

Drying and Dehydration of Flowers and Foliage of Bundelkhand Region for Value Addition

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FIGURE 1. Dried flowers (Image Courtesy: papik.pro, 2022)

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SUMMARY

Dry flower industry is contributing about 70 % share of flower export from India. The technique of drying of flowers is not new and has been practiced over the centuries. Dried flower arrangements remain as it is, look beautiful and add colour to a home and do not wilt and require replacement unlike fresh flowers. Different flower parts are generally utilized for making dry flowers viz; unopened flower buds, flowers/ inflorescence, fruits/pods, leaves, twigs etc. which can be utilized either as it is or after value addition for making various dry flower products.

INTRODUCTION

There is great potential of growing variety of flowers in India due to its varied climate. Flowers have been associated with man from centuries and have their own importance. Flowers are required in various celebrations, functions, ceremonies etc. from dawn to the dusk. In India, flower cultivation is generally done for the production of cut flowers and loose flowers. Generally cut flowers and loose flowers are highly perishable and can be preserved for short period by careful post-harvest handling. By using best post-harvest management practices, we can extend the shelf life of the flowers ranging from few days to few weeks only, but the technique of drying or dehydration can be utilized for extending their life for months to years. Sometimes due to glut in market and pandemics like COVID-19, the farmer cannot realize profits and forced to dispose of the produce in the market and therefore, value addition is one of the best alternatives under such circumstances. India is bestowed with rich biodiversity of plants comprising a wide range of ornamental trees, shrubs, climbers, perennials etc. which are not being utilized as fresh or loose flowers but their branches, flowers, fruits, cones, bark etc. can be utilized for making dry flowers by preserving them through dehydration. Apart from adding aesthetic beauty, drying of flowers is a lucrative income generating option for entrepreneurs. Dried ornamental products have a wide range of qualities like variety, novelty, longevity, aesthetic beauty and flexibility. Dry flowers and ornamental plant parts have great potential and can substitute fresh flowers and foliage for interior decoration.

In the last 2-3 decades, the export of dried flowers and products is about 70% of the total floriculture export. India exports dry flowers to USA, Europe, Japan, Australia, Far East and Russia. Dried flowers constitute nearly 15% of the global floriculture business.

Initially raw material from India was exported, but nowadays value added products like greeting cards, wall hanging, floral designs, gift boxes, pot pourries are being exported. Apart from this, dried flowers and foliage can be utilized for making calendars, bouquets, floral balls, festive decorations, paper weights, pendants, table pieces. The demand of dried flowers and their products is rising with increasing standard of living. The range of dried flowers and other attractive plant parts is extensive viz., stems, roots, shoots, buds, flowers, inflorescence, fruits, fruiting shoots, cones, seeds, foliage, bracts, thorns, bark, lichens, fleshy fungi, mosses, sellaginellas etc.

There great scope of dry flower industry in Bundelkhand region of the country so that socio-economic status of the farmers of this area can be uplifted. The available native flora can be utilized as well as the annual crops suitable for this purpose can also be cultivated in the climatic conditions of this region. The species suitable for drying and value addition will be identified. However, some of the native species of Bundelkhand region suitable for this purpose have been identified. Different plant parts of these species can be used as dry flower after drying and value addition. For example, inflorescence or flowers of *Celosia argentea*, *Butea monosperma*, wild grass species etc. and fruits or pods of

Abutilon indicum, *Martynia annua*, *Inga dulcis*, *Nelumbo nucifera*, *Cassia alata* etc. that can be utilized for drying and value addition. In a preliminary study different species of flowers suitable for drying like *Lagurus* sp., *Bromus* sp., *Briza* sp., *Helichrysum bracteatum*, *Acroclium roseum*, *Bracteantha viscosa*, *Limonium sinuatum*, *Gypsophila paniculata*, *Gomphrena globosa* etc. have been cultivated in the university and evaluated for its use as dry flower. Apart from these species, other cultivated species like corn sheaths, cotton pods, panicles of pearl millet, sorghum, pods of linseed etc. are also suitable for making dry flowers can also be cultivated. These species have been commercially utilized and sold in market after bleaching and dyeing.

Essential precautions during dehydration

For ensuring better results and quality products the following points should be considered-

- i. Collect material after the dew and surface moisture has evaporated.
- ii. Collection should be made in dry season and on a sunny day.
- iii. Material should be collected after irrigating fields a day or two.
- iv. Fresh material should be collected.
- v. All stages of flower development in an inflorescence should be collected, which have sufficiently hardened as immature shrivel very fast.

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- vi. Material should be embedded immediately after plucking.
- vii. One type of flowers and foliage should be embedded at one time.
- viii. Undesirable plant portions should be cut before embedding.
- ix. Spread uniformly all plant parts/ petals in herbarium press.
- x. The plant parts should be harvested when highest possible quality product can be harnessed.

Uses of dried ornamental plant parts

These dried items may be used with fresh flowers or alone as floral arrangements, bouquets, gift boxes/packs, festive decorations, collages, flower pitchers, floral balls, pomanders, wall sceneries, sweet smelling pot-pourris have become very popular among the flower lovers especially in European countries.

Techniques for dehydration

(a) Natural Drying

In this method ornamental plant parts are allowed to dry naturally on the plant itself. These are collected as and when completely dried during excursion trips to forests, countryside, gardens or cultivated fields. The plants viz., *Abutilon indicum*, *Aegle marmelos*, *Bambusa* spp., *Bauhinia retusa*, *Cassia fistula*, *Pithecellobium dulce*, *Lagerstroemia flosreginae*, *Martynia annua*, *Sapindus mukorossii* etc. have beautiful fruits or fruiting shoots, whereas plants like *Abrus precatorius*, *Aesculus indica* and *Sapium sebiferum* have beautiful seeds.

(b) Press drying

Press drying was first reported in 1820. Later it was used by the herbalists or botanists for the preparation of herbarium. The flowers and foliage are placed between the pages of a book or magazine or between the folds of newspapers or blotting sheets by giving some space between the flowers/foilage. These sheets are kept one above another and corrugated cardboard sheets of same size are placed between the folded sheets so as to allow the water vapours to escape. The whole bundle is then kept in the room. The drying in oven at 35-39°C for 48 hours was optimum for pansy, whereas 24 hrs. for the leaves of *Grevillea*, *Adiantum*, *Thuja*, *Nephrolepis* and flowers of *Hibiscus*, *Cassia biflora*, *Calliandra* and marigold, while 40-44° C for 24 hrs for *Euphorbia*, *Galphimia*, *Lantana* spp and 45-49°C for a period of 24 hrs for flowers of *Ixora* and *Mussaenda*. The time required for press drying of rose, carnation and *Helichrysum* was 120, 132 and 72 hrs, respectively.

(c) Air drying

It is a common method of drying plant

material in air by hanging of flowers in inverted condition in a well ventilated room. Crisp textured flowers like *Helichrysum* and *Limonium* can be easily dried by this method. Other flowers like *Acroclinium*, *Anaphalis*, *Rumex*, *Holmskioldia* and *Delphinium* can also be dried by air drying. The flower heads of *Hydrangea* and *Gypsophila* can be dried by putting their stems in a little water. The temperature and duration schedule for drying of many flowers like China aster, *Zinnia*, *Tagetes* and *Gomphrena* are different type.

(d) Embedded drying

It is difficult to avoid shrinkage and damage in morphology of dehydrated ornamental plant material during hang-drying mainly due to less of moisture from the cells. To avoid shrinkage and morphological changes in dehydrated materials due to air drying, the flowers and foliage are embedded very carefully in various desiccants such as sand or silica gel in a suitable container. This method can maintain the original shape, colour and size for a long time, thus making them highly suitable substitutes for fresh flowers.

Drying was found much faster with silica gel and borax in comparison to sand due to the strong hygroscopic nature of silica gel and borax which leads to rapid removal of moisture from flowers. Borax being hygroscopic in nature, also bleaches flower petals if embedded for a long time. However flowers like rose, aster, carnation and delphinium dried well in borax. The best quality dried chrysanthemum can be obtained by embedding them in silica gel and keeping them at 50°C for 48 hrs in the hot air over advocated the use of microwave oven for drying of plant material. Different methodology for drying flowers of chrysanthemum and observed that flowers dried in microwave oven embedded in silica gel got the best results.

(e) Oven drying

Hot air and microwave oven are also being used for drying and improving the quality of dried flowers. Microwave oven drying is a fast method which saves the time as well as retains the natural colour of the plants.

(f) Freeze drying

Another effective method of drying is cryo drying or freeze drying. It relies on the principle of sublimation; where by ice under conditions of partial vacuum (less than 4.58 torr) and low temperature (less than 0°C) will evaporate on heating without going through a liquid phase. The colour and even the fragrance are retained in the dried article.

Packaging, Handling and Storage of dried ornamentals

One of the clear benefits associated with dehydrated/dried plant material is its relatively non-perishable nature as compared to fresh parent plant material. As a result packaging and handling should theoretically offer no real problem, but due to less moisture dried plant material is very brittle. Thus, packaging for delicate dried plant material should serve to both contain and protect the product. Therefore, it is advisable to purchase superior grade or standard cartons/ boxes for packing dried plant material. Dried plant material should not be roughly handled during transportation and distribution and it can be done through education by creating awareness of the product characteristics. Dried plant material should be protected from moisture throughout the marketing channel. Dried plant materials absorb atmospheric moisture and lose their shape, therefore, should be stored immediately in moisture proof containers. Different containers like glass desiccators, tin boxes, cartons, wrapped with plastic sheets or wax paper and herbarium vasculums fitted with cork sheet are used for storage of dried ornamental plant material. Small quantity of silica gel may be placed at the bottom to absorb moisture. Protect the material from direct sunlight or more light intensity especially from incandescent lamps. The storage should be dust free and keep the cartons/ boxes clean from time to time. Store separately different dried ornamental plant material and fix proper label outside with complete description of the product kept inside, which will be very helpful during handling, transportation and marketing.

Insect-pests and diseases

Insect-pests can afflict all types of dehydrated plant material. These can be controlled by insecticides applied in solid pest strips or gas (phenyl tablets). Book lice, silver fish, mice are the common pests infesting dried plant material. Microbes notably fungi can be controlled by regulating relative humidity to keep the water activity of the dried plant material below that which does not allow spore germination, mycelial growth and sporulation. As a general principle the development of fungi is negligible below 65% relative humidity. The dried plant material to be packed at low relative humidity and the containers should be properly sealed which preclude fungal growth and prevent suppleness during handling. The common genera of fungi viz., *Aspergillus*, *Penicillium* and *Rhizopus* infest dried plant material. The plant material before collection should be treated with different fungicides.

CONCLUSION

For uplifting the socio-economic status of the farmers of Bundelkhand region dry flower technology can be considered one of the best viable options. The available native flora along with some dry flower species suitable for this purpose can also be cultivated in the climatic conditions of this region can be utilized. Different plant parts after drying and dehydration can be used for making value added products like greeting cards, pot pourri, flower arrangements, photo frames, pomanders, wall hangings, paper weights, jewellery etc.

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