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Rationalization of post-harvesting unit operation of mahua flowers (*Madhuca longifolia*, *Madhuca indica*): Systematic interventions and benefits for tribals

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Abstract: The most common method used for collection of mahua flowers by burning the undergrowth under mahua trees which often caused forest fire and loss of flora and fauna of nature. The comparative analysis of traditional flower collection vis-a-vis net collection was analyzed during the research. The most significant benefits were on prices, time reduction and quality of products. These benefits will encourage the adoption of this technique by forest dwelling communities for mahua collection. The net collected flowers sold at 110 to 120 ₹ compared with 25–30 ₹ with traditional collection ($p < 5 ₹$). The time and manpower reduced by 80% ($p < 1\%$) in net collection. Total 87.95 K MT mahua exported from India with value of 70.01 million USD in FY 2022. India rank 7th in global export of Mahua in 2022. Nearly 75% of entire tribal household in the country are involved in the collection of mahua flower which will contribute up to 30% of their annual cash income. To handle mahua around 11 lakh peoples are directly involved and 20 to 25 lakh peoples indirectly involved. To produce liquid >90% mahua utilized in India. During this research post-harvest unit operations also standardized. New food product like syrup, cookies, jam, spread, jelly, gummies, energy drink, beverages, hard-boiled candies development were done, and stabilities were conducted with utilization of 10% to 60% mahua.

Keywords: mahua flowers; tribal; net-collection; food products

1. Introduction

Because of its versatility, mahua is an important economic and cultural forest product. Mahua flowers, seeds and fruits form a large part of the income of many tribal communities and provide the 3Fs of food, fodder, and fuel [1]. Given the dependence of tribal people on non-timber forest products (NTFP) and the adverse effects of logging techniques, there is a need to develop alternative logging techniques that are cheap and easy to use. In addition, the techniques must maintain the quality and quantity of the product [2]. Mahua trees are found mainly in the forest regions of Madhya Pradesh, Jharkhand, Chhattisgarh, Odisha, Maharashtra, and Bihar. Tribal communities such as Korkus, Santhal, Sahariya, Gond and Baiga tribes in Madhya Pradesh collect mahua flowers, fruits, seeds and leaves due to their economic importance [3]. Various folk dances and songs celebrate the glorious mahua. The flowers of the tree are preserved and used during celebrations, important events and rituals. Before the flowering season begins, trees are sown with prayers and love and worshipped in various tribes and states before the flower collection begins. Mahua flowers are preserved to be used as cooking ingredients to garnish sweets such as the delicious Mahua jaggery and others [4]. Mahua flowers have traditionally been used

in the preparation of several traditional dishes such as halwa, kheer, meethipuri and barfi in the mahua-producing regions of India [5]. Roti and sabzi made from mahua flowers are delicacies of tribal communities. In addition, fruit oils have healing properties and mahua oil cakes are used as an environmentally friendly fertilizer. To understand its cultural and economic importance, the forest departments of Maharashtra, Bihar and other state governments have explored the production of jams, squashes, biscuits, and jellies to add value to mahua flowers [6]. Mahua flowers collected from the forest are sold by local communities and are a source of income for tribal peoples. The dried flowers are used to make mahua wine, a traditional alcoholic drink used by local people. Thanks to the entire collection of mahua flowers, 90% of the flowers go into alcohol production. Both men and women enjoy alcoholic beverages or drinks made from mahua and consider them an essential part of all kinds of parties and evening activities.

Therefore, mahua is culturally important to the tribal community. Mahua trees start blooming in March. The villagers start collecting these flowers from March to the end of April. After the end of flowering, the tree begins to bear fruit from May to June. Tribal people used Mahua flowers as a sweetener in common foods because of their sweetness. The sweetness is due to the high concentration of reducing sugar. Flowers are used as sweeteners in many local dishes like halwa, kheer, desserts, puri, burfi, etc. [7]. Location of flowers in a clear chain near the tips of tree branches. It was found hanging from a stem. The flowers look small, about 2 cm long. The color of the flower varies from pale white to dull, and the texture looks juicy. Mahua Corolla looks fleshy, tubular, and pale yellow. It gives a characteristic aroma, which is used as a seasoning in food and in the preparation of pickles [8]. Adding fresh Mahua flowers while cooking rice gives a pleasant aroma or aromas containing 2-acetyl-1pyrroline (2AP) [9]. Ripe flowers are used in cooking because when the flower is ripe and the flower becomes juicy, only 2AP is synthesized [9]. Sepals are covered with rusty tomentum [10]. Collection and sale of mahua flowers are considered an alternative economic activity among tribals of Bihar, Madhya Pradesh, Himachal Pradesh, Orissa, and Maharashtra [11]. Locally known as seagull or toy, it is used to extract an edible oil that has biofuel, medicinal properties, and economic value. Villagers in many states use mahua leaves to make tableware, i.e., plates, cones, and bowls that are sold and used for eating at home and during traditional celebrations [12]. Mahua flowers contain a lot of sugars. The sugar content is 66%–72% of their dry weight [5]. The high sugar content is the main reason mahua flowers are used to make liqueur. Each Mahua tree produces an average of over 200 kg of flowers and a household can earn between ₹1000 and ₹3000 from flower sales [12].

Mahua trees are native trees about 40 feet tall, found in the natural deciduous forests of central India. The flowers usually fall from mid-April to May between 4 am and 12 pm. The traditional Mahua flower gathering technique is to pick the flowers from the ground under and around the trees. It usually takes about 5–6 h before a person chooses a basket full of flowers. To facilitate the gathering, mahua gatherers sweep trash and grass under the tree and burn it. Collecting yellow flowers becomes much easier with the black background of scorched earth. However, fires set to clear land are often not extinguished and escape the area to start wildfires. Therefore, large areas of forest are burnt every year across India [13,14]. During these months, there is

a lot of calendulas on the floor, which acts as heating oil. Forest fires are very destructive and cause a significant loss of biodiversity. Forest fires can cause serious death in young people. Many birds and mammals that nest or give birth in the summer have been severely affected by wildfires. Forest fires can affect the availability of prey, nesting sites and species reproduction. To reduce fires in the mahua collection season, a new concept of mahua flower collection sheets has been introduced to facilitate the sustainable collection of mahua flowers without burning the understory under the mahua trees. Mahua collection journals have been promoted elsewhere in eastern Maharashtra by the Forest Department but have not yet been systematically evaluated. In India, tribals face difficulties due to a lack of scientific support for post-harvest handling methods and value addition. In the open garden, sun drying is still a common flower-drying technique. The flowers are preserved after sun drying and used for sale in local markets [15]. This research will help introduce post-harvest technologies that will help preserve natural flora and fauna and help tribes increase their incomes. The research focuses on the low investment and high yield of existing mahua flowers through value addition.

2. Material and method

Mahua flower collection methodologies were studied and a comparative analysis between the traditional flower collection and net collection was studied. This study was conducted in the forest region of Maharashtra and Madhya Pradesh with the help of local forest officers. This research was conducted scientific steps including mahua collection, post-harvest operation and value-added product development.

Equipment and Materials:

- 1) 2 Nets/tree (for flower collection per tree) + 1 net for drying of flowers.
- 2) Sacs and tents to fix net.
- 3) Weighing machine to weigh flowers.
- 4) Reusable plastic sheets for drying mahua flowers

2.1. Mahua flower collection methods

The perfect harvesting season for mahua flowers is from mid-March to mid-April. The mahua flower showering takes place between 4 am to 12 noon every day depending on the local weather conditions.

2.1.1. Traditional mahua collection practices

The collection of flowers session starts early in the morning and can last until lunchtime, when almost all family members are involved. Most of the collectors are women and children. Women are more involved in collecting, drying, and preserving the produce. The collection period lasts a maximum of three to four weeks. This study investigated the collection analysis and related details. Landfilling and burning lead to forest fires, reduction of soil moisture and death of microflora and fauna. Forest fire resulted in almost complete or reduced recovery of mahua trees. Foragers gather all the flowers from the earth and harvest the wild animals that depend on mahua flowers for food. The quality of the juice is affected by the current method of collection, which is sought at a low market price. It becomes difficult to process low-quality mahua into foods. The traditional collection method applies to all family members and is time-

consuming.

2.1.2. Mahua flower collection by net

Using a net to collect fallen flowers adds value to the entire collection and future market cycle. Compared to the traditional collection system investigated in the study, online collection practices offer advantages. 20 × 20 m can be sewn into the net. Nooses were set up in the corners to try to catch the rope or catch nearby trees. It has an indentation in the center on one side to accommodate the trunk of the Mahua tree. The mahua collector net was introduced under the mahua trees at the beginning of the mahua flowering season. Its corners and edges were pulled up and tied with ropes to trunks or branches of neighboring trees. If there were no suitable trees nearby, poles had to be hammered into the ground and the net tied to the poles. Flax can be laid on the ground, but in the study area the corners and edges were pulled up by tying them to surrounding trees and posts to prevent cattle or wildlife from eating the flowers at night. Mahua flowers come off the tree at night and fall directly onto the linen. Collecting flowers with a mahua collection net gives a clean harvest and saves a lot of time. By using mahua gathering leaves, tribal peoples can gather almost all their produce with remarkable ease and without having to burn the undergrowth under the tree. The flowering of Mahua is quite short-about 15–20 days. The mahua collection leaf is removed at the end of mahua flowering. These networks increase productivity by four times that of traditional techniques. In addition, Mahua quality is improved, the loss is reduced, and the local environment is better protected.

2.2. Designing and issuance of standard operating procedures

Systematic procedures were developed for each step in conducting this study. Team members are provided with training to implement all processes and the following parameters. During the survey, the areas were identified based on the presence and frequency of good volume aids. Sensitization activities including meetings were organized. Meetings were held in the evening to ensure maximum participation. Identification of village leaders those having good communication skills to lead the food grade Mahua collection project. These village leaders helped identify the beneficiaries. We developed a unique code linking each mahua flower collector to a tree and tried to ensure traceability and support through assisted records.

2.3. Mahua drying

Fresh mahua flowers contain about 80% moisture. For the flowers to last longer, we need to improve our quality by reducing moisture through drying methods. During the research, we studied the method of drying. A comparative analysis of sun drying, tunnel test and hot air oven drying methods was performed. After drying, the flowers remain stable for two years. In the sun, mahua flowers were dried in nets on raised platforms. Mahua flowers are left in open ground at least 4 m above the ground for a maximum of 4–5 days. stability study until the year ended during the study.

2.4. Stability of mahua flowers

A stability study was conducted on Mahua flowers to check the shelf life of the flowers. This study was conducted at a temperature of 40 °C and a relative humidity

of 75%. Considering the weekly estimated sample and stability, one week equals one month. Physical, chemical, microbiological, and sensory properties were checked during this study.

2.5. Mahua testing at collection centers

During this study, we developed primary quality check methods for mahua flowers. Some mandatory quality parameters: Physical Appearance like the colour of flowers, size of flower, Sand/Soil/any solid particle (0%), Grit (0%) and Moisture test (<15%). Check the quality of the mahua flower sediment test. This was considered the level of contamination in this quality control. 100 g of dried mahua flowers should be added to 500 mL of water in a beaker. If the contamination is on the higher side, the flowers will go to the bottom of the beak. This gives an approximate idea of the method of collecting flowers, i.e., net- collection or traditional collection. After quality control, the flowers are stored in airtight food-grade plastic bags. To preserve the flowers, they should be packed in double-layer polybags and kept in a cardboard box for easy storage. Appropriate markings have been made to ensure traceability.

2.6. Value-added product preparation

Various food items such as jam, jelly, spreads, syrups, soft drinks, energy drinks, hard candies etc. This high-quality mahua flower is a prerequisite food product for all processing.

3. Result and discussion

3.1. Mahua flower collection methods

3.1.1. Traditional mahua collection practices

Given the dependence of tribal people on non-timber forest products (NTFP) and the negative consequences of collection techniques, there is a need to develop alternative collection techniques that are cheap and easy to use. In addition, the techniques must maintain the quality and quantity of products specified in **Table 1**.

Table 1. Difference between traditional method of flower collection vs. Net collection method.

Item	Traditional Collection	Collection through Nets
Labour	Labour Intensive	Reduces drudgery
Forest Fire	The practice of burning grasses increases the risk of forest fire	Reduces instances of fire
Quality and Quantity	More prone to spoilage and low in quality	Reduces losses, improves quality and quantity
Prices	Low price realization	Better price realization
Collection technique	By sweeping the floor under the tree. By sweeping and burning the undergrowth	Flowers will be collected from the net.
Quantity of flowers collected per day	Flowers are collected from two to four trees per family i.e., on average per person collects 10 to 15 kg of flowers per day	One to two manpower will collect flowers from more than 10 trees i.e., >50 kg per day
Collection of flowers per season by person	Per person collecting 2 to 4 MT flowers in a season	Per person collect > 10 MT flowers per season

Table 1. (Continued).

Item	Traditional Collection	Collection through Nets
Drying method	Sun drying is the common method used in village and tribal communities	The drying of flowers depends on facilities available with collectors i.e., sun drying, low tunnel solar drying or hot air drying.
Sales and marketing of flowers	Local market or to the forest department	Demand for net collected flowers to develop value-added products
Price of flowers	Fresh flower Price: 10 ₹/kg Dried Flower Price: 30 to 40 ₹/kg	Fresh flower price: 30–40 ₹/kg Dried flower price: 110 to 120 ₹/kg

3.1.2. Mahua flower collection by net

In Mahua flower collection, the intervention of post-harvest techniques is beneficial to the tribal communities. Net-quality flowers are of higher quality because they do not fall to the forest floor, which greatly reduces the risk of contamination. The purity of the flowers is also guaranteed. The net collected flowers used in production of oil and foods like mahua tea, mahua syrup, mahua jam, mahua jelly, mahua spread, mahua candies, mahua carbonated drinks, mahua juices, etc. Collecting volume via net collection has environmental implications. The net collection helps protect biodiversity and reduce carbon emissions by reducing attempted fires, which were deliberate forest fires that used to be needed to clear the land before logging. It also helps protect local flora and fauna and eliminate unnecessary carbon dioxide emissions. The biggest contribution to reducing the loss of flowers before collection. With the traditional method, the loss of flowers was approximately 35% ($p < 1\%$). Additionally, the nets naturally sift out other foreign debris saving the producer’s time as mentioned in **Figure 1**.

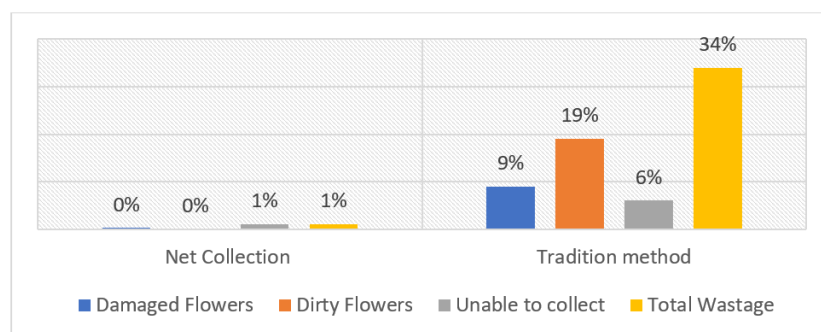


Figure 1. Wastage % of flower during collection.

The net collection method of flowers not only helped the environment but also contributed to social and economic qualities. The flowers collected by the net method improve the standard of living of the tribes by multiplying the market price. The selling price of fresh flowers is ₹25 and ₹10/kg for net collection and traditional collection method, which is a 250% markup. Similarly, the cost of dried flowers is ₹110 for net collection and ₹40 for traditional collection method as shown in **Figure 2**. Due to the improved flower quality when using nets, the product can command a higher selling price, which increases income and thus the quality of life. The harvesting method is four times more efficient with the net collection compared to the traditional collection method. The flower collection jobs that used to take all day can now be done in a few

hours. This huge time savings results in people working multiple jobs to supplement their incomes and children staying in school during the harvest.

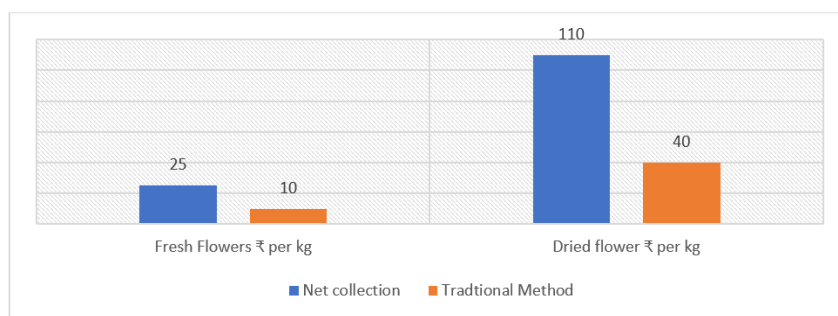


Figure 2. Price of flowers ₹ per kg.

3.2. Designing and issuance of standard operating procedures

During the study, each stage was monitored using standard operating procedures and recorded data. Panel training was conducted during the study and the same panel was used throughout the study.

3.3. Mahua drying

The flowers are collected by the traditional method of picking the flowers by hand from the forest without fire. The collection of flowers started at 7:00 in the morning. After collection, flower analysis was done with the following parameters and placed on the floor to dry in the sun. The drying process begins at 9:30 am on weekdays, and the flowers are collected and stored under cover at 5:30 p.m. The total drying time was 8.00 h per day. Temperature was measured every hour. Analysis of the drying study is mentioned in **Table 2**. The most common method of drying is sun drying, followed by 99% of tribal peoples. According to **Table 3**, it takes a period of five days to decrease the moisture levels of the flowers from 80% to 15% in this approach. During drying, the color of the flower changed from light yellow to dark brown. Physical, chemical, microbiological, and sensory tests were carried out during the five days of drying, which are presented in **Table 3**.

Table 2. Drying study of mahua flowers.

Method of drying	Time required for drying (Hours) ± 1	Temperature (°C) ± 1	Moisture (%) ± 0.5
Sun Drying	190	Atmospheric	16.80%
Low Tunnel Solar Drying	120	Atmospheric	15.00%
Hot Air Oven Drying	50	70	11.20%

Table 3. Study of flowers during sun drying.

Sun Drying Method	Result					
	On Day of Collection	After 1st Day Drying	After 2nd Day Drying	After 3rd Day drying	After 4th Day Drying	After 5th Day drying
Average Temperature	20 °C	36 °C	36 °C	35 °C	36 °C	38 °C
Drying Time	8 hours	8 hours	8 hours	8 hours	8 hours	8 hours
Moisture Content (%)	80%	50%	35%	25%	20%	15%

Table 3. (Continued).

Sun Drying Method	Result					
	On Day of Collection	After 1st Day Drying	After 2nd Day Drying	After 3rd Day drying	After 4th Day Drying	After 5th Day drying
Infestation (Y/N)	Not Observed	Not Observed	Not Observed	Not Observed	Not Observed	Not Observed
Colour	Pale Yellow	Sligh brownish	brownish	Dark Brown	Dark Brown	Dark Brown
Odour	Sour, Citrus, Sweet	Sour, Citrus, Sweet	Sweet, citrus, alcoholic	Sweet, alcoholic, syrupy	Sweet, alcoholic, syrupy	Sweet, alcoholic, syrupy
Lump Formation	No Lump	Lump Observed while pressing	Lump Observed while pressing	Loose lump while pressing	No Lump while Pressing	No Lump while Pressing
Total Plate Count, cfu/g,	<10	<10	<10	<10	<10	<10
Yeast & Mould Count cfu/g	<10	<10	<10	<10	<10	<10
Salmonella sp., per 25g	Absent	Absent	Absent	Absent	Absent	Absent
E.Coli, per g,	Absent	Absent	Absent	Absent	Absent	Absent
S.aureus per g	<10	<10	<10	<10	<10	<10

Figures 3–6 demonstrate representations associated with mahua flowers. The changes in the flowers during drying are indicated in the **Figures 7–11**. The flower colour of traditional flowers and net-collected flowers changes from light yellow to dark brown to golden brown after the 4th day of sun drying, as indicated in **Table 4** and **Figure 12**. The colour changes for the first five days of the experiment.



Figure 3. Mahua tree.



Figure 4. Mahua flower on branch of tree.



Figure 5. Fresh mahua flower.



Figure 6. Fresh Mahua Flower cross sectional view (stamen view).



Figure 7. Mahua flowers after 1st day of drying.



Figure 8. Mahua flowers after 2nd day of drying.



Figure 9. Mahua flowers after 3rd day of drying.



Figure 10. Mahua flowers after 4th day of drying.



Figure 11. Mahua flower after one year of storage.



Figure 12. Quality check method schematics.

Left Side (Net Collected Flowers); Right Side (Flowers collected by traditional Method).

Table 4. Colour of flowers in traditional flowers and net collected flowers.

Parameters	On Day of Collection	After 1st Day Drying	After 2nd Day Drying	After 3rd Day drying	After 4th Day Drying	After 5th Day drying
Traditional Collected Flowers	Pale Yellow	Sligh brownish	brownish	Dark Brown	Dark Brown	Dark Brown
Net Collected Flowers	Pale Yellow	Golden	Golden	Dark Golden	Dark Golden	Dark Golden

3.4. Stability study of dried flowers

The study found that dried flowers with moisture levels below 15% remained stable for 12 months without any changes in their physical, chemical, microbiological, and organoleptic properties. This study revealed that dried flowers can be preserved for one year under extreme conditions. The stability results are shown in **Table 5**.

3.5. Mahua testing at collection centers

Taking long hours and energy to collect flowers was the traditional method, but it resulted in only a few flowers being picked. This method also has some disadvantages, for example, primary collectors usually clear the ground by removing litter and sometimes starting a fire under the trees to keep the fallen flowers free of unwanted materials such as leaves and insects. The cleaning and burning lead to forest fires, reduction of soil moisture and death of microflora and fauna. Forest fire resulted in almost complete or reduced recovery of mahua trees.

Assessing the level of contaminating flowers. We took a glass and added water. Flowers bought from the market and picked were added to the water. **Figure 12** illustrates the difference between high-quality flowers floating in the water and dirty flowers sinking to the bottom due to their density.

We calculated the percentage of infected flowers:

$$\text{Percent Contaminated Flower} = \frac{\text{Quantity of sink flowers}}{\text{Total flower quantity}} \times 100$$

The average contamination level of flowers collected by the net collection method is 1.40% and 12.57% with the traditional collection method mentioned in **Table 6**.

3.6. Value-added product preparation

Value-added foods made from Mahua flowers i.e., Mahua Syrup, Mahua Jelly, Mahua Hard-boiled Candy, Mahua Drink, Mahua Energy Drink, Mahua Spread, Mahua Jam and Mahua Cookies. For mahua to be used in food processing, certain points must be ensured. Proper drying of the flowers and moisture below 10% improves the shelf life of the flowers, the purity of the flowers, avoids fermentation of the flowers during storage, avoids the addition of possible putrefactive substances, and there is no infection or fungal and bacterial contamination. This quality of the mahua flower is a prerequisite for any food processing. Value-added products were formed with different percentages of mahua syrup mentioned in **Table 7**.

Table 5. Stability study of dried mahua flowers.

Parameters	Zero Day	Month 01	Month 02	Month 03	Month 04	Month 05	Month 06	Month 07	Month 08	Month 09	Month 10	Month 11	Month 12
Temperature	40	40	40	40	40	40	40	40	40	40	40	40	40
Relative humidity	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%
Moisture content (%)	15%	15.20%	15.20%	15.40%	15.60%	16.00%	16.00%	16.10%	16.00%	16.50%	16.60%	17.00%	17.60%
Infestation (y/n)	Not observed	Not observed	Not observed	Not observed	Not observed	Not observed	Not observed	Not observed	Not observed	Not observed	Not observed	Not observed	Not observed
Colour-traditional flowers	Dark brown	Dark brown	Dark brown	Dark brown	Dark brown	Dark brown	Dark brown	Dark brown	Dark brown	Dark brown	Dark brown	Dark brown	Blackish brown
Colour-net collected flower	Dark golden	Dark golden	Dark golden	Dark golden	Dark golden	Dark golden	Dark golden	Dark golden	Dark golden	Dark golden	Dark golden	Dark golden	Dark golden
Odour	Sweet, alcoholic, syrupy	Sweet, alcoholic, syrupy	Sweet, alcoholic, syrupy	Sweet, alcoholic, syrupy	Sweet, alcoholic, syrupy	Sweet, alcoholic, syrupy	Sweet, alcoholic, syrupy	Sweet, alcoholic, syrupy	Sweet, alcoholic, syrupy	Sweet, alcoholic, syrupy	Sweet, alcoholic, syrupy	Alcoholic, syrupy, sour	Alcoholic, syrupy, sour
Lump formation	No lump while pressing	No lump while pressing	No lump while pressing	No lump while pressing	No lump while pressing	No lump while pressing	No lump while pressing	No lump while pressing	No lump while pressing	No lump while pressing	Slight lump while pressing	Slight lump while pressing	Slight lump while pressing
Total plate count, cfu/g,	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Yeast & mould count cfu/g	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Salmonella sp., per 25g	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
E. coli, per g,	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
S. aureus per g	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

Table 6. Contamination level of flowers in different collection method.

Method of Flower Collection	% Contaminated Flower			
	Batch 01	Batch 02	Batch 03	Average
Net collected Flowers	1.00%	1.20%	2.00%	1.40%
Traditional Collected Flowers	12.20%	11.90%	13.60%	12.57%

Table 7. Value-added food product with mahua.

Product	Mahua content
Mahua Syrup	100%
Mahua Jelly	15%, 25%, 40%
Mahua Jam	40%, 50%, 60%
Mahua Spread	30%, 40%, 50%
Mahua Hard-boiled Candy	10%, 15%, 20%
Mahua Beverage	10%, 20%, 30%
Mahua Energy Drink	20%, 30%, 40%
Mahua Cookies	15%, 25, 35%

4. Conclusion

To create a value proposition for the tribal community and promote forestry, we should adopt scientific post-harvest practices. Mahua Flower’s collection system must change from a traditional collection to a net -collection. This intervention to facilitate the collection of mahua flowers and reduce forest fires ensures better prices, reduces time, and improves product quality. The main purpose of the net-collected mahua was to prevent fires and preserve natural flora and fauna. Most peoples’ economic livelihoods are dependent on the collection, sale, and acquisition of mahua in tribal communities. Mahua should become the base of value-added tribes. The process of switching alcohol production to value-added products will help the tribes improve their economic situation. In order for tribes to be able to supply industry with mahua or create products that sell at a higher price in the market, different drying techniques such as tunnel drying or hot air oven drying must be adopted to maintain quality compared to sun drying. Conducting quality control before selling the products to the customer is an important criterion for mahua to maintain consistent product quality. To maintain the value chain, certain points are most important, such as proper drying of flowers and moisture below 15% to ensure better preservation of flowers, purity of flowers, avoidance of fermentation of flowers during storage, addition of degrading agents, and absence of infections. and fungi or bacteria. contamination during the use of mahua flowers.

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