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STANDARDIZATION OF DEHYDRATION TECHNIQUES FOR PRODUCTION AND QUALITY OF DRY FLOWERS IN *DENDROBIUM NOBILE* CV. MARY TROWSE

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ABSTRACT

The present investigation was carried out to evaluate the effect of different embedding media and traditional drying methods on the dehydration behaviour of *Dendrobium nobile* cv. Mary Trowse flowers. Flowers were embedded in borax (M_1), silica gel (M_2) and a borax–silica gel mixture (M_3) and subjected to shade drying (Dm□) and sun drying (Dm,). The results revealed a progressive reduction in moisture content from 83.63% on Day 1 to 49.30% by Day 7, accompanied by a corresponding increase in moisture loss (16.74% to 90.21%) and change in diameter (0.158 cm to 0.749 cm). Among the embedding media, silica gel (M_2) recorded the lowest residual moisture content and highest moisture loss, whereas borax (M_1) retained the highest moisture. Similarly, sun drying (Dm_2) proved more effective than shade drying (Dm_1) in promoting dehydration. Significant interaction effects were observed, with silica gel combined with sun drying (M_2Dm_2) yielding the lowest moisture content (16.24%) and highest moisture loss (93.36%). The maximum change in diameter was recorded under the combination of borax–silica gel mixture and sun drying (M_3Dm_2). Overall, the study established that silica gel with sun drying (M_2Dm_2) is the most efficient treatment for rapid dehydration and improved dry flower quality in orchids, corroborating earlier reports in rose, gerbera and gomphrena.

Key words : Dehydration techniques, Quality of dry flowers, *Dendrobium nobile* cv. Mary Trowse.

Introduction

Value-addition through dehydration and drying involves reducing moisture content of flowers to a point at which bio-chemical changes are minimized while maintaining cell structure, pigment level and flower shape (Singh and Dhaduk, 2005) and this provides additional income beyond the bondage of seasons. Drying of flowers and foliage by various methods like sun drying, air drying, oven drying, microwave oven drying, freeze drying and embedded drying can be employed for making decorative floral craft *i.e.*, cards, floral designs, wall hangings, pomanders, calendars, potpourri and candles etc.

One of the critical challenges faced by the floriculture sector is the extremely short shelf-life of fresh flowers, which often results in heavy post-harvest losses. Traditional markets in India are highly unorganized, and lack of cold-chain infrastructure further aggravates wastage. Value-addition through drying not only minimizes these losses, but also ensures round-the-year availability of floral products. Dried flowers are lightweight, non-perishable, easy to handle during transport and retain their ornamental value for extended periods, making them ideal for both domestic and export markets.

The growing awareness of environmental sustainability has created a surge in demand for biodegradable and eco-friendly decorative materials. Unlike artificial flowers made from plastics and synthetic fibers, dried flowers are natural, renewable and environment-friendly. With changing lifestyle trends, consumers are increasingly adopting dried flowers for interior decoration, home fragrance, eco-friendly weddings and lifestyle accessories. This aligns with global movements towards sustainable living and offers India an opportunity to position itself strongly in the natural products segment.

Drying and preserving flowers and plant material is a form of artistic expression that has been very popular during the Victorian age and is gaining popularity in recent time. Dried or dehydrated flowers or plant parts (roots, leaves, stem, bark or whole plant) have tremendous potential to substitute fresh flowers and foliage for the interior decoration and other aesthetic and commercial uses.

Despite its growing importance, the dried flower industry in India remains underdeveloped compared to Western countries. Systematic research on optimizing drying techniques, standardizing protocols for different flower species and evaluating quality parameters such as color retention, texture and fragrance is still limited. Innovative approaches, such as microwave-assisted drying, freeze-drying and the use of natural preservatives, hold promise for enhancing the quality and marketability of dried flowers. Furthermore, linking scientific findings with practical training programs for farmers and entrepreneurs can bridge the gap between research and commercial application.

Orchids are beautiful elegant looking flowers that come variety of flowers and they can be made highly suitable reserves for interior decoration and value-added products. Employing scientific drying and preservation techniques for orchids not only reduces wastage but also creates a new niche market for orchid-based decorative products. Research on orchid drying methods can thus provide dual benefits of enhancing farmer income and supplying premium products to eco-conscious global consumers. The dried flowers marketing has grown rapidly has consumers have become eco conscious and choose dried flowers as the biodegradable and environmentally friendly alternative over other products.

Materials and Methods

The present investigation was conducted at PG Laboratory, Department of Floriculture and Landscaping, College of Horticulture, Dr. Y.S.R Horticultural University, Venkataramannagudem. The location falls under agro-climatic zone-10, humid, East Coast Plains and Hills (Krishna-Godavari Zone) with an average rainfall of 900 mm at an altitude of 34 m (112 feet) above the mean sea level. The experimental location was geographically situated at 16.83 °N latitude and 81.5°E longitude. The design used in this investigation was Completely Randomized Design with the factorial concept.

Embedding media used in experimentation

Borax : Fine 0.2-2.0 mm diameter white powder of borax manufactured by Molychem, Mumbai was used as embedded media.

Silica gel : Fine white homogenous powder of silica gel having a size of 60-120 mesh manufactured by Molychem, Mumbai was used as embedded media.

Borax: Silica gel (50:50 v/v) Borax of 0.2-2.0 mm diameter was thoroughly mixed with Fine white homogenous powder of silica gel having a size of 60-120 mesh in the ratio 1:1 was used as one of the embedding media.

Containers used for embedding

For shade and sun drying, embedding materials were filled up in plastic trays of 5.0 cm height, 35.0 cm width, 25.0 cm length and aluminium trays of 6.0 cm height, 23.0 cm width, 33.0 cm length. For microwave oven drying circular steel plates with diameter of 30.0 cm and 4.0 cm height were used.

Methodology adopted for embedding procedure

The tray was filled with appropriate embedding media up to 2.5-3.0 cm depth. The surface of the media was levelled with the help of scale. Each flower was placed in face up position and a layer of media was gradually poured with gentle care, first around each flower then on the top of the flower completely filling the gaps and crevices in between the petals without disturbing any petals. Care was taken that the original shape of flower was not disturbed. The whole flower was completely covered with embedding media and approximately 1.5-3.5 cm layer of embedding media was placed on the top of the flower.

Embedded shade drying

After embedding the flowers in appropriate drying media, the trays were kept in shade in the laboratory. The flowers are kept till they completely dried up properly and the data was recorded at daily regular intervals.

Embedded sun drying

After embedding the flowers in appropriate drying media, the trays were exposed to the sun every day from 9.15 AM – 4.15 PM and shifted to laboratory during evening time and again the next morning they were kept under the sun. This practice was followed till the flowers dried completely and the data was recorded at daily intervals.

Embedded microwave oven drying

In microwave oven drying circular steel plates embedded with flowers placed in electronically operated microwave oven with media, different microwave power level and duration. After completion of duration in microwave oven, the trays along with the flowers (undisturbed) were kept at room temperature for setting till 48 hrs. Readings were taken at 12 hrs interval during the time of setting.

Removal of the embedding material

After completion of the upper 1.5 cm layer of the media was removed drying very slowly and gently from the container. Then very lightly, the fingers were inserted into the media at the edge of the embedded material and gently with the help of fingertips, flowers were lifted from the media. Then it was cleaned with the paint brush to remove the adhered particles from flower surface. The materials were taken out from the media at regular intervals for recording purpose of the observations and placed back in the same media for setting till next observations.

Judging the end points

At the end of drying, the petals of the flowers were pressed with fingers to check the presence of moisture. If the moisture was still present and soft to touch then the flowers were further exposed for drying for complete elimination of moisture from itself.

Observations Recorded

Moisture content of fresh flower (%)

Moisture content of the samples (Fresh flowers) was determined by using the SHIMADZU digital infrared moisture analyzer 200 mg sample of petals taken for the determination of moisture at 170^{0}C and the moisture content displayed directly on percentage basis.

Moisture content after drying (%)

Moisture content of the samples (dried flowers) was determined by using the SHIMADZU digital infrared moisture analyzer 200 mg sample of petals was taken for the determination of moisture at 170^{0}C and the moisture content displayed directly on percentage basis.

Per cent moisture loss after drying (%)

Difference between fresh moisture of flower to the flower after dehydration and expressed in terms of percentage.

Change in flower diameter (cm)

Change in the diameter of the flowers was recorded by using vernier calipers and expressed in centimeters.

Change in flower diameter (cm) = Fresh flower diameter (cm) – Dry flower diameter (cm)

Treatment details

Number of treatment combinations: 6

Number of flowers per treatment: 5

Treatment combinations

T_1- M_1Dm_1: Borax + Shade drying

T_2- M_1Dm_2: Borax + Sun drying

T_3- M_2Dm_1: Silica gel + Shade drying

T_4- M_2Dm_2: Silica gel + Sun drying

T_5- M_3Dm_1: Borax: Silica gel (50:50 v/v) + Shade drying

T_6- M_3Dm_2: Borax: Silica gel (50:50 v/v) + Sun drying

Results and Discussion

Per cent moisture content (%)

The findings reveal that the mean moisture content of the flowers decreased steadily from 83.63% on Day 1 to 49.30% by Day 7.

The differences in moisture content among the various embedding media were found to be significant. The moisture content of the flowers consistently decreased during the drying period. The lowest moisture content was recorded in flowers embedded in silica gel (M_2), which dropped from a mean of 85.20% on Day 1 to 50.56% on Day 7. This was followed by flowers embedded in the borax and silica gel mixture (M_3), which showed a decrease from 83.91% to 58.11%. The highest moisture content was observed in flowers embedded in borax (M_1), which decreased from 81.75% on Day 1 to 66.56% on Day 7.

The drying methods also had a significant effect on the per cent moisture content. The moisture content consistently decreased throughout the drying period. The lowest moisture content was recorded with sun drying (Dm_2), which dropped from 75.52% on Day 1 to 35.58% on Day 7. In contrast, the highest moisture content was found with shade drying (Dm_1), which decreased from 91.75% to 63.03% over the same period.

The interaction between the different embedding media and drying methods was found to be significant from Day 2 to Day 5. The lowest moisture content was observed in flowers embedded in silica gel and dried in the sun (M_2Dm_2), decreasing from 79.19% on Day 1 to 16.24% on Day 7. The highest moisture content was noted in flowers embedded in borax and dried in the shade (M_1Dm_1), which decreased from 91.75% on Day 1 to 70.83% on Day 7. The interaction was non-significant on Day 1, Day 6 and Day 7.

From the results, it can be concluded that the combination of silica gel as the embedding medium and sun drying (M_2Dm_2) was the most effective in reducing the moisture content of the flowers. From the above results it was observed that flowers embedded in silica

Table 1 : Effect of different embedding media and traditional drying methods on per cent moisture content (%) in *Dendrobium nobile* cv. Mary Trowse.

Media (M)	Traditional drying methods (Dm) – Days taken for drying: Initial moisture content			Day 1			Day 2			Day 3		
	Dm_1	Dm_2	Mean	Dm_1	Dm_2	Mean	Dm_1	Dm_2	Mean	Dm_1	Dm_2	Mean
M_1	91.20	92.30	**91.75**	78.50	74.23	**76.36**	67.53	64.78	**66.15**	57.33	54.51	**55.92**
M_2	91.19	91.28	**91.24**	77.10	69.70	**73.40**	65.61	59.51	**62.56**	55.15	49.53	**52.34**
M_3	90.55	91.29	**90.92**	76.30	75.52	**75.91**	66.58	61.48	**64.03**	56.66	51.31	**53.98**
Mean	**90.98**	**91.62**	**91.30**	**77.30**	**73.15**	**75.22**	**66.57**	**61.92**	**64.24**	**56.38**	**51.78**	**54.08**

Factors	SEm (±)	CD @ 5%	SEm (±)	CD @ 5%	SEm (±)	CD @ 5%	SEm (±)	CD @ 5%
Media (M)	-	-	0.11	0.34	0.07	0.21	0.10	0.32
Drying method (Dm)	-	-	0.09	0.27	0.05	0.17	0.08	0.26
M × Dm	-	-	0.16	0.48	0.10	0.30	0.15	0.45

Media (M)	Traditional drying methods (Dm) – Days taken for drying: Day 4			Day 5			Day 6			Day 7		
	Dm_1	Dm_2	Mean	Dm_1	Dm_2	Mean	Dm_1	Dm_2	Mean	Dm_1	Dm_2	Mean
M_1	47.19	44.20	**45.69**	35.48	32.61	**34.05**	27.34	25.21	**26.27**	21.81	19.86	**20.83**
M_2	45.20	41.77	**43.48**	33.30	27.46	**30.38**	26.56	16.16	**21.36**	18.79	13.69	**16.24**
M_3	47.20	43.77	**45.49**	33.40	29.48	**31.44**	22.97	19.41	**21.19**	17.61	15.04	**16.32**
Mean	**46.53**	**43.25**	**44.89**	**34.06**	**29.85**	**31.95**	**25.62**	**20.26**	**22.94**	**19.40**	**16.20**	**17.80**

Factors	SEm (±)	CD @ 5%	SEm (±)	CD @ 5%	SEm (±)	CD @ 5%	SEm (±)	CD @ 5%
Media (M)	0.06	0.20	0.08	0.26	0.09	0.28	0.08	0.24
Drying method (Dm)	0.05	0.16	0.07	0.21	0.07	0.22	0.06	0.20
M × Dm	0.09	0.28	0.12	0.37	0.13	0.39	0.11	0.35

M_1: Borax, M_2: Silica gel, M_3: Borax: Silica gel (50:50 v/v); Dm_1: Shade drying, Dm_2: Sun drying.

gel and dried under sun (M_2Dm_2) record minimum per cent moisture content. Similar results were reported in rose, gerbera and gomphrena by Varu (2014).

Per cent moisture loss (%)

Among the various media, the highest per cent moisture loss was observed in flowers embedded in silica gel (M_2), rising from a mean of 29.80% on Day 1 to 90.21% on Day 7. This was followed by the borax and silica gel mixture (M_3), which increased from 32.43% to 82.04%. The lowest moisture loss was recorded in flowers embedded in borax (M_1), which increased from 16.74% to 77.28%.

The influence of drying methods on per cent moisture loss was also significant. Moisture loss consistently increased throughout the drying period. The highest moisture loss was recorded under sun drying (Dm_2), which increased from a mean of 34.05% on Day 1 to 92.51% on Day 7. In contrast, the lowest moisture loss was found with shade drying (Dm_1), which increased from 18.03% to 88.52%.

The interaction between the different embedding media and drying methods was significant from Day 1 to Day 5. The highest moisture loss was noticed in flowers embedded in silica gel and sun-dried (M_2Dm_2), which rose from 31.43% on Day 1 to 93.36% on Day 5. The lowest moisture loss was observed in flowers embedded in borax and shade-dried (M_1Dm_1), increasing from 13.92% on Day 1 to 77.48% on Day 7. The interaction

Table 2 : Effect of different embedding media and traditional drying methods on per cent moisture loss (%) in *Dendrobium nobile* cv. Mary Trowse.

Media (M)	Traditional drying methods (Dm)																				
	Days taken for drying																				
	Day 1			Day 2			Day 3			Day 4			Day 5			Day 6			Day 7		
	Dm_1	Dm_2	Mean	Dm_1	Dm_2	Mean	Dm_1	Dm_2	Mean	Dm_1	Dm_2	Mean	Dm_1	Dm_2	Mean	Dm_1	Dm_2	Mean	Dm_1	Dm_2	Mean
M_1	13.92	19.57	**16.74**	25.94	29.81	**27.88**	37.13	40.94	**39.03**	48.25	52.11	**50.18**	61.09	64.66	**62.88**	70.02	72.68	**71.35**	76.08	78.48	**77.28**
M_2	15.44	23.64	**19.54**	28.05	34.81	**31.43**	39.51	45.74	**42.63**	50.43	54.24	**52.34**	63.49	69.92	**66.70**	70.87	82.30	**76.58**	79.39	85.00	**82.20**
M_3	15.74	17.28	**16.51**	26.47	32.65	**29.56**	37.42	43.80	**40.61**	47.87	52.05	**49.96**	63.12	67.71	**65.41**	74.63	78.73	**76.68**	80.56	83.53	**82.04**
Mean	**15.03**	**20.16**	**17.59**	**26.82**	**32.43**	**29.62**	**38.02**	**43.49**	**40.77**	**48.85**	**52.80**	**50.82**	**62.56**	**67.43**	**65.01**	**71.84**	**77.90**	**74.87**	**78.68**	**82.34**	**80.51**

Factor	**SEm(±)**	**CD @ 5%**	**SEm(±)**	**CD @ 5%**	**SEm(±)**	**CD @ 5%**	**SEm(±)**	**CD @ 5%**	**SEm(±)**	**CD @ 5%**	**SEm(±)**	**CD @ 5%**	**SEm(±)**	**CD @ 5%**
Media (M)	0.22	0.67	0.19	0.59	0.18	0.55	0.13	0.40	0.12	0.35	0.11	0.35	0.12	0.36
Drying method (Dm)	0.18	0.54	0.16	0.48	0.15	0.44	0.11	0.33	0.09	0.29	0.09	0.28	0.10	0.29
M × Dm	0.31	0.94	0.28	0.83	0.26	0.77	0.19	NS	0.17	0.50	0.16	0.49	0.17	0.51

M_1: Borax, M_2: Silica gel, M_3: Borax: Silica gel (50:50 v/v); Dm_1: Shade drying, Dm_2 : Sun drying.

was non-significant on Days 6 and 7.

From these results, it is clear that the combination of silica gel as the embedding medium and sun drying (M_2 Dm_2) was the most effective in promoting moisture loss. Similar results were reported in rose, gerbera and gomphrena by Varu (2014).

Change in diameter (cm)

The findings clearly reveals that the mean change in diameter (cm) of *Dendrobium nobile* cv. Mary Trowse, as influenced by different embedding media and traditional drying methods, consistently increased from 0.158 cm on Day 1 to 0.749 cm on Day 7.

The differences in the change in diameter as influenced by the various embedding media were found to be significant. The change in diameter consistently increased throughout the drying period. The minimum change in diameter was recorded in flowers embedded in borax (M_1), increasing from a mean of 0.165 cm on Day 1 to 0.755 cm on Day 7. This was followed by flowers embedded in silica gel (M_2), which increased from 0.157 cm to 0.758 cm. The maximum change in diameter was observed in flowers embedded in a borax and silica gel mixture (M_3), increasing from 0.152 cm to 0.741 cm.

The effect of drying methods on the change in diameter was also significant. The change in diameter consistently increased during the drying period. The minimum change in diameter was recorded under shade drying (Dm_1), increasing from 0.150 cm on Day 1 to 0.706 cm on Day 7. Conversely, the maximum change in diameter was recorded under sun drying (Dm_2), which increased from 0.165 cm to 0.793 cm.

The interaction between the different embedding media and drying methods was significant from Day 1 to Day 6. The minimum change in diameter was noted in flowers embedded in borax and shade-dried (M_1Dm_1), increasing from 0.145 cm on Day 1 to 0.727 cm on Day 7. The maximum change in diameter was observed in flowers embedded in a borax and silica gel mixture and sun-dried (M_3Dm_2), rising from 0.161 cm on Day 1 to 0.762 cm on Day 7. The interaction was non-significant on Day 7. Jeevitha *et al*. (2020) reported similar reports regarding diameter change in orchid flowers during dehydration.

Conclusion

The study clearly demonstrated that both embedding media and traditional drying methods exerted a significant influence on the post-harvest quality parameters of *Dendrobium nobile* cv. Mary Trowse

Table 3 : Effect of different embedding media and traditional drying methods on change in diameter (cm) in *Dendrobium nobile* cv. Mary Trowse.

Media (M)	Traditional drying methods (Dm)											
	Days taken for drying											
	Initial flower diameter			Day 1			Day 2			Day 3		
	Dm_1	Dm_2	Mean	Dm_1	Dm_2	Mean	Dm_1	Dm_2	Mean	Dm_1	Dm_2	Mean
M1	5.545	5.305	**5.425**	0.136	0.165	**0.151**	0.260	0.272	**0.260**	0.370	0.382	**0.376**
M2	5.385	5.265	**5.325**	0.145	0.157	**0.151**	0.267	0.279	**0.267**	0.395	0.406	**0.401**
M3	5.445	5.515	**5.480**	0.134	0.152	**0.143**	0.255	0.269	**0.255**	0.369	0.386	**0.378**
Mean	**5.458**	**5.362**	**5.410**	**0.138**	**0.158**	**0.148**	**0.261**	**0.273**	**0.261**	**0.378**	**0.391**	**0.385**

Factors	SEm (±)	CD @ 5%	SEm (±)	CD @ 5%	SEm (±)	CD @ 5%	SEm (±)	CD @ 5%
Media (M)	-	-	0.004	0.004	0.004	0.004	0.004	0.004
Drying method (Dm)	-	-	0.012	0.009	0.012	0.009	0.013	0.012
M × Dm	-	-	0.004	0.004	0.004	0.004	0.004	0.004

Media (M)	Traditional drying methods (Dm)											
	Days taken for drying											
	Day 4			Day 5			Day 6			Day 7		
	Dm_1	Dm_2	Mean	Dm_1	Dm_2	Mean	Dm_1	Dm_2	Mean	Dm1	Dm_2	Mean
M_1	0.485	0.521	**0.503**	0.562	0.631	**0.597**	0.647	0.715	**0.681**	0.717	0.775	**0.746**
M_2	0.421	0.606	**0.514**	0.596	0.650	**0.624**	0.700	0.753	**0.727**	0.768	0.835	**0.802**
M_3	0.466	0.527	**0.497**	0.572	0.639	**0.606**	0.670	0.727	**0.699**	0.750	0.811	**0.781**
Mean	**0.457**	**0.551**	**0.504**	**0.577**	**0.640**	**0.608**	**0.672**	**0.732**	**0.702**	**0.745**	**0.807**	**0.776**

Factors	SEm (±)	CD @ 5%	SEm (±)	CD @ 5%	SEm (±)	CD @ 5%	SEm (±)	CD @ 5%
Media (M)	0.006	0.006	0.007	0.006	0.007	0.006	0.008	0.006
Drying method (Dm)	0.018	0.015	0.020	0.017	0.021	0.018	0.023	0.019
M × Dm	0.006	0.006	0.007	0.006	0.007	0.006	0.008	0.006

M_1 : Borax, M_2 : Silica gel, M_3 : Borax : Silica gel (50:50 v/v); Dm_1: Shade drying, Dm_2 : Sun drying.

flowers. A steady decline in moisture content and a corresponding increase in moisture loss and change in diameter was observed during the drying period. Among the embedding media, silica gel (M_2) proved to be the most effective in reducing moisture content and promoting moisture loss, followed by the borax and silica gel mixture (M_3), while borax (M_1) recorded the least efficiency. Similarly, among the drying methods, sun drying (Dm_2) facilitated faster dehydration and greater moisture loss compared to shade drying (Dm_1). The interaction effects further highlighted that the combination of silica gel and sun drying (M_2Dm_2) was the most effective treatment in achieving rapid and efficient dehydration, with the lowest residual moisture content and maximum moisture loss, while maintaining acceptable flower quality. These results are in line with earlier findings in rose, gerbera and gomphrena (Varu, 2014) and orchid dehydration (Jeevitha *et al.*, 2020), thereby validating the potential of silica gel-assisted sun drying as a simple, cost-effective and efficient technique for quality dry flower production in orchids.

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References

Bhutani, J.C. (1995). Drying of flowers and floral crafts. *Adv. Horticult. Ornamen. Plants*, **12**, 1053-1058.

Datta, S.K., Bose T.K., Maiti R.G., Dhua R.S. and Das P. (1999). Dehydrated flowers and foliage and floral craft. *Floriculture and Landsaping*, 696-703.

Desh, Raj and Gupta P. (2003). Standardizing dehydration technology for ornamental plant parts of shrubs forms mid-hills of Himachal Pradesh. *J. Ornament. Horticult.*, **6(4)**, 357-361.

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

Geetha, C.K., Shalini M., Rajeevan P.K. and Valsalakumari P.K. (2002). Effects of desiccants on drying of Indian blue water lily (*Nymphaea stellata* Wild). National symposium on Indian floriculture in the new millennium. *Indian Society of Ornamental Horticulture*, IARI, New Delhi. Abstract: p. 88.

Harten, C. (2002). Preserving and drying flowers and foliage. http://www. thegardener.btinternet.co.uk/ preserving.html>

Jawaharlal, M., Visalakshi M., Cintu S. and Ganga M. (2013). Standardization for drying, bleaching and dyeing processes in dried flowers. *J. Horticult. Sci.*, **8(1)**, 65-69.

Lee, W.Y., Yoon M.J., Kwak B.H. and Park C.H. (2003). Effects of various drying methods for wild flower. *Horticult. Sci. Technol.*, **21(1)**, 50- 56.

Lourdusamy, D.K., Vadivel E. and Azhakiamanavalan R.S. (2001). Research and development in dry flower technology. *Floriculture Today*, **5**, 8-13.

Murugan, P.A., Thiyagarajan G. and Ramesh K. (2007). Dry flower technology. <http://www.technopreneur.net/ informationdesk/sciencetechmagazine/2007/Dec07/Dry-flower.pdf>

Nataraj, S.K., Kulkarni S.B., Gangadharappa P.M., Reddy B.S., Hegde N.K. and Mathad G.V. (2004). Standardisation of drying techniques in Nerium oleander. National symposium on recent trends and future strategies in ornamental horticulture. *Indian Soc. Ornamen. Horticult.*, New Delhi. Abstracts: p.121.

Nirmala, A., Chanadrasekhar R., Padma M. and Raj Kumar M. (2012). Effect of different media and microwave oven drying on production of quality dry flowers of carnation cv. Master. *J. Res. ANGRAU*, **40(1)**, 1-5.

Singh, A.S.A. (2000). Standardzation of Dehydration Technique for ornamental Flowers of *Zinnia linearis* Benth. *Ph.D. Thesis*. Floriculture and Landscaping Department, Aspee College of Horticulture and Forestry Gujarat Agriculture University, Navsari.

Varu, D.K. (2014). Standardization of dehydration techniques for cut flowers viz., rose, gerbera, gomphrena. *Ph.D. Thesis*. Junagadh Agriculture University, Junagadh.

Yadlod, S.S., Dalal S.R. and Nagare P.K. (2016). Effect of harvest stages, cultivars and drying methods on diameter and quality of dry Dutch Rose flowers. *Multilogic in Science*, **6(17)**, 192-197.