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EFFECT OF DIFFERENT EMBEDDING MEDIA AND DURATION OF DRYING ON PRODUCTION OF QUALITY DRY FLOWERS IN GERBERA (*Gerbera jamesonii* Bolus ex. Hooker F)

Subhendu S. Gantait[1*] and Suresh Mahato[2]

[1]*Deptt. of Floriculture & Landscaping, Bidhan Chandra Krishi Viswavidyalaya, P.O. Krishi Viswavidyalaya, Mohanpur, Nadia-741252, West Bengal*

[2]*RRS Kalimpong, Uttar Banga Krishi Viswavidyalaya, Kalimpong, Dist. Darjeeling*

**E-mail: ssgflori@gmail.com*

ABSTRACT : Investigation was carried out to standardize the suitable embedding media and drying duration for dehydration of gerbera (*Gerbera jamesonii* Bolus ex. Hooker F) flowers. Fully opened flowers were embedded in four drying media (Coarse Silica Gel, Fine Silica Gel, Coarse Sand and Fine Sand) and dried in four drying durations (12 hours, 18 hours, 24 hours and 30 hours) at constant drying temperature (45°C) in hot air oven. Dried samples were given subjective scores on average 10 points scale with reference to ornamental values comparable to fresh samples on the basis of colour, texture and shape. Among different drying media, the decrease in weight of gerbera flower was highest (67.15 %) by embedding in Fine Silica Gel (FSG) in hot air oven for 30 hours. Effect of drying on colour (8.35), texture (8.00) and shape (8.00) were recorded highest score in hot air oven drying when embedded in Fine Silica Gel. In regardless of all the parameters, the flowers dehydrated by embedding in Fine Silica Gel for 12 hours in hot air oven at 45° C were found to be of best quality.

Keywords: *Dehydration, gerbera, embedding media, silica gel, fine sand, hot air oven drying*

Gerbera is a perennial plant grown in a wide range of climatic conditions which provide greater scope for producing various coloured and shaped dried gerbera flowers. Dry flowers and plant materials have a tremendous potential as substitute for fresh flowers and foliage for interior decoration along with other artistic and commercial purposes as these are long-lasting, possess aesthetic beauty and are available throughout the year. The flower drying is an important postharvest technique for enhancing keeping quality and providing value addition. The flowers drying technique involves reducing moisture content of flowers to a point at which bio-chemical changes are minimized while maintaining cell structure, pigment level and flower shapes (Singh and Dhaduk, **6**). Dry flowers have good demand both in Indian and International markets. From India it is being exported to countries like USA, Japan and Europe. India stands first in dry flower export owing to the availability of variety of plants. Export of dried flowers and plants from India is over Rs. 100 crore per year. The industry exports 500 varieties of flowers to 20 countries (Swarnapriya and Jayesekar, 7). Dried flowers as well as plant parts are the major segment accounting for 70% of total share of floriculture products exported from India (Singh, 5). Drying techniques for many ornamental plants including gerbera are available (Datta, 1) but suitability of the techniques varies with flower. Moreover, during summer month, due to extreme high temperatures, the fresh cut flowers do not stay for longer periods irrespective of the best care given. Therefore, in the light of above information, the present studies were taken to find out the suitable techniques of dehydration for gerbera flowers.

MATERIALS AND METHODS

For the purpose of the experiments gerbera flowers were harvested at full bloom stage. The flowers were collected from the Research Farm, Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar. In first experiment, the flowers were given drying treatments in hot air oven at 45°C after embedding them in Coarse Silica Gel (CSG), Fine Silica Gel (FSG, 60-120 mesh), Coarse Sand (CCS) and Fine Sand (FFS). In hot air oven gerbera flowers were dried for 12 hrs, 18 hrs, 24 hrs and 30 hrs. In the experiment the data were recorded for various parameters and were subjected to statistical analysis using factorial completely randomized design (CRD) with three replications (In case of calculation of effect on colour, texture and shape ten replication were used). Physiological properties like decrease in weight of flowers in percentage were recorded by dividing weight of dried flowers by weight of fresh flowers and visual quality

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parameters like colour, appearance and texture were assessed by means of sensory evaluation by scoring on average ten point scale. The point distribution patterns were: excellent (8.0-10.0), very good (6.0-8.0), good (4.0-6.0) poor (2.0-4.0) and very poor (below 2.0). Based on cumulative score (total sum of quality parameters), ranks were given and the best treatment combinations were worked out as per Deshraj (2).

RESULTS AND DISCUSSION

The data presented in Table 1 showed that maximum decrease (48.71%) in dry weight was in Fine Silica Gel (FSG) which was differed significantly over other embedding media. Whereas decrease in weight was highest (63.11%) when flowers dried over 30 hour duration in embedded condition and that was also significantly superior to other duration of drying. The data regarding different media and duration of drying revealed that the percentage of flower's dry weight decreased gradually with increase in duration of drying from 12 hours (27.15 %) to 30 hours (67.15%) in Fine Silica Gel (Table 1 & Fig. 1). Similar trends were observed on Coarse Silica Gel, Fine Sand and Coarse Sand in respect of duration of drying. Removal of moisture from the flower by the flow of hot air might be a reason for decrease of the dry weight. None the less, Moona (3) reported that this might be due to the strong hygroscopic nature of the fine silica gel which led to

Table 1: Effect of different drying media and drying duration on quality attributes of gerbera after hot air oven drying (at 45°C).

Media	Decrease in weight (%)	Colour	Texture	Shape
CSG	43.14	6.05	6.08	6.23
FSG	48.71	7.27	7.22	7.20
CCS	39.81	5.22	5.28	5.24
FFS	45.62	6.85	6.88	6.64
CD (P=0.05)	0.481	0.398	0.413	0.421
Duration				
12H	23.23	7.58	7.47	7.46
18H	40.12	6.75	6.84	6.79
24H	50.83	5.96	6.01	6.02
30H	63.11	5.09	5.14	5.04
CD (P=0.05)	0.43	0.40	0.403	0.422
Interaction				
CSG x 12H	21.85	7.15	7.14	7.91
FSG x 12H	27.15	8.35	8.00	8.00
CCS x 12H	19.65	6.77	6.82	6.77
FFS x 12H	24.26	8.05	7.91	7.14
CSG x 18H	38.11	6.35	6.45	6.35
FSG x 18H	46.10	7.57	7.62	7.57
CCS x 18H	34.96	5.93	5.98	5.93
FFS x 18H	41.29	7.16	7.32	7.32
CSG x 24H	49.92	5.87	5.92	5.96
FSG x 24H	54.45	6.67	6.70	6.70
CCS x 24H	46.55	5.03	5.08	5.18
FFS x 24H	52.39	6.28	6.33	6.24
CSG x 30H	62.69	4.82	4.81	4.69
FSG x 30H	67.15	6.49	6.57	6.53
CCS x 30H	58.09	3.15	3.22	3.09
FFS x 30H	64.51	5.89	5.94	5.84
CD (P = 0.05)	0.961	0.793	0.834	0.815

CSG – Coarse Silica Gel *CCS – Coarse Sand* *12H – 12 Hours* *24H – 24 Hours*

FSG – Fine Silica Gel *FFS – Fine Sand* *18H – 18 Hours* *30H – 30 Hours*

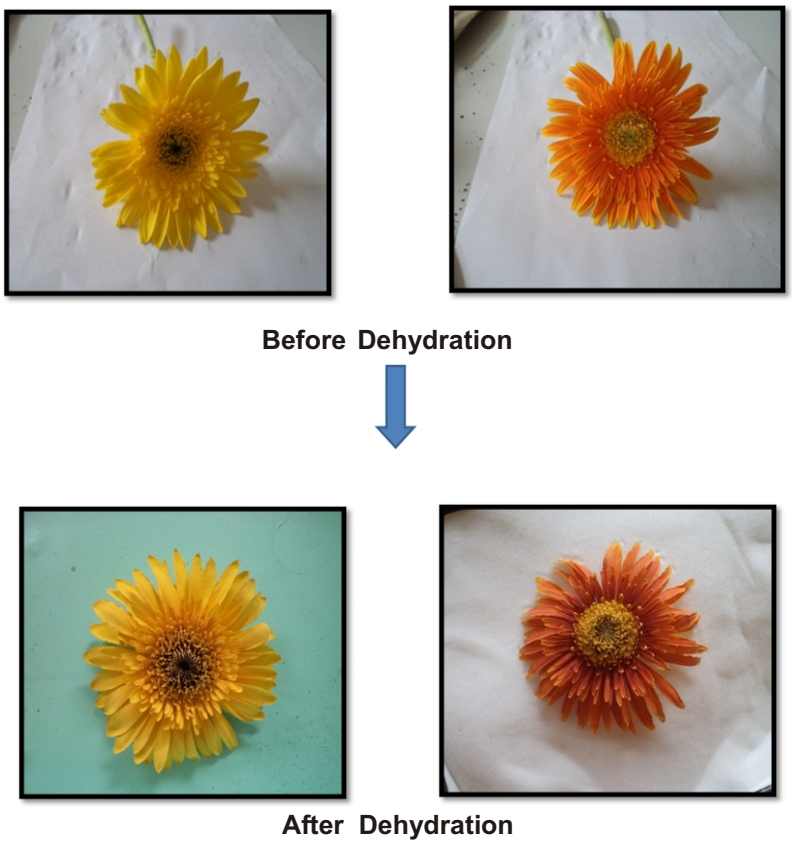

Fig. 1. Before and after dehydration of Gerbera flowers in Fine Silica Gel for 12 hours in hot air over at 45°C temperature.

Table 2: Ranking of Gerbera flowers based on colour, texture and shape after hot air oven drying (at 45°C).

Media	Duration (Hours)	Colour	Texture	Shape	Average	Rank
CSG	12	7.15	7.14	7.91	7.40	4
FSG	12	8.35	8.00	8.00	8.12	1
CCS	12	6.77	6.82	6.77	6.79	6
FFS	12	8.05	7.91	7.14	7.70	2
CSG	18	6.35	6.45	6.35	6.38	9
FSG	18	7.57	7.62	7.57	7.59	3
CCS	18	5.93	5.98	5.93	5.95	11
FFS	18	7.16	7.32	7.32	7.27	5
CSG	24	5.87	5.92	5.96	5.92	12
FSG	24	6.67	6.70	6.70	6.69	7
CCS	24	5.03	5.08	5.18	5.10	14
FFS	24	6.28	6.33	6.24	6.28	10
CSG	30	4.82	4.81	4.69	4.77	15
FSG	30	6.49	6.57	6.53	6.53	8
CCS	30	3.15	3.22	3.09	3.15	16
FFS	30	5.89	5.94	5.84	5.89	12

CSG – Coarse Silica Gel FSG – Fine Silica Gel CCS – Coarse Sand FFS – Find Sand

rapid removal of moisture from the flowers. The scoring of colour content was maximum (7.27) in FSG as embedding media for dehydration. The colour scoring was found to be best (7.58) when flowers were dried for minimum time *i.e.* 12 hour. The interaction between embedding media and duration of drying was significant on colour content of dry gerbera flowers petals. Among the desiccants, the scoring for colour,

Fine Silica Gel (8.35) was significantly superior over Coarse Silica Gel (7.15) and Coarse Sand (6.77) and but was at par (8.05) with Fine Sand on 12 hours of drying. The performance of the other dehydration media was similar after 18 hours, 24 hours and 30 hours of drying treatments (Table 1). Naeve (4) also reported that silica gel was superior for colour retention. Silica gel has been reported to be the fastest acting desiccants. It was found that the texture of the dehydrated flowers was better on Fine Silica Gel (8.00) followed by Fine Sand (7.91), Coarse Silica Gel (7.14) and Coarse Sand (6.82) after 12 hours, 18 hours, 24 hours and 30 hours of drying. Significant interaction between media and duration of drying was noticed (Table 1). The effect of dehydration treatments on shape of gerbera flowers was better on Fine Silica Gel (8.00) and Coarse Silica Gel (7.91) as compared with Find Sand (7.14) and Coarse Sand (6.77) after 12 hours of drying. The scoring for shape was decreased in respect of increase in duration of drying (Table 1.).

The highest to least rank (1-16 in order) was tabulated on the basis of overall average (colour, texture and shape) after giving the overall treatments of dehydration. The data in the Table 2 revealed that Gerbera flower ranked 1st when embedded in Fine Silica Gel (avg. 8.12) and was 2nd when embedded in Find Sand (avg. 7.70) for 12 hours in hot air oven, respectively, followed by 3rd rank when embedded in Fine Silica Gel for 18 hours (Avg. 7.59) in hot air oven. The least rank (16th) was scored to Coarse Sand (Avg. 3.15) with drying duration 30 hours. Fine Silica Gel was best and found to be superior to maintain original colour, texture and shape of gerbera flowers for a long time, making them highly suitable substitutes for fresh flowers.

Conclusion

Among different drying media, the decrease in weight of *Gerbera* flower was highest by embedding in Fine Silica Gel in hot air oven for 30 hours. Effect of drying on colour, texture and shape of flowers were found to be highest in hot air oven drying when embedded in Fine Silica Gel. The first rank was given to Fine Silica Gel for all the flowers when dried for 12 hours in hot air oven at 45 °C for all the parameters.

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