



## Research Article

# STUDIES ON DIFFERENT DRYING METHODS IN ORNAMENTAL FLOWERS CONCERNING QUALITY DRY FLOWER PRODUCTS

MIR S.R.\*<sup>1</sup>, SHINDE B.M.<sup>2</sup> AND SONAWANE H.B.<sup>1</sup>

<sup>1</sup>Department of Botany, Prof Ramkrishna More Arts, Commerce & Science College, Akurdi, Pune, 411044, India

<sup>2</sup>Department of Botany, Annasaheb Waghare College, Otur, Pune, 412409, India

\*Corresponding Author: Email - saimarashidmi@gmail.com

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**Abstract:** In the modern era of eco-awareness, dried flowers and dried botanicals have attained substantial growth in horticulture commercial enterprise. Future possibilities of the dry flower industry are relied upon to contribute a ton to the country's economy in contrast to fresh flowers and other live plants. Apart from flower structure and season of gather, the nature of dry flowers inconceivably depends on the method of drying. Hence, the current investigation was undertaken with the objective to determine the appropriate methods of drying in ornamental flowers with respect to quality dry flower products. The ornamental flowers chosen for the examination was exposed to all the drying methods employed in study viz., Air drying, Silica gel drying, Borax drying and Hot air oven drying. Total 25 flower samples were dried and drying time required for each sample was recorded.

**Keywords:** Dry flowers, Drying methods, Ornamental flowers, Value addition

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## Introduction

The interest for ornamental flowers is truly expanding in the global and homegrown market with the improvement in way of life and personal satisfaction. Flowers are magnificent creation of nature considered as an image of adoration, excellence and a worldview of life in sight of their innumerable tones. Govt of India has categorized floriculture as a dawn industry and concurred it 100% export status, owing to consistent expansion in demand of flowers floriculture has become one of the significant commercial trades in agriculture [1]. The fresh flowers, however wonderful in their magnificence, are costly, brief and delicate to temperature and are accessible just during a specific season [2]. Their freshness and excellence are lost because of different biochemical changes and microbial activities, thus can be retained only for few days, even by utilizing the best methods of postharvest technology [3]. The shelf life of flowers could be drawn out only to an extent of 40% even when the best flower additives or chemicals were utilized [4]. To conquer this problem the same flowers and foliages can be dried to prolong their beauty and freshness which hold both economic and aesthetic importance [5]. Thus, dried flowers come as a brilliant option in contrast to fresh flowers and foliage for interior design as well as for a variety of other aesthetic and commercial uses.

Dried flowers are lifelong and can be used number of times to meet the decorative demands, dry flowers provide an outstanding opportunity to Indian entrepreneurs as the country is bestowed with comprehensive variety of floral material, cheap labour and favorable climate [6]. Dry flowers and foliages are attractive and possess number of abilities including ornamental, durable, lifelong and year-round availability [7]. The dried flowers and plant parts are natural, inexpensive and have everlasting value with year around availability [8].

Dry flower industry has developed quickly with more than 60% portion of benefits belonging to the floriculture business [4]. The business extended yearly turnover starting at 2003 was in excess of 150 crores [9]. Potpourris are the significant portion of dry flower industry esteemed at Rs.55 crores in India alone [10]. The business in India is over 40 years old and exports 500 varieties of flowers to 20 nations [11].

The USA is a biggest consumer of dried and artificial flowers assessed at (US \$2.4 million) yearly followed by Germany and UK [11]. Dried flowers can be formed by different drying methods and can be productively utilized in preparation of various decorative and aesthetic products. However, apart from flower structure and time of collect, the quality of dry flowers incredibly relies upon the method of drying. Hence, the current investigation was undertaken to determine the suitable drying methods in ornamental flowers concerning quality dry flower products.

## Materials and Methods

Present investigation was conducted at the research laboratory of Department of Botany, Prof Ramkrishna More Arts, Commerce & Science College, Akurdi, Pune, Maharashtra. The distinct drying methods including Air drying, Silica gel drying, Borax drying and Hot air oven drying was employed to drying of 25 ornamental flowers. Flowers under test were already authenticated by referring literature for the identification. Flowers at the peak blooming season were selected and harvested with proper care along with their beauty, mostly flowers with bright color and slightly at immature stage were harvested. Five flower replicates were used for each treatment and the suitable methods of drying was determined along with approximate drying time taken to dry by the ornamental flowers [Table-1].

## Drying Methods

### Air Drying

Plant material as displayed in [Table-1] was selected and used for the formation of dry flowers via air drying. In this method the floral material was tied with a rope and was kept in hanging position in clean, dark and well-ventilated area and were observed periodically [12].

### Silica gel Drying

Plant material as displayed in [Table-1] was selected for silica gel drying. In this method the silica gel crystals were poured in a container with tight lid, selected flowers were placed in this container and covered to embed in excess silica gel, containers thus prepared, were observed periodically [12].

Table-1 Suitable drying method with approx. drying time of 25 distinct sorts of ornamental flowers

Plant material	Family	Part of plant used	Suitable drying method with Approx. drying time(days)			
			Air drying	Silica gel drying	Borax drying	Hot air oven drying
<i>Anthurium andraeanum</i>	Araceae	Flower	✗(07)	✓(05)	✓(12)	✓(02)
<i>Amaryllis belladonna</i>	Amaryllidaceae	Flower	✗(07)	✓(05)	✗(12)	✓(02)
<i>Bellis perennis</i>	Asteraceae	Flower	✗(08)	✓(06)	✗(10)	✗(02)
<i>Crysanthemum morifolium</i>	Asteraceae	Flower	✓(07)	✓(05)	✓(10)	✓(02)
<i>Cosmos bipinnatus</i>	Asteraceae	Flower	✗(07)	✓(05)	✓(10)	✓(02)
<i>Callisthpus chinensis</i>	Asteraceae	Flower	✗(08)	✓(05)	✗(11)	✓(02)
<i>Dahlia pinnatus</i>	Asteraceae	Flower	✗(08)	✓(06)	✗(13)	✓(02)
<i>Dendrobium nobile</i>	Orchidaceae	Flower	✗(07)	✓(05)	✗(12)	✓(02)
<i>Dianthus caryophyllus</i>	Caryophyllaceae	Flower	✗(09)	✓(06)	✗(10)	✗(02)
<i>Dendranthema grandiflora</i>	Asteraceae	Flower	✗(08)	✓(06)	✗(12)	✓(02)
<i>Eucharis astrophiala</i>	Amaryllidaceae	Flower	✗(07)	✗(06)	✗(12)	✗(02)
<i>Gerbera jamesonni</i>	Asteraceae	Flower	✗(09)	✓(07)	✓(14)	✓(03)
<i>Geranium belladonna</i>	Geraniaceae	Flower	✓(08)	✓(07)	✗(14)	✗(02)
<i>Helianthus annuus</i>	Asteraceae	Flower	✗(09)	✓(07)	✓(12)	✓(03)
<i>Ipomoea purpurea</i>	Convolvulaceae	Flower	✗(07)	✗(06)	✗(10)	✗(02)
<i>Lilium longiflorum</i>	Liliaceae	Flower	✗(07)	✓(05)	✗(10)	✓(02)
<i>Lavendula angustifolia</i>	Lamiaceae	Flower	✓(07)	✓(05)	✓(10)	✓(02)
<i>Narcissus pseudonarcissus</i>	Amaryllidaceae	Flower	✗(08)	✗(05)	✗(10)	✗(02)
<i>Rosa indica</i>	Rosaceae	Flower	✓(07)	✓(05)	✓(12)	✓(02)
<i>Salvia rosmarinus</i>	Lamiaceae	Flower	✓(07)	✓(06)	✓(11)	✓(02)
<i>Spathiphyllum wallisii</i>	Araceae	Flower	✗(08)	✓(06)	✗(12)	✗(02)
<i>Tagetes patula</i>	Asteraceae	Flower	✓(07)	✓(05)	✓(13)	✓(02)
<i>Tagetes erecta</i>	Asteraceae	Flower	✓(07)	✓(05)	✓(13)	✓(02)
<i>Zinnia angustifolia</i>	Asteraceae	Flower	✓(07)	✓(05)	✓(11)	✓(02)
<i>Zinnia elegans</i>	Asteraceae	Flower	✓(07)	✓(05)	✓(11)	✓(02)

### Borax drying

Plant material as displayed in [Table-1] was selected for borax drying. In this method the flowers were carefully placed according to their shape in proper position and were again covered with sufficient quantity of borax so as to all flower heads gets embedded properly in borax material in container. Containers thus prepared, were observed periodically [11].

### Hot air oven drying

Plant material as displayed in [Table-1] was selected for hot air oven drying. In this method the flowers were kept in hot air oven at 45-50°C controlled temperature. Time and temperature combination were selected on the basis of compactness and thickness of flower [11].

### Results and Discussion

Twenty-five types of ornamental flowers were processed for drying by different drying strategies. The data presented in [Table-1] indicated that different flowers are suitable for drying by different drying methods. The great variation in drying time was found under various drying methods. It is seen from the [Table-1] that time required for the drying of flowers with air drying method was found in the range of 07-09 days. The method air drying was found suitable for some flowers. However, it produced dark stiff and fragile products as was also reported by Saima [13]. Pertuit [14] observed that flowers dried by air drying are extremely stiff once dried. Silica gel drying was completed in 5-7 days. The flowers dried in silica gel was found with the maximum retention of color and shape, similar results were obtained by Radha [15]; Saima [5]. Prasad [16] suggested silica gel drying as the best method for delicate flowers like roses, dahlia, carnation etc.

Time required for the drying of flowers with borax drying was found in the range of 08-14 days. This method was found suitable for certain flowers, the flowers obtained were found with good color retention. Although this method of drying requires more time in drying of plant material. However, it is cost-effective and is convenient to use. Similar results of borax drying were obtained by Saima [5]. Sujata [17] reported that borax crystals and sand in the ratio of 1:1 was the best combination for dehydration of flowers along with the retention of color.

Time required for the drying of flowers with hot air oven drying was found in the range of 2-3 days. By this method good quality products with very less

deformation of shape, color and texture was obtained in lesser time. The quality of roses come up as the finest with hot air oven drying. Hot air oven drying is one method where the roses retain their maximum shape, color and texture [18]. The best quality of roses with hot air oven drying was also acquired by Saima [5]; Radha [15]. Verma [12] reported that hot oven drying was the best method to obtain superior quality products.

### Conclusion

The results of the present study indicated that different methods of drying can be followed for the drying of ornamental flowers, but there are some flowers that respond very well to certain drying methods as indicated in [Table-1]. Of all the methods tried good quality dry flower products were obtained by hot air oven drying and embedding drying in silica gel and borax. The drying methods including silica gel drying and hot air oven drying were found suitable to almost all the flowers selected in study. Silica gel being expensive can be substituted with less expensive desiccants viz., borax or both sand and borax can be used in combination with cornmeal for better results. The dry flowers obtained from these drying methods can be employed in generating of diverse value-added products. The sufficient need of awareness among the youth and rural women about the potential of dry flower technology is necessity, which in turn can play a vital role in employment generation.

**Application of Research:** Present study is useful in preparing of different valuable artefacts, and subsequently can be used as part time source of income. Women's especially from socio economically weaker sections of society and rural areas can work collectively to create numerous profitable craft items and can acquire a new business enterprise.

**Research Category:** Dry flowers and dry flower products

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**\*\*Principal Investigator or Chairperson of research: Saima Rashid Mir**

Institution: Prof Ramkrshna More Arts, Commerce and Science College, Akurdi, Pune, 411044

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**Cultivar / Variety / Breed name:** Ornamental flowers

**Conflict of Interest:** None declared

**Ethical approval:** This article does not contain any studies with human participants or animals performed by any of the authors.

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