# Standardization of Desiccants and Stage of Harvest under Shade Drying Techniques in Gerbera for Value Addition

Manjunath S. Patil[1] and Dr. A.R. Karale[2]

## ABSTRACT

*The cut flowers are short lived, as they are perishable in nature. Flower drying offers viable solution to preserve the beauty of cut flowers and extend their marketability. A study was conducted to investigate appropriate harvesting stage and desiccant for drying cut flowers of gerbera variety Goliath. Fully opened flowers or three days before harvesting stage were dried in three desiccants namely fine river bed sand, silica gel and mixture of sand and silica gel in 1:1 ratio. The desiccants were used as embedding materials of cut flowers in aluminum boxes. Minimum dry weight (1.17 g/flower) was recorded when silica gel was used as embedding material, while sand resulted the highest dry weight (1.27 g/flower). Minimum number of days (5.10) was required to dry the flowers when silica gel was used as desiccant. Fully opened flowers embedded in silica gel took the least number of days (5.00) for drying. Silica gel was found superior for colour retention indicated by highest score (3.93), retention of shape (3.65) and for retention of shape (3.51).*

**Key words**: Desiccants, harvesting stage, shade drying, value addition, gerbera.

## INTRODUCTION

Gerbera (*Gerbera jamesonii* Hook) is popularly known as 'Transval daisy' or 'Barbeton daisy'. The cut flowers are short lived, as they are perishable in nature. However, the concept of flower drying offers viable solution to preserve the beauty of cut flowers and extend their marketability. Dry flower industry in India is about 40 years old and its products have higher export value. The USA has the largest demand for dried and artificial flowers, which is estimated at US $2.4 million annually, followed by Germany and UK (Datta, 2004). Dry flowers and plant parts hold tremendous potential since they are cheaper and easily available, eco-friendly and biodegradable and the items are varied and many. Flower drying offers excellent prospects, particularly for the Indian entrepreneurs, as the country is blessed with a wide range of flora and fauna, which are the starting materials. The industry also enjoys the benefit of the cheap labour and favourables climate as against other countries (Gurumurti, 1997). Dry flowers are becoming very popular due to non-perishability of the produce leading to their longer life indoor. All kinds of flowers and plants can be dried and preserved in various forms. No organised production for these products is undertaken, but most of the material is collected from natural forests and hilly areas, dried and marketed. At present, there is hardly any domestic market for these products. In view of longer period of enjoyment of these products, people have started investing on them. An arrangement with dry flowers gives pleasure for several months. When tired of it, one can take them apart and store for future use (Conder *et al*., 1993). High quality dry flowers could be produced only from just blooming stage of flowers with thin petals and small flower heads. Therefore, the time of harvest, stage of harvest, pre-treatments, method of drying, type of desiccant used are a few to mention of many factors that decide the final quality of dry flowers. The

[1] Asst. Prof. (Hort), College of Agriculture, Pune-411005, M.S. patilmsflori@rediffmail.com
[2] Principal and Professor, College of Horticulture, Pune-411005, M.S

published literature with respect to effect of these factors on dry gerbera flowers is limited and available methods are to be fine tuned to get high quality dry flowers.

## MATERIALS AND METHODS

The present study was conducted at College of Horticulture, Pune during 2010-11. The gerbera variety used for the present study was Goliath, which bears orange coloured flowers. Healthy flowers at two stages of harvest, *viz*., fully opened flower and three days before harvesting stage with three desiccants, *viz*., fine river bed sand, silica gel and mixture of sand and silica gel in the ratio of 1: 1 were used as embedding materials. The experiment was laid in Factorial completely randomized design with six treatments and five replications. Fine river bed sand was sieved and aluminium boxes with lid were chosen for embedding the flowers. Desiccants were spread to a depth of five centimeter at the bottom of the container. The desiccant was poured up to four to five centimeter above the flowers. Based on the results of experiment-I, best harvesting stage, *i.e.*, fully opened flower stage along with best desiccant (silica gel) was chosen to determine the duration of pre-treatment with glycerol for better texture retention of dry flowers. The fragments of desiccant adhering to petals were removed by brushing gently with fine camel hair brush. The quality parameters like colour, shape texture and appearance were assessed by sensory evaluation done by a panel of judges on a five point scale. The score of 1,2,3,4 and 5 represented very bad, bad, good , very good and extremely good, respectively. With respect to texture, a score of 5.00 represented soft, while a score of 1.00 represented brittle and rest were intermediates between brittle to soft.

The average room temperature recorded during the experiment ranged from 18.5°C (minimum) to 29.5°C (maximum) and average relative humidity was 67.5 percent. The results were analyzed as given by Sunderaj *et al*. (1972).

## RESULTS AND DISCUSSION

The dry weight of gerbera flowers (Table 1) varied significantly due to different desiccants used. The minimum dry weight (1.17 g/flower) was recorded when silica gel was used as embedding material, while sand resulted the highest dry weight (1.27 g/flower). Among the different interaction effects, the flowers harvested at three days before recommended stage embedded in silica gel recorded the least dry weight (1.08 g/flower), while maximum dry weight (1.29 g/flower) was recorded in those flowers harvested at fully opened stage and embedded in sand. Minimum dry weight was obsered in silica gel embedding, which might be due to the fact that silica gel is the till date available fastest drying agent (White *et al*., 2002).

No significant difference was noticed with respect to different stages of harvest which might be due to the fact that rate of dehydration was uniform at both the stages of harvest, as the flowers were exposed to uniform room temperature. Similar observations were reported by Patil (2003) with respect to drying of carnation flowers.

There was no significant difference observed in the moisture loss due to desiccants, harvest stages and interaction effect between stages of harvest and desiccants (Table 1). Number of days for drying, irrespective of harvesting stages, differed significantly due to desiccants of harvest. Minimum number of days (5.10) was required to dry the flowers when silica gel was used as desiccant, while sand took more time (8.90 days). The silica gel was associated with high moisture loss from flowers compared to sand.

This could be attributed to the hydrosorbent properties of silica gel. Similar results were obtained in rose by Gangadharswamy (2003).

Among the harvestn stages, the open flowers required minimum number of days (6.54) to dry, while flowers harvested at three days before recommended stage required maximum (7.53) days to dry irrespective of desiccants used. Among the interactions, the fully opened flowers embedded in silica gel dried earliest (5.0 days) while flowers harvested at three days before recommended stage and embedded in sand required longer period (9.70 days) for drying (Table 1). The silica gel granule is composed of a vast network of interconnecting microscopic pores, which attract and hold moisture by a phenomenon known as physical adsorption and capillary condensation. Through this phenomenon, it acts as a dehydrating agent (Anon., 1997). White *et al*. (2002) reported that silica gel is the fastest acting drying agent available till today.

Silica gel was significantly superior for colour retention as indicated by flowers dried in it by recording the highest score (3.93), while those dried in sand got least points (2.49) for the same. Among the interactions, drying the fully opened flowers by embedding in silica gel scored maximum points (4.75) followed by fully opened flowers embedded in 1: 1 sand: silica gel (4.00), while flowers harvested at three days before recommended stage and dried with sand scored the least points (2.00) (Table 2). Silica gel has been reported to be the fastest acting desiccants (Musagrave, 1998 and White *et al*., 2002). The results of the present study were in harmony with the aforesaid reports, wherein silica gel by acting as drying agent could produce better quality dry flowers compared to sand. Similarly, better colour retention was obtained in the flowers harvested at commercial stage in statice by Padmavathamma (1999) and in China aster by Raju (2001).

The silica gel was significantly superior for retention of shape as indicated by flowers dried in it by recording the highest score (3.65), while those dried in sand received the lowest (2.60) points. There was non-significant difference in the shape of dried gerbera flowers due to the influence of different stages. The flowers harvested 3 days before recommended stage of harvest embedded in silica gel scored maximum points (4.25). Drying open flowers by embedding in the mixture of sand and silica gel scored next to best (3.05), while the least score (2.55) was recorded by flowers harvested at three days before recommended stage and embedded in sand. This might be due to compactness of most of the petals and attainment of attractive shape as compared to fully opened flowers. Among the different desiccants, the appearance of dried gerbera flowers was good in flowers embedded in silica gel, which recorded maximum score of 3.70 compared to the flowers embedded in sand (2.40). The different stages of harvest and flowering had no significant influence on the appearance of dried flowers. There were no significant differences observed in the interaction effects between desiccants and harvest stage. The flowers dried in silica gel recorded maximum score (3.51) for retention of good texture, while the least score (2.40) was recorded by the flowers when sand was used as a desiccant. The highest score of 3.92 was recorded by fully opened flowers dried in silica gel, which was on par with the flowers dried at fully opened stage with the mixture of silica and sand in the ratio of 1:1 ratio, while the least score (2.31) was recorded by the flowers harvested at three days before recommended stage and embedded in sand (Table 2). This might be due to optimum moisture retention by the flowers dried at fully opened stage with silica gel as desiccant. This result is in conformity with the findings of Patil (2003) in carnation.

**Table 1.** Influence of desiccants and stage of harvest on dry weight, moisture loss and time taken for drying of gerbera under shade

| Treatment | Dry weight (g/flower) | Moisture loss (%) | Time taken for drying (days) |
|---|---|---|---|
| **Desiccant (D)** | | | |
| Sand | 1.27 | 82.01 | 8.90 |
| Silica gel | 1.17 | 82.68 | 5.10 |
| Sand : silica gel (1 : 1) | 1.20 | 82.10 | 7.11 |
| S.Em± | 0.01 | 0.20 | 0.16 |
| C.D. at 1% | 0.04 | NS | 0.58 |
| **Stages of harvest (S)** | | | |
| Fully opened stage | 1.22 | 82.18 | 6.54 |
| Three days before harvesting stage | 1.21 | 81.66 | 7.53 |
| S.Em± | 0.01 | 0.22 | 0.20 |
| C.D. at 1% | NS | NS | 0.70 |
| **Interaction (D x S)** | | | |
| Three days before recommended stage of harvest with sand | 1.26 | 81.42 | 9.70 |
| Three days before recommended stage with silica gel | 1.08 | 81.53 | 6.30 |
| Three days before recommended stage with silica gel : sand (1 : 1) | 1.12 | 82.09 | 8.10 |
| Fully opened stage with sand | 1.29 | 82.07 | 7.90 |
| Fully opened stage with silica gel | 1.26 | 82.38 | 5.00 |
| Fully opened stage with sand : silica gel (1 : 1) | 1.25 | 82.02 | 5.22 |
| S.Em± | 0.01 | 0.13 | 0.01 |
| C.D. at 1% | 0.03 | NS | 0.05 |

NS = Non-significant

**Table 2.** Influence of desiccants and stage of harvest on quality parameters of dried gerbera as assessed through sensory evaluation

| Treatment | Colour | Shape | Appearance | Texture |
|---|---|---|---|---|
| **Desiccant (D)** | | | | |
| Sand | 2.49 | 2.60 | 2.40 | 2.40 |
| Silica gel | 3.93 | 3.65 | 3.70 | 3.51 |
| Sand : silica gel (1 : 1) | 2.83 | 2.74 | 2.59 | 2.64 |
| S.Em± | 0.11 | 0.12 | 0.09 | 0.09 |
| C.D. at 1% | 0.40 | 0.41 | 0.33 | 0.32 |
| **Stages of harvest (S)** | | | | |
| Fully opened stage | 3.01 | 3.56 | 2.74 | 2.73 |
| Three days before harvesting stage | 3.15 | 2.85 | 3.06 | 3.96 |
| S.Em± | 0.14 | 0.05 | 0.12 | 0.11 |
| C.D. at 1% | NS | 0.19 | NS | NS |
| **Interaction (D x S)** | | | | |
| Three days before recommended stage of harvest with sand | 2.00 | 2.55 | 2.40 | 2.31 |
| Three days before recommended stage with silica gel | 3.25 | 4.25 | 2.31 | 2.81 |
| Three days before recommended stage with silica gel:sand (1:1) | 3.00 | 2.64 | 2.48 | 2.49 |
| Fully opened stage with sand | 2.50 | 2.57 | 2.41 | 2.49 |
| Fully opened stage with silica gel | 4.75 | 2.72 | 4.06 | 3.92 |
| Fully opened stage with sand : silica gel (1 : 1) | 4.00 | 3.05 | 3.34 | 3.04 |
| S.Em± | 0.08 | 0.08 | 0.07 | 0.01 |
| C.D. at 1% | 0.28 | 0.29 | NS | 0.23 |

NS = Non-significant

## REFERENCES:


Anonymous, 1997, Silica gel treatment (desiccants for drying flower). Website: http://www.bbc.org/~thickman/silica.htm.

Conder, S., S. Phillips and P. Westland, 1993, *The Hamlyn Step By Step Flower Craft Book*. Reed International Books Limited, London, pp. 10-14.

Datta, S.K., 2004, Dehydration of flowers: A new diversified product for floriculture industry. In *Emerging Trends in Ornamental Horticulture*, Ed. Reddy, B.S., Janakiram, T., Kulkarni, B.S. and Narayanswamy, P. *Indian Society of Ornamental Horticulture*, New Delhi, pp. 157.

Gangadharswamy, S, 2003, Standardisation of drying techniques in rose. *M.Sc. (Hort.) Thesis*, University of Agricultural Sciences, Dharwad.

Gurumurthi, N., 1997, Dried flowers offer bright prospect for Indian entrepreneur. *Floriculture Today*, **2**(1): 33-34.

Musagrave, M. B., 1998, Drying and preserving flowers and plant materials for decorative use. Website: www.aces.edu.

Pandmavathamma, P., 1999, Standardisation of drying techniques for statice cut flower. *M.Sc. Thesis*, University of Agricultural Sciences, Bangalore.

Patil, K., 2003, Standardisation of drying techniques in carnation for value addition. *M.Sc. (Hort.) Thesis*, University of Agricultural Sciences, Dharwad.

Raju, M. S., 2001, Standardisation of drying techniques for China aster cut flower. *M.Sc. Thesis*, University of Agricultural Sciences, Bangalore.

Sundarraj, N., S. Nagaraju, Venkatramu, M. M and Jagannath, M. K., 1972, Design and analysis of experiments. Directorate of Research, University of Agricultural Sciences, Bangalore, pp. 424.

White, P., Tjia, B. and Sheehan, M. R., 2002, Drying and preserving plant materials. Website: http://edis.ifas.ufl.edu/body-ep004.