International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2017; 5(5): 557-559

Received: 24-07-2017
Accepted: 25-08-2017

Khyati M Patel
Department of Floriculture and Landscape Architecture ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat, India

RB Patel
Department of Floriculture and Landscape Architecture ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat, India

SL Chawla
Department of Floriculture and Landscape Architecture ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat, India

Swati Parmar
Department of Floriculture and Landscape Architecture ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat, India

Unnati R Patel
Department of Floriculture and Landscape Architecture ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat, India

Correspondence
Khyati M Patel
Department of Floriculture and Landscape Architecture ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat, India

Standardization of drying method for winter annual flowers

Khyati M Patel, RB Patel, SL Chawla, Swati Parmar and Unnati R Patel

Abstract
The present experiment was conducted to study the standardization of drying methods for various winter annual flowers *viz.*, dianthus, annual chrysanthemum and China aster. Drying in room condition recorded significantly maximum loss in fresh weight percentage, moisture percentage and took minimum day to drying with silica gel as embedding method while, minimum reduction in dried flower diameter was recorded with sea sand embedding media in dianthus, annual chrysanthemum and China aster. Drying with silica gel embedding also obtained maximum point scale on visual basis of colour, texture and appearance in dried flowers of dianthus, annual chrysanthemum and China aster.

Keywords: winter annuals, room drying, silica gel

Introduction
In the present era of eco-consciousness, use of natural products like dry flowers and their parts has become the premier choice of the masses in their lifestyles for interior decoration. Future prospects of the dry flower industry are expected to contribute a lot to the country's economy in comparison to the fresh cut flowers and other live plants. Dry flowers and plant materials have tremendous potential as substitute for fresh flowers and foliage for interior decoration as well as for a variety of other aesthetic and commercial uses. Drying and preserving of flowers and plant materials is a form of artistic expression that was very popular during the Victorian age and has once again gained popularity. India is one of the major exporters of dry flowers to the tune of 5% of the world trade. This industry shows a growth rate of 15% annually. Potpourri is a major segment of dry flower industry valued at Rs. 55 crores in India alone. Easy availability of products from forests, possibility of manpower, availability of labours, intensive craft making and availability of wide range of products throughout the year are the reasons for development of dry flower industry in India. This industry provides direct employment to around 15,000 persons and indirect employment to around 60,000 persons. Dried flowers and plant parts are the major segment and constitute 77.1% of the total share of floriculture products export from India. Research on dry flower is meager, hence, the research Endeavour was planned for standardization of drying methods for annual flowers like dianthus, annual chrysanthemum, China aster.

Materials and Methods
Three separate studies were conducted to standardization of drying method for three winter annual flowers *viz.*, dianthus, annual chrysanthemum, China aster at Laboratory, Floriculture and Landscape Architecture, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat, India during 2015-16. Separate three experiments were laid out in a completely randomized block design with five repetitions for China aster, annual chrysanthemum and dianthus. Flowers were harvested in the morning hours between 8.00 and 11.00 am from Floriculture Research Farm. Immediately after harvest, flowers were treated with different treatment *viz.*, T_1- without embedding, T_2- Sea sand embedding, T_3- Silica gel embedding and T_4- Sand + Borax mixture (1:1) embedding and kept in room temperature. About two cm layer of the desiccant (sea sand, silica gel and borax) was poured at the bottom of container and the flower stems were pushed into the medium. The flowers were kept in erect position. Desiccants were then gently and gradually poured all around and over the flower up to 3 to 4 cm above, so as to fill all the crevices in between the petals without disturbing the shape of flowers. Plastic tray was used as a container for embedding. After drying, the containers were tilted for removing the desiccants over and around the flowers.

The dried flowers were picked up by hand, cleaned by inverting them and tapping the stems with fingers slowly and gently. Remaining desiccants were finally removed with the help of fine brush. The different quantitative and qualitative parameters *viz.,* Fresh weight loss, moisture loss, flower diameter reduction, time taken for drying, colour, texture, shape of dried flowers as influenced by room drying were statistically analyzed using standard method as suggested by Panse and Sukhatme (1967) [10].

Result and Discussion

It is explicit from the data (Table 1) that application of silica gel embedding media (T_3) for drying recorded significantly maximum per cent fresh weight loss (64.34%, 82.86% and 74.89%), per cent moisture loss (88.93%, 87.27% and 85.41%) and minimum days for drying (4.3 days, 4.5 days and 6.0 days) in dianthus, annual chrysanthemum and China aster, respectively in room condition. It was because of greater capacity of silica gel to absorb moisture up to 30-50% of its own weight (Maureen, 1988, Brandenberg *et al.,* 1961 and Pertuit, 2002) [6, 1, 11]. Among all the desiccants, silica gel (60-120 mesh) has been found to be the best absorbent for removing moisture from the flower and foliage (Desh Raj *et al.,* 2006, Nazki *et al.,* 2012 and Gupta *et al.,* 2005) [3, 8, 5]. Drying was much faster with silica gel followed by sand and borax mixture. This might be due to strong hygroscopic nature of silica gel. This might also be attributed to the hydrosorbant nature of silica gel which is manufactured from sodium silicate. Silica gel 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 and thus act as a dehydrating agent as also explained by Sindhuja *et al.* (2015) [3]. Minimum fresh weight per cent loss in dianthus (59.91%), annual chrysanthemum (76.17%) and China aster (64.64%); minimum moisture loss per cent in annual chrysanthemum (71.58%), China aster (83.59%) were recorded in sand embedding treatment (T_2); while, minimum moisture loss per cent in dianthus (73.95%) was observed in without embedding treatment (T_1).

Minimum flower diameter reduction in dried flowers of dianthus (0.3 cm), annual chrysanthemum (0.3 cm) and China aster (0.5 cm) were recorded in the treatment of sand embedding (T_2) followed by silica gel embedding (T_3) while, it founded maximum in the treatment of without embedding (T_1). Lowest flower diameter reduction was observed with sand embedding media. This may be due to the fact that sand dose not react with water vapour released during the process of drying as in the case of silica gel and borax. It allows the water vapour to escape in to the air freely thereby causing minimum loss in size of flowers as explained by Sindhuja *et al.* (2015) [3]. Maximum flower diameter reduction was observed in without embedding drying condition. This may be due to uneven petal cell shrinkage due to no pressure of embedding media. These results were in line with Nirmala *et al.* (2008) [9] in carnation.

It is explicit from the data (Table 2) that silica gel embedding treatment (T_3) showed excellent score for flower colour (3.9, 3.8 and 3.8), appearance (3.8, 3.9 and 3.8), texture (3.9, 3.8 and 3.7) and minimum shattering of petals in dianthus, annual chrysanthemum and China aster, respectively. Silica gel embedded dried flowers scored high for quality owing to high colour retention, smooth petal texture and flower shape. Among the desiccants like sand, cornmeal, borax and silica gel used, silica gel has been found to be the best. Champoux (1999) [2] reported silica gel as the best medium for getting excellent dried flowers that retain colour and shape. Silica gel embedding drying methods has been reported to be provided best quality of dried flowers (Sindhu 2002, Dhatt *et al.,* 2007, Singh *et al.,* 2004 and Meman *et al.,* 2008) [12, 4, 14, 7]. Flower dried without embedding scored minimum owing to shrinkage of flower petals, rough texture and loss in flower shape caused deterioration of flowers.

Thus the resulted proved that silica gel embedding treatment was found to be the best method of drying as it gave good quality flowers as well as resulted in to faster drying in the flowers of dianthus, annual chrysanthemum and China aster. Best quality of dry flower employing room drying can be obtained by embedding in silica gel for 4.3 days in dianthus, 4.5 days in annual chrysanthemum and 6.0 days in China aster flowers.

Table 1: Effect of different drying methods on quantitative characteristics of different winter annual flowers under room drying condition

Treat.	Dianthus				Annual chrysanthemum				China aster			
	Fresh weight loss (%)	Moisture loss (%)	Flower diameter reduction (cm)	Time taken for drying (days)	Fresh weight loss (%)	Moisture loss (%)	Flower diameter reduction (cm)	Time taken for drying (days)	Fresh weight loss (%)	Moisture loss (%)	Flower diameter reduction (cm)	Time taken for drying (days)
T_1	64.08	73.95	2.7	8.3	77.70	78.84	2.7	8.3	73.56	84.00	1.2	12.0
T_2	59.91	81.35	0.3	6.1	76.17	71.58	0.3	6.0	64.64	83.59	0.5	7.6
T_3	64.34	88.93	0.7	4.3	82.86	87.27	0.7	4.5	74.89	85.41	0.8	6.0
T_4	64.11	77.74	1.1	7.6	78.06	78.36	1.1	7.6	54.97	84.41	0.9	10.6
S.Em±	0.99	0.59	0.04	0.08	0.03	0.16	0.04	0.05	0.03	0.18	0.03	0.23
CD at 5%	2.98	1.77	0.12	0.24	0.10	0.48	0.12	0.15	0.09	0.54	0.09	0.65
CV	3.52	1.64	7.47	2.65	0.09	0.45	7.48	1.74	0.10	0.48	6.99	5.32

Table 2: Effect of different drying methods on qualitative characteristics of different winter annual flowers under room drying condition

Treat.	Dianthus				Annual chrysanthemum				China aster			
	Colour	Appearance	Texture	Shatterig of petals	Colour	Appearance	Texture	Shattering of petals	Colour	Appearance	Texture	Shattering of petals
T_1	0.6	0.1	0.2	0.3	0.7	0.2	0.3	0.2	1.0	0.2	0.1	0.7
T_2	3.0	3.2	2.0	2.0	3.6	3.7	3.3	3.2	3.3	2.4	2.3	2.9
T_3	3.9	3.8	3.9	3.9	3.8	3.9	3.8	3.8	3.8	3.8	3.7	3.7
T_4	2.0	0.8	0.9	0.8	2.0	1.1	0.8	1.9	2.3	2.2	2.0	2.1
For colour, Appearance and Texture : 0-0.4: Very Poor, 0.5-1.4: Poor, 1.5-2.4: Moderate, 2.5-3.4: Good, 3.5-5: Excellent												
For shattering of petals : 0-0.4: Very High, 0.5-1.4: High, 1.5-2.4: Medium, 2.5-3.4: Low, 3.5-5: Nil												

References

1. Brandenberg RN, Simons JW, Smith LL. Why and how seeds are dried The processing of seeds In Seeds: The Year Book of Agriculture Alfred Steferud (ed) U S Govt printing office Washington, 1961, 295-306
2. Champoux J. Tips and home remedies, 1999. Website: http://www.kaepsmlin.com/tips.html
3. Desh Raj. Drying of attractive plant parts and flowers *Advan. Ornam. Hort.* Pointer Publishers Jaipur, 2006.
4. Dhatt KK, Singh Kushal, Kumar Ramesh. Studies on methods of dehydration of rose buds J. Ornam. Hort. 2007; 10(4):264-267
5. Gupta, Desh Raj, Prashant K. Standardizing dehydrated technology for ornamental plant part of shrubs from outer Himalayas. J Ornam. Hort. 2005; 8(1):53-55
6. Maureen F. The Flower Arrangement Encyclopedia of Preserving and Drying Sterling Publication Co. Inc 387 Park Avenue South New York, 1988, 160.
7. Meman MA, Barad AV, Varu DK. Technology for dry flower production of calendula (*Calendula officinalis*) flowers. The Asian J. Hort. 2008; 3(1):1 4
8. Nazki IV, Lone NH, Qadri ZA, Nelofer, Rather ZA. Evalution of dehydration techniques for product diversification in floral craft in some genera of Kashmir valley. J Ornam. Hort. 2012; 15(3-4):259-265
9. Nirmala A, Chandrasekar R, Padma M, Rajkumar M. Standardization of drying techniques ofcarnation (*Dianthus caryophyllus*) J. Ornam. Hort., 2008; 11:168-172
10. Panse VG, Sukhatme PV. Statistiacl Methods for Agri Workers ICAR publication New Delhi, 1967.
11. Pertuit A. Preserve flowers using the microwave, 2002. Website: http://hgic/clemson.edu
12. Sindhu A. Studied on dehydration of winter annuals. M.Sc. thesis submitted to Punjab Agricultural University Ludhiana, 2002.
13. Sindhuja S, Padmalatha, Padmavathamma AS. Effect of embedding on production of quality dry flowers in carnation. *Plant Archives.* 2015; 1(15):27-33
14. Singh A, Dhaduk BK, Shah RR. Effect of different temperatures and embedding media on flower dehydration of zinnia (*Zinnia linearis* Benth.). Indian J. Hort. 2004; 61(3):249-252