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Dry Flower Technology in Intensifying Livelihood and Employment Generation: A Review

Saima Rashid Mir

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ABSTRACT

Dry flowers have been used as commercial art for many years, with an immense business enterprise throughout the world. Beautifully arranged dried flowers may be a little bit pricier, but they are quite long-lasting and can last for many years. The dry flower industry is offering a big opportunity for the national economy in diversified dimensions by creating job opportunities and entrepreneurial development. Dry flowers are modest, extensive and hold their aesthetic worth regardless of the period. Air drying, press drying, embedded drying in desiccants, hot air oven drying, microwave oven drying, glycerine drying and skeletonization are among the techniques used to create dried appealing plant material. The dried flowers obtained using the aforementioned drying procedures can be used to make a variety of value-added products, including greeting cards, photo frames, tablemats, coasters, wall hangings, landscapes and different types of flower arrangements.

Key words: Dry flowers, Drying methods, Employment generation, Floriculture, Value addition.

Department of Botany, Prof. Ramkrishna More Arts, Commerce and Science College, Akurdi, Pune-411 044, Maharashtra, India.

Corresponding Author: Saima Rashid Mir, Department of Botany, Prof. Ramkrishna More Arts, Commerce and Science College, Akurdi, Pune-411 044, Maharashtra, India.
Email: saimarashidmi@gmail.com

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Fresh cut flowers are appealing and attractive, but maintaining their allure and fresh appearance for an extended period of time is difficult. To overcome this issue, the same flowers and foliage can be dried with various drying procedures to increase their magnificence and aesthetic importance (Saima *et al.,* 2020). The idea of flower drying is an age-old and well-established process in India. Dry flowers and other dried botanicals have been traded throughout the previous 40 years and today, India is one of the driving nations in this industry. Dry flowers are the key components of the floriculture industry, which is rapidly rising in international trade. This industry has developed quickly, with more than 60% of benefits belonging to the floriculture business (Ranjan and Mishra 2002). 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 to 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 USA is the biggest consumer of dried and artificial flowers, assessed at US $2.4 million yearly, followed by Germany and the UK (Bhattacharjee and De 2003).

The demand for dried flower-based commodities is steadily increasing due to their exceptional features such as never-ending quality, year-round accessibility, eco-friendliness and suitability for the creation of various value-added products. Floral craft items like cards, floral segments, wall hangings, landscapes, calendars, potpourris, *etc.*, could be made by utilising these dried flowers or foliage. Thus, with different drying methods, the number of flowers, foliage, hard shoots, seeds, barks, grasses, *etc.*, can be preserved and can be employed in the generation of diverse economically useful products (Saima 2021), which in turn can empower people in abundance, specifically rural women and housewives.

Drying methods

The present study was carried out at Research Laboratory, Department of Botany, Prof Ramkrishna More Arts, Commerce and Science College Akurdi, Pune during 2020-2022. Drying of flowers is a method of preservation of flowers or the process of disposing of moisture from the flowers. Dehydration of flowers and other botanicals can be accomplished using a number of drying techniques. Air drying, press drying, embedded drying in desiccants, hot air oven drying, microwave oven drying, water drying, glycerin drying and skeletonization (Drying methods shown in combined Fig 1a) are some of the more well-known and widely used techniques. The variety of flowers and foliage are well dried and respond very well to certain drying methods. Some plant materials, on the other hand, are naturally dry and require little work to preserve them.

Fig 1a: Different methods of drying.

Air drying (Verma *et al.*, 2012)

Air drying, often known as “Upside Down” or “Hang and Dry,” is the simplest and most cost-effective way of drying. Flowers of good quality, somewhat at an immature stage, should be chosen for drying. In this method, the plant material is appended to rope or wire and kept in a hanging position in a warm, clean, dark, well ventilated area with low humidity. Flowers take 1-2 weeks to dry, totally dependent upon the moisture content, temperature and humidity. Bryan (1992) found air drying to be the most effortless technique to dry roses, statice, straw flowers, *etc*. This technique can be used to dry a wide variety of flowers. However, some of the blooms lose their colour and become black and stiff as a result of this process (Saima *et al.,* 2019). Roses, larkspur, statice, helichrysum, acroclinum, salvia, chrysanthemum, delphinium and other plants are suitable for air drying.

Press drying (Bhutani 1990)

Press drying is one of the oldest techniques in use, with the first reference dating back to 1820. It was later used by botanists and herbalists to prepare herbarium specimens (Lawrence 1969). Plant specimens that have been pressed and dried can be used as teaching aids, reference sources for plant identification, or as ornamental material. In press drying, plant material is inserted between the folds of absorbent paper and pressure is applied until the material is completely dried. The duration required for 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 take no longer than four weeks. However, the drying time could be reduced if flowers folded in sheets are put in the oven at an appropriate temperature (Datta 1997). Most flowers and leaves are suitable for press drying, except those with bulky centres, 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 *et al.,* 1997). However, most flowers and foliage dried by this method retain their maximum colour (Saima 2021). Roses, candytuft, daisy, statice, ferns, zinnia, cockscomb, silver oaks, thuja, ixora, lantana, verbena and other plants are suitable for press drying.

Embedded drying in desiccants (Battarcharjee and De 2003)

Embedded drying is one of the best methods of flower drying, especially for those with a delicate texture and high moisture content, which shatter or distort when air dried. The commonly used desiccants are sand, borax, sawdust and silica gel. 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. The use of silica gel has significantly extended the varieties of flowers that can be dried. Silica gel is light in weight, streams effectively and makes it simple to encompass all the parts of the flowers for quick drying. It requires 5-8 days to dry and flowers that are not suitable for air drying can be well dried with this method. In the embedded drying method, the desiccant is evenly spread at the bottom of the container, the selected flowers are carefully positioned in the right position according to their shape and the container is then covered with enough desiccant to ensure that all of the flower heads are properly embedded in desiccant. Containers thus prepared should be kept in a well-ventilated place and should be observed periodically. Silica gel has been discovered to be the best desiccant for eliminating moisture from foliage

and flowers (Gupta and Prashant 2005). The flowers dried with silica gel are less deformed and retain maximum colour (Saima *et al.,* 2021). The plant materials suitable for embedded drying are: rose, aster, carnation, marigold, dahlia, zinnia, chrysanthemum, delphinium, geranium, larkspur, *etc.*

Hot air oven drying (Battarcharjee and De 2003)

Temperature plays an essential role in the drying of flowers and other plant parts in this method of drying. Specimens are kept at a specific temperature for a certain amount of time. The exact combination of time and temperature varies from plant to plant and is mostly determined by the compactness and thickness of the flowers. The temperature of 40-45°C, on the other hand, is ideal for the drying of most flowers. Flowers that are half opened or in the bud stage are excellent for drying in a hot air oven. However, fully opened flowers are not suitable, as their petals lose their versatility and strip off easily when dried (Verma *et al.,* 2012). This method yields superior quality products with the retention of both shape and colour, excluding white-coloured flowers, in a shorter time (Saima *et al.,* 2021). Plant material suitable for hot air oven drying includes roses, marigolds, gerbera, orchids, zinnia, marigold, chrysanthemum, anthurium, *etc.*

Microwave oven drying (Thomler 1997)

Microwave oven drying works by generating an electronic microwave that releases the moisture from an organic substance by agitating the water molecule. It is a quick strategy with higher product quality that is better in terms of maintenance of colour, shape and texture. The drying time in a microwave oven differs as per the size and moisture content 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 a setting time so that the moisture evaporates and the plant material is completely dried. Plant materials suitable for hot air oven drying include roses, marigolds, carnations, gerbera, helichrysam *etc.*

Water drying (Anonymous 2001)

There are some flowers that dry well in water by the process of evaporation (Sushil Kumar *et al.,* 2021). In this method, the stems of the flowers are first positioned in water at a few inches deep where water is taken up by the fresh flowers to keep the petals intact. The container and flowers should be kept in a dry, warm and dark area for 6-10 days to dry normally. Anonymous (2001) suggested that Hydrangea, Gypsophila and Alchemilla mollis should be picked and set in an upright position in a jar with an inch of water in the base. When the flowers have utilised all the water, they have dried effectively. Plant materials suitable for water drying are *Hydrangea macrophylla, Centaurea cyanus, Gypsophila* spp., *Celosia argentea* and *Moluccella laevis*.

Glycerin drying (Joyce 1998)

The use of humectants to preserve ornamental plant parts is common. Humectants are hygroscopic compounds that draw water vapour from the surrounding atmosphere to assist in retaining the suppleness of dried plant material. As a result, the preserved material is significantly less brittle than dry material, making it more resistant to shattering and mechanical damage. Glycerine is the most commonly used humectant for preserving plant parts. In this method, one part of glycerine is blended with two parts of warm water and the appropriate plant material is kept in a glycerol water solution at a depth of 5 cm. The duration of treatment varies from 2-3 weeks depending upon the texture and size of the plant material used. Plant materials suitable for glycerinization are aspidistra, magnolia, eucalyptus, *etc.*

Skeletonization (Saima *et al*., 2013)

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 enthralling of craftiness can be enjoyed. Fantabulous images of leaf veins can be acquired from leaves from which the soft tissue is excluded. In skeletonizing leaves, it is important to choose leaves that are naturally perfect and haven't been damaged by insects or environmental conditions. The selected leaves are thoroughly rinsed with water to remove any debris or dust. The leaves are then introduced into the flasks containing freshly prepared aqueous yeast solution and kept for fermentation for skeletonization. After completion of fermentation for an optimal period, the leaves are taken out of the solution and kept in a vessel of clean water. The tissue between the veins is removed very carefully by brushing from the middle rib to the leaf edge and by using more water to wet the leaf between brushings, if needed. The best way of separating the two parts is by carefully rubbing the leaf between the thumb and finger when the leaf skeletons are cleared off the soft matter. The wet leaves are then laid perfectly flat on a piece of paper with a porous texture for drying. One can preserve the lovely skeletonized structure of different kinds of leaves and use them as decorations, bookmarks, gifts, or mementos. The leaf skeletons thus obtained can be dyed with vibrant colours and can be used for the preparation of a variety of flowers and other value-added artefacts (Saima *et al.,* 2019). Plant material suitable for the process of skeletonization is heavily textured and matured leaves (Saima *et al.,* 2013).

Bleaching

It is a chemically induced discoloration or whitening process. Dry flowers and skeletonized leaves are characterised by discoloration due to yellowing or some other undesirable colour. To lighten discoloration, plant material can be bleached using oxidative and reductive bleaching agents or sulfured. As oxidative bleaches such as chlorites, hypochlorite and peroxides or peroxy compounds break down coloured compounds, adding reductive bleaches such as borohydrides and sodium sulphide tends to convert them into colourless compounds. The chemical property of sodium chlorite makes

it an excellent bleaching agent, as it selectively binds to lignin without damaging the fiber. Among reductive bleaches, zinc or sodium hydrosulfite is the least expensive and offers the strongest bleaching power. The bleached plant material can be immediately incorporated into a variety of floral arrangements or can be dyed with different colours. Bleaching allows the usage of dyes for the colouring of plant material.

Dry flower products

Dry flowers obtained through various drying methods (Fig 1b) can be used to create a variety of economically useful products such as artistic greeting cards, wall hangings, gift cards, calendars, landscapes, table mats, coasters, candle decorations (skeleton leaves can be embedded in earring/pendants to enhance the beauty of the jewellery), various dried flower arrangements and floral designs of numerous varieties with no limits. To create a beautiful, appealing, fascinating and long-lasting dried flower item, all one needs is some wild imagination. The following are some of the dried flower items:

Greeting cards

Beautiful and artistic greeting cards can be made with dried flowers. Card paper is required for the greeting card, as well as a suitable background of matching floral material, which is chosen and arranged on the card paper according to the desired design before being affixed to it using adhesives. This procedure can also be used to prepare a number of other valuable items.

Candle making

To enhance the attractiveness of candle making, dried flowers can be used. Dry flowers are simply placed next to basic candles outside for decorating. Alternatively, dried flowers can be pulverised and put on waxy paper, which is then filled with light melted wax and rolled.

Potpourris

Potpourri is a fragrant blend of dried plant parts such as flowers, leaves, seeds, stalks and roots. For the preparation of potpourri, a fixative is required as it is responsible for absorbing and gently releasing the fragrant oils. Potpourris are a significant portion of the dry flower industry, esteemed at Rs. 55 crores in India alone (Murugun *et al.,* 2007). As gifts and personal items, potpourris (room fresheners) are becoming increasingly popular. Rose petals, gomphrena, marigold petals and lotus pods can all be used to make potpourri. Herbs such as artemesia, thyme, sage, rosemary, basil, achillea (yarrow), lavender, scented geranium, mint, marjoram, verbena, anise and fennel can be used for scent.

Dry flower arrangements

Dry flowers and foliage can be used to create unique, appealing and artistic flower arrangements that can be used as interior decor. They can be placed in various vases in the same way that fresh-cut flowers are. In dried flower arrangements, roses, statice, straw flower, paper flower, billy button, nigella, briza, brumus, larkspur, roses, lavender, achillea and other flowers, as well as dried grass seed heads and pods, can be used.

Packing and storing of dry flowers

Since dried flowers are fragile, they require extra care when handling and storing them. The packaging materials provide a protective support during shipping to reduce lesions. Dry flowers and dry flower products are always stored in a moisture-proof container and should always be avoided in direct sunlight or areas with high light intensity to maintain their form and beauty. Silica gel is used to absorb excess

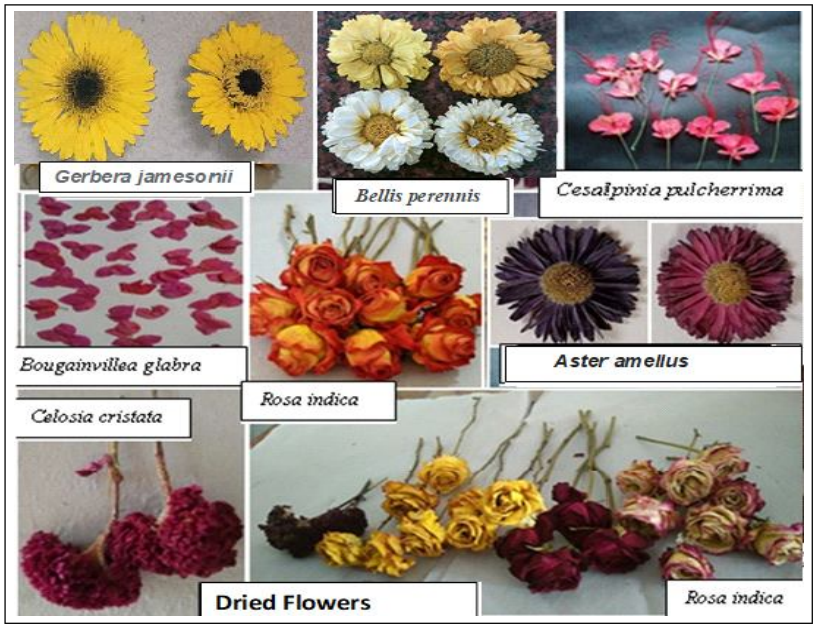

Fig 1b: Dry flowers obtained following different drying methods.

moisture from the product. As a result, before final packaging, silica gel sachets are placed on the lower side of the container. The moisture content of dried items is checked before final packing. The packaging materials should be tightly coated with polythene to prevent the access of exterior moisture and to guard against insect pests. Proper packaging and storage are required to keep their colour and shape for a longer period of time.

CONCLUSION

Dry flowers can be formed by simple drying methods in which, along with the reduction of water content, the colour and shape of flowers are retained to a maximum extent, preserving the beauty and thus the value of the flowers. Artistic greeting cards, calendars, landscapes, wall plates, wall quilts, visiting cards, photo frames, candle holders, handmade paper, lamp shades and more can all be made with press-dried flowers and foliage. On the other hand, dried flowers obtained by silica gel drying and oven drying can be used in a variety of floral arrangements for interior design since the product quality obtained through these methods is superior in terms of colour and shape retention. The skeleton leaves can also be used to add beauty to any dry flower arrangement. Dried flowers from other drying methods can also be utilised to create a variety of value-added goods. Hence, dry flower technology has a wide scope of use, especially for unemployed youth, housewives and rural women, as countless valuable products which hold both economic and aesthetic importance can be made using different drying techniques. Proper training, awareness, motivation and funding can encourage the physically challenged, housewives and rural women to start small-scale ventures in this business opportunity. Awareness can be raised through workshops, exhibitions and training programmes by which individuals could be directed to achieve sustainable livelihood and income by converting agro-items into value-added products. This could lead to the development of sustainable livelihoods and income generation for women, which in turn would develop self-esteem, self-reliance and self-dependence among women.

Supplementary materials

Supplementary material will be provided on request to author.

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