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## Standardization of different drying techniques for retaining the colour of chrysanthemum flower powder

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### Abstract

To effectively utilize discarded temple flowers and also as of now there has been no research work done for standardizing the flower powder by different drying techniques. The present study was undertaken to standardize the suitable drying technique for retaining the colour of chrysanthemum flower powder. Among the five drying methods investigated, which include solar poly dryer, microwave oven drying, silica gel drying, hot air oven drying, and sun drying. The highest colour retention was observed in the petals dried using a solar poly dryer and the time took for complete drying is 6 hours.

**Keywords:** Temple flowers, chrysanthemum, solar poly dryer, microwave oven, silica gel, hot air oven

### Introduction

Temples are considered the house of deities, holding great cultural significance for followers of the Hindu religion. Before embarking on any auspicious occasion, adherents visit these temples to seek blessings from their gods. Among them, devout believers visit the temples daily as an integral part of their worship. The commonly used flowers for offerings include rose, chrysanthemum, tuberose and others.

Pilgrims offer flowers to their idols, considering them as divine entities. These floral tributes are made in temples, mosques, churches, gurudwaras, and other places of worship. However, after being offered, the flowers are not reused and are instead discarded. Unfortunately, in India, there is currently no efficient mechanism for disposing of the substantial amount of waste generated by these floral offerings at religious sites across various cities. As a result, an estimated 3.4 to 4.0 tonnes of floral waste accumulates without proper management. (Waghmode *et al.*, 2016) [2].

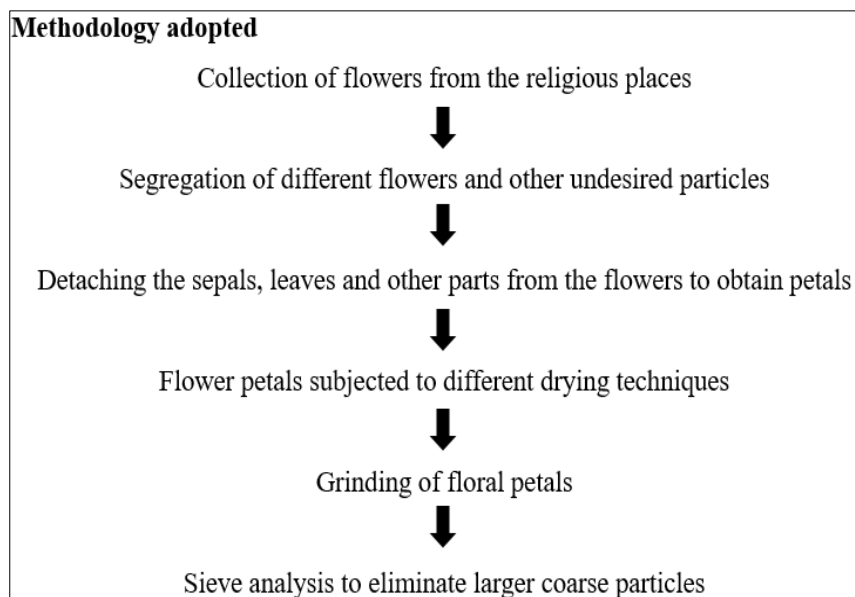
The generation of flower waste from religious activities poses harmful effects on various life forms, making its management a pressing concern. As a result, the present research work focuses on finding effective ways to reduce flower waste.

### Materials and Methods

The study was conducted at Dr. YSRHU- Citrus Research station, Dry flower technology value addition centre at Tirupati, Andhra Pradesh to utilize the worshipped flowers (Nirmalya) for value addition. The experiment was laid out in a CRD (completely randomized design) during the year 2022-23.

In the present investigation the chrysanthemum flowers were collected from various temples under the control of Tirumala Tirupati Devasthanam, Tirupati after utilization. Five different drying techniques were used i.e. solar poly dryer, microwave oven drying, silica gel drying, hot air oven drying and sun drying (Pre-treated flowers in liquid nitrogen) to standardize the colour retention of chrysanthemum flower powder by using Hunter Colour Flex Colorimeter.

The observations recorded for dry weight of flower petals, moisture loss after drying, dry flower powder recovery percentage and the data were subjected to statistical analysis adopting the standard procedure as laid down by Panse and Sukhatme (1985) [1].



### Results and Discussion

From table 2. It shows that among all the treatments the highest dry weight for chrysanthemum flower petals was seen in T<sub>3</sub> (102.00). While, lowest dry weight was noticed in T<sub>5</sub> (62.25). The highest moisture loss per cent (87.95%) for chrysanthemum flower petals was observed in T<sub>5</sub>, whereas the

lowest moisture loss (79.91%) was recorded in T<sub>3</sub>, as indicated in table 3.

In table 4, it was noticed that T<sub>3</sub> yielded the highest dry flower powder recovery percentage for chrysanthemum, standing at (17.85 %), whereas the lowest recovery percentage was observed in T<sub>5</sub> (12.43%) among all the treatments.

**Table 1:** Time taken for drying chrysanthemum flower petals

Treatments	Drying time (hours/min/days)
T <sub>1</sub> (Solar poly dryer)	6 hours
T <sub>2</sub> (Microwave oven drying)	6 min
T <sub>3</sub> (Silica gel drying)	6 days
T <sub>4</sub> (Hot air oven drying)	12 hours
T <sub>5</sub> (Sun drying) pre-treated flowers in liquid nitrogen	6 days

**Table 2:** Effect of different drying methods on the dry weight (g) of chrysanthemum flower petals

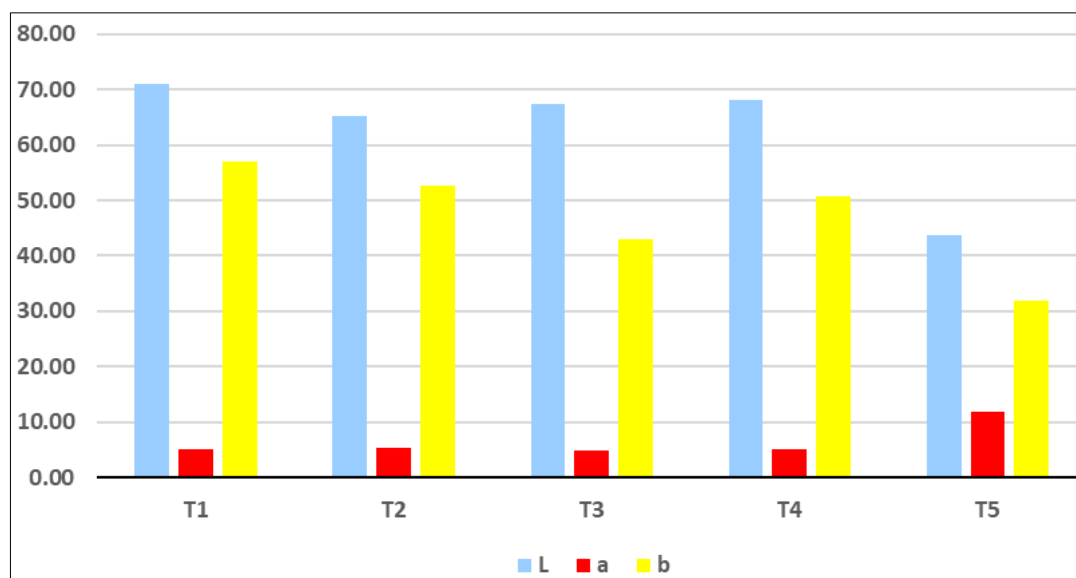
Treatments	Mean
T <sub>1</sub> (Solar poly dryer)	84.00
T <sub>2</sub> (Microwave oven drying)	91.50
T <sub>3</sub> (Silica gel drying)	102.00
T <sub>4</sub> (Hot air oven drying)	84.75
T <sub>5</sub> (Sun drying) pre-treated flowers in liquid nitrogen	62.25
SE (m)	1.14
CD	3.45

**Table 3:** Effect of different drying methods on moisture loss (%) of different flower petals

Treatments	Mean
T <sub>1</sub> (Solar poly dryer)	82.71
T <sub>2</sub> (Microwave oven drying)	81.95
T <sub>3</sub> (Silica gel drying)	79.91
T <sub>4</sub> (Hot air oven drying)	82.50
T <sub>5</sub> (Sun drying) pre-treated flowers in liquid nitrogen	87.95
SE(m)	0.49
CD	1.46

**Table 4:** Effect of different drying methods and flower petals on dry flower powder recovery (%)

Treatments	Mean
T <sub>1</sub> (Solar poly dryer)	15.33
T <sub>2</sub> (Microwave oven drying)	16.23
T <sub>3</sub> (Silica gel drying)	17.85
T <sub>4</sub> (Hot air oven drying)	14.73
T <sub>5</sub> (Sun drying) pre-treated flowers in liquid nitrogen	12.43
SE(m)	0.37
CD	0.53



**Fig 1:** Effect of Hunter colour Flex (L, a and b values) on colour retention of chrysanthemum dry flower powders

From the figure 1. It was reported that the maximum colour retention was seen in T<sub>1</sub> (Chrysanthemum petals kept under solar poly dryer) while, minimum was noticed in T<sub>5</sub> (Chrysanthemum powder dried under sun drying).

### Conclusion

Among all the treatments, the highest dry weight and dry flower recovery percentage was seen in T<sub>3</sub> (Silica gel drying) whereas for per cent moisture loss T<sub>5</sub> [Sun drying (pre-treated flowers in liquid nitrogen)] was found best. The maximum colour retention for chrysanthemum flower powder was noticed in T<sub>1</sub> (Solar poly dryer).

### Future line of work

The maximum colour retention obtained from different drying techniques for chrysanthemum flower powder can be further utilized to create value added products like photo frames, incense sticks and dhoop sticks and dhoop cups etc.

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