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GLYCERINIZATION OF FOLIAGES FOR DRY FLOWER PRODUCTS MAKING

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ABSTRACT
The study was undertaken to assess the effect of glycerine on preservation of foliages for making dry flower products. The experiment was conducted with four different foliages *viz*., podocarpus, leather leaf fern, baby eucalyptus and silver dollar and two methods of glycerinization (full dip, uptake) with different concentrations of glycerine (10, 20, 30, 40 and 50%). Uptake method of drying with 10% glycerine reduced the time taken for drying of podocarpus and full dip method of glycerine at 10% concentration recorded the lowest moisture loss of 5.24% in podocarpus as compared to other foliages. Among the different drying treatments, full dip method of glycerine at 50% improved all the quality parameters for podocarpus and uptake method of glycerine at 10% improved all the quality parameters for leather leaf fern, baby eucalyptus and silver dollar respectively.

INTRODUCTION

Floriculture has become a profitable industry in many parts of the globe. The export basket comprises dry flowers, fresh cut flowers, live plants, fresh bulbs and foliages among these dry flowers occupy highest percentage than other forms. Dry flowers have good demand both in domestic and international markets. Dry flowers constitute nearly 15% of the global floriculture business and form the major Indian floricultural exports as well (Singh, 2009). Dried flowers are exported mainly from Tamil Nadu and West Bengal, with the later accounting for around 70 per cent of the dried flower exports from the country (Sumana, 2011).

Fresh flowers and foliages having shorter shelf life because of its perishable nature. so there is a need for throughout the year production and it can be replaced by everlasting dry flowers. Dry flower products and botanicals hold tremendous potential since they are cheaper, easily available, eco-friendly and biodegradable (Bhattacharjee and De, 2003).

Normally the flowers and foliages were dried by different drying methods like air, desiccant, oven, freeze and water drying. All the methods of drying were most suitable for flowers and in the case foliages it leads to brittle, degradation of green colour. Glycerine drying is most suitable for foliage because it never modifies the foliage colour. Foliages are most suitable for glycerine drying because it is an osmotic reagent (Harten, 2002) and it retain flexibility, shape and texture of foliages (White *et al*., 2007). Glycerine method of drying was recommended mainly for foliage as it gave the materials more flexibility (Anita, 2010 and Cintu, 2010). Drying plant materials with glycerine make them pliable and retain their natural shape and it recommended for leaves and berries (Anon., 2011). Based on their earlier studies they find glycerine is a superior drying agent for foliages, in this view the study was undertaken to find the effect of different concentration of glycerine on drying of foliages for dry flower products making.

MATERIALS AND METHODS

The experiment was laid out in a FCRD (completely randomized block design with factorial concept) with two factors, which comprising two treatment combinations in the laboratory of Horticultural Research Station, Yercaud, during the year 2010-2011. In the present investigation different plant species such as foliages of podocarpus (*Podocarpus macrophyllus*), leather leaf fern (*Rumohra adiantiformis*), baby eucalyptus (*Eucalyptus pulverulenta*) and silver dollar (*Eucalyptus polyanthemos*) were used. The treatments consist of air drying (control), preserved under glycerine with full dip (10, 20, 30, 40 and 50%) and uptake method (10, 20, 30, 40 and 50%). The following observation *viz*., percentage of moisture loss and time taken for drying and quality parameters like shape retention, texture, brittleness, brightness, colour retention and overall acceptance were assessed by means of sensory evaluation by scoring on five point scale *i.e*., excellent, good, moderate, poor and very poor. The data were subjected to statistical analysis adopting the standard procedure as laid down by Panse and Sukhatme (1985).

RESULTS AND DISCUSSION

Time taken for drying and moisture loss of foliage during drying

Table 1: Time taken for drying (days) of podocarpus, leather leaf fern, baby eucalyptus and silver dollar under glycerinization

Treatments	Podocarpus			Leather leaf fern			Baby eucalyptus			Silver dollar		
	Full dip method	Uptake method	Mean	Full dip method	Uptake method	Mean	Full dip method	Uptake method	Mean	Full dip method	Uptake method	Mean
T_1 - 10 % Glycerine	2.00	2.20	2.10	2.40	2.60	2.50	2.20	2.20	2.20	2.40	2.20	2.30
T_2 - 20 % Glycerine	3.00	2.60	2.80	2.60	2.60	2.60	3.20	2.40	2.80	2.40	2.60	2.50
T_3 - 30 % Glycerine	3.20	2.60	2.90	2.60	2.80	2.70	3.20	2.60	2.90	2.60	2.60	2.60
T_4 - 40 % Glycerine	3.60	2.60	3.10	2.80	2.80	2.80	3.60	2.60	3.10	2.60	2.60	2.60
T_5 - 50 % Glycerine	4.40	3.20	3.80	2.80	3.00	2.90	3.60	2.60	3.10	2.80	2.80	2.80
Mean	3.24	2.64	2.94	2.64	2.76	2.70	2.48	2.82	2.56	2.56	2.56	2.56
Control (Air drying)	6.00	5.80	6.00	7.00								
	SEd	CD (0.05)		SEd	CD (0.05)		SEd	CD (0.05)		SEd	CD (0.05)	
Method	0.16	0.32		(N.S)	0.35		(N.S)	0.29		(N.S)	0.30	
Concentration	0.25	0.50		(N.S)	0.56		(N.S)	0.46		(N.S)	0.63	
M X C	0.35	0.71		(N.S)	0.79		(N.S)	0.65		(N.S)	0.89	

Table 2: Percentage of moisture loss for drying of podocarpus, leather leaf fern, baby eucalyptus and silver dollar under glycerinization

Treatments	Podocarpus			Leather leaf fern			Baby eucalyptus			Silver dollar		
	Full dip method	Uptake method	Mean	Full dip method	Uptake method	Mean	Full dip method	Uptake method	Mean	Full dip method	Uptake method	Mean
T_1 - 10 % Glycerine	5.25	7.64	6.45	9.42	11.67	10.54	5.24	8.46	8.46	5.25	11.67	8.46
T_2 - 20 % Glycerine	7.12	10.41	8.77	9.79	12.29	11.04	6.55	9.47	9.47	6.55	12.39	9.47
T_3 - 30 % Glycerine	9.67	15.28	12.48	10.70	16.25	13.48	6.77	9.73	9.73	6.77	12.67	9.73
T_4 - 40 % Glycerine	11.67	18.21	14.94	10.92	16.82	13.87	7.07	10.35	10.35	7.07	13.64	10.35
T_5 - 50 % Glycerine	14.04	21.55	17.80	10.98	17.89	14.44	10.98	12.87	12.87	10.98	14.76	12.87
Mean	9.55	14.62	12.08	10.36	14.98	12.67	7.32	13.03	10.18	7.32	13.03	10.18
Control (Air drying)	55.20	44.79	49.84	55.88								
	SEd	CD (0.05)		SEd	CD (0.05)		SEd	CD (0.05)		SEd	CD (0.05)	
Method	1.00	2.03		1.27	2.56		1.34	2.72		1.21	2.45	
Concentration	1.59	3.21		2.00	4.05		2.12	4.29		1.91	3.87	
M X C	2.25	4.55		2.83	5.73		3.00	6.07		2.71	5.47	

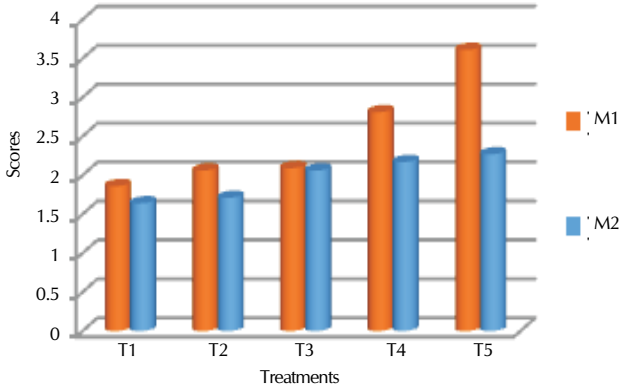

Figure 1: Score on overall acceptance of podocarpus under glycerinization

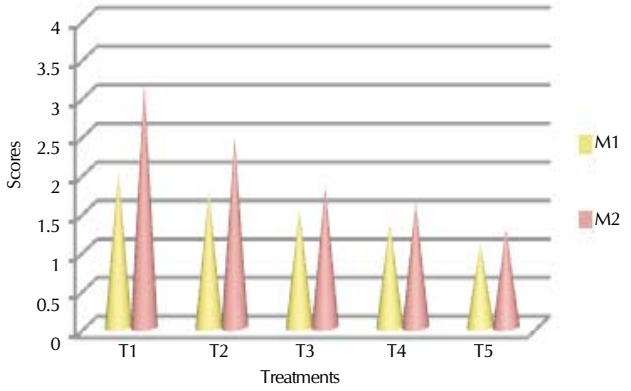

Figure 2: Score on overall acceptance for drying of leather fem under glycerinization

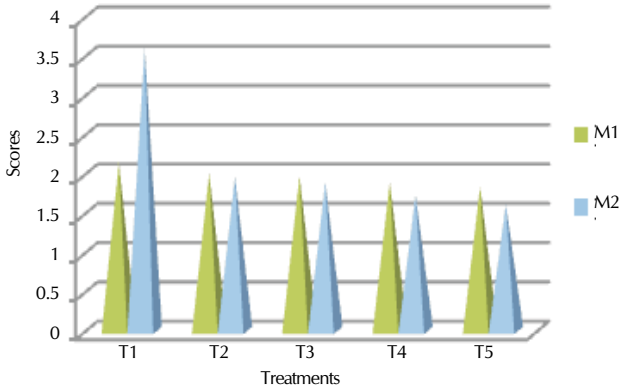

Figure 3: Score on overall acceptance for drying of baby eucalyptus under under glycerinization

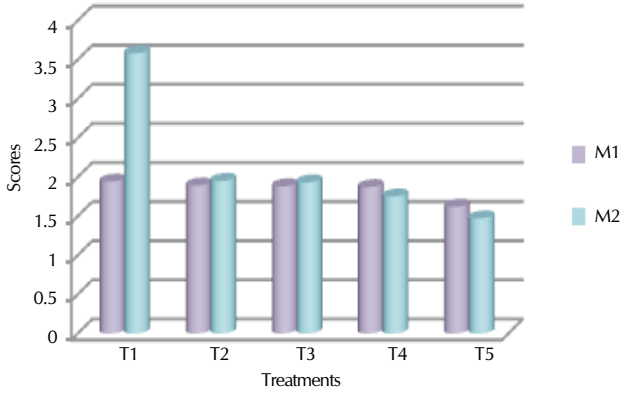

Figure 4: Score on overall acceptance for drying of silver dollar under glycerinization

M_1- Full dip method, M_2- Uptake method, T_1- Glycerine 10%, T_2- Glycerine 20%, T_3-Glycerine 30%, T_4- Glycerine 40%, T_5- Glycerine 50%

with glycerine by two different methods (uptake and full dip) with five different concentrations are presented in table 1 and Table 2.

Time taken for drying

Among the different foliage used time taken for drying was significantly influenced the podocarpus as compared to leather leaf fern, baby eucalyptus and silver dollar. In podocapus recorded lowest time (2.20 days) taken for drying in uptake method with 10% glycerine concentration, while highest time (6.00 days) taken for drying was recorded in control (air drying). Because drying time varied according to the size and density of the plant materials and it may take four days to three weeks (Westland, 1993). This result is further supported by Bale (2006) who stated that foliage texture affects the time taken for drying and also he reported that drying depends on the absorbing capacity of planting materials. Fine textured leaves required less time as compared to coarse textured leaves. This observation is in conformity with the view of Dana and Lerner (2002) observed that glycerinisation is useful during summer due to rapid absorption of glycerine. Paul and Joyce (2005) have opined that glycerinisation method depends on the type of leaf.

Moisture loss

Full dip method of glycerine at 10% concentration was recorded the lowest moisture loss of 5.24% in podocarpus followed by leather leaf fern (9.42%), baby eucalyptus (5.24%) and silver dollar (5.25%). This may be attributed to the reason that glycerine replaces the moisture by capillary action and has antifreeze property (White *et al*., 2007) also glycerine having three OH groups so it has strong affinity towards water (Visalakshi, 2013).

These findings are in accordance with the earlier reports of Paul and Joyce (2005) in emu bush (*Podocarpus* sp.) and umbrella fern (*Sticherus* sp.), Anon. (2004) in eucalyptus, Gouin (1994) in magnolia, Smith and Laschkewitsch (1998) in oak, Anon., (2004) in ivy,

White *et al*. (2007) in magnolia and palmetto, Deepthi (2008) in camellia, maiden hair, Cintu (2010) in camellia, silver oak and thuja and Anitha (2010) in podocarpus and pteridium.

Quality Parameters of foliages

Podocarpus

Fig. 1 depicts that leaves preserved with full dip method of glycerine at 50% concentration resulted in highest score for maintaining the shape (3.55), texture (3.69) and overall acceptance (3.61) of podocarpus foliages. These findings are in accordance with the reports of Paul and Joyce (2005) which confirmed that 50% glycerine mixture was most suitable for full absorption method to retain the shape and texture of the

foliages. Dana and Lerner (2002) found that glycerinization method was best for retaining the shape of leaves.

The brittleness was noticed less and flexibility (3.27) was observed higher in podocarpus leaves treated with full dip method of glycerine at 50% concentration as compared to the air dried leaves (0.95). This result is in accordance with the findings of Paul and Joyce (2005) who recommended 50% concentration of glycerine suitable for actively growing foliage. Glycerine which is hygroscopic compound holds water and ensures that foliages treated with glycerine does not dry to the point of brittleness. The results obtained from podocarpus leaves treated by full dip method of glycerinization are in harmony with the findings of Cintu (2010) who found that full dip method of glycerinization was the best method to maintain the quality parameters.

Leather leaf fern

The leather leaf fern leaves treated with 10 % glycerine by uptake method received the highest score for the shape retention (3.34), brightness (3.05) and over all acceptance (3.19). This might be due to the effect of glycerine which preserves the foliage by retaining the shape of leaves through softening of stem which leads pliable and long lasting foliages.

Among the treatments glycerine at 10% uptake method recorded highest score for colour retention (3.15). This might be due to minimum water loss leads to minimum changes in cholorophyll content.

Brittleness of leather leaf fern was found to be less with glycerine at 10% concentration by uptake method as compared to the air dried leaves (control) which recorded highest score (3.15) for brittleness. This might be due to the fact that optimum usage of glycerine would lead to complete preservation, whereas too much use of glycerine leads to cohesion tension in the plant which could not be strong enough to uptake a very viscous fluid (Le, 1997).

Baby eucalyptus

Baby eucalyptus leaves treated with 10% concentration of glycerine by uptake method were aesthetically more acceptable and received the highest scores for texture (3.54), brightness (3.50), colour retention (3.62) and overall acceptance (3.61) (Fig. 3). This finding was in accordance with the report of Bale (2006) glycerine preserves foliage by replacing the natural moisture present in the leaf with a substance that maintains the leaf form, texture and sometimes colour.

Among the treatments glycerine at 10% concentration by uptake method was found good in retaining the shape (2.81) of leaves. These findings are supported by the reports of Lawrence (1993) who stated that preservation of leaves in a mixture of glycerine and hot water helps to retain the shape of the foliage. The brittleness of leaves of baby eucalyptus dried using 10% glycerine was less and also it recorded the highest score (3.57) as compared to control (0.89). This may be due to the plasticizing and softening action of glycerine. These findings are further confirmed with the statement of Anon. (2011) who reported that glycerine keeps the dried materials more pliable and in their natural shape.

Silver dollar

In terms of quality parameters, the silver dollar leaves treated with 10% glycerine by uptake method scored maximum points for over all acceptance (3.19) and colour retention (3.40). Among the treatment glycerin at 10 % concentration by uptake method maintained their shape (3.58) after drying as compared to control (0.83). The above results are in coincidence with the findings of Mercer (1996) and Susan (1990) who assured that glycerinized materials retain the natural shape and flexibility of whole branches or single leaves.

Texture of the leaves of silver dollar received highest score (3.60) when treated with 10 % glycerinization by uptake method as compared to that of the air dried leaves (control). These findings are in line with observation of Bale (2006) who confirmed that glycerine replaces the natural moisture present in the leaves and hence maintains the leaf form and texture. Earlier works on comparison of drying methods for foliages indicated that air drying is the most simple and cheap method (Datta, 2004) but had the drawbacks of colour fading, tired looking and brittleness. For this reason glycerine is used for quality improvement of leaves (Barnett and Roger, 1996). The above findings coincide with the present findings where leaves of silver dollar treated with glycerine looked brighter than the air dried leaves (control).

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