

Dry Flower Technology: A Profitable Venture to Empower Women

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ABSTRACT

The demand for dried flower-based products is steadily rising in today's eco-aware era owing to their outstanding characteristics, including unwavering quality, accessibility, sustainability, and compatibility for preparing numerous value-added products throughout the year. Various drying techniques can be employed to preserve different flowers, foliage, leaves, and other botanicals for use as decoration and ornamentation. Dehydrated flowers, foliage, seeds, and other products constitute India's dry flower industry. Suitable drying techniques can be applied to almost any sort of flower, including leaves and other botanicals. The process of drying is a crucial factor in determining the quality of dried flowers, in addition to flower structure and collection time. Air drying, press drying, desiccant drying, microwave oven drying, hot air oven drying, glycerin drying, and leaf vein clearing are some of the different processes involved in the production of dried and appealing plant material. The flowers dried using the aforementioned methods can be used to create a variety of aesthetically important items, thus creating employment opportunities, especially for rural women and housewives.

Key words: *Dry flowers, Drying techniques, Leaf vein clearing, Skeleton leaves, Floral craft, Aesthetic products, Women empowerment*

Introduction

Fresh flowers are stunning and spectacular, they are regarded as exquisite work of nature that convey admiration, excellence, and a positive outlook on life in view of their endless hues (Saima, 2022). Fresh flowers, regardless of how beautiful they are, are pricey, ephemeral, temperature-sensitive, and only available in certain seasons. Their freshness and quality are lost due to various biochemical changes and microbiological activities, and they can be retained only for a few days, even with the best post-harvest technologies (Datta, 1999). To conquer this issue, the same flowers and foliage can be dried with various drying procedures to expand their appeal and economic importance (Saima Mir *et al.*, 2020).

The drying techniques result in the preservation of flowers and foliage, and the products obtained can be successfully utilised in the preparation of various floral decorations and different commercial items (Saima Mir *et al.*, 2019)^a. Compared to fresh flowers, which lessen their allure and attractiveness, dried flowers persist for a longer period if dried with an appropriate method of drying. 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 (Saima, 2022). The practice of drying flowers in India is an enduring and widely recognised process. Dry flowers have been traded over the past 40 years, and today, India is one of the leading nations in this market. Dry flowers are the most prominent sector of

the floriculture industry, which is growing significantly in global trade, accounting for more than 60% of the benefits to the floriculture business. (Ranjan and Mishra, 2002). The United States, Japan, Australia, Europe, and Russia account for 60–70% of India's dry flower export market. Exporting companies at Kolkata in West Bengal, Tuticorin in Tamil Nadu, Mumbai in Maharashtra, and Hyderabad in Andhra Pradesh are earning 10-15 times greater returns than regional markets (Verma *et al.*, 2012).

Dried flowers are exported to more than 59 countries. India exported dried flowers worth \$4.17 million in the years 2020 and 2021 (April–November). In the years 2020-2021 (April–November), the total volume of exports was roughly 32,84,910. In the year 2018, the total volume of dried flowers exported around the world was 347,469. The results demonstrate that Indian exporters of dried flowers have great potential to grow their market share and boost their numbers (Vidhya *et al.*, 2021). The industry is offering significant opportunities for the national economy in diversified dimensions by fostering entrepreneurship and job possibilities. Dry flowers can be created following simple drying techniques by lowering the water content while retaining the color and shape of the flowers to the maximum extent, so as to preserve their beauty and consequently their value. The various methods used for the drying of plant materials include. Air drying, press drying, desiccant drying, microwave oven drying, hot air oven drying, glycerin drying, leaf vein clearing, etc. The demand for dried flower-based commodities is progressively increasing due to their unparalleled qualities and suitability for a variety of value-added products. Dry flowers are modest, extensive, and hold their aesthetic worth regardless of the period (Saima Mir, 2022). Dried flowers are versatile enough to produce a variety of economically important products, which in turn can empower a large number of individuals, especially housewives and rural women (Saima Mir, 2021).

Selection of a suitable plant specimen to get better quality products

The primary requirement for obtaining higher quality products is the selection of a suitable crop. The plant material selected for the drying process can be harvested throughout the year. Almost every sort of plant material, including leaves, flowers, cones, branches, seed pods, and tree branches, can be dried effectively employing different methods of drying.

The following important measures should be taken while collecting the plant material to get the intended results:

- Plant specimens, including flowers, foliage, leaves, must be healthy (they should be free from any insect or environmental damage) and should always be cut with a sharp cutter.
- It is best to collect the foliage at the peak of its developmental period. However, the flowers can be collected at various stages of development.
- Flowers often lose color in the process of drying, to retain the color brightly colored flowers should be always chosen.
- Before being subjected to the process of drying, plant material should be wiped off with any moisture.
- Plant material to be dried should be collected in larger quantities to allow for some loss.
- Plant material should be processed for drying soon after the collection to get better quality products.

The appropriate season of harvesting

The appropriate season for harvesting the plant material for drying is important to get optimal results. The proper phase of flowers to be reaped is the point at which they have just started to develop or are at a completely open stage. However, it varies as per the species and the form of flower desired. Fresh plant material should be gathered for drying, while blurred and old ones should be discarded. Different plant flowers can be gathered at different phases. However, they should be collected only once they attain maturity. To preserve the color, flowers should be picked either at the buds stage or later stages until their colour has not blurred. Datta (1997) recommended that flowers and foliage should be gathered from the fields a couple of days after irrigation. The gathered material should be liberated from surface dampness and dew. Subsequently, it is better to gather the material in the dry season on a bright day. White *et al.* (2002) reported that materials like dry grasses, seeds, pinecones, and most seed heads should be reaped in their full maturity stage towards the end of their developing season before they become wilted.

Methods of drying

Drying of flowers is a technique by which flowers can be preserved for longer periods, or the method of removing moisture from the selected flowers and

foliage's (Saima Mir *et al.*, 2019)^b. The quality and appearance of dried flowers and other dried botanicals are heavily influenced by the drying strategy. Various methods involved in the production of dried plant material are: air drying, press drying, desiccant drying, microwave oven drying, hot air oven drying, glycerin drying, leaf vein clearing, etc.,

Air drying

For air drying flowers of superior quality, a slightly immature stage should be selected, and thereafter stripped off the foliage and hung upside down in a warm, dark area. Similarly, flowers can be scattered over blotting sheets or newspapers and left in the light or the dark. Air drying is a commonly used method for drying plants. Plant materials are fastened to a rope or wire and hung in the sun or in the dark to expedite the drying process for one to two weeks in a warm, dark place with adequate air circulation, depending entirely on the moisture content, temperature, and humidity. Oversized flower heads should be hung separately. The majority of the flowers can be dried on their own stems. Yet, some flowers, like strawflowers, have delicate stems and require the insertion of a wire before drying to support the flower. Flowers should be kept in the same position and without touch for the next 1-2 weeks for absolute drying. The more fleshy the foliage or flowers, the longer it takes to dry. To obtain better a quality of dried flowers employing this technique, the stage of harvest is also crucial. Strawflower, Globe amaranth, Salvia, Chrysanthemum, and other flowers should be picked at the bud stage or partially opened because they continue to open while drying (Smith, 1993). Straw flowers, statice, and other flowers with a crisp texture suit well for this drying technique (Susan, 1993). This technique is basic and modest. However, the drying time is longer, and these flowers typically hold straight stems after drying. Air drying is suitable for drying a wide variety of flowers. However, throughout this process, some of the flowers lose their color and become rigid and black (Saima Mir *et al.*, 2020).

Press drying

Press drying is an extensively used method that was first documented in 1820. Eventually, it was used for the preparation of herbariums by botanists and herbalists. Pressed and dried plant specimens can be used as ornamental elements, educational tools, or sources of reference for plant identification. In press

drying, a plant specimen is placed within the folds of absorbent paper, and the material is dried by applying the appropriate amount of pressure. Exaggerated imbrications of plant parts and unnecessarily folding of leaves should be avoided. The pressure can be applied in various ways, such as with the help of a plant press. The plant press is equipment that is particularly designed for botanists to flatten plant samples. It is composed of an exterior board and an inner board, two robust boards with screws or straps that can be tightened around them to apply pressure. In addition, the blotting paper with plant material can be kept between the heavy books to accomplish press drying. The time required by the plant material to dry by press drying varies with the type of plant material and the water content of the tissue, but it should be completed within four weeks (Sell, 1993). Even so, the drying time can be shortened if the sheets are exposed to an appropriate temperature in the oven. Most flowers and leaves are suitable for pressing, except those with bulky center, such as succulents, and odd-shaped flowers, such as daffodils. In that case, it needs to be cut in half and opened out before pressing (Anonymous, 2001). The shape of the material cannot be maintained as it becomes flattened because the fresh material, after pressing within the iron or wooden frame, tends to stick to the paper (Prasad, 1997). However, most flowers and foliage dried by this method retain their maximum color (Saima Mir, 2021).

Desiccant Drying Methods

Embedded drying in desiccants is one of the most significant method of drying flowers, especially delicately structured and heavily moist flowers that shatter or deform when air dried. This method is beneficial for delivering flawless life to flowers in both form and color. The commonly used desiccants are silica gel, sand, and borax.

Silica gel drying

Embedded drying in desiccants is one of the best methods of flower drying. The desiccants sawdust, sand, borax, and silica gel are frequently used. However, for delicate flowers like roses, dahlias, carnations, etc., silica gel is the best desiccant for getting the excellent quality of dry flowers that retain shape and colour (Saima Mir *et al.*, 2021)^a. The use of silica gel has dramatically extended the variety of flowers that can be dried. Silica gel is lightweight, streams

smoothly, and is easy to spread throughout each part of the flower for rapid drying. It requires 5-8 days to dry, and flowers that are not suitable for air drying can be well dried with this method. Even though silica gel is a pricey desiccant, it can be potentially recycled multiple times (crystals of silica gel can be dried properly in an oven at 100-125 °C temperature to be reused many times).

Sand drying

Sand drying is one of the earliest and least costly methods for the dehydration of flowers. The sand used as a desiccant for flowers must be fine, clean, dry, and preferably salt-free. In this procedure, a suitable amount of sand (about an inch or two) is poured into a box or container, the material of interest is organised in accordance with its shape, and the sand is very carefully dusted around each petal without altering the position or shape of flower. The resulting containers must be kept for drying in a warm, and well ventilated area for 1-2 weeks.

Borax drying

Borax as a desiccant can be used in the drying of flowers and can also be used in conjunction with sand and cornmeal to attain the best possible outcomes. This method involves adding a sufficient amount of borax to the bottom of the container, then placing the chosen flowers in the appropriate positions, and then covering the entire surface with enough borax to ensure that all of the flower heads are properly embedded in the borax material inside the container. The resulting containers must be kept for drying in a warm and well ventilated area for 1-2 weeks.

Microwave oven drying

The process of microwave oven drying involves creating an electrical microwave that agitates the water molecules, therefore releasing moisture from organic materials. It's a rapid strategy, and the product quality maintains colour and shape better. Microwave oven drying is not suitable for all types of flowers. It works wonderfully with flowers that feature numerous petals, like marigolds, roses, carnations, and zinnia. Flowers with clusters of florets, such as Golden Rod, Gypsophilla, and Corn flower, are better suited for microwave drying. Whereas, this method of drying is not recommended for flowers with thick petals or high water content, such as orchids, magnolias, and hyacinths (Verma *et al.*,

2012). In this method, the flowers are placed in a microwave safe compartment. Set a little cup of water in the microwave prior to cooking to avoid over-drying. Drying time differs as per the form and degree of moisture of the flower. However, plants are typically dried in 2-5 minutes, and the material is kept at room temperature (for 4-5 hours as setting time).

Hot air oven drying

In this method, the plant material is kept at controlled temperature conditions for a specified time. The flowers are inserted through holes in a wire mesh rack in the oven. Time and temperature combinations vary from plant to plant and mainly depend upon the compactness and thickness of flowers. Temperature plays a significant role in the drying of flowers and other plant parts by influencing both qualitative and quantitative parameters. The rate of transpiration is significantly higher at higher temperatures, with the increase in temperature, the diffusion pressure deficit of air increases, which stimulates diffusion of the internal moisture surface and further increases its vaporisation rate, thus leading to high moisture loss at higher temperatures (Mayank, 1980). Half opened flowers or flowers at the bud stage are suitable for drying in a hot air oven, while completely opened flowers are not appropriate as their petals free versatility and strip off effectively on drying (Verma *et al.*, 2012). This method yields superior quality products with the retention of both shape and color, excluding white colored flowers, in a shorter time (Saima Mir *et al.*, 2020; Saima Mir *et al.*, 2021^b).

Glycerin drying

Glycerin drying is comparatively economical and has an excellent water-holding capacity; it has been used by numerous workers, notably for the prolonged preservation of leaves (Joyce 1998). Many different kinds of foliage have been successfully preserved by immersing leaves or crushing stems in a 33 percent glycerol solution. The resultant leaves are soft and flexible. In glycerin drying, the quality of the product was good as moisture in the flower was replaced by a mixture of water and glycerin (Paul 2002). This technique works better on foliage than on flowers, though some flowers can be used, including rose hips, ringers of Ireland, statice, hydrangeas, woman's mantle, and narcissus (Anonymous 2001). Glycerinisation is best for preserving small

tree branches where glycerin enters the leaves and becomes brown. The normal time taken for drying is 2-3 weeks (Dana 2002). For glycerin drying, one part of glycerin is mixed with two parts of warm water, and the desired plant material is kept in a glycerol water solution at a 5 cm depth. It takes 1-3 weeks for drying, depending on the plant material.

Leaf vein clearing

It is well-known that people utilise an array of plant materials for decorative purposes in multiple ways. The leaf venations that have been reduced to their system of veins can be made to preserve the unceasing attractiveness of leaves, in which both the qualities of nature's creation and the enthrall of craftiness can be enjoyed. Fantabulous images of leaf veins can be acquired from leaves from which the soft tissue is excluded. Leaf clearing is a natural process, but it takes a long time to expose the inner mantle of leaves. The naturally processed skeleton leaves have a deteriorated network of veins. Hence, it cannot be used in any application because of the damaged structure of the venations (Saima Mir *et al.*, 2019)^a. This procedure removes all green tissue but keeps the veins of the leaf intact. In this procedure, leaves are boiled for 40 minutes in a solution of 1 teaspoonful of baking soda or lye per quart of water and then rinsed with cold water. The tissue between the veins is removed cautiously with the help of a soft brush. To lighten the color of the leaf skeleton, they can be processed for bleaching in 1-quart water and 2 tablespoons of household bleach solution for 2 hours (Saima Mir *et al.*, 2021^c). The leaf skeletons thus obtained can be preserved and used for the preparation of different value-added artefacts (Saima Mir 2020). Plant material suitable for the process of skeletonization are heavily textured and mature leaves. (Saima *et al.*, 2013).

Summary

Dry flowers obtained from various drying procedures can be used to generate a variety of financially valuable products, including beautiful greeting cards, wall hangings, gift cards, calendars, coasters, table mats, candle decorations, skeleton leaves, various arrangements of dried flowers, and endlessly varied floral designs. Dried flowers that are breath-takingly colorful and vibrant can be organised or assembled in a variety of ways to create a striking arrangement. Press-dried flowers and greenery can

be used to create a wide range of crafts, including picture frames, handmade paper, candles, calendars, landscapes, greeting cards, wall plates, wall quilts, and lamp shades. Conversely, the dried flowers produced by hot air oven and silica gel drying are excellent since they retain the most color and shape, making them suitable for a variety of floral arrangements for interior design. Cleared leaves obtained from leaf vein clearing can be incorporated to add elegance to any dry flower arrangement. Similarly, dry flowers acquired from other methods of drying can be employed in the production of diverse products with added value. Therefore, dried flowers have a wide range of applications, particularly for young people without jobs, housewives, and rural women, as dry flower technology may be used to create endless value. It could begin as a small-scale business that women may run from their homes. Women are incredibly capable of creating new business sectors and can perform admirably while still taking care of their families, which in turn could help them grow in confidence, independence, and self-reliance. The need for sufficient awareness is necessity regarding the potential of dry flower technology through workshops, seminars, and training programmes.

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Conflict of Interest - None

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