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Long Lasting Dhoopbatti/Insects repellent for Sustainable Income Generation

Prof. Vaishali D. Jaysingpure[1], Prof. Priti Gajghate[2]
Abhilasha Manukar[3], Pradip Dudhagi[4], Rohan Kapure[5], Dnyaneshwar Karnawar[6]
Professor, Department of civil Engineering[1]
Students, Department of civil Engineering[2-6]
JSPM's Rajarshi Shahu College of Engineering, Tathawade, Pune, India

Abstract: *Floral waste is a significant environmental concern, particularly in countries where flowers are widely used in religious rituals, ceremonies, and decorations. A large portion of discarded flowers ends up in water bodies or landfills, contributing to pollution and waste accumulation. This research explores an innovative and sustainable approach to floral waste management by converting discarded flowers into eco-friendly dhoopbatti (incense cones). The study aims to address environmental challenges while promoting economic empowerment for women through sustainable entrepreneurship.*

The research investigates the process of floral waste collection, segregation, drying, and blending with natural binding agents such as cow dung, sawdust, and essential oils to create organic, non-toxic incense products. The methodology involves evaluating the quality, burning efficiency, and aromatic properties of the dhoopbatti to ensure commercial viability. Furthermore, this study examines the feasibility of establishing small-scale floral waste recycling units managed by women, fostering skill development, employment opportunities, and financial independence.

The initiative aligns with circular economy principles by transforming waste into value-added products, reducing environmental degradation, and promoting sustainable livelihoods. The study also explores potential market linkages, consumer acceptance, and the role of social enterprises in scaling up the production and distribution of eco-friendly dhoopbattis. By integrating waste management with women's economic empowerment, this research highlights a sustainable model that can be replicated in various regions

The findings of this study contribute to sustainable waste utilization, green entrepreneurship, and gender-inclusive economic development. The proposed solution not only mitigates floral waste pollution but also creates an alternative source of income for women, promoting environmental conservation and social upliftment.

Keywords: Floral Waste Management, DhoopBatti, Sustainable Entrepreneurship, Women Empowerment, Circular Economy, Green Business

I. INTRODUCTION

Floral waste refers to the leftover flowers, petals, and other plant materials that are discarded after they have served their initial purpose. This can include flowers from events, floral arrangements, or even flowers that have wilted or dried up. Instead of being thrown away, floral waste can be repurposed and used in various ways. One common way to manage floral waste is through composting. Composting involves the natural decomposition of organic materials, including flowers and plant trimmings, into nutrient-rich soil. By composting floral waste, we can reduce the amount of waste that ends up in landfills and instead create a valuable resource for gardening and agriculture. The ayuvedic importance of various plant based products has been in scripted in Hindu Religious Books. Here effort has been given to select the ingredients base on their ayuvedic beliefs to manufacture Dhoopbatti"/ Insects repellent. Fragrance of flower is used for aroma therapy for relaxing and calming effect. "Havan samagri" and Neem, marigold are known as insect repellent. Specific plant wood like Mango, "Tulsi", "Bilva", "Pipal", "Bargad" when burnt during Havan they

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works as antioxidant, antibacterial antifungal etc. Cow dung is also used for havan and puja due to its environmental benefits. By finding creative, economical and sustainable way to manage floral waste, we can minimize its environmental impact and make the most out of these natural resources. Natural dhoop is not only effective but also a cost-effective option. By using natural ingredients like floral waste, herbs, and essential oils, you can create your own dhoop at a fraction of the cost of commercially available incense. Plus, it's a great way to repurpose materials and reduce waste. So, not only do you get to enjoy the pleasant aroma, but you also save some money in the process.

A project was done with floral waste management from temples for manufacturing of dhoop-batti insects repellent. One of the very old temples "Morya Gosavi

Temple" situated in Chinchwad village of Pune district, Maharashtra was considered for this project.

Floral Waste Management, Sustainable Entrepreneurship, and Women's Economic Empowerment through the production of eco-friendly dhoopbatti (incense cones). With the increasing floral waste generated from religious and social activities, improper disposal leads to environmental pollution. This study explores an innovative solution by converting discarded flowers into organic dhoopbatti, promoting sustainable waste management and reducing environmental impact. Additionally, the research emphasizes the economic benefits of this initiative, particularly for women, by providing them with skill development, employment opportunities, and financial independence through small-scale enterprises. By integrating circular economy principles, this study aims to create a sustainable model that not only addresses waste management challenges but also fosters women-led green entrepreneurship, contributing to both environmental conservation and inclusive economic growth.

II. PROBLEM STATEMENT

The extensive utilization of chemical insect repellents has raised increasing apprehensions over their detrimental impacts on human health. The absence of accessible and cost-effective insect repellents in numerous rural and marginalized populations intensifies the issue, resulting in a heightened prevalence of insect-borne diseases and economic distress. Consequently, there is an urgent necessity to create a durable, eco-friendly, and cost-effective dhoopbatti/insect repellent that can offer sustained income creation prospects for local communities, while simultaneously enhancing public health and well-being. This project intends to address this problem by developing and accessing a unique, natural, and sustainable dhoopbatti/insect repellant that can suit the demands of these communities.

Sr. no	Material	Process
1.	Flower waste	vermicomposting
2.	Rose petals	Making rose water
3.	Marigold flowers	Making dyes
4.	Flower waste	Making holicolour
5.	Flower waste	Generation of biogas
6.	Marigold flowers	Production of handmade paper
7.	Marigold flowers	Making of dhoopbatti

Floral waste and their useful products.

III. MATERIAL AND METHOD

Materials All the plant powders were procured from local market and they were screened for their quality and then used for the preparation. The cow dung was then pulverized in a domestic grinder and sieved to obtain the fine powder. Cow's ghee was also procured from local market after checking its quality. All the ingredients were taken in required proportion.

Manufacturing of "Dhoop-batti"/ insect repellent

Dry the floral and leaf waste and convert to powder form

Add binding material, all the ingredients as per the requirement of the product.

Kneaded into dough and rest for maturation.

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Manufacture outer cell with cow dung for long lasting incineration and for lacking fragrance. Make a small hole to insert the cotton wick.

Place cotton wick

Fill the cow dung container with the dhoopbatti or insect repellent mixture.

The list of ingredient used here along with their ayurvedic importance has been listed in Table. Flower and leaf remaining were collected from the temple on regular day and special days. Below listed plant wood and leaf were collected from locally available plants. Ingredients like cow dung, camphor, ghee, neem binding material, perfume etc. were purchased from locally available shops. Flower and leaf were segregated, cleaned, dried and pulverised. As neem leaf and neem gond works as insect repellent they also have been used in the dhoop mix. Camphor, perfumer, binder etc. were mixed in different proportion and moulded in different shapes. Product with each proportion was tested for fragrance, smoke produced, ease of incineration, duration of burning etc. By considering ayurveda, the dhoopbatti cost less than market available dhoop, It is cost effective and reduce water pollution as well soil pollution, So from naturally availability material make a dhoopbatti and save the money as well as reduce the floral waste.

List of ingredients and their effect on Human Body.

Ingredients	Effect on Human Body and surrounding environment
1.Flower petals	Show powerful cleansing properties. Essential oils derived from roses/ Jasmin have powerful anti-bacterial properties when applied topically. Burning incense releases antiseptic elements into the air, cleansing the room, relax the mind, improves confidence. Marigolds act as natural repellent of mosquitoes, pests and other insects.
2.Plant wood	The wood of Tulsi, mango, bilva, peepal, neem, bargad etc. plant is used in havans which release maximum antioxidants to keeps the atmosphere clean. At the same time they act as antibacterial, antiviral etc.
3.Plant leaves	The leaves of bilva, neem are antibacterial, antifungal in nature.
4.Kapoor/camphor	Camphor fumes purify the environment. They kill the bacteria viruses & other microbes and act as fantastic antioxidant.
5.Cow dung cake	Purify and detoxify the atmosphere. As per Ayurveda – germicidal, reduces odour, absorber.

IV. ADVANTAGES OF DHOOP BATTI

Dhoop made from floral waste has several advantages. it offers a sustainable alternative to traditional incense. By using floral waste, we can reduce the demand for new resources and minimize environmental impact.

Dhoop made from floral waste emits a pleasant fragrance when burned. This can create a calming and soothing atmosphere, making it ideal for meditation, yoga, or simply creating a relaxing ambiance in your space.

Dhoop made from floral waste can be a way to repurpose and give new life to flowers that would otherwise be discarded. It allows us to appreciate the beauty and fragrance of flowers even after they have served their primary purpose.

Using Dhoop made from floral waste also supports local artisans and small businesses who are involved in its production. By purchasing these products, we can contribute to the livelihoods of these individuals and promote sustainable practices. Overall, dhoop made from floral waste offers a sustainable and fragrant option for creating a pleasant atmosphere while also reducing waste and supporting local communities.

V. OUR WORK

This study explores the potential of utilizing waste flowers to create dhoop (incense sticks), providing a sustainable livelihood opportunity for rural women. Through extensive research and experimentation, an optimized recipe for

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converting floral waste into fragrant dhoop was developed. This initiative aimed to promote environmentally friendly waste management practices while empowering women with a viable income generation source.

A pilot project was conducted in a rural village, where local women were trained in the production of dhoop from waste flowers. The training program equipped participants with the necessary skills and knowledge to produce high-quality dhoop, enabling them to earn a steady income. This initiative demonstrated the potential for sustainable livelihoods to improve the economic and social well-being of rural women.

The findings of this study highlight the feasibility and benefits of utilizing waste flowers to create dhoop, providing a valuable income generation opportunity for rural women. This initiative contributes to the broader goals of sustainable development, environmental conservation, and women's empowerment.

VI. GENERAL METHOD OF ORGANIC DHOOP MAKING.

Finely soften the herb dust and cow in a clean, dry mortar and pestle. Cow's milk, boiled and enriched with clarified butter, underwent further digestion on a hot plate. This enriched mixture was carefully incorporated into the powder blend and finely macerated to achieve a smooth paste. To create Dhoop sticks, a plastic syringe was precisely cut from the apical side, fully opening the syringe's mouth. Using this, along with a plunger, Dhoop sticks were crafted and subsequently dried for four days in an oven set at 40°C. The dried sticks were then securely stored in an airtight container. Following a month of storage, these sticks were employed for the evaluation of their cleansing activity.

Step 1: Prepare the Dough

Mix base ingredients (charcoal powder + sandalwood powder + gum arabic) in a bowl.

Add herbal powders (turmeric, neem, loban) and mix well.

Slowly add warm water/milk/honey to form a thick, kneadable paste.

Step 2: Add Fragrance

Mix in essential oils (5-10 drops per 100g mixture). Optional: Add crushed dry flowers, cinnamon, or camphor for extra aroma.

Step 3: Shape the Dhoop

For cones/sticks: Roll the dough into thin sticks or cone shapes.

For loose dhoop: Flatten into small cakes or pellets.

For agarbatti-style: Coat bamboo sticks with the paste a

Step 4: Drying

Place dhoop in a shaded, well-ventilated area for 2-3 days until completely dry.

Avoid direct sunlight to prevent cracking.

Step 5: Storage & Use

Store in an airtight container to preserve fragrance.

Burn a small piece for aroma & therapeutic benefits.

Variations

Medicinal Dhoop: Add neem, tulsi, or ashwagandha for purification.

Ayurvedic Dhoop: Use guggal, shankhpushpi, or jatamansi.

Floral Dhoop: Use rose petals, jasmine, or marigold powder.

This method avoids synthetic chemicals, making it eco-friendly and safe for daily use. Let me know if you need a specific recipe.

Organic Dhoop Ingredients & Preparation Method.

Category	Ingredients	Purpose
Base/Binder	Charcoal powder, Gum Arabic, Jiggery (natural glue), Honey, Guggal resin	Helps bind the mixture

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Herbs & Resins	Sandalwood powder, Loban (Benzoin), Guggal, Haldi (Turmeric), Neem leaves powder	Aromatic & therapeutic properties
Essential Oils	Lavender, Rose, Camphor, Eucalyptus, Lemongrass, Clove oil	Adds fragrance & benefits
Natural Scents	Dry flower powder (Rose, Jasmine), Cinnamon, Cardamom, Kapur (Camphor)	Enhances aroma
Other Additives	Cow dung (optional, for Vedic dhoop), Water/Milk (for consistency)	Traditional & binding

Ingredient	**Quantity (per 100g)**	**Role in Formulation**
Marigold Powder	15.0 g	Antioxidant, Mosquito repellent.
Neem Powder	15.0 g	Antimicrobial, Insecticidal.
Tulsi Powder	10.0 g	Antiviral, Antifungal.
Sandalwood Powder	10.0 g	Aromatic, Binding.
Cow dung Powder	40.0 g	Disinfectant, Binder.
Timber Powder	--	Binding.
Cow Ghee	50.0 g	Binding, Traditional use
Camphor (Kapur)	50.0 g	Insect repellent, Cooling
Raad	50.0 g	Likely Binding agent
Havan Samgri	50.0 g	(Traditional herb)
Honey	20. 0 mL	binding
Rose water	20.0 mL	Fragrance, binding

Ingredients and Quantity

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VII. MATERIAL AND PRODUCT

Notes:

Exact identity of "Raal" and "Kapoor" not specified in the paper; assumed as traditional additives.

Total dry weight (powders + resins) ≈ 270g (scaled down proportionally for 100g batch). Adjust liquids (ghee, oils, water) to achieve dough consistency.

Cow dung and starch act as primary binders; reduce if paste is too thick.

Method Summary for 100g Batch

Mix dry powders (marigold, neem, tulsi, pudina, sandalwood, cow dung, starch, camphor, guggul, loban).

Add liquids (cow ghee, rose water, orange oil) gradually to form a moldable paste.

Shape & dry: Extrude into sticks/cones; dry at 40°C for 4 days.

Evaluation Parameters:

Drying time: 2 days

Mosquito repellence: 60% efficacy (per paper).

All the plant powders, raal, timber powder, Kapoor, cow dung powder mixed with honey, rose water, oil. This mixture was then added to the mixer and again macerated finely to obtain a fine paste. When it getting perfect required mixture for Dhoop were made using to dhoop making mould. These dhoop were dried for 4 days in required temperature for dry.

Herbs used in incense preparation A previously conducted study revealed the mosquito-repellent effectiveness of essential oils extracted from various leaves, including Cymbopogon Nardus (Citronella), Cymbopogon citrates (Lemongrass), Ocimum Basilicum (Sweet Basil), Ocimum sanctum (Tulsi), Ocimum Americanum (Hairy Basil), Eucalyptus citriodora (Eucalyptus), Eucalyptus globulus (Eucalyptus), Curcuma longa (Turmeric) rhizomes, Citrus sinensis (Sweet Orange) peels, Citrus Limonium (Lemon) peels, SyzgiumAromaticum (Clove) buds, and Pinus

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Roxburghii resins. Furthermore, the study highlighted that extracts from Azadirachta Indica (Neem) seeds not only possess mosquito-repellent properties but also contribute to purifying the atmosphere. This extensive exploration of natural sources showcases their dual role in providing protection against mosquitoes and enhancing environmental cleanliness.

Tulsi Synonyms: - Scared Basil, Holy Basil Family: -Lamiaceae Biological Source: - Tulsi consist of and dried leaves of Ocimum sanctum linn. Chemical Constituent: - It contains approximately 70% Eugenol, Methyl Eugenol, Carvacrol (3%) And Eugenol-Methyl-Ether (20%) Uses: - Oil is often used for its Antibacterial properties, while it can also serve as an effective insecticidal agent when applied appropriately. Medicinal Uses: - Coughing, Sneezing, Relaxation of stress and respiratory health, etc.

Nilgiri Synonyms: - Eucalyptus, Dinkum oil Family: -Myrtaceae Biological Source: - Eucalyptus oil is the volatile oil is obtained by the distillation of the fresh leaves of Eucalyptus Globules and Other Species Eucalyptus Chemical Constituent: - Eucalyptus oil chiefly contain cineole, also known as Eucalyptol (about 80%). It also contains pinene, camphene and traces of Phellandrene, Citronellal, Geranyl acetate Uses: - Eucalyptus oil is used as antiseptic, expectorants and antibacterial properties.

Neem Synonyms: - Margosa Family: -Meliaceae Biological Source: - It consists of all aerial parts of plants known as Azadirachta Indica. Chemical Constituent: -Nimbin, Nimocinol, Quercetin, Nimbinene Uses: - Which have Mosquito Repellent, Insecticide, Antifeedant, Nematicide and Antimicrobial. Medicinal Uses: -Antibacterial, Antimicrobial, Kill Insecticides, etc

Material Materials are the Local plant powders were selected and screened for quality before being utilized in the preparation. Dried cow dung, sourced from a Pune district dairy milk supplier, underwent pulverization in a domestic grinder and subsequent sieving for a fine powder. The procurement of cow's milk and ghee from the local market ensured the quality of these ingredients. A consistent proportion of all components was maintained throughout the preparation.

PROJECT RESULT

The organic incense sticks (dhoop-batti) produced through this initiative are entirely free of synthetic chemicals, making them environmentally friendly. Compared to conventional incense sticks, they produce less smoke, generate minimal ash, and emit a pleasant fragrance. Additionally, the ash can be safely disposed of in the environment without causing harm, while the fumes naturally repel insects. The product is also cost-effective, priced 10-12% lower than traditional alternatives. To address plastic pollution, the incense sticks are packaged in an innovative outer casing made of cow dung and plant-based wood powder, which not only preserves the fragrance for longer but also reduces soil and water pollution.

Sustainable Income Generation for Women Empowerment:

This project not only promotes environmental sustainability by repurposing floral waste into valuable products but also creates livelihood opportunities for women. By involving women in the production process, the initiative empowers them economically and socially, fostering financial independence and skill development. The engagement of local women strengthens community ties and ensures that the benefits of the project are distributed equitably, contributing to long-term social upliftment.

We visited Nere Gaon in Taluka Mulshi with the aim of initiating a sustainable livelihood project focused on empowering rural women through dhoop (incense) stick making. As part of our outreach, we met with the Sarpanch of the village to discuss the potential of this initiative. During our meeting, we explained the concept of converting floral waste and other organic materials into eco-friendly dhoop sticks, which can serve as a source of steady income for local women. The Sarpanch responded positively and extended his full support in coordinating the training program. With his assistance, we were able to gather a group of interested women and conduct a hands-on training session. The women were guided through the complete process—starting from the collection and segregation of floral waste, to drying, grinding, mixing, and molding the dhoop. This training not only imparted them with a valuable skill but also opened up

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opportunities for self-employment. The initiative was well-received by the community and laid the foundation for future activities focused on women's empowerment and sustainable income generation through local resources.

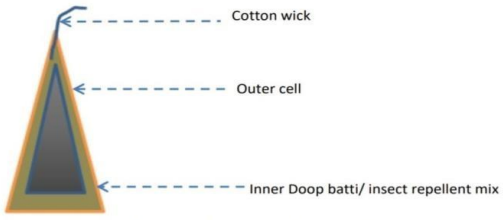
Women Empowerment

Market Appeal and Cultural Significance:

The unique selling proposition of eco-friendly, flower-waste-based incense sticks appeals to environmentally conscious consumers, setting the product apart in the market. The cultural significance of handmade dhoop, combined with its sustainable story, enhances its marketability. By aligning with ethical and sustainable practices, the project builds a positive brand image, attracting customers who value social responsibility. This initiative not only addresses waste management and pollution but also establishes a scalable model for sustainable income generation, benefiting both the environment and marginalized communities.

VIII. MODIFICATION

As per our observation provision incense sticks or dhoop-batti are generally packed with plastic packaging to retain its fragrance. After opening the packet the fragrance of the incense sticks gradually reduces. At the same time the packing waste made of plastic causes environment pollution. Here, an outer cell of mixture of cow dung and above mentioned plant wood powder will be provided as protecting layer. This outer cell will also support the product to rest easily. Cause of this dhoopbatti has a long lasting fragrance. It also reduce the water pollution as well as soil pollution.



Design of modified dhoop batti/ insect repellent

IX. CONCLUSION

This project offers a simple yet powerful solution to two major issues—floral waste pollution and economic challenges faced by women. By converting discarded flowers into organic dhoopbatti, we not only reduce environmental damage but also create sustainable livelihood opportunities for women. This initiative empowers them with skills, financial independence, and a chance to contribute to a greener future. Moreover, the production of organic, chemical-free dhoop ensures a healthier alternative for consumers while promoting eco-friendly practices. With the right support and awareness, this model has the potential to grow, making waste management more sustainable and empowering communities in the process.

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