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Silica –Gel Drying an Effective Preservation Technique for Value Addition of Orchid Flowers

K. M. Jeevitha[1*] and Veena S. Jadhav[1]

[1]Department of Family Resource Management; College of Community Science; University of Agricultural Sciences; Dharwad; Dharwad District; Karnataka, India.

Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Aim: Demand of dry flowers is cumulative day by day equally in national and international marketplace, as dried flowers have a prodigious potential as substitute of fresh flowers. This study aims to know the effect of Silica-gel drying technique on the quality of Orchid flowers.
Study Design: The experimental research design was adopted and flowers were subjected to Silica-gel drying technique.
Place and Duration of Study: The study was during October 2017- November 2020 in the Department of Family Resource Management, College of Community Science, Dharwad.
Methodology: White and Purple Orchid were selected and collected from local growers. Moisture loss, time taken for drying, Effect on Qualitative parameters were statistically analyzed. Dried flowers were added value through application of color. Dyed flowers were used in development of products such as frames and potpourris. Cost of each product was estimated and 30 consumers selected randomly assessed the products for consumer acceptability.
Results: The results reveal that in Silica-gel drying technique Orchid has taken 5 days to dry completely. Maximum moisture loss was 81-83 per cent. Color of Orchid had faded and appearance became lusterless. Hence value addition of color was required for these flowers. The most suitable value addition was Fabric paints, Oil and Spray paints. Some value added products were prepared from dried orchids such as frames and potpourris. The consumer acceptability of these products was extremely acceptable.

**Corresponding author: E-mail: jeevithauasd@gmail.com;*

Conclusion: The existing technology has the prospective to employ thousands of people especially to unemployed youths, Schools and College drop-outs, housewives and rural women's as limitless aesthetic products can be shaped using dry flower technology, it can start up a small scale industry from their householdscan perform exceptionally to begin new markets. There is a necessity to generate adequate consciousness about the potential of this technology by workshops and seminars etc.

Keywords: Orchid; silica-gel drying technique; moisture loss; quality parameters; consumer acceptability.

1. INTRODUCTION

Orchids are the second largest families of flowering plants and are distributed throughout the world. Orchids are attractive elegant flowers that come in variety of colours and they can be used in dried flower craft to make value added products. Orchids generally have simple leaves with parallel veins. Orchids are arranged with flowers on an inflorescence. An orchid flower comprises of three sepals, two petals, a lip and the column [1].

Dry flowers are vital export articles equally in Indian and Global markets and Indian export is composed of 71 per cent dry flowers which are shipped to chiefly USA, Japan, Australia, Russia and Europe. The demand for dry flowers is growing at an inspiring rate of 8-10 per cent yearly thus contributing a lot of prospects for the Indian entrepreneurs to arrive in the worldwide floricultural trade [2]. This commerce exports dried flowers and plants from India is about Rs. 100 crores. Potpourri is a main part of dry flower industry appreciated at Rs. 55 crores in India alone. This commerce delivers direct employment to about 15,000 persons and secondary employment to around 60,000 persons. In India, nearly 60% of the resources are obtained from forests and plains, only 40% of the flowers are cultivated for drying and coloring [3].

The purity, beauty and quality of Orchid flowers can be retained only for few days or few weeks. But, beauty and quality of dried orchid flowers can be retained from few months to several years by applying suitable drying technique. In order to reduce the major problem of short life of fresh orchid flowers, drying techniques play an important role. The simplified drying technique such as Silica-gel drying technique is standardized in this study by which they retain their fresh look for several months to several years. Hence, dried Orchid flowers can be made highly suitable reserves for interior decoration and value added products. The dried flowers marketing has grown rapidly as consumers have become "Eco conscious" and choose dried flowers as the biodegradable and environmental friendly alternative over other products [4]. Based on the above rationale, the study on 'Silica-gel drying technique and value addition of Orchid flowers' was undertaken with the following objectives:

1. To assess the effect of silica-gel drying technique on the qualitative characteristics of Orchid flowers.
2. To assess the time taken for drying in silica-gel drying technique for Orchid flowers.
3. To develop value added products and evaluate the consumer acceptability of the developed value added products from dried Orchid flowers.

2. MATERIALS AND METHODS

2.1 Study Area

The present investigation was carried out in the year 2017-20 in the Department of Family Resource Management, College of Community Science, University of Agricultural Sciences, Dharwad, Karnataka [Fig. 1].

2.2 rocurement of Flowers

Cut flower were harvested in the early morning or late evening hours because the water requirement is comparatively less and have higher vase life. The flowers were cut at their stem in an angle using sharp pruning shears. The cut flowers were placed in water. They were placed in shade avoid heat stress and unusual drying of petals. The two different colours i.e., White and Purple Orchid flowers were chosen and collected from the local flower growers for the experimentation purpose [Fig, 2].

2.3 Selection of Drying Technique

In this research study selected flowers dried in silica gel. It is a chemical desiccant with high

moisture absorbing capacity to dry flowers. Silica gel must be used in an airtight container. If it becomes saturated with moisture, it will not have the capacity to dry flowers. Hence it must be dried again by placing it in an oven. Spread in a shallow pan, place in a warm oven (250°–275°), stirring occasionally until it returns to its original bright blue colour. Store silica gel in an airtight container until it is used again.

2.4 Silica-gel Drying Process

Long and shallow plastic containers were chosen. They were wiped thoroughly to check moisture. The base was filled with an inch of silica-gel to create a bed for flowers. The orchids must be placed face upwards. Gently cover flowers with half an inch of silica-gel. The flower head must be fully buried. Silica-gel must be poured in between the petals so it reaches all corners of bloom. Then the container was sealed airtight with a lid. Further, it was placed out of direct sunlight and disturbances. The flowers were left for drying for at least a week in the container. Each day flowers were removed to record the dry weight. Once they are dried carefully remove them, with help of a paintbrush wipe off silica-gel stuck on and preserve them in a air-tight container.

2.5 Research Tools

The observation noted were fresh weight, dry weight, moisture loss (%) and time taken for drying of flowers. The qualitative parameters viz., colour, texture, shape and appearance were assessed by scoring on a five point scale given by [5]. The point distribution patterns are Excellent (5.00), Very good (4.00), Good (3.00), Bad (2.00) and Very bad (1.00). The data was recorded and subjected to statistical analysis using suitable statistical tools.

2.6 Development of Value Added Products

The dried and dyed flowers were subjected to value addition by applying color manually. The dyed flowers were used in designing and development of beautiful value added products such as frames and potpourris.

2.6.1 Cost estimation of value added products

The cost of manufacturing of these products was assessed by guidelines given by University of Agricultural Sciences Dharwad (UASD), Karnataka. The Electricity cost was calculated as 10 per cent of Cost of production. The cost of labour was calculated as 15 per cent of cost of production. The miscellaneous cost was calculated as 20 per cent of cost of production. The profit was calculated as 30 per cent of the cost of production. Totaling all the components the selling price was devised.

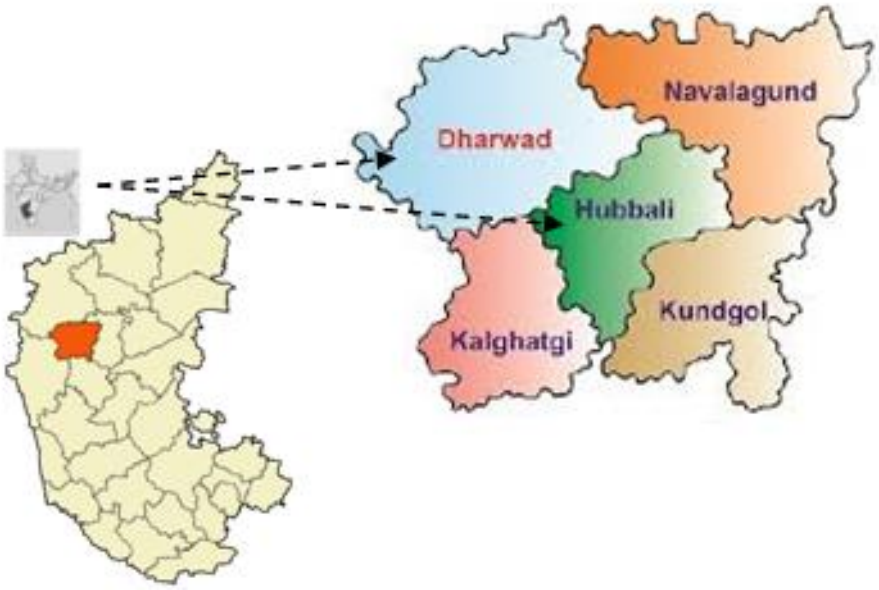

Fig. 1. Map of Dharwad and Hubballi cities in Dharwad Dist., Karnataka

Fig. 2. White [right] and purple [left] fresh orchid flowers selected for the study

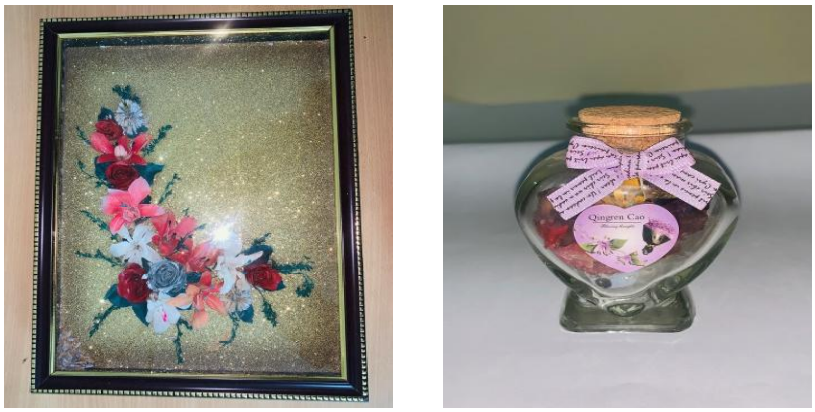

Fig. 3. Frame [right] and potpourri [left] designed and developed from dried orchid flowers

2.6.2 Consumer acceptability of value added products

The consumer acceptability was assessed by 30 consumers who were randomly selected based on their interest in volunteering for this research study. It was interpreted in terms of mean score. A scale was developed to assess the acceptability in point distribution pattern based on the factors such as Visual appearance, Size of the product, Weight of the product, Ease of maintenance, Durability and Cost of the product each rated as Extremely acceptable (5.00-4.00), Moderately acceptable (4.00-3.00), Slightly acceptable (3.00-2.00), Moderately defied (2.00-1.00) and Extremely defied (less than 1.00).

3. RESULTS AND DISCUSSION

Orchid flowers were procured from local growers such as florist shops and nurseries located in Dharwad and Hubballi cities, Karnataka state [Fig. 1]. Orchid flowers (*Orchidaceae*) were available only during Monsoon, Autumn and Spring seasons.

3.1 Moisture Loss in Orchid Flowers

As interpreted in Table 1 the fresh weight of White Orchid was 4.00 g, with 82.50 per cent of moisture loss the dry weight recorded was 0.70 g. Purple Orchid weighed 3.50 g of fresh weight and 0.60 g of dry weight with 82.85 per cent of moisture loss. From Table 2 it can be interpreted that Calculated F value is 14.93 and F critical value is 5.32 and Critical difference (C.D.) is 0.004. As the Calculated F value is more than F Critical Value and C.D. is less than 0.05 there is significant difference within fresh weights and dry weights of Orchid flowers with respect to colour of Orchid flower. The results were contradicting findings of Singh and Thapa [3], who suggested that 8-10 per cent of moisture retention in dried orchid will ensure good quality and firmness of dried orchids.

Table 1. Moisture loss (%) in Orchid flowers as effect of silica gel drying technique

Type of flower	Flower colour	Fresh Weight(g)	Dry Weight(g)	Moisture Loss (%)
Orchid	White	4.00	0.70	82.50
	Purple	3.50	0.60	82.85

Table 2. ANOVA for moisture loss (%)

Variables	DF	C. D. Value	Cal- F Value	F critical Value
A – Fresh weight&Dry weight	1	0.004	14.93	5.32
B – Exotic Flowers	4			

3.2 Qualitative Parameters of Exotic Flowers

The qualitative parameters of Orchid flowers were physically examined and depicted in Table 3. The colour of both White and Purple Orchid flower faded as an effect of Silica-gel drying technique. The texture became rough and brittle, shape was retained and stiff with petals being wrinkle free. Irrespective of the colour of flower, dried orchid flowers became lustreless due to silica-gel drying technique. The results are on par with findings of Singh and Thapa [3]. According to them Orchid flowers faded in colour irrespective of the colour of flower. The Texture of petals became rough and brittle but retained shape of the flower. Petals were not wrinkled and stood stiff.

3.3 Sensory Evaluation of Dried Exotic Flowers

As interpreted in Table 4, among Orchid flowers, highest mean sensory evaluation score 4.10 was secured by Purple Orchid with 3.9 to Colour, 2.9 to Texture, 4.8 to Shape and Overall appearance each, followed by 4.07 mean sensory evaluation score was secured by White Orchid with 3.4 to Colour, 2.9 to Texture, 5.0 to Shape and Overall appearance each. The observation of both white and purple Orchid recorded was 'Excellent'. Within Both Orchid flowers the Calculated F value was 6.29 and F critical value was 3.25 whereas Critical difference (C.D.) was 0.005. As the Calculated F value is more than F Critical Value and C.D. is less than 0.05 there is significant difference within sensory observations of dried Orchid flowers with respect to colour of flowers (Table 5). The results were on par with research findings of Sudeep et al. [6]. They revealed that shape retention of orchid flowers was scored 4.31, Texture was scored 4.07 and overall appearance was scored 4.10.

3.4 Time Taken for Drying of Exotic Flowers

The time taken for drying in silica-gel drying technique is represented in Table 6. Orchid flowers irrespective of the colour of flower consumed 144 hours (6 days) for drying. In this case the research results were contradicting, according to Singh and Thapa [3] orchids took 2-3 days for drying. The reason behind this might be the change in cultivar chosen for the study, size of the flower and moisture content in the flower.

3.5 Development of Value Added Products from Dried Orchid Flowers

Silica-gel dried orchid flowers can be used for preparation of diversified value added products. Dry flowers with original colour and shape, developed through embedding, can be utilized for preparation of three dimensional arrangements. There is no limit of product range. This research was intended to develop value added products like: Frame and Potpourri [7]. According to Katagi et al [8] dehydrated flowers and foliage can be used for designing distinctive, fascinating and artistic decorative items e.g. greeting cards, wall plates, calendar, landscapes, etc. Floral Craft means skilful and artistic use of floral materials for making saleable items for decoration purpose. These dried items may be used with fresh flowers or alone as: Floral arrangements, bouquets, gift pack, festive decorations, collages, flower pitchers, floral balls, pomanders, wall sceneries, greeting cards, wedding cards, sweet smelling potpourris. The following items are required for preparation of greeting cards, floral designs, pictures, landscapes, calendars etc. Saima et al [9] opined that the drying techniques results in the preservation of flowers and foliage and the material can be can be successfully used in preparation of various floral decorations and different craft items viz greetings cards, wall

hangings, photo frames, bouquets, decorative pots, book coverings, potpourris, flower baskets and various other economically useful creations.

3.6 Cost Estimation of Value Added Products

The cost estimation of designed and developed value added products is interpreted in Table 7 was calculated on the guidelines given by University of Agricultural Sciences, Dharwad [2]. The Selling price was calculated on the basis of components such as cost of flowers and foliage, cost of raw materials, cost of moulds/frames. Containers, Cost of electricity (10%), Labour cost (15%), miscellaneous cost (20%) and Profit (30%). The Cost of production of 30X60 cm frame was Rs. 522.00/- which comprised Rs. 150.00/- as Cost of flowers and foliage, Rs. 60.00/- as Cost of raw materials, Rs. 150.00/- as Cost of frames, Rs. 36.00/- as Electricity cost, Rs. 54.00/- as Labour cost, Rs. 72.00/- as Miscellaneous cost. Calculated 30 per cent of profit was Rs. 156.60/-, which made Selling price of Bookmarks was Rs.678.66/-. The Cost of production of Potpourriswas Rs. 64.25/- which comprised Rs. 15.00/- as Cost of flowers and foliage, Rs. 15.00/- as Cost of raw materials, Rs. 15.00/- as Cost of glass containers, Rs. 4.50/- as Electricity cost, Rs. 6.75/- as Labour cost, Rs. 8.00/- as Miscellaneous cost. Calculated 30 per cent of profit was Rs. 19.27/-, which made Selling price of Potpourriswas Rs. 83.52/-.

3.7 Consumer Acceptability for the Developed Floral Crafts

The designed and developed products were observed to be 'Extremely acceptable to moderately acceptable'. Acceptability mean

Table 3. Qualitative parameters of dried orchid flowers

Flowers	Colour	Colour change	Texture	Shape	Over all appearance
Orchid	White Purple	Faded Faded	Rough & Brittle	Stiff flower, wrinkle-free petals & Retained shape	Lustreless

Table 4. Sensory evaluation of dried orchid flowers

Type of flower	Flower colour	Colour	Texture	Shape	Over all appearance	Mean	Observations
Orchid	White	3.4	2.9	5	5	4.07	Excellent
	Purple	3.9	2.9	4.8	4.8	4.10	Excellent

Table 5. ANOVA for sensory observations of dried orchid flowers

Variables	DF	C.D Value	Cal- F Value	F critical Value
A – Sensory evaluation scores	3	0.005	6.29	3.25
B – Exotic Flowers	4			

Table 6. Time taken for drying by orchid flowers in silica gel drying technique

Flowers	Colour	Time taken	
		Days	Hours
Orchid	White	6	144
	Purple	6	144

Table 7. Cost estimation of value added products developed from dried orchid flowers

P. D	C. F (Rs.)	C. R (Rs.)	C. C (Rs.)	E. C @ 10% (Rs.)	L. C @ 15% (Rs.)	M. C @ 20% (Rs.)	C. P (Rs.)	Profit @ 30% (Rs.)	S. P (Rs.)
Frames (30x60)	150	60	150	36	54	72	522	156.60	678.66
Potpourris (small)	15	15	15	4.50	6.75	8.00	64.25	19.27	83.52

Note: P.D: Product Description; C. F: Cost of flowers; C. R: Cost of raw materials; C.C: Cost of containers
E. C: ElectricityCost; L. C: Labour Cost; M. C: Miscellaneous Cost; C. P: Cost of Production; S. P: Selling Price

Table 8. Consumer acceptability of value added products developed

P. D	V. A	S. P	W. P	E. M	D. P	C. P	O. A	Observations
Frames	5.00	3.00	3.00	3.00	4.00	4.00	3.67	Moderately acceptable
Potpourris	5.00	4.00	5.00	4.00	4.00	4.00	4.33	Extremely acceptable

Note: P.D: Product Description; V. A: Visual appearance; S. P: Size of Product; W. P: Weight of Product; E. M: Ease of Maintenance; D. P: Durability of Product; C. P: Cost of Product; O. A: Overall Acceptability

score was 4.33 given to Potpourris [Table 8]. Potpourris secured 5.00 for Visual appearance, Size, Weight and 4.00 for Cost, Ease of maintenance and Durability each. Potpourris were Extremely accepted by the consumers. Acceptability mean score 3.67 was given to Frames with 5 for Visual appearance, 4 for Durability, Cost and 3 for Size, Weight and Ease of maintenance. It was Moderately accepted by the consumers.

4. CONCLUSION

India has a nature's boon of abundant sunshine, water, different agro-climatic conditions and good international connections. India has huge skilled human resource base. Virtually unlimited talents for innovative designs are available in the farms of folk artisans. Virtually unlimited talents for innovative designs are available in the farms of folk artisans. Dry Orchid flowers have many advantages such as they are cheaper, minimum up keep, not easily perishable, eco-friendly & biodegradable, year round availability & not dependable on weather or season, hence they can be replaced costly and perishable fresh flowers. There was no significant difference found in dried Orchid flowers w.r.t qualitative parameters such as colour, texture, shape and overall appearance within flowers. Consumers showed eagerness in learning about developed value added products, products such as bookmarks, coasters, key chains, floral jewelry, potpourris & paper weights were rated as extremely acceptable by consumers. The existing technology has the prospective to employ thousands of people especially to unemployed youths, Schools and College drop-outs, housewives and rural women's as limitless aesthetic and decorative products can be shaped using dry flower technology, it can start up with a small scale industry which can be run from their households. They can work together and perform exceptionally to begin new markets. There is a necessity to generate adequate consciousness about the potential of this technology by workshops, exhibitions and seminars etc.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. De LC, Bhusal A, Gurung RC, Waste to wealth from orchids. Biotica Research Today. 2020;2(10): 992-995.
2. Singh HP, Floriculture industry in India: The bright future ahead. Indian Horti Culture. 2009;54(1):3-8.
3. Singh LCD, Thapa S, Drying technologies in Orchids. Int J Environ Sci Nat Res. 2017;5(1):555652.
4. Joshi S, Jadhav VS, Effect of different drying techniques on Dutch rose. Inter national Journal of Chemical Studies. 2018;6(6):490-492.
5. Oulakh B, Consumer acceptability and keeping quality of dried flower products using selected packaging material. MHSc Thesis. 2012;1-128
6. Sudeep HP, Seetharamu GK, Aswath C, Munikrishnappa PM, Sreenivas KN, Basavaraj G, Gowda DM. Standardization of embedding media and drying temper ature for superior quality of dry orchid flower production var. Sonia-17. Int J Pure App Bio Sci. 2018;6(2):69-73.
7. Jeevitha KM, Standardization of drying technique for development of value added products from exotic and underexploited flowers and foliage. PhD Thesis. 2020;1-113.
8. Katagi A, Ishwaree RM, Hosur S, Flower Dehydration: A profitable business

for rural people. Popular Kheti. 2014;2(2): 56-60.
9. Saima M, Shinde BM, Chaskar MG, Jana MM. Dry flowers and floral craft: For better subsistence and women empowerment, International Journal of Research and Analytical Reviews. 2019;6(1):209-213.

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