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COMPARATIVE STUDY ON DIFFERENT DRYING METHODS IN ROSE. HYBRID TEA, FLORIBUNDA & MINIATURE

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Abstract
Present investigation was undertaken to compare the six different methods of drying in rose flowers to determine the most suitable drying method and drying time concerning quality parameters like color, shape and texture. The rose varieties (Hybrid tea, Floribunda, and Miniature) chosen for the experiments were exposed to all the six methods of drying viz., Air drying, sand drying, borax drying, borax and sand drying, silica gel drying and hot air oven drying. With respect to drying methods air drying was least acceptable as far as color, shape and texture. Borax and sand drying yield deformed flowers, where as good results were obtained by the combination of borax and sand mixture. Silica gel was found the best desiccant and better quality products were acquired by hot air oven drying in lesser time.
Keywords: Drying methods: Flower quality: Rose flowers: Value added products.

Article History

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1. Introduction

Rose is one of nature's most excellent manifestations and is all around praised as "Crown of flowers". Rose flowers are different having wonderful shape, size, lovely tones and nice fragrance. Rose is the best cut flower and as such is in incredible interest in worldwide business sectors, but it is hard to support their excellence for significant period. However, those same can be dried and preserved with various dehydration techniques to extend their beauty and aesthetic significance (Saima *et al.,* 2020)[1]. Dry flowers are the key components of floriculture business which is getting up quicker rate in the worldwide exchange (Gangadhar *et al.,* 2009)[2]. Dried flowers are lifelong and can be used several times to meet the decorative demands, dry flowers provide an outstanding opportunity to Indian entrepreneurs as the country is bestowed with comprehensive variety of floral material, cheap labour and favorable climate (Gurumurti 1997)[3]. Dry flower industry has developed quickly with more than 60% portion of benefits belonging to the floriculture business ((Ranjan *et al.,* 2002)[4]. The business extended yearly turnover starting at 2003 was in excess of 150 crores, (Singh 2009)[5]. Potpourris are the significant portion

of dry flower industry esteemed at Rs.55 crores in India alone (Murgan *et al.,* 2007)[6]. The business in India is over 40 years old and exports 500 varieties of flowers to 20 nations (Bhattacharjee *et al.,* 2003)[7]. The USA is a biggest consumer of dried and artificial flowers assessed at (US $2.4 million) yearly followed by Germany and UK (Bhattacharjee *et al.,* 2003)[7].

Dried flowers can be formed by different drying techniques and can be productively utilized in preparation of various decorative and aesthetic products such as handmade paper, lampshades, wall quilt, decorations, books, candle holders, etc. The floral arrangements utilizing dried cone, foliage, flower like rose buds and other such plant material improves the excellence of dry flowers, expanding the worth of this industry However, apart from flower structure and time of collect, the quality of dry flowers incredibly relies upon drying method. Hence, the current investigation was undertaken to compare the six different drying methods in rose flowers to determine the most suitable drying method and drying time with reference to color, shape and texture.

2. Materials and Methods

Present work was carried out in the laboratory of Department of Botany. Prof Ramkrishna More A.C.S College Akurdi, Pune, Maharashtra. The healthy, blemish free, pest free and half opened rose flower varieties of Hybrid tea, Floribunda and Miniature were collected within the college campus and were processed for drying. Five flower replicates were used for each treatment and the suitable drying method was determined along with approximate drying time taken to dry by the rose flowers (Table-1). The drying methods employed in the study were as air drying, sand drying, borax drying, borax and sand drying, silica gel drying and hot air oven drying.

Drying methods

(i) Air Drying (Verma 2012)[8]

In this method, rose flowers (Hybrid tea, Floribunda, Miniature) were tied with a rope and were kept in hanging position in clean, dark and well ventilated area and were observed periodically.

(ii) Borax drying (Battarcharjee & De 2003)[7]

In this method, borax was used as desiccant and was sufficiently spread at the bottom of container, the rose flowers were carefully placed according to their shape in proper position and were again covered with sufficient quantity of borax. Containers thus prepared, were kept for drying in a well ventilated area and were observed periodically.

(iii) Sand drying (Singh *et al.*, 2004)[9]

In this method, sand was sufficiently spread at the bottom of container, the rose flowers were carefully placed and then were again covered with sufficient quantity of sand. Containers thus prepared, were kept for drying in a well ventilated area and were observed periodically.

(iv) Borax and sand drying (Sujata 2001)[10]

In this method, equal parts of sand and borax were mixed (1:1 ratio) and were used as desiccant. The bottom of the container was filled with a double layer of borax sand mixture and rose flowers were placed in it and were again covered with the desiccant. Containers thus prepared, were kept for drying in a well ventilated area and were observed periodically**.**

(v) Silica gel drying (Verma 2012)[8]

In this method, silica gel crystals were poured in a container with tight lid, selected rose flowers were placed in this container and covered to embed in excess silica gel, containers thus prepared, were observed periodically.

(vi) Hot air oven drying (Battarcharjee & De 2003)[7]

In this method, rose flowers were kept in hot air oven at 45-50oC controlled temperature. Time and temperature combination were selected on the basis of compactness and thickness of flower.

3. Results and Discussion

Parameters like time taken for drying, color shape and texture of rose dry flowers as affected by various drying methods are presented in Table 1. The notable distinction was observed by all the drying methods with regard to quality parameter. It is seen from the Table-1 that time required by the flowers to dry by air drying method was found in the range of 8-10 days. Rose dry flowers obtained by this method were found dark, deformed in shape and rough in texture of petals as same reported by Pertuit (2002)[11]. Verma (2012)[8] reported that the low quality products were obtained due to unfavorable weather, which had decreased the ornamental value. Our results are actually coordinating to their results i.e. stiff flower yields obtained by Pertuit. The duration needed by the rose flowers to form dry flowers by embedding in borax was found in the range of 10-13 days. It is observed from the Table-1 that the shape in rose dry flowers was maintained to some extent. However, flowers obtained were faded in color and rough in texture. The same results of fading color and rough petal texture by borax drying was reported by Westland (1992)[12]. Datta (1997)[13] reported that due to hygroscopic nature of borax it could cause bleaching, brittleness and sometimes burn the flower petals if embedded for a long time. Time required by the flowers to dry by embedding in sand was found in the range of 11-13 days. The dry flowers obtained by this method were found with some color retention but shape and texture of petals was deformed. Similar findings of sand drying resulted in flattening of shape of flowers was reported by Trinklein (2006)[14].

It is evident from the Table-1 that flowers took 11-12 to dry by embedding in borax and sand mixture. This method was found effective in drying of floribunda and miniature rose flowers and also reported as least expensive. According to Sujata (2001)[10] borax crystals and sand in the ratio of 1:1 was the best combination for dehydration of flowers along with the retention of color.

The drying time required by the flowers to dry by embedding in silica gel was in the range of 5-7 days as same indicated in Table-1. The dry flowers obtained by this method were found with the maximum retention of shape, color and texture of petals. The results of our study are similar with the study done by Radha *et al.,* (2016)[15]. Silica gel is the best desiccant for getting excellent quality of dry flowers that retain color and shape (Champoux 1999[16]; Verma *et al.,* 2012)[8] Prasad, *et al.,* (1997)[17] suggested silica gel drying as the best method for delicate flowers. Paul and Shylla (2002)[18] while reviewing the efficacy of different desiccants for flower drying concluded that though silica gel was an expensive desiccant but could be recycled for reuse.

The flowers dried in hot air oven drying took 2-3 days to dry (Table-1). Excellent quality rose dry flowers were obtained by this method in shorter time. Similar reports of rapid drying of flowers in oven drying was documented by Chen (2000)[19]. Hot air oven drying is the best method of drying flowers to get the superior quality products and is comparatively faster when compared with the other methods of drying (Saima *et al.,* 2020)[1].

Table-1 Appropriate drying method with approx. drying time of selected rose flowers

Drying method	Plant material (Rose)	Approx. Drying Time (Days	Shape	Color	Texture
Air Drying (1)	Hybrid tea	9-10	U	U	R
	Floribunda	9-10	U	U	R
	Miniature	8-9	U	U	R
Borax Drying(2)	Hybrid tea	11-12	U	U	R
	Floribunda	12-13	S	U	R
	Miniature	10-12	S	U	R
Sand Drying(3)	Hybrid tea	12-13	U	S	R
	Floribunda	12-13	U	S	R
	Miniature	11-12	S	S	R
Borax & Sand Drying(4)	Hybrid tea	11-12	U	S	R
	Floribunda	11-12	S	S	S
	Miniature	11-12	S	S	S
Silica gel Drying(5)	Hybrid tea	6-7	S	S	S
	Floribunda	6-7	S	S	S
	Miniature	5-6	S	S	S
Hot air oven drying(6)	Hybrid tea	2-3	S	S	S
	Floribunda	2-3	S	S	S
	Miniature	2-3	S	S	S

S- Satisfactory: U-Unsatisfactory: R-Rough

4. Conclusion

The results of the present study indicated that the methods of drying significantly influence the quality of dry flowers. Air drying was found the most unsatisfactory drying method for selected rose varieties. Silica gel was found the best desiccant among other desiccants used in study. However, silica gel being costly can be subbed with more affordable desiccants viz., sand and borax mixture. The consequences of present investigation propose that silica gel drying and hot air oven drying are the best methods for getting predominant quality rose dry flowers of hybrid tea, floribunda and miniature. The dry flowers obtained following appropriate drying method can be utilized in making of different floral arrangements and various worth added items. The sufficient need of

awareness among masses about the potential of dry flower technology is necessity, which in turn can play a vital role in employment generation.

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