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Floral Waste Repurposing: A Path to Sustainability and Profitability

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Abstract

India's dry flower industry is a thriving segment of floriculture, leveraging the natural beauty and longevity of dried flowers for domestic and international markets. With annual exports generating ₹100 crores, the industry caters to over 20 countries, including the USA, Japan, and Europe. Simultaneously, floral waste, a significant by-product of rituals and celebrations, poses environmental challenges due to improper disposal methods. This study explores the potential of dry flowers and floral waste recycling in creating eco-friendly, value-added products like compost, incense sticks, natural dyes, and even sustainable leather alternatives. Innovative initiatives by startups and institutions, such as Phool, Holy Waste, and Mahakal Temple, highlight sustainable approaches to managing floral waste while empowering rural women and youth. The recycling of floral waste not only mitigates pollution but also offers economic and employment opportunities. This paper underscores the role of dry flowers and floral waste in addressing environmental concerns, enhancing rural livelihoods, and contributing to a sustainable economy.

Keywords: Dry flower industry, Floral waste recycling, Eco-friendly products, Sustainability, Employment generation

Introduction

Dry flowers are in high demand in both Indian and international markets due to their longevity, low maintenance, and affordability compared to fresh flowers. India, a leading exporter of dry flowers, supplies nearly 500 varieties to over 20 countries, including the USA, Japan, and Europe, generating an annual revenue of approximately ₹100 crores (Reddy *et al.*, 2020). Daily, places of worship in the country produce nearly 20 tonnes of floral waste (Kumar *et al.*, 2022).

Certain flowers, such as *Globosa*, *Helichrysum*, *Acrolinum*, *Celosia*, *Cockscomb*, *Cotton*, *Gypsophila*, *Statice*, *Lavender*, *Larkspur*, and *Roses*, are ideal for drying. Depending

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on the type and storage conditions, dry flowers can last for 2–4 years. Flowers have been integral to Indian culture for centuries, serving both ornamental and ritualistic purposes. Dried flowers, often referred to as everlasting flowers, are produced by removing moisture from suitable plant materials. These flowers are highly valued in floriculture due to their durability, year-round availability, eco-friendliness, and versatility for making products like potpourri and natural spices.

Fresh flowers, though appealing, are seasonal, expensive, and short-lived, whereas dried flowers retain their aesthetic appeal irrespective of the season. The practice of drying flowers dates back centuries and was initially used by botanists for plant identification. The commercial production of dried flowers began in Germany, offering products that combine novelty and practicality. Common drying techniques include air drying, oven drying, microwave drying, glycerin preservation, and freeze drying (Gupta *et al.*, 2021).

Recycling Floral Waste

India faces a significant challenge in managing floral waste, which is a major pollutant in water bodies and on land. Floral offerings, considered sacred, are often discarded into rivers and lakes rather than conventional waste bins. The River Ganges alone receives nearly 8 million metric tonnes of floral waste annually (Mishra & Verma, 2020), and Hyderabad generates about 1,000 metric tonnes from places of worship (Das *et al.*, 2023). This waste pollutes water channels, clogs drainage systems, and releases harmful chemicals, posing health risks to aquatic and terrestrial ecosystems.

In areas without access to water, flower waste is often dumped in landfills or left in heaps, contributing to air and soil pollution and increasing carbon emissions. However, innovative entrepreneurs across India have started transforming discarded flowers into useful products, including:

- **Compost:** Unused parts of dried flowers are converted into organic fertilizers.
- **Value:** added products: Soaps, candles, incense sticks, perfumes, handmade paper, rose water, rose oil, herbal teas, and more.
- **Edibles:** Extracts like *Mahua* flowers are used in jams, jellies, and biscuits, while petals rich in antioxidants (e.g., rose, jasmine) are used in herbal teas.

This recycling not only reduces pollution but also provides employment opportunities for rural women and unemployed youth. Dried flowers and floral waste can also be used in biosorption for wastewater treatment and other industrial applications (Chatterjee *et al.*, 2023).

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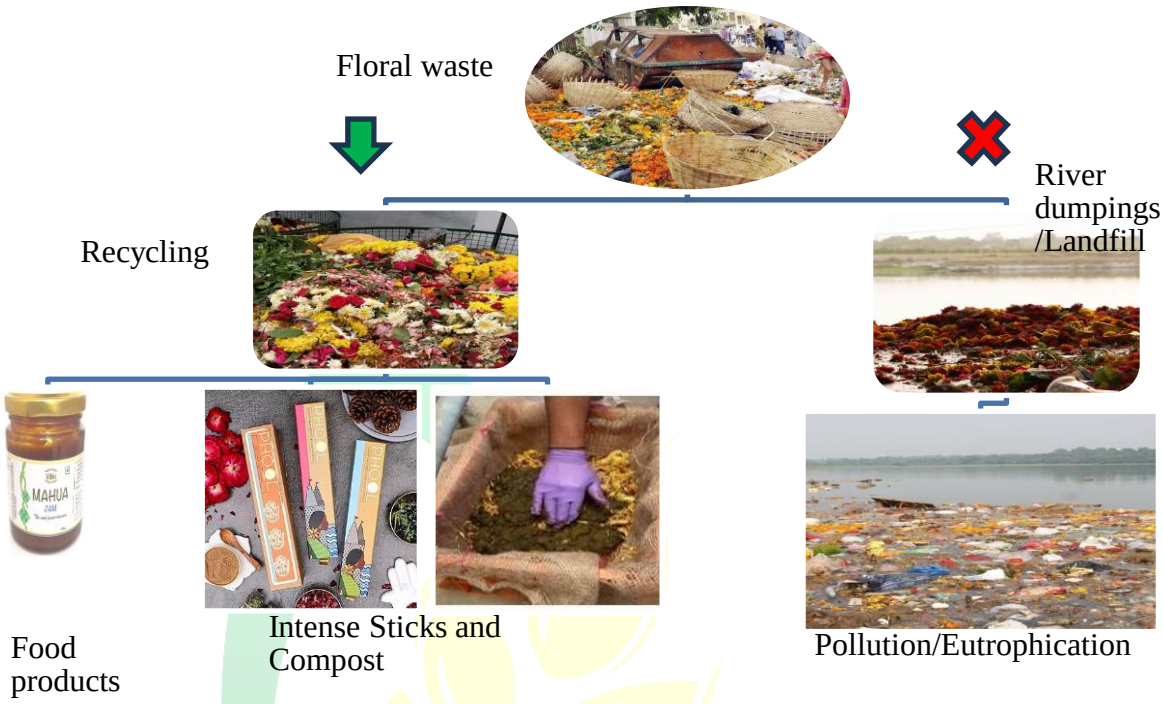

Figure 1. Floral Waste Management: Pathways to Eco-Friendly Products

Economic Potential

Dry flowers offer a high-profit margin of about 65%, making the business financially viable despite challenges (Patel, 2019). The industry holds immense potential, especially for rural women, homemakers, and young entrepreneurs. Workshops, training sessions, and seminars can promote awareness about dry flower technology and foster small-scale industries. Recycling floral waste reduces landfill usage, conserves energy and resources, prevents pollution, and creates sustainable job opportunities. Dry flower technology is not only eco-friendly but also a significant contributor to India's floriculture and craft industries, offering a sustainable livelihood and addressing environmental concerns.

Companies/Startups on Conversion

1. **Mahakal Temple, Ujjain**: With 75,000–100,000 daily visitors, the temple generates 5–6 tonnes of floral and other waste daily. This waste is collected by 'Pushpanjali Econirmit' vehicles and processed at a 3TPD plant to create eco-friendly products. A group of 16 women from the Shiv Arpan Self-Help Group craft high-quality items from

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the floral waste. Additionally, the waste is converted into briquettes and compost, benefiting local farmers and serving as biofuel (Rajput *et al.*, 2022).

2. **Siddhivinayak Temple, Mumbai**: Welcoming 40,000–50,000 devotees daily, with peaks of 100,000, the temple generates 120–200 kg of floral waste daily. Sustainable design house 'Adiv Pure Nature' turns discarded blooms into natural dyes used for creating textiles such as garments, scarves, and tote bags. The company collects 1,000–1,500 kg of floral waste weekly, transforming it into dyes through artisan-led processes. Beyond marigold, rose, and hibiscus, coconut husks are also utilized to create textured prints and vibrant dyes (Iyer & Shah, 2021).
3. **Tirupati Municipal Corporation**: Managing over 6 tonnes of floral waste daily from temples, the city upcycles waste into reusable products through a 15-ton capacity agarbatti manufacturing plant at the Tirumala Tirupati Devasthanam. The initiative employs 150 women from self-help groups, and products are packaged using recycled and plantable *Tulsi* seed-embedded paper to maintain a zero-carbon footprint (Reddy *et al.*, 2022).
4. **Phool, Kanpur:** This innovative startup collects 21 MT of floral waste weekly (3 TPD) from temple towns like Ayodhya, Varanasi, Bodh Gaya, Kanpur, and Badrinath. The waste is transformed into incense sticks, cones, havan cups, and bamboo-less incense. Phool's employees, primarily women, receive fair wages, transportation, and healthcare benefits. Additionally, the company has pioneered 'Fleather,' a sustainable alternative to leather, earning PETA's Vegan Innovation award (Shukla, 2023).
5. **HolyWaste, Hyderabad**: Founded in 2018, HolyWaste collects 1,000 kg of floral waste weekly from 40 temples and other sources. This waste is converted into fertilizers, incense sticks, scented cones, and soaps, preventing it from polluting water bodies or landfills. The company collaborates with vendors, event organizers, and decorators under the process termed 'Florjuvination' (Reddy *et al.*, 2021).
6. **Aaruhi, Delhi-NCR**: Founded by Poonam Sehrawat, Aaruhi recycles 1,000 kg of floral waste daily, collected from 15 temples, into eco-friendly products. With a monthly revenue of over ₹2 lakh, Sehrawat has trained over 3,000 women to create products from floral waste, empowering them economically (Sehrawat, 2022)

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Conclusion

The dry flower industry in India represents an eco-friendly and economically viable sector with immense potential for growth. The ability to convert fresh flowers into durable, aesthetic products extends their utility and reduces dependency on seasonal floral supplies. Simultaneously, the recycling of floral waste addresses critical environmental challenges such as water pollution, landfill overflows, and carbon emissions. Innovative ventures like Phool and Holy Waste have demonstrated the transformative power of sustainable practices, turning discarded flowers into value-added products, thereby reducing pollution and empowering women and marginalized communities.

The convergence of dry flower technology and floral waste recycling exemplifies a circular economy model that aligns with India's sustainability goals. This dual approach of utilizing dry flowers for commercial purposes and recycling floral waste for eco-friendly products can significantly contribute to reducing environmental degradation while providing sustainable livelihoods. Future research and policy support can further enhance this sector, making it a cornerstone of India's green economy.

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