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Effect of Pre-drying Treatment on Carnation Dried Flower Quality

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ABSTRACT

Dehydration of flowers is an ancient practice. In India, commercial boost for dried flowers was gained only a decade old. Dried flowers demand in the domestic as well as in the international flowers is increasing at the annual rate of 15 per cent presently raw materials for the dried flower industry is dependent on 60 per cent of raw materials from wild and 40 per cent of the raw material is obtained from cultivation. Dried flower quality greatly depends on flowers structure, moisture content, stage of harvest, time of harvest and drying methods. Hence, the present study was taken with the objective to know the effect of variety, harvest stage and drying methods on dried flower qualities. Carnation cultivation has increased in the country. Carnation flowers are gaining importance among the cut flowers for their brightness, when fresh as well as dried. Pre–treatment with glycerol influenced quality of dried flowers of carnation var. Dona. 1.1 glycerol : water and 1:3 glycerol : water pre drying treatment for 24 hours yielded better quality dried carnation flowers with respect to colour (4.2) texture, (4.52), appearance (4,17) and shape (3.96).

Keywords : Dried flower, Carnation, Qualty, Pre drying

INTRODUCTION

Floriculture business is expanding rapidly through out the world. It has tremendous potential for export besides home consumption. Cut flowers are one of the main components of floriculture trade. The demand for fresh cut flowers is increasing day by day and their prices have shot up considerably. The shelf life of fresh cut flowers is limited, in spite of using best chemicals for improvement of keeping quality and enhancement of vase life. Hence, the fresh cut flowers can not be stored for a long time. Non-availability of flowers at times and places where one wants them very much is an additional problem. Efforts are being made since centuries to find alternatives for fresh flowers. For these efforts, dried flowers hold an economic and eco-friendly answer.

Flowers have been dried, for various reasons from thousands of years. The ancient Egyptians made immensely detailed preparations for their dead to enjoy all that they had during this life in the next one. Many centuries later medieval monks harvested and dried the flowers and an herb by hanging bunches upside down in shade for medicinal use (Susan, 1990). Flowers drying offer excellent prospects, particularly for the Indian entrepreneurs. The country is blessed with a wide range of flora which is the starting materials. The industry also enjoys the benefit of the cheap labour and favourable climate as against other countries (Gurumurti, 1997). Dried flowers are long lasting and can be used several times. An arrangement with dried flowers gives pleasure for several months. When dried of it, one can take them apart and store for future use (Conder *et al.,* 1993). In India, dried flower industry is as old as 40 years. But it is only the last decade that brought in a lot of changes and widened the scope of this industry. The momentum of growth was surprisingly high during the past 10 years (Singhvi, 2001).

The life of dried flowers varies with different flowers according to the species, texture of their petals and total consistency of flowers (Deborah, 1992). High quality dried flowers could be produced only from just blooming stage of flowers with thin

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petals and small flower heads. Therefore, the time of harvest, stage of harvest, pre-drying treatments, method of drying, type of desiccant used are a few to mention of the many factors that decide the final quality of dried flowers. The published literature with respect to effect of these factors on dried carnation flowers is meagre and the available methods have to be fine tuned to get high quality dried flowers. Virtually all the species can be dried, but certain considerations have to be kept in mind before selecting the material. Fore most is that the material should have less moisture and fibrous tissues, secondly, the fluffy and open flowers are difficult to be dried as they lose their shape during drying process (Kaur, 1999). Flowers are of fancy item, hence, the consumer preference keeps changing in the market, only 1 or 2 varieties are only in ever demand. But most of the varieties exist only for 3-5 years in the market. Therefore, process of the dehydration techniques to the latest varieties is required to boost the dried flower export.

Floriculture has emerged as a lucrative profession with a much higher potential for returns than most field and many horticultural crops (Raghava, 2001). In India, we have never looked into the tremendous export potential of dried flower industry and till date it is the most neglected industry. There is an unlimited prospect in this field and only with sustained efforts; we can make a significant presence in the world a significant presence in the world market. So there is a need to tune the techniques of drying of flowers with special reference to the available flora and fauna under the conditions prevailing in India. Carnation (*Dianthus caryophyllus*) belonging to family Caryophyllaceae is one of the most important commercial cut flowers known for its exquisite beauty and wide range of colours. It is most popular among consumers. Hence, the present study was undertaken to standardize drying technology for carnation flowers with the following objectives is to explore the possibility of improving the dried flower quality with glycerol pre-drying treatment and to find out the feasibility of dried flowers in product diversification.

MATERIALS AND METHODS

The present investigation on “Effect of pre-drying treatment on carnation dried flower quality” was carried at the Division of Post Harvest Technology, Indian Institute of Horticulture Research, Hessaraghatta, Bangalore. Cut carnation flowers for the experiment were brought from ‘Hoomane”, private farm near Nelamangala, Bangalore, which is located at about 20 km away from Indian Institute of Horticultural Research, Hessarghatta, Bangalore**.** Flowers were harvested between 9-11 a.m. and were transported immediately to the laboratory. Good and uniform harvest stage flowers were selected and trimmed to 30 cms stalk length. Treatments were imposed to flowers along with leaves. Drying of flower was standardized by adopting different drying methods as described separately under each experiment. Five flowers were used per replication. During the studies the day relative humidity and temperature of the laboratory were 55-60 per cent and 25 – 28^{o}C respectively. Two durations of glycerol pre drying treatments tried were 24 hours and 48 hours. Freshly harvested flowers without the pre drying glycerol treatment were control. Glycerol pre treated and the control flowers were embedded in sand desiccant as described in experiment and subjected to hot air oven for 24 and 48 hours duration.

Glycerol concentration

1) 1:1 glycerol water
2) 1:3 glycerol water
3) 1:5 glycerol water
4) Water
5) Glycerol
6) Control

The observation were recorded for all the experiments are fresh weight of all the samples before subjecting to treatment was expressed as gram (g) per flower, dry weight of all samples after drying was expressed as gram (g) per flower. Per cent moisture loss by difference between fresh weight and dry weight of the flower expressed in percentage (Eq. 1).

$$\text{Moisture loss (\%)} = \frac{\text{Fresh weight - dry weight}}{\text{Fresh weight}} \times 100 \quad \text{(Eq. 1)}$$

Drying time calculated by the time taken for drying was determined when two consecutive constant dry weight readings of the samples were recorded. Drying rate was calculated by using the following formula (Eq. 2).

$$\text{Drying rate(Expressed in g/water/hour)} = \frac{\text{Amount of moisture removed (g)}}{\text{Time taken x bone dry weight (g)}} \quad \text{(Eq. 2)}$$

Quality parameters like colour, texture, shape and appearance of carnation dried flowers obtained under each experiments were assessed by means of sensory evaluation. Panel of judges assessed the quality parameters viz., colour, shape, texture and appearance by scoring on a five-point-scale was excellent, very good, good, bad and very bad with the weightage of 3.5 – 4.0, 2.5 – 3.4, 1.5 – 2.4, 0.5 – 1.4 and 0.0 – 0.4, respectively. Experimental data was subjected to statistical analysis by using completely randomized design at the computer centre, University of Agricultural Sciences, Gandhi Krishi Vignana Kendra, Bangalore.

Table 1: Effect of pre-drying treatment with glycerol on fresh weight (g) of carnation var. Dona, flowers.

Concentrations (B)	Durations (A)			
	Initial	24 hours	48 hours	Mean
1 : 1	14.20	16.05	13.45	14.75
1 : 3	14.21	14.30	13.70	14.00
1 : 5	14.00	13.60	13.55	13.57
Water	14.10	14.75	14.10	14.42
Glycerol	14.50	16.55	14.15	15.35
Control	14.60	12.85	12.07	12.47
Mean	14.26	14.68	13.50	14.09
Levels	SEm±	LSD 0.05		
A	0.181	0.521		
B	0.314	0.903		
A x B	0.444	1.277		

RESULTS AND DISCUSSION

Effect of pre-drying treatment with glycerol on carnation Var. Dona dried flower quality.

Influence of glycerol pre drying treatment on flower fresh weight, dry weight, drying rate, drying time, per cent moisture loss and sensory score of dried flower quality of carnation var. Dona are presented in the tables 1.

Fresh weight

Effect of pre drying treatment with glycerol on fresh weight of carnation Var. Dona flowers was found significant (Table-1). Glycerol concentration and duration of treatments individually and interaction effects were found significant on fresh weight of carnation Var. Dona open flowers. Fresh weight was higher with 24 hours of treatment at all levels of glycerol as compared to the flowers treated for 48 hours. Maximum fresh weight of (16.55g) was obtained with flowers treated with glycerol alone followed by 1:1 glycerol: water treatment for 24 hours. Minimum fresh weight of 12.07g was obtained after 48 hours of pretreatment with control flowers.

Dry weight

Effect of pre drying treatment with glycerol on dry weight (g) of carnation Var. Dona open flowers was found significant (Table 2). Glycerol concentration and duration of treatments individually and their interaction levels had significant effect on dry weight of carnation Var. Dona open flowers. Dry weight with flowers treated for 24 hours of all levels of glycerol and control as compared to the flowers treated for 48 hours. However, maximum dry weight of 5.0 g was obtained with flowers treated with glycerol alone followed by (4.5 g) dry weight of flowers with 1:1 glycerol: water treatment for 24 hours. Minimum dry weight of 2.55 g was obtained with control flowers after 48 hours.

Per cent moisture loss

Effect of pre-drying treatment with glycerol on per cent moisture loss of carnation Var. Dona flowers was found significant (Table-3). Effect of duration of glycerol pre drying treatment on per cent moisture loss was found non-significant. Per cent moisture loss during hot air oven sand embedded drying of carnation Var. Dona open flowers was higher at 48 hours at all the glycerol pre drying treatments as compared to 24 hours of glycerol pre drying treatments. Maximum per cent moisture loss of 79.50% was obtained with flowers treated for 48 hours followed by 24 hours control treatment (78.52%). Minimum moisture loss of (67.42%) was obtained with 1:1 glycerol: water pre dry treatment for 24 hours.

Effect of pre-drying treatment with glycerol on sensory of carnation Var. Dona dried flowers

Effect of pre-drying treatment with glycerol on sensory quality of carnation Var. Dona dried flower

data is presented in table 4. Effect of duration of pre-drying treatment with glycerol on dried flower texture of carnation var. Dona was found significant whereas on dried flowers colour, shape, texture and appearance was found non-significant. Maximum sensory score of 3.05 was given to the colour of carnation var. Dona dried flowers of 24 hours glycerol pre drying treatment. Minimum sensory score of 2.82 was given to texture of 48 hours pre drying glycerol treated dried flowers. Effect of glycerol concentrations on carnation var. Dona dried flowers colour, texture, shape and appearance was found significant. Interaction effect of duration and glycerol concentrations on sensory score was found non-significant with respect to dried flower colour, texture and appearance at both duration of treatments. Whereas, interaction effect on sensory score with respect to dried flowers shape was found significant at both duration.

Table 2 : Effect of glycerol pre drying treatment on dry weight (g) of carnation var. Dona flowers dried in sand embedded hot air oven.

Concentrations	Durations (A)		
(B)	24 hours	48 hours	Means
1 : 1	5.00	4.05	4.52
1 : 3	4.50	3.90	4.20
1 : 5	4.15	3.55	3.85
Water	3.45	3.70	3.57
Glycerol	3.80	4.05	3.92
Control	2.67	2.55	2.61
Mean	3.92	3.63	3.78
Levels	**SEm±**	**LSD 0.05**	
A	0.078	0.224	
B	0.133	0.388	
A x B	0.191	NS	

Drying rate: Data reveals that effect of duration of glycerol pre treatment on drying rate was non-significant, whereas, glycerol concentration had significant effect on drying rate. Highest drying rate of 3.55 g of moisture loss per hour was recorded in control flowers by 3.01 g of moisture loss per hour was obtained with flowers as held, whereas, drying rate of glycerol treated flowers decreased with increased glycerol concentration. Minimum drying rate of 2.46 g of moisture loss per hour was obtained with flowers pretreated with 1:1 glycerol: water. Packaging and storage studies to enhance shelf life and display quality of dried flowers. Advanced techniques like freeze drying and dielectric method of drying can be tried for different types of flowers. There is a need to study the suitability or performance of other desiccants and their combinations for embedded drying methods.

Table 3 : Per cent moisture loss of pre drying glycerol treated carnation var. Dona flowers dried in hot air oven

Concentrations	Durations (A)		
(B)	24 hours	48 hours	Means
1 : 1	79.42	77.36	78.39
1 : 3	76.89	77.36	77.12
1 : 5	77.05	78.67	77.85
Water	76.23	74.81	75.52
Glycerol	77.46	77.68	76.57
Control	79.09	78.32	78.70
Mean	77.69	77.03	77.35
Levels	**SEm±**	**LSD 0.05**	
A	0.595	NS	
B	0.031	0.093	
AxB	1.458	NS	

Effect of pre-drying treatment with glycerol on sensory quality of carnation Var. Dona dried flower data is presented in table 5 and 6. Effect of duration of pre-drying treatment with glycerol on dried flower texture of carnation var. Dona was found significant whereas on dried flowers colour, shape, texture and appearance was found non-significant. Maximum sensory score of 3.05 was given to the colour of carnation var. Dona dried flowers of 24 hours glycerol pre drying treatment. Minimum sensory score of 2.82 was given to texture of 48 hours pre drying glycerol treated dried flowers.

Table 4: Drying rate of pre draying glycerol treated carnation cv. Dona flowers dried in hot air oven

Concentrations	Durations (A)		
(B)	24 hours	48 hours	Means
1 : 1	2.46	2.46	2.46
1 : 3	2.82	2.53	2.67
1 : 5	2.18	2.86	2.52
Water	3.18	2.83	3.01
Glycerol	2.48	2.50	2.49
Control	3.41	3.68	3.55
Mean	2.75	2.81	2.78
Levels	**SEm±**	**LSD 0.05**	
A	0.33	NS	
B	0.057	0.165	
AxB	0.081	0.234	

Effect of glycerol concentrations on carnation var. Dona dried flowers colour, texture, shape and appearance was found significant. Interaction effect of duration and glycerol concentrations on sensory score was found non-significant with respect to dried flower colour, texture and appearance at both duration of treatments. Whereas, interaction effect on sensory score with respect to dried flowers shape was found significant at both duration.

Table 5 : Effect of pre-drying treatment with glycerol on sensory quality of carnation cv. Dona dried flowers

Treatments	Colour	Texture	Shape	Appearance
24 hours	3.05	3.04	2.83	2.93
48 hours	3.03	2.82	2.83	2.96
SEm±	0.046	0.069	0.069	0.084
CD 0.05	NS	0.199	NS	NS
Treatments (B)				
1:1	4.15	4.30	3.96	4.16
1:3	3.87	3.98	4.08	3.92
1:5	3.06	3.36	3.30	3.71
Water	2.95	2.56	2.47	2.91
Glycerol	2.31	2.02	1.72	1.66
Control	1.91	1.37	1.46	1.32
SEm±	0.080	0.119	0.120	0.147
LSD 0.05	0.230	0.344	0.344	0.422
Duration 24 hours				
1:1	4.25	4.52	3.95	4.17
1:3	3.87	4.20	4.05	3.82
1:5	3.05	3.30	3.32	3.85
Water	2.87	2.80	2.82	3.10
Glycerol	2.32	2.05	1.52	1.45
Control	1.95	1..37	1.32	1.22
SEm±	0.113	0.169	0.169	0.208
LSD 0.05	NS	NS	0.487	NS
Duration 48 hours				
1:1	4.05	4.07	3.97	4.15
1:3	3.87	3.77	4.12	4.02
1:5	3.07	3.42	3.27	3.57
Water	3.02	2.32	2.12	2.72
Glycerol	2.30	2.00	1.92	1.87
Control	1.87	1.37	1.60	1.42
SEm±	0.113	0.169	0.169	0.208
LSD 0.05	NS	NS	0.487	NS

NS = Non-significant

Table 6 : Sensory evaluated dried flower products

Sl. No.	Products	Sensory score
1.	Flower arrangements	4.43
2.	Floral greetings	3.75
3.	Bouquets	4.10
4.	Floral arrangement in glass	4.70
5.	Wreaths	4.28
6.	Photo frames	4.50
	SEm±	0.095
	LSD 0.05	0.277

CONCLUSION

Dried Carnation flowers are gaining importance. Pre–treatment with glycerol, l:1 glycerol : water and 1:3 glycerol : water pre drying treatment for 24 hours yielded better quality dried carnation flowers with respect to colour, texture, appearance and shape.

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