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Quality Characteristics of dried flowers as influenced by packaging materials

Bhupender Oulakh* **and P. Radha Rani**

Department of Resource Management and Consumer Sciences, College of Home Science, ANGRAU, Hyderabad 500030, Telangana

ABSTRACT

Quality reliability and continuity are major considerations when purchasing dried flower products because dried flowers and foliages are fragile and require careful handling. Before using dried materials for making decorative items, it is necessary to protect them from all possible hazards. Therefore, recent advances in packaging and presentation of dried flowers and foliages with the research needs are presented in this study. Rose, Chrysanthemum, Gerbera, Orchid, Carnation, Chandini (Jasmine), and Gloxinia were dried using various techniques like air drying, press drying and desiccant drying (silica gel, borax and sand) whereas glycerin drying was used for foliage drying. After that the dried flowers were arranged in five of different packaging materials i.e. wooden fiberboard, glass, acrylic, plastic (PVC) and thermocol and developed various dried flower products (Shadow boxes, table mounts, photo frames, potpourris and paperweights). The colour of the dried flowers was analyzed before and after three months storage through spectrophotometer and weigh-ment method was used for moisture analysis before and after three months of storage. The result revealed that different display packaging materials can be used to enhance the appearance of the products and also to retain the overall quality of the dried flowers for longer period.

Key words: Colour analyses, Keeping quality, Moisture content, desiccant drying, foliage drying.

INTRODUCTION

Drying and preserving flowers and plant materials is a form of artistic expression that was very popular during the Victorian age and has once again gained popularity. Dried flowers and other plant parts is a Rs. 100 crore industry in India and such dry decorative materials are globally accepted as natural, eco-friendly, long lasting and inexpensive. A turnover of more than rupees 150 crores is projected every year in Indian dried flower industry. The industry exports 500 varieties of flowers to 20 countries and is highly in demand in USA and UK markets (Varuna *et al*., 6).

Since flowers and foliage consists of more water, dehydration is necessary for getting dry flowers. Methods used for removing water from plant parts are:

- air-drying
- sun drying
- oven drying
- embedding (sand, borax, silica gel and combination of these materials)
- glycerining (Glycerinating)
- microwave oven drying,
- freeze-drying
- press drying

Dried and preserved ornamental products offer a wide range of qualities like novelty, longevity, aesthetic properties, flexibility and year round availability. Therefore it can be used for making decorative floral crafts items like cards, floral segments, wall hangings, landscapes, calendars, potpourris etc for various purposes (Bhutani, 2; Bhalla *et al*., 1). Dry flowers are fragile and require careful handling. Before using dried materials for making decorative items, it is necessary to protect them from all possible hazards. The enemies of successful drying are dampness and light. Dampness because it causes mildew and light, bleaches out colour. Therefore, dried material should be stored in a dark and dry airtight container. Sealable articles like paper weights, pendants and table pieces can be made by embedding the dry flowers in transparent blocks or sheets. There are endless uses of dried flowers to decorative items. For the decorative floral crafts, display packaging material should be stable and firm to hold the dry flowers well without any damage during storage and transportation. Several wooden and wrought iron framed dried flowers are also available. These are exquisite arrangements of dried for flower on unusual or handmade paper, which have been framed in elegant frames. They look great wherever they are placed and also make wonderful gifts.

Therefore, dry flowers score over the cut flowers that often decorate homes and offices because of their ability to remain decorative for longer periods almost definitely with less care. Hence, the objective

*Corresponding author's Email: bhupinder.aulakh117@gmail.com

of this study was to test "Quality Characteristics of the Dried Flowers Influenced by Packaging materials".

MATERIALS AND METHODS

In the present study Rose, Chrysanthemum, Gerbera, Orchid, Carnation, Chandini (Jasmine), and Gloxinia were dried using various techniques like air drying, press drying and desiccant drying (silica gel, borax and sand) whereas glycerin drying was used for foliage drying as it was found that these techniques are suitable for drying.

Dry flowers can be packed in a variety of ways: in window box, cardboard box, glass container, acrylic box or in a thermocol box. In the present study, five display packaging materials i.e. wooden fiber-board, glass, acrylic, thermocol and plastic (PVC) sheet were identified for the purpose. The criteria of selection of packaging materials were based on their availability and cost effectiveness.

The overall keeping quality (colour, shape, fungus, insects and moulds) of dry flower products was observed at the interval of 15 days for three months by using observation sheet.

The colour of the dried flowers was analyzed before and after three months storage through spectrophotometer.

Quantitative measurement of colour : The perception and subsequent interpretation of colour changes from person to person. An International Committee has formulated various equations to express colour and most commonly used equations are CIE Yxy, CIE L* a* b*. The computerized colour matching system works on the principle of scanning the sample/colorant through the spectrophotometer. The L* coordinate indicates darkness (%0) to lightness (%100) of color. Chromaticity coordinates, a* and b*, indicate color directions: +a* is the red direction, –a* is the green direction, +b* is the yellow direction and -b* is the blue direction.

Assessment of color is more than a numeric expression. Usually it's an assessment of the color difference (delta) from a known standard. CIELAB and CIELCH are used to compare the colors of two objects. But in this study CIELAB was used to compare the colors of fresh and dry flowers. The expressions for these color differences are ΔL* Δa* Δb* or DL* Da* Db*, (Δ or D symbolizes "delta," which indicates difference). Fig. 1 compare the color of dried yellow rose before and after three months storage. Using the value of ΔL* Δa* Δb*, the color difference of dried flowers can be expressed as:

ΔL* = -2.301, Δa* = 0.556, Δb* = -12.633

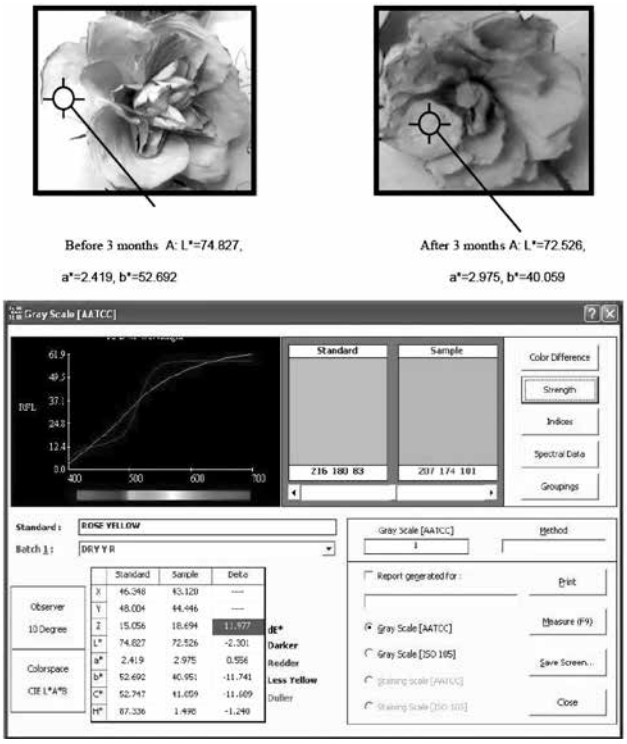

Fig. 1. Assessing delta values with spectrophotometer using CIE L*a*b* colour system.

Moisture analysis:

For moisture analysis the percentage of weight loss of flowers was observed by weighing the flowers before and after the experiment by using the electronic weighing balance. This helped in knowing the extent of loss of moisture in the dried flowers after evaporation in the drying process. Moisture content was estimated after three month by using the formula given below and expressed as percentage.

Moisture content (%) = BW - AW X100/BW

Where,
BW = weight of dried flowers before three months
AW = weight of dried flowers after three months

RESULTS AND DISCUSSION

In present study dried flowers were treated, preserved and artistically arranged in display containers which will enhance the beauty of the interiors. The value added products namely shadow boxes, table mounts, photo-frames, potpourris and paperweights were developed using selected packaging materials i.e. wooden fiber-board, glass, acrylic, plastic and thermocol. The study conducted by Kapur & Bajpal (5) stated that dried flowers and plants are used in value added products like collages, flower pictures, flower balls, cards and covers, pomanders, festival decorations, sweet

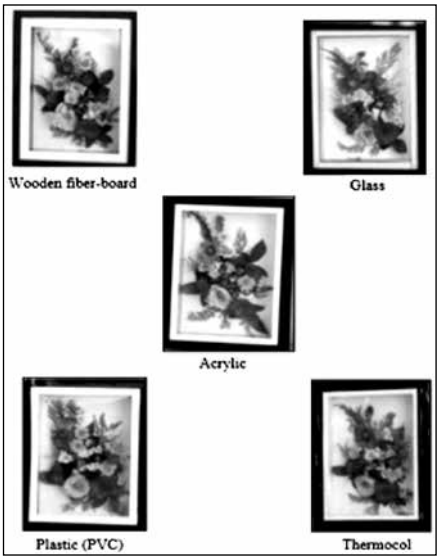

Plate 1. Arrangement of the dried flowers in different Shadow Boxes.

smelling potpourris etc. The developed products are mentioned in plates.

A shadow box is a framed box, usually square and rectangular in shape, with glass front. It is used for displaying and protecting value items. A Shadowbox is a deep frame measuring in depth from about 2.5", outer length and width are 16" × 12" and inner length and width are 14" × 8.7". The design space allows for 3 dimensional objects along with flowers to be placed within the frame to create a everlasting items.

Various types and colors of dry flowers are beautifully arranged in the shadow boxes and can be stored for longer (Plate 1). It can firmly hold dry flowers and protect them. Shadow boxes are made of highly durable wooden fiber-board box, glass, acrylic, plastic (PVC) sheet and thermocol. The wooden fiber-board is strong and sturdy to take the weight of dry flowers and added marbles or pebbles. They won't rot and are backed with a lifetime guarantee.

Flowers and leaves after dehydration may be arranged aesthetically and covered with transparent glass/plastic to protect them from atmospheric humidity, wind and dust. Dry flowers sealed in box may be used for interior decoration. The dimensions of the boxes are 4" × 4" × 6".

Handicrafts made by the artisans and craftsmen in India are in great demand worldwide. Handmade dried flowers photo frame is a major industry in India (Plate 2a). A greeting-frame is a decorative edging for a greeting, intended to enhance it, make it easier to display, or protect it. Greeting frames are generally square or rectangular, though circular and oval frames are not uncommon. For this study rectangular shape

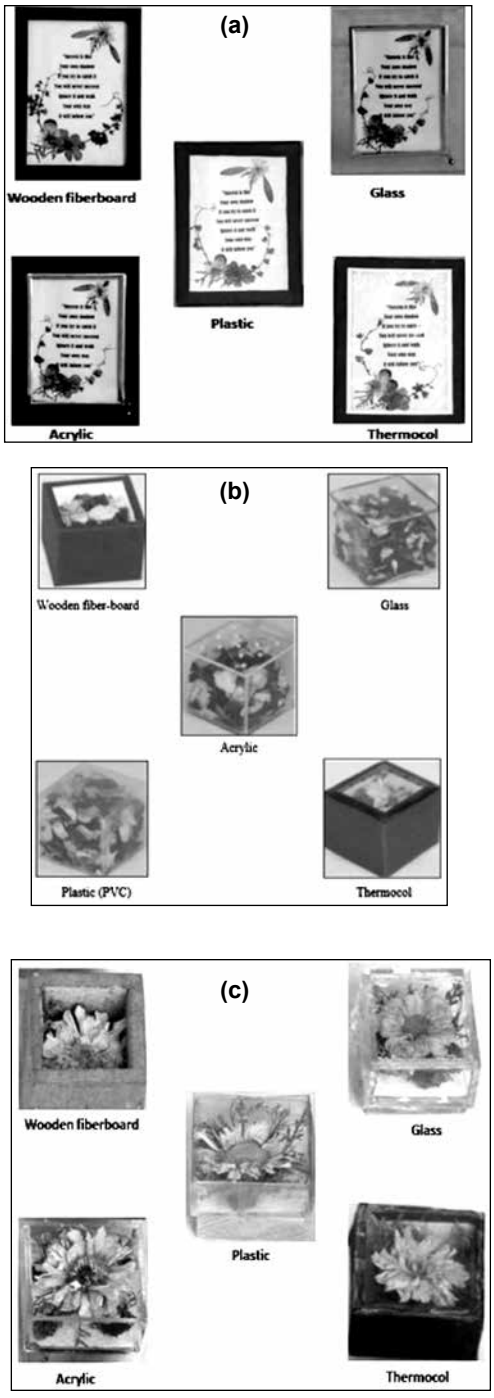

Plate 2. (a) Arrangement of the dried flowers in different Photo-frames, (b) Arrangement of the dried flowers in different Potpourris (c) Arrangement of the dried flowers in different paper weights.

of same size was taken for all the frames made out of selected packaging materials. Different types of materials are used to make dried flowers greeting frames. These are wooden fiber-board, glass, acrylic,

plastic (PVC) and thermocol. The size of the greeting frames are 6" × 4".

Potpourri is a mixture of dried, sweet- scented plant parts including flowers, leaves, seeds, stems and roots. The basis of a potpourri is the aromatic oils found within the plant. In the present study dried rose petals were used for making potpourris and added aromatic oil (Lavender oil) for pleasing smell (Plate 2b).

It is placed in a decorative wooden fiber-board box, glass box, acrylic box, plastic (PVC) box and thermocol box. The size of the box is 3" × 3" × 3.15".

Paperweights are a great form of art. The most common use of a paperweight is to keep documents, files, etc. in place. With a paperweight one can keep these in place by weighing them down. Setting flowers into paperweights is an easy way to enjoy garden flowers every day, all year long. The paperweight becomes functional as well as decorative when combined with flowers and set out to be used and admired. The dimensions of the paper weights are 1.6" × 1.6" × 1.6" (Plate 2c).

Colour changes were observed in selected flowers under three months of storage (Table 1). The colour difference between before and after three months storage of dry flowers was analyzed through spectrophotometer and can be seen in CIELAB colour chart. The values of spectrophotometer (L*, a*, b*) are mentioned in Table 1.

***1. Colour analysis of yellow rose*:** The values for dry yellow rose before and after three month are shown in the table 4.10. On a* axis, reading of +0.996 indicates more green colour or less red after three month of storage in compare to the colour of the dried flower before three months and on the b* axis, a reading of -11.196 indicates more blue or less yellow colour. On the L* plane, the measurement difference of 0.949 shows that yellow dry rose is lighter. The dry flower colour had more green value and less yellow value. It might be due to silica gel treatment as it lost its lusture and found to be dull, though it has retained the natural shape of the flower.

***2. Orange rose*:** It was noted from Table 1 that after three months the colour of dry orange rose become

Table 1. Colour analysis of selected flowers.

S.No.	Flower	Colour	L*	a*	b*	ΔL*	Δa*	Δb*
1.	Yellow Rose							
	Before		74.827	2.419	52.692	0.949	0.099	-11.196
	After		75.776	2.518	41.496			
2.	Orange Rose							
	Before		36.706	36.081	14.120	-8.801	20.623	-1.31
	After		27.905	56.704	12.810			
3.	Country Rose							
	Before		36.706	19.816	21.774	-12.713	-12.827	-12.849
	After		23.993	6.989	8.925			
4.	Orchid							

	Before		32.471	27.105	-13.962	-0.476	-3.671	6.348
	After		31.995	23.434	-7.614			
5.	**Gerbera**							
	Before		55.365	15.077	-0.782			
	After		60.593	8.760	3.447	5.228	-6.317	4.229
6.	**Yellow chandini**							
	Before		50.193	14.625	60.403	9.606	-3.741	4.862
	After		59.799	10.884	65.265			
7.	**White chandini**							
	Before		71.294	2.393	38.590	-0.144	-4.55	2.667
	After		71.150	-2.157	41.257			
8.	**Carnations**							
	Before		36.230	33.617	0.986	3.717	2.519	0.183
	After		39.947	36.136	1.169			
9.	**Yellow chrysanthemum**							
	Before		68.245	8.643	68.074	-2.901	-1.11	-12.563
	After		65.344	7.533	55.511			
10.	**Gloxinia**							
	Before		45.828	16.708	34.987	-2.161	-1.308	-4.258
	After		47.989	18.016	39.245			

more dark (ΔL*=-8.801). On a* axis, a reading of +20.623 indicates more red or less green colour. On the b* axis, a reading of -1.31 indicates more blue or less yellow.

Dry weight and moisture content analysis in dried flowers before and after storage of three months in presented in Table 2.

3. Country rose: It is a shaded red colour, small rose flower. The country rose has the low ΔL* value (-12.713), which represents darkness of the dried flower. It was able to detect Δa* values i.e. -12.827, was more toward the green colour and less red. The country rose also had negative Δb* value i.e. -12.849. It means on b* axis the colour of the dried flower was more toward blue colour.

4. Orchid: Orchid selected for the study has flat-faced petals, sepals of equal size and violet in colour with the value of ΔL*-0.476, Δa* -3.671 and Δb* 6.348. It has shown that after drying the violet orchid colour turned to dark violet colour and this colour was more toward green colour on the a* axis and yellow on the b* axis.

5. Gerbera*:* Gerbera flowers exhibit large (4") blooms with yellowish central disks surrounded by colorful rays. The rays are most commonly yellow, red or orange. After three months of storage the colour analysis was done. The ΔL*, Δa* and Δb* values of gerbera flower were +5.22, -6.317 and +4.229. It revealed that dried gerbera flower was more light and on a* axis it was more toward green and on b* axis more toward yellow colour.

6. Yellow chandini: The values of fresh and dry yellow chandini flower were presented in the Table 1. It was observed that dry yellow chandini flower was turn to darker after 3 months of storage (ΔL*= -9.606). On a* axis, a reading of -3.741 indicates green or less red colour. On the b* axis, a reading of 4.862 indicates more blue or less yellow colour.

7. White chandini: The value for ΔL*, Δa* and Δb* were -0.144, -4.55 and +2.667 respectively. The value ΔL*indicated that dry white chandini flower was darker and Δa* shows that the colour of the dried flower was shifted toward green on a* axis and Δb* was shifted toward yellow.

8. Carnation: The carnation flower which was used for the study had pink colour and silica gel was used for drying. The colour analysis of dry flower has shown the values of ΔL*, Δa* and Δb* i.e. +3,717, 2.519 and +0.183 respectively. It was found that the flower become darker and reading +2.519 indicated that the colour of the dry flower moved toward red and +0.183 indicated that it was more toward yellow colour.

9. Yellow chrysanthemum: Generally chrysanthemum characterized by aromatic, deeply lobed, alternate leaves and often large and showy flowers. It was treated with sand for drying. The colour of dried yellow chrysanthemum was tested. The ΔL* -2.901 coordinate indicates darkness of color. Chromaticity coordinates, a* and b*, indicated color directions: Δa*-1.11 gave the green direction and b*-12.563 gave the blue direction. The result has shown that the dry flower was darker in colour (Table 1).

10. Gloxinia: The gloxinia flower had the high ΔL*value (+2.161), which represents the lightness, (Table 4.8). It was found that Δa* values i.e +1.308 moved toward the red direction and has less red value. The Δb* value i.e. +4.258 indicates more blue and less yellow. Dried gloxinia flower was lighter.

The results indicated negligible fading in dried flower colour after three month storage. It reveals that storage of dried flowers in closed packaging helped in retaining the colour of dried flowers and longevity. Similarly, Dilta *et al*. (4) reported that rose flowers that dry well and retain bright colour include orange, medium and dark yellow, medium red, medium and dark pink colours. Dark red tends to turn black and light pink becomes pale. Venugopal & Patil (7) noted the effect of drying methods and temperatures on colour intensity of everlasting flower and suggested that Helichrysum flowers dried at room temperature and at 50°C in oven for 48 hours to retain good colour and shape for 150 to 180 days which could be followed in dry flower trade with everlasting flowers.

3. Moisture content analysis in dried flowers

Three months observations regarding moisture content for different types of dried flower products using selected packaging materials are presented in Table 2. It was observed that no change in moisture content was found for all the selected packaging materials regarding shadow box. With respect to table mount, plastic (PVC) and thermocol packaging materials observed no change in moisture content while wooden fiber-board, glass and acrylic observed negligible moisture loss. It might be due to little weight loss was found in the dried flowers. Further results highlighted that gain in moisture content was observed regarding plastic (PVC) packaging material because weight of the dried flowers were increased from 0.059 to 0.060. No change in moisture content was observed for wooden fiber-board, glass, acrylic and thermocol. It was revealed from the results that in thermocol and plastic potpourri dried flowers had gain little weight and increased moisture content. Wooden fiber board, glass, and acrylic potpourri observed no change in moisture. It was striking to note that wooden fiber-board, glass and acrylic paper weight had no change in moisture content while all the other packaging materials observed gain in moisture

Table 2. Dry weight and moisture content analysis in dried flowers before and after storage of three months.

S. No.	Dried flower product	Dried flower product's weight (kg.)		Moisture content (After 3 months) %	
		Before 3 months	After 3 months	Moisture gain	Moisture loss
1.	Shadow box				
	Wooden fiber-board	1.300	1.300	No change	No change
	Glass	3.450	3.450	No change	No change
	Acrylic	0.925	0.925	No change	No change
	Plastic	0.210	0.210	No change	No change
	Thermocol	0.180	0.180	No change	No change
2.	Table mount				
	Wooden fiber-board	0.395	0.395	-	0.765
	Glass	0.760	0.759	-	0.131
	Acrylic	0.325	0.323	-	0.619
	Plastic	0.091	0.091	No change	No change
	Thermocol	0.085	0.085	No change	No change
3.	Greeting frame				
	Wooden fiber-board	0.195	0.195	No change	No change
	Glass	0.286	0.286	No change	No change
	Acrylic	0.128	0.128	No change	No change
	Plastic	0.059	0.060	-	0.001
	Thermocol	0.087	0.087	No change	No change
4.	Potpourris				
	Wooden fiber-board	0.280	0.280	No change	No change
	Glass	0.280	0.280	No change	No change
	Acrylic	0.120	0.120	No change	No change
	Plastic	0.020	0.035	6.0606	-
	Thermocol	0.019	0.020	5.2	-
5.	Paper-weight				
	Wooden fiber-board	0.038	0.038	No change	No change
	Glass	0.096	0.096	No change	No change
	Acrylic	0.037	0.037	No change	No change
	Plastic	0.024	0.024	4.167	-
	Thermocol	0.023	0.023	8.695	-

content. This means that wooden fiber-board, acrylic and glass packaging materials are better than other types of selected packaging materials regarding storage of dried flower products. It might be due to no direct contact with external environment.

CONCLUSION

Based on the present study it can be concluded that various dried flowers products can be developed using dried plant materials. Different display packaging materials can be used to enhance the appearance of the products and also to retain the keeping quality of the dried flowers for longer period. Dried or preserved plant materials complement any home decor in both formal and informal arrangements. They will last almost indefinitely if carefully done and require very little care. Flower arrangements, wreaths, pressed pictures, potpourri and wall hangings are some of the creative possibilities with preserved plant materials (Dana & Lerner, 3).

FUTURE SUGGESTIONS

Further research can be taken up to check the keeping quality of dried flowers in different packaging

materials. The present study can be done in different geographical areas using wild dried flowers and foliages for making various floral crafts.

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