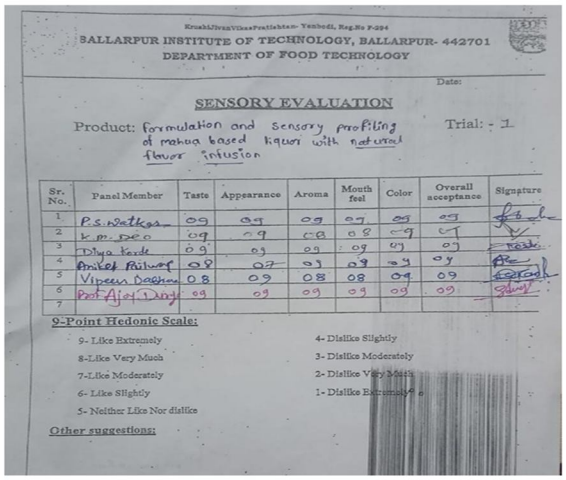
Product: Trial: -

Sr. No.	Panel Member	Taste	Appearance	Aroma	Mouth feel	Color	Overall acceptance	Signature
1								
2								
3								
4								
5								
6								
7								

9-Point Hedonic Scale:

9- Like Extremely
8-Like Very Much
7-Like Moderately
6- Like Slightly
5- Neither Like Nor dislike
4- Dislike Slightly
3- Dislike Moderately
2- Dislike Very Much
1- Dislike Extremely

Other suggestions:



BALLARPUR INSTITUTE OF TECHNOLOGY, BALLARPUR- 442701
DEPARTMENT OF FOOD TECHNOLOGY

Date:

SENSORY EVALUATION

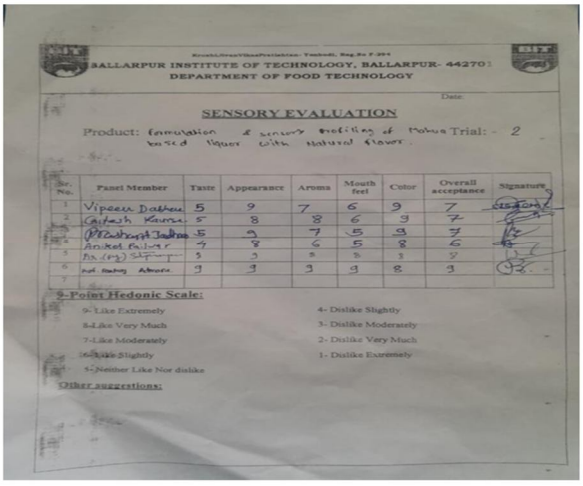
Product: formulation and sensory profiling of mahua based liquor with natural flower infusion Trial: - 1

Sr. No.	Panel Member	Taste	Appearance	Aroma	Mouth feel	Color	Overall acceptance	Signature
1	P.S.Watkar	09	09	09	09	09	09	
2	K.M. Deo	09	09	08	08	09	09	
3	Diya Kerde	09	09	09	09	09	09	
4	Aniket Raiwar	08	07	09	08	09	09	
5	Vipeen Dashan	08	09	08	08	09	09	
6	Prof Ajay Dixit	09	09	09	09	09	09	
7								

9-Point Hedonic Scale:

9- Like Extremely
8-Like Very Much
7-Like Moderately
6- Like Slightly
5- Neither Like Nor dislike
4- Dislike Slightly
3- Dislike Moderately
2- Dislike Very Much
1- Dislike Extremely

Other suggestions:



BALLARPUR INSTITUTE OF TECHNOLOGY, BALLARPUR- 442701
DEPARTMENT OF FOOD TECHNOLOGY

Date:

SENSORY EVALUATION

Product: formulation & sensory profiling of mahua based liquor with natural flower Trial: - 2

Sr. No.	Panel Member	Taste	Appearance	Aroma	Mouth feel	Color	Overall acceptance	Signature
1	Vipeen Dahan	5	9	7	6	9	7	
2	Gitesh Kawar	5	8	8	6	9	7	
3	Prashant Jadhao	5	9	7	5	9	7	
4	Aniket Raiwar	4	8	6	5	8	6	
5	[illegible]	3	3	3	3	3	3	
6	[illegible]	3	3	3	3	8	3	
7								

9-Point Hedonic Scale:

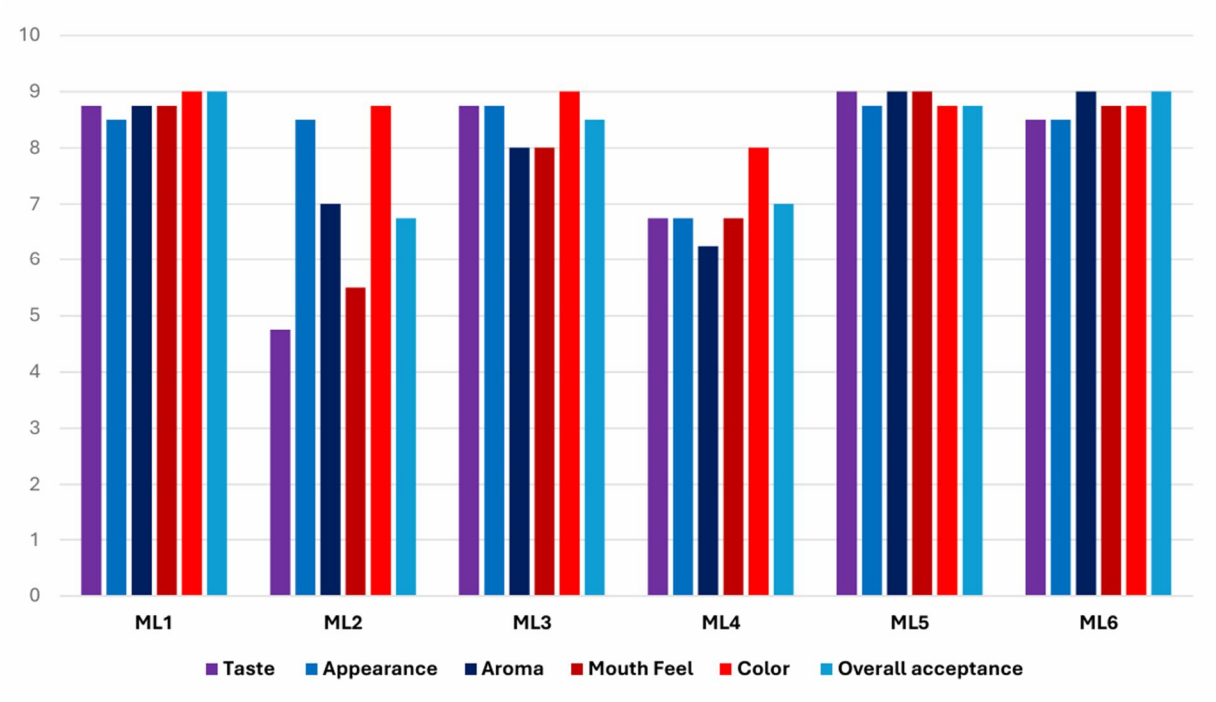
9- Like Extremely
8-Like Very Much
7-Like Moderately
6- Like Slightly
5- Neither Like Nor dislike
4- Dislike Slightly
3- Dislike Moderately
2- Dislike Very Much
1- Dislike Extremely

Other suggestions:

Table: Physicochemical Analysis

Parameter	Result
Alcohol Content	32.5%
pH	4.25
Methanol Content	85 mg/L
Total Sugar	0.24 g
Acidity	0.042%
TDS	215 mg/L

Sensory Analysis Of Final Product



GRAPHICAL REPRESENTATION OF SENSORY EVALUATION

B. Proximate Analysis

1) Alcohol Percent (%)

The alcoholmeter method is a quick and reliable technique used to determine the alcohol percentage in distilled beverages such as brandy, whisky, and vodka. An alcoholmeter is a specialized hydrometer calibrated to measure alcohol by volume (ABV) directly in solutions containing only alcohol and water. The distilled sample is first collected and cooled to the standard temperature (usually 20°C) because temperature affects density and can change the reading. The sample is then poured into a clean measuring cylinder, and the alcoholmeter is gently lowered into the liquid, allowing it to float freely.

$$\mathbf{ABV = (OG - FG) \times 131.25}$$

2) Presence of Methanol

To detect methanol in a sample of brandy, 2 mL of the distillate is placed in a test tube and mixed with 1 mL of potassium permanganate solution. The mixture is heated for 10 minutes to convert any methanol present into formaldehyde. After cooling, 5 mL of chromotropic acid reagent and concentrated sulfuric acid are added carefully. Within a few minutes, the solution develops a purple coloration.

$$\mathbf{Methanol(mg/L) = (A\ sample - A\ blank) \times F}$$

©IJRASET: All Rights are Reserved | SJ Impact Factor 7.538 | ISRA Journal Impact Factor 7.894 |

3) Sugar Content

To determine the sugar content in a sample of mahua brandy, the alcohol is first removed by gently evaporating 25 mL of the brandy on a water bath until the volume is reduced to one-third. This concentrated aqueous extract is then cooled and used for analysis by the Lane-Eynon titration method. A measured volume of the extract is 33 titrated against Fehling's solution using methylene blue as the indicator.

Sugar Content (% w/w) = Grams of sugar/ Grams of product × 100

4) TDS total dissolve solid

The Total Dissolved Solids (TDS) method is used to determine the concentration of non-volatile dissolved components present in brandy, such as minerals, trace sugars, phenolic compounds, acids, and other soluble materials. Since brandy is a distilled spirit with low solid content, TDS measurement helps evaluate purity, quality, and the presence of additives.

IV. FINAL PRODUCT

The final product developed in this study was a Mahua-based distilled alcoholic beverage infused with natural fennel flavour. The beverage possessed a pleasant floral aroma, mild sweetness, smooth mouthfeel, and refreshing herbal flavour due to the addition of fennel seeds during distillation. The liquor appeared clear with light golden colour and showed good sensory acceptability.

The developed product contained approximately 32.5% alcohol with safe methanol levels and satisfactory microbial quality. Controlled fermentation and distillation improved the flavour, purity, and overall quality of the beverage. The final product demonstrated good commercial potential as a value-added traditional alcoholic drink with enhanced sensory characteristics.



V. CONCLUSION

Mahua brandy is a traditional alcoholic beverage prepared by fermentation and distillation of mahua flowers (Madhuca longifolia), which are rich in natural fermentable sugars and impart a characteristic aroma and flavor to the product. In the present study, different trials were conducted to standardize the formulation, and among them Trial Number 5 was found to be the best, showing an alcohol content of 32.5% and a pH of 4.25, Methanol Content of 85mg/L, Total sugar of 0.24 g, Acidity (Acetic Acid) content 0.042 %, and Total Dissolved Solids 215 mg/L, which are within acceptable limits for brandy.

The balanced alcohol concentration and suitable acidity contributed to better stability and sensory quality. Sensory evaluation further confirmed that the mahua brandy from Trial 5 was acceptable for consumption, indicating its good overall quality and consumer acceptability**.**

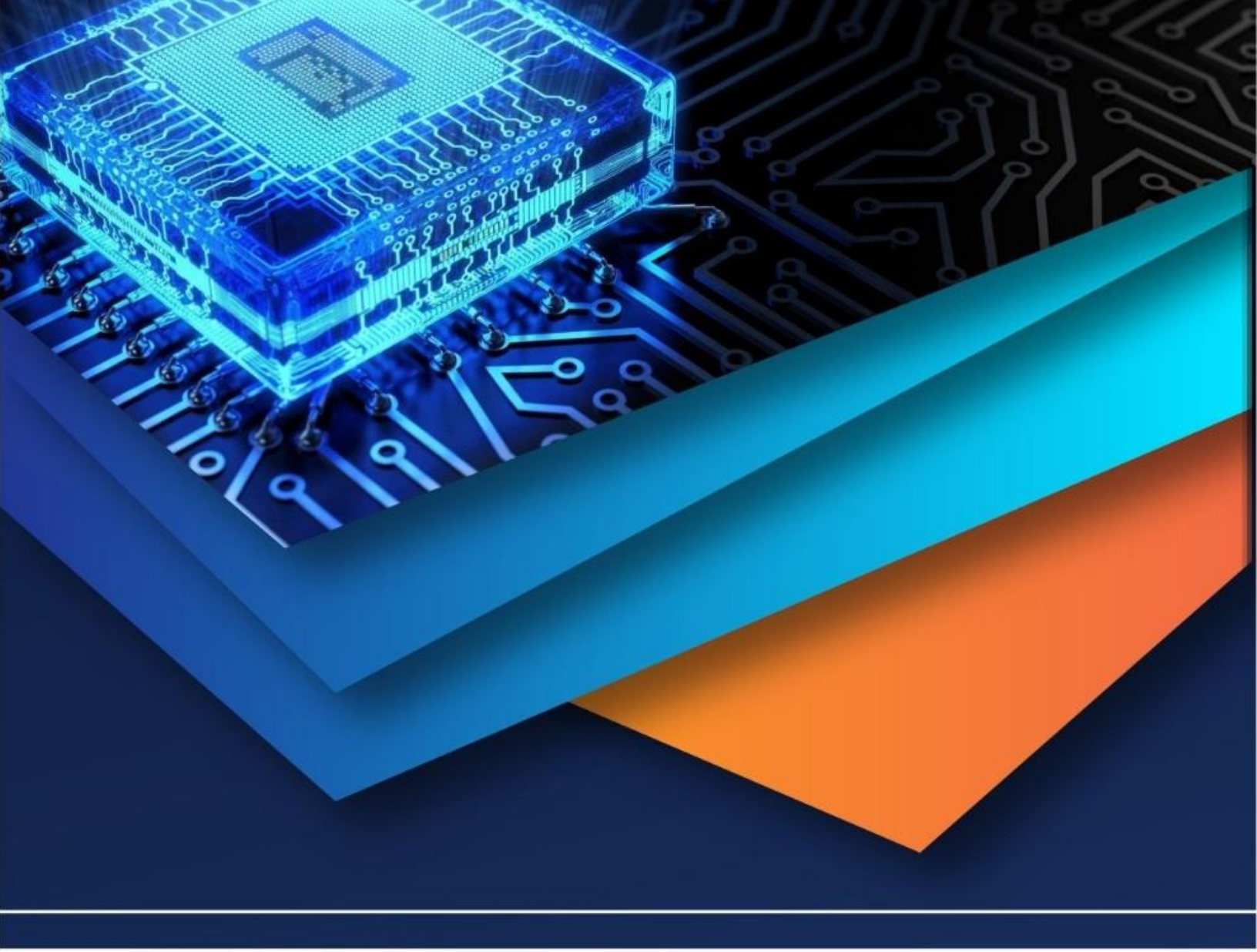
Physicochemical analysis revealed that the developed product possessed suitable alcohol content, safe methanol levels, proper acidity, and satisfactory microbial stability. The use of natural flavour infusion enhanced the quality and market potential of traditional Mahua liquor while maintaining its cultural identity.

©IJRASET: All Rights are Reserved | SJ Impact Factor 7.538 | ISRA Journal Impact Factor 7.894 |

REFERENCES

[1] Verma, R., Chattopadhyay, S., & Mehta, D. (2019). Etymology and historical evolution of distilled beverages. International Journal of Food History, 7(2), 89–101
[2] Ghosh, S., Banerjee, A., & Gupta, R. (2017). Influence of distillation parameters on the volatile composition of fruit-based spirits. Journal of Distilled Beverage Technology, 5(1), 33–47.
[3] Patel, M., Desai, R., & Jadhav, S. (2022). Aroma retention and impurity removal during fractional distillation of grape brandy. Food Chemistry Advances, 1(4), 112–124.
[4] Parker, L., Henderson, J., & Silva, A. (2020). Chemical transformations during oak barrel aging of fruit spirits: Impact on sensory and volatile composition. Journal of Beverage Science and Technology, 14(2), 101–118.
[5] Reddy, P. S., Naik, M. L., & Rao, D. V. (2022). Advances in non-grape fruit brandies: Production techniques, chemical composition, and market trends. Journal of Fermented Foods and Distilled Products, 9(3), 215–230
[6] Kumar, S., Verghese, R., & Patil, A. (2023). Emerging regional fruit spirits: Phytochemical attributes, sensory profiles, and industrial potential. International Journal of Food and Fermentation Technology, 13(1), 45–62.
[7] Patel, R., Singh, P., & Kharadi, H. (2020). Chemical composition and fermentative characteristics of Madhuca longifolia flowers for traditional alcoholic beverage production. Journal of Ethnobotany and Food Science, 8(2), 134–148.
[8] Meena, R., Kumari, S., & Sharma, V. (2020). Phytochemical profiling and antioxidant potential of mahua (Madhuca longifolia) flowers. International Journal of Medicinal Plants and Natural Products, 6(4), 55 67

©IJRASET: All Rights are Reserved | SJ Impact Factor 7.538 | ISRA Journal Impact Factor 7.894 |



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)