Journal of Advanced Zoology

ISSN: 0253-7214

*Volume **45** Issue **-2** Year **2024** Page 1787:1790*

Utilisation Of Flower Waste For Making Incense Sticks

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History

Abstract: -

In India, it is a common practice for people to carry flowers to temples as offerings; almost 500,000 people do this every day. An estimated 800 million tonnes of flowers are utilized for different functions at various religious places all around the country. Flowers, after they have served their function, are thrown away in the water bodies, which is the primary cause of pollution in them. The main focus of this study is to repurpose discarded flowers into incense sticks. It highlights the collection, segregation, utilisation, and management of waste flowers produced by temples. In this study, rose powder prepared from the flower waste generated in the popular temples of Jaipur city was used as the main ingredient to produce incense sticks. The prepared sticks were also evaluated for their impact on indoor air quality and subsequently compared with both commercially available herbal and chemical incense sticks. This paper introduces a concept for utilizing and managing floral waste generated from temples by transforming it into incense sticks, with the aim of promoting the concept of eco-friendly and sustainable temple practices.

Keywords- Incense Sticks, Temple Waste, Floral waste

INTRODUCTION

Worship is ingrained in the culture of India, and its people practice it as a way of life. Flowers are one of the most common types of offerings made to the numerous deities in the temples of India, which is a country that is home to a diverse range of religious traditions. Flowers such as marigolds, roses, jasmine, chrysanthemums, and hibiscus are often presented as offerings in various religious settings. Because of this, there is an unusually large quantity of unused flowers that are thrown away in their premises. At present, the total amount of flowers that are produced in our nation is 27,85,000 metric tonnes. The floriculture market is expected to expand at a Compound Annual Growth Rate (CAGR) of 20.1% from 2019 to 2024, according to this, India's generation of floral waste will continue to rise in the years to come [1]. The majority of it ends up in landfills, where it does not degrade as quickly as it would normally, since it is combined with other types of trash that are not

biodegradable. The dumping of flowers in waterways such as rivers, seas, and other bodies of water also contributes to water pollution and affects the living species that are present in the water [2]. The production of garbage that is not subjected to any kind of treatment is one of the issues that points to the deterioration of the environment. Because there are not enough facilities for waste management, any activity might result in the production of garbage, which then gets dumped in a sanitary landfill [3]. It is possible to build some useful items out of flower-related offerings to protect our surroundings from the negative impacts that are generated by their disposal. Temple waste comprising flowers and unused coconut shells from offerings, has been utilised to create the fragrant incense sticks [4]. The utilisation of flower detritus in vermicomposting has also been reported extensively [5]. The potential for generating low-cost bioenergy from floral waste in various forms such as biogas, biohydrogen, bioethanol, biocharcoal, or direct burning for heat energy, derived from floral waste disposal has also been studied[6]. Flowers like red rose, hibiscus and marigold have been utilised to extract natural dyes for colouring the cotton fabric; and rose petals are also used to produce essential oils[7][8].

In India, annually, large quantities of floral waste are discarded into rivers and other water bodies, leading to significant pollution. Often, during festivals and ritual ceremonies, flowers are offered to deities, only to be discarded afterward. However, by employing this floral waste effectively, its volume can be substantially decreased. This research focuses on utilizing discarded rose flowers as the primary ingredient in the production of incense sticks. This study represents a modest effort to repurpose and manage waste flowers (especially roses) from temples by transforming them into a valuable, herbal product with added benefits.

OBJECTIVE OF THE STUDY:

Due to concerns regarding the raw materials, quality, and safety of the incense sticks available commercially, there has been a shift in preference towards natural and eco-friendly incense sticks, providing a sense of assurance about the substances that are being inhaled. The major objective of this research paper is to bring forth the idea of sustainable utilization of the floral waste generated from the temples by making herbal incense sticks. The primary aim is to lesser the indoor air pollutants released from the commercially available incense sticks while also addressing the management and disposal of the floral waste generated in temples to achieve sustainability. Utilizing discarded roses from the floral waste of temples as a raw material instead of charcoal, coal tar, etc. in the preparation of the herbal incense sticks is the major highlight of this study.

METHODOLOGY

1. Preparation of incense sticks

1.1 ***Collection and segregation of flowers:*** Rose flowers collected from different temples of Jaipur city during different festivals and occasions were segregated. The petals were separated for utilization and the remaining flower material was discarded.

1.2 ***Preparation of Dough****:* The segregated petals were then weighed accurately and were then allowed to dry completely at room temperature to be converted into fine powder. The dough was prepared by mixing 200 gm flower powder, 200 gm wood powder, 75 gm joss powder, 25 gm binding agent and 25 ml rose fragrance with just enough water to form a pliable substance.

1.3 ***Dough binding***: With the help of the incense stick making machine, the dough was evenly rolled around 6-inch bamboo stick that possesses a smooth surface. After that, the dough-laden sticks were left in the shade for approximately a week to facilitate complete drying.

2. ***Testing of incense sticks***: With the aid of the GRAY WOLF equipment for Indoor Air Quality, Total Volatile Organic Compounds(TVOC), nitrogen oxide, sulfur dioxide, carbon monoxide, carbon monoxide, Suspended Particulate Matter(SPM), Particulate Matter (PM 2.5 and PM 10) were estimated at 26.1^0C in the incense sticks prepared from discarded rose flowers. The test method for all parameters was ISSPL/STP/C/007. The results were then compared with the same parameters for commercially available herbal incense sticks and chemical incense sticks.

RESULTS:

Incense sticks (Figure 1) were prepared by utilizing floral waste, wood, joss, and dried rose petal powder, along with rose fragrance. The Floral Waste Incense Sticks (FWIS) exhibited better results in terms of

atmospheric parameters when compared with both Commercial Herbal Incense Sticks (CHIS) and Commercial Chemical Incense Sticks (CCIS), as illustrated in Table 1. The PM 2.5 levels were found to be 35 ug/m³ for CHIS, 26 ug/m³ for CCIS, and 10 ug/m³ for FWIS. PM10 level for CHIS, CCIS and FWIS were 67 ug/m³, 62 ug/m³, 19 ug/m³ respectively. Carbon monoxide levels were 18.5 mg/m³ for CHIS, 17.5 mg/m³ for CCIS, and 3.0 mg/m³ for FWIS. Suspended Particulate Matter (SPM) values were 102 ug/m³ for CHIS, 88 ug/m³ for CCIS, and 29 ug/m³ for FWIS. Nitrogen dioxide levels were 15.8 ug/m³ for CHIS, 15.9 ug/m³ for CCIS, and 10.2 ug/m³ for FWIS. Sulphur dioxide concentrations were 7.1 ug/m³ for CHIS, 7.7 ug/m³ for CCIS, and 5.3 ug/m³ for FWIS. Carbon dioxide values were 872 mg/m³ for CHIS, 879 mg/m³ for CCIS, and 510 mg/m³ for FWIS. Total Volatile Organic Compounds were Non-Detectable (ND) in all the samples tested. While values of all the samples for all parameters were within permissible limits for CHIS, CCIS, and FWIS; incense sticks made from floral waste i.e. FWIS exhibited significantly lower levels of atmospheric parameters when compared to that of the other two commercially available incense sticks.

Figure 1: Floral Waste Incense Sticks (FWIS)

Parameters	PM (2.5) ug/m³	PM (10) ug/m³	CO mg/m³	SPM ug/m³	NO_2 ug/m³	SO_2 ug/m³	CO_2 mg/m³	TVOC mg/m³
Permissible Limits as per ASHRAE & OSHA	**35**	**150**	**55**	**_**	**9000**	**13000**	**_**	**_**
CHIS	**35**	**67**	**18.5**	**102**	**15.8**	**7.1**	**872**	**10.5**
CCIS	**26**	**62**	**17.5**	**88**	**15.9**	**7.7**	**879**	**9.9**
FWIS	**10**	**19**	**3.0**	**29**	**10.2**	**5.3**	**510**	**ND**

CHIS: Commercially Herbal Incense Sticks
CCIS: Commercially Chemical Incense Sticks
FWIS: Floral Waste Incense Sticks

Table:1 Comparison Results of CHIS, CCIS, FWIS

CONCLUSION: Utilization of the floral waste generated from the temples to prepare herbal incense sticks was one of the major objectives of this study. The indoor air quality parameters of incense sticks made from floral waste were measured and contrasted with the same parameters of incense sticks that are currently available in the market (herbal and chemical-laden). The results obtained indicated that all the indoor air quality parameters lay within the permissible limits as per ASHRAE (American Society of Heating, Refrigerating, and Air Conditioning Engineers) & OSHA (Occupational Safety and Health Administration) guidelines. However, it is evident from the results that the incense sticks prepared from the floral waste are far safer than the commercially available incense sticks, as all the indoor air pollutants released by burning the former are lesser than those released by burning the latter. Using floral waste as the main ingredient not only capitalizes

on the natural attributes of flowers but also offers a sustainable substitute for commercially available charcoal-based incense sticks that deteriorate indoor air quality. By choosing this natural product, we not only save ourselves from respiratory diseases caused by harmful chemicals but also improve the ambient and indoor air quality besides managing the floral waste generated from the temples.

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