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Standardization of Sun drying and pretreatment of glycerol for drying of carnation var. Soto

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Abstract: *The present Investigation was carried out to standardize the sun drying and optimum concentration for pre drying treatment of carnation var. Soto. The flowers embedding in silica gel under shade drying +sun drying is best in retaining all the quality parameters of dried Carnation flower var. Soto..The maximum fresh weight (7.15 g/flower) was recorded by flowers subjected to drying at shade +sun drying with black cotton cloth.While least fresh weight (4.33 g/flower) was noticed by the flowers subjected to sun drying + white cotton cloth. The flowers dried under shade + sun drying scored the highest sensory points of 3.00 and were significantly superior over other treatments. Whereas the flowers dried under sun drying + white cotton cloth showed poor acceptability (2.13). The fresh flowers were subjected to glycerol pre-treatment with different glycerol concentrations and time duration. Flowers were imposed to different concentrations and duration of glycerol. The experiment was laid out in a completely randomized block design with three replications. The sensory score for colour (4.11), shape (4.11), texture (4.11) and overall acceptability (4.00) was scored maximum values in flowers treated with glycerol: water in the ratio 1:5 for 12 hours and least scores (3.11), (3.22), (3.44) and (3.22) was recorded in untreated flowers for colour, shape, texture and overall acceptability respectively.*

Key words: *carnation, silica gel, sun drying. glycerol. soto. cultivar.*

INTRODUCTION

Carnation (*Dianthus caryophyllus* L.) is considered as one of the nature's beautiful creations because of having excellent flowers of exquisite shape, size and bewitching colour. It is native to Mediterranean region and Asiatic region and is popularly known as Divine flower, Clove pink, Gilly Flower. Carnation is used extensively in flower arrangement and as a cut flower. The cut flowers are short lived, as they are perishable in nature. However, the concept of flower drying offers viable solution to preserve the beauty of carnation cut flowers and their marketability.

The dried flowers industry in India is about years old and its products have got high export value. As a matter of fact, this industry was introduced initially by the British and located at Kolkata for its nearness to the north-east and eastern regions where exotic and diverse blooms were available in nature. Export of dried flowers and plants from India is worth of about ₹ 100 crores per year, which contributes to nearly 60 per cent of floriculture export to Europe, and it is below 1.5 per cent of the world requirement.

1. Sun drying of Carnation cut flower var. Soto.

An experiment was laid out to evaluate sun drying method for better quality of dried carnation var. Soto was carried out in College of Horticulture, Mudigere, Chickmagalore district, Karnataka during the year 2011-12.

MATERIAL AND METHODS

Under sun drying the flowers embedded in silica gel were exposed to sun every morning and shifted to rooms in the evening. Trays covering with black and white cotton cloth also exposed to sun for drying. Based on previous experiment results of shade drying, the flowers kept for drying by embedding in silica gel under shade for half a period of the drying (that they took for drying under shade by embedding in silica gel), then they were subjected for sun drying, sun drying with black cotton cloth and white cotton cloth. The experiment was laid out in a completely randomized block design

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Method of drying (Treatments)

T_1 : Sun drying

T_2 : Sun drying with black cotton cloth

T_3 : Sun drying with white cotton cloth

T_4 : Shade drying + Sun drying

T_5: Shade drying + Sun drying with black cotton cloth

T_6 : Shade drying + Sun drying white cotton cloth

RESULT AND DISCUSSION

Sun drying on different quantitative parameters of Soto variety of Carnation flowers are presented in Table 1. There was a significant difference with respect to fresh flower used for sun drying. Maximum fresh weight (7.15 g/flower) was recorded by flowers subjected to drying at shade +sun drying with black cotton cloth (T_5) which was on par with fresh weight of flowers (6.31 g/flower) subjected to shade + sun drying (T_4). However least fresh weight (4.33 g/ flower) was noticed in sun drying + white cotton cloth (T_3).

There was a significant difference with respect to dry flower weight due to the effect of sun drying. Maximum dry weight (2.10 g/flower) was noticed by the flowers subjected to sun drying + white cotton cloth (T_3) which was on par with the dry weight of flowers (1.98 g/flower) subjected to shade + sun drying (T_4). Minimum dry weight (1.17 g/flower) was noticed by flowers subjected to sun drying+ black cotton cloth. The percent moisture loss of flowers dried under sun. Maximum moisture loss (78.87 %) was recorded by the flowers dried under sun drying + black cotton cloth (T_2), which is on par with the flowers dried under sun drying (76.13 %)(T_1). Minimum moisture loss (51.32 %) was recorded by the flowers dried under sun drying + white cotton cloth (T_3).

There was a significant difference in the time taken by the flowers as influenced by sun drying. Maximum time (4.58 days) was recorded by the flowers dried under shade + sun drying with black cotton cloth (T_5), which is followed by the flowers dried under shade + white cotton cloth (4.17 days) (T_6),. Minimum time (3.50 days) was recorded by the flowers dried under sun drying + black cotton cloth (T_2). Fresh flower diameter used for sun drying. However maximum fresh flower diameter (5.69 cm) was noticed in the flowers used for sun drying (T_1). Least fresh flower diameter (5.21 cm) was noticed by the flowers used for drying under shade + white cotton cloth (T_6).

No Significant difference was noticed with respect dried flower diameter of Carnation var. Soto. Maximum dry flower diameter (5.56 cm) was recorded by the flowers dried under sun drying (T_1). Minimum dried flower diameter (5.13 cm) was recorded by the flowers dried under shade + white cotton cloth (T_6).

The influence of sun drying on quality parameters of Soto variety of Carnation flowers was presented in table 2. Significant difference was noticed with respect to colour of Carnation influenced by sun drying of flowers. Sensory score (3.63) was found maximum by the flowers subjected to shade + sun drying (T_4) . The least score (1.75) was noticed by the flowers subjected sun drying + white cotton cloth (T_3).

It is evident from the data that sun drying had a significant effect on the texture of the dry flowers. Among the treatments, the highest score (3.25) and the lowest (2.00) sensory points were scored by the flowers dried shade + sun drying (T_4) and sun drying, sun drying + white cotton (T_3) cloth respectively. Shape of dried Carnation flowers differed significantly. Flowers dried under shade + sun drying scored maximum points (T_4) (2.87). However the minimum sensory score (1.88) was noticed by the flowers dried under sun drying+ white cotton cloth (T_3).

Significant difference was found with respect to over all acceptability of dried Carnation flowers due to sun drying. However, the flowers dried under shade + sun drying (T_4) scored the highest sensory points of 3.00 and were significantly superior over other treatments. Whereas the flowers dried under sun drying + white cotton cloth (T_3) showed poor acceptability (2.13).

Among the different treatments of sun drying tried, significant difference was found with respect to dry weight, moisture loss and time taken for drying. Minimum dry weight (1.17 g/flower) with maximum moisture loss (78.87 %) and least time (3.50 days) was noticed by flowers subjected to sun drying+ black cotton cloth. This may be due to better elimination of moisture by this method as black cotton is absorbant of heat. A black cotton cloth, on the other hand is absorbing all of the incident wavelengths (along with all of their energies) which causes it to heat upand silica gel acts as quick absorbant. The per cent weight loss and moisture loss were significantly higher under sun drying embedded in silica gel for China aster flowers (Meman *et al*., 2006) and Gerbera (Hulgur., 2011).

Table 1
Influence of sun drying on quantitative parameters of Soto variety of Carnation flowers

Sl. No.	*Treatment*	*Fresh weight (g/flower)*	*Dry weight (g/flower)*	*Per cent Moisture loss*	*Time taken (Days)*	*Fresh flower diameter (cm)*	*Dried flower diameter (cm)*
1	T_1 Sun drying	5.41	1.31	76.13	3.58	5.69	5.56
2	T_2 Sun drying+ Black cotton cloth	5.55	1.17	78.87	3.5	5.57	5.45
3	T_3 Sun drying + White cotton cloth	4.33	2.10	51.32	3.75	5.28	5.17
4	T_4 Shade + Sun drying	6.31	1.98	68.68	4	5.47	5.37
5	T_5 Shade + Sun drying with black cotton cloth	7.15	2.02	71.62	4.58	5.59	5.5
6	T_6 Shade + Sun drying with white cotton cloth	5.60	1.65	70.61	4.17	5.21	5.13
	S.Em±	0.16	0.05	1.14	0.10	0.14	0.14
	CD at 1%	0.68	0.20	4.94	0.44	NS	NS

Table 2
Influence of sun drying on quality parameters of Soto variety of Carnation flowers

Sl. No.	*Treatment*	*Colour*	*Texture*	*Shape*	*Over all acceptability*
1	T_1 Sun drying	2.63	2	2.5	2.63
2	T_2 Sun drying+ Black cotton cloth	3.25	2.63	2.75	2.88
3	T_3 Sun drying + White cotton cloth	1.75	2	1.88	2.13
4	T_4 Shade + Sun drying	3.63	3.25	2.87	3
5	T_5 Shade + Sun drying with black cotton cloth	2.88	2.63	2.5	2.75
6	T_6 Shade + Sun drying with white cotton cloth	3.38	2.88	2.25	2.88
	S.Em±	0.02	0.02	0.02	0.02
	CD at 1%	0.07	0.09	0.08	0.07

Table 3
Effect of concentration of glycerol and duration of treatment on quantitative parameters of Soto variety of Carnation flowers dried under shade

Sl. No.	*Treatment*	*Fresh weight (g/flower)*	*Dry weight (g/flower)*	*Per cent Moisture loss*	*Time taken (Days)*	*Fresh flower diameter (cm)*	*Dried flower diameter (cm)*
1	T_1	5.74	1.32	76.47	5.33	5.77	5.68
2	T_2	5.9	1.29	76.2	5.67	5.86	5.78
3	T_3	6.6	1.51	76.94	5.67	6.38	6.3
4	T_4	5.56	1.44	74.09	5.33	5.79	5.73
5	T_5	6.03	1.35	77.89	5.33	5.98	5.93
6	T_6	5.67	1.49	73.16	5.67	6.12	5.96
7	T_7	5.3	1.51	74.1	5.33	5.67	5.26
8	T_8	5.19	1.38	73.01	5.83	5.52	5.47
9	T_9	5.47	1.25	69.82	5.67	6.06	6.03
10	T_{10}	4.99	1.19	78.05	5.5	5.55	5.43
S.Em±		0.16	0.05	1.32	0.16	0.19	0.17
CD at 1%		0.65	0.22	5.3	NS	NS	0.67

Glass painted black and exposed to the rays of the sun is more likely to crack than is glass painted white. If two pieces of cloth, one white and the other black, are placed on a piece of ice in bright sunshine, the black piece of cloth will absorb the light rays and melt its way into the ice much faster than the white one will Mike (2010).The drying flowers embedding in silica gel and covered in black cotton cloth under sun is effective to removing maximum moisture from flowers in minimum time duration.

Sensory score 3.63 for colour retention, texture (3.25), shape (2.87) and over all acceptability (3.00)was noticed by the flowers subjected Shade drying +sun drying. This might be due to combined influence of shade and sun drying, the slight variation in temperature might have influenced on original colour retention, texture, shape and over all acceptability of flowers. The flowers and foliage have to be embedded in a suitable container before they are exposed to direct sunlight (Datta, 1999).

The least score for colour (1.75), texture (2.00), shape (1.88)and poor acceptability (2.13) was noticed by the flowers subjected sun drying+ white cotton cloth. This might be due to white absorbs minimal solar radiation, white shade cloths are most effective in reflecting the sun's heat. The entire incident light energy is reflected away and none (or very little) is absorbed by Mike (2010).

2. Standardization of pretreatment of glycerol for drying of carnation var. Soto under laboratory condition

The present Investigation was carried out to standardize the sun drying and optimum concentration for pre drying treatment of carnation var. Soto. The flowers embedding in silica gel under shade drying +sun drying is best in retaining all the quality parameters of dried Carnation flower var. Sot

MATERIAL AND METHODS

The materials used and methods followed during the period of the experimentation are described below. The Carnation var. Soto (yellow). Silica gel (60-120 mesh) plastic and metal trays, siever and hair brush. Flowers were harvested in the morning hours between 8.00 and 9.00 am. Immediately after harvest, the cut ends of the flower stalks were immersed in water. After brought to the laboratory, the flowers were sorted for petal damage, pests and diseases. Stems of uniform size were selected and trimmed to uniform length and the treatments were imposed immediately. Flowers were imposed to different concentrations and duration of glycerol.

Treatment Details

T_1: Glycerol: Water in the ratio 1:3 for 12 hours
T_2: Glycerol: Water in the ratio 1:4 for 12 hours
T_3: Glycerol: Water in the ratio 1:5 for 12 hours
T_4: Glycerol: Water in the ratio 1:3 for 24 hours
T_5: Glycerol: Water in the ratio 1:4 for 24 hours
$T_{6:}$ Glycerol: Water in the ratio 1:5 for 24 hours
T_7: Glycerol: Water in the ratio T_4 1:3 for 36 hours
T_8: Glycerol: Water in the ratio 1:4 for 36 hours
$T_{9:}$ Glycerol: Water in the ratio 1:5 for 36 hours
T_{10}: Control (drying without any pre treatment)

The experiment was laid out in a completely randomized block design with three replications. Parameters were recorded fresh weight, dry weight, per cent moisture loss, time taken for drying, fresh flower diameter, dried flower diameter, colour, texture, shape and over all acceptability of dried flower.

RESULTS AND DISCUSSION

The data pertaining to the influence of pre-drying treatment of glycerol and duration of treatment on fresh weight, dry weight, per cent moisture loss , time taken for drying, fresh flower diameter, dried flower diameter **are presented in table 3.**

There was a significant difference in fresh weight of Carnation flowers due to different concentrations of glycerol pretreatment for different duration. Maximum fresh weight (6.60 g/flower) was noticed in T_3which was on par with fresh weight (6.03 g/flower) in T_5. However the minimum fresh weight (4.99 g/flower) was noticed in the untreated flowers (T_{10}).

With respect to dry weight of flowers significant difference was noticed in different concentrations of treatments for different duration. Minimum dry weight (1.19 g/flower) was noticed in the flowers untreated flowers (T_{10}) whereas maximum dry weight (1.51 g/flower) was noticed in T_3 and T_7. Fresh weight and dry weight variation in glycerol treatment might be due to the fact that glycerol enters the plant material by osmosis and replaces native water content. These plasticizers generally increase gas, water vapour and permeability. Therefore,the permeability for gas and water vapour might have maintained the moisture in glycerol treated flowers. These findings were reported by Ravichandra (2005), Safeena (2013),Nirmala (2012) and Salma (2012).

There was a significant difference in the percent moisture loss of flowers. Maximum per cent of moisture loss (78.05) was noticed in untreated flowers (T_{10}) followed by T_5 (77.89) which is on par with all the other treatments. Minimum per cent of moisture loss was noticed in T_9 (69.82). This may be due to higher uptake of glycerol by flowers which in turn must have increased the dry weight of flowers or decreased the dehydration. Higher uptake of glycerol increases the dry weight of Carnation flowers and per cent moisture loss decreases with decrease in glycerol concentration Ravichandra (2005).

There was no significant difference was observed in time taken for drying by the flowers. Maximum time taken for drying was reported in T_8 (5.83 days) There was no significant difference was observed in fresh flower diameter was maximum in T_3 (6.38 cm) followed by T_6 (6.12 cm) and minimum fresh flower

diameter (5.52) was noticed in T_8. Dried flower diameter maximum in T_3 (6.30 cm) which is on par with T_9 (6.03 cm) However minimum dried flower diameter (5.26cm) was noticed in T_7.

The data pertaining to the influence of pre-drying treatment of glycerol and duration of **treatment on quality parameters** of Soto variety of Carnation flowers dried under shade are presented in **table 4.** Significant difference was noticed with respect to colour of flowers. The highest score (4.11) was recorded in T_3, while the lowest score (3.11) was recorded in T_4, T_6 and T_{10}.

Table 4
Effect of concentration of glycerol and duration of treatment on quality parameters of Soto variety of Carnation flowers dried under shade

Sl. No.	*Treatment*	*Colour*	*Texture*	*Shape*	*Over all acceptability*
1	T_1	3.44	3.44	3.33	3.33
2	T_2	3.88	3.77	3.55	3.88
3	T_3	4.11	4.11	4.11	4.00
4	T_4	3.11	3.33	3.55	3.88
5	T_5	3.66	3.55	3.66	3.55
6	T_6	3.11	3.66	3.55	3.44
7	T_7	3.33	3.33	3.68	3.55
8	T_8	3.22	3.44	3.44	3.33
9	T_9	3.88	3.66	3.89	3.77
10	T_{10}	3.11	3.22	3.44	3.22
S.Em±		0.02	0.03	0.03	0.03
CD at 1%		0.08	0.11	0.11	0.11

With respect to texture of flowers varied significantly among the treatments, Maximum was observed in T_3 (4.11) which is on par with T_2 (3.77) However minimum (3.22) was noticed in T_{10}.There was a significant difference with respect to shape of the flowers. Among the glycerol treatments, maximum score (4.11) wasrecorded in T_3 followed by T_9 and T_7. Minimum score (3.33) was recorded in T_{10}.

The overall acceptability of flowers was found superior in T_3 (4.00) followed by T_4 (3.88). The least score (3.22) was recorded by untreated flowers T_{10}.The change in colour might be due to the stability of colouring pigments with advanced stage of harvest, attractive architecture of loosened petals and optimum moisture retention of flowers. Similar results were found in Arvinda and Jayanthi (2004), AprajitaKatoch*et al.* (2010) and Hulgur (2011). The texture and shape were significantly affected due to increase in time at low level and high moisture loss. Similar results were found in Kshama (2003).

CONCLUSION

From the above experiments, with respect to sun drying, it may be concluded that drying flowers by embedding in silica gel under shade drying +sun drying is best in retaining all the quality parameters of dried Carnation flower var. Soto. With respect to pre treatment of glycerol experiment, it may be concluded that treating them with (T_3) Glycerol: Water in the ratio 1:5 for 12 hours and(T_4) Glycerol: Water in the ratio 1:3 for 24 hours could produce better quality of dried flowers.

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