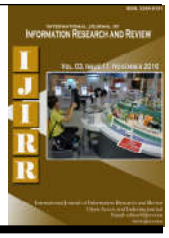
IJIRR

International Journal of Information Research and Review
Vol. 03, Issue, 11, pp. 3003-3007, November, 2016



Research Article

EFFECT OF PRESERVATIVE TREATMENTS ON THE QUALITY OF FREEZE DRIED STATICE

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ARTICLE INFO

Article History:

Received 28th August, 2016
Received in revised form
22nd September, 2016
Accepted 15th October, 2016
Published online November, 30th 2016

Keywords:

Freeze Drying,
Preservation,
Exotic Flowers,
Hydration,
Package of Practice.

ABSTRACT

The present invention relates to method of preserving flowers for use in decorative displays. The study was conducted to explore the effect of selected preservation treatments on the quality of Statice flower in floral freeze dryer. This study comprises, selection of flowers, hydrating, pre treating, freeze drying and post treating the flowers, whereby the cut flower can maintain qualities similar to those of the natural state for a long period of time. The flower treated with preservative Silverthiosulphate (STS) during hydration process, followed by pre treatment with improved composition T_5 (blending less harsh dehydrant, colour fixer and colour preservative), after hydration and pretreatment these flowers were dried with freeze drier and followed by post treatment *i.e.,* application of Acrylic clear spray as sealant was found to be effective for retaining intrinsic traits of the flowers.

INTRODUCTION

Flower preservation is as early as the history of man, although deliberate flower preservation is a more recent phenomenon. Dried flowers are a good standby for the florist's, since designs can be made up during the slack periods and arrangements can be displayed where fresh flowers are unsuitable from the grower's point of view and the price is less than for equivalent fresh flowers (Salinger 1987). For making decorative floral craft items, interior decoration and commercial exploitation, dry flower technology is preferred (Ranjan and Misra, 2002). Statice flowers are one of the most widely used in dried flower arrangements. Statice flowers come in white, lavender, and pink colors. The tiny funnel-shaped Statice flowers have a delicate, airy, hazy appearance, almost like smoke. These flowers are used extensively for border, bed and dry arrangements. Preserved flowers and foliage are natural flowers and greens that have been processed with a revolutionary technology to maintain their fresh appearance for several months or even years.

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Their beauty and soft delicate appearance makes it difficult to differentiate between cut flowers and the fresh look of our products. The aim of the study is to preserve the statice flower through freeze drying process and to investigate the outcomes of freeze dried flowers with selected treatments.

MATERIALS AND METHODS

The study was conducted at Department of Resource Management and Consumer Sciences, College of Home Science, Acharya N.G. Ranga Agricultural University, Hyderabad during the year 2011- 2012 with Floral Freeze Dryer equipment by adopting experimental research design. Each of these flowers had different formation in terms of colour, form, texture and appearance. Fresh and partially bloomed flowers suitable for freeze drying process were selected for the study. Treated flowers were analyzed quantitatively and qualitatively to explore the effect of these treatments on following physical characteristics (colour, form, texture and appearance) of selected statice flower. The treatments were identified and evaluated for suitability for hydration, pre and post treatments listed below during the freeze drying process.

Hydration Treatments

T1:5ml of Silver thiosulphate to a litre water

T2: Sprite 50ml, Bleach 1.5gms to a litre of luke warm water 43-450c.

T3:150mg of Aspirin powdered and added to a litre luke warm water 43-450c.

T4: Lemon Soda 50ml, Bleach 0.7gms to a litre of water.

T5: Sugar 2gm, Bleach 1.5gm, Listerine Mouth Wash 6ml to a litre of water.

T6: Epsom Salt 2gm, chlorine bleach 2gm, Lemon Soda 50ml to a litre of water.

Pre treatments

Basic compositions*

T1 – Base 1
T2 - Base 2
T3 – Base 3

Improved composition**

T4 – Base 1 + Polymer I in 50: 50
T5 – Base 2 + Polymer I in 50: 50
T6– Base 3 + Polymer I in 50: 50

Advanced composition***

T7– Base 1 + Polymer I + Polymer II in 50: 45: 5
T8– Base2 + Polymer I + Polymer II in 50: 45: 5
T9– Base3 + Polymer I + Polymer II in 50: 45: 5

*Basic three compositions : There were the blend of tertiary butyl alcohol, 1-propanol and 2-propanol, dibasic sodium phosphate, sodium formaldehyde sulfoxylate, citric acid, thiourea, aluminum sulphate, sodium citrate, cupric sulphate, propionic acid, phenol and silicone resin in different proportions. (T1, T2 & T3) in different qualities

**Improved Composition: It is an improvement to basic treatments to improve shatter resistance with a polymer I-Ethyl Vinyl Acetate (EVA) (T4, T5, and T6).

***Advanced composition: Further modified to improve pliability of the flower with polymer II- Poly Ethylene Glycol (PEG) (softening agent) (T7, T8 & T9).

A set of fourteen different chemicals cited in US free Patent 4349459, which fall into the category of exchange medium, biological fixatives, preservatives, environmental fixers, and buffers, mordant's, pH modifiers, were used in this study and were tested on the flower individually and in combination. Florets of the flower were immersed in each solution for five seconds to study the effect of these chemicals. Each of these chemical solvents was found to play a crucial role on colour, texture, form and appearance of flower. These chemical solvents were blended into different compositions in the on-going Freeze dried flowers research project of the department (Reddy and Kumari, 2010).

Post – Treatment

T1 – Acrylic Clear Spray (ACS)
T2 – Picture Varnish (PC)
T3 – Glazing Medium (GM)
T4 – Gloss Lustre (GL)
T5 – Dried Material Preservative (DMP)
T6 – Glazing Dip (GD)

The four distinct variables were selected for assessing physical characteristics of flower such as change in colour, change in form, change in texture and change in appearance. In addition moisture loss in flower was also assessed to explore the extent of evaporation. These were measured through quantitative and qualitative assessment.

- Effect of Hydration Treatments: Qualitative analysis.
- Effect of Pre Treatments: Qualitative and Quantitative analysis
- Effect of Post Treatments: Quantitative analysis

Three point scale was used for scoring the variation in each of these qualities for evaluation by a panel of three experts. The scores obtained for each of these variables were subjected to analysis of variance-one way classification to study the effect of treatments on keeping quality of flower.

RESULTS AND DISCUSSION

Effect of Hydration treatments on Statice

Effect of selected treatments on Statice was evaluated and the scores are tabulated in 1

Data pertaining to effect of hydration treatments on Statice was presented in this Table 1. Statice flower showed the marked variation in the quality of flower with and without treatments. From the observations, it can be noticed that in all the treatments, Statice was fresh up to 3rd day and from 4th day onwards gradual change in flower was observed in all treatments. Among the six treatments, T_1 maintained better quality up to 8 days. From this observation it can be concluded that the T_1 treatment with STS performed better on Statice than the others. These physical observation scores were statistically analysed to establish the influence of treatments on number of days to retain the qualities of flowers and presented in Table 2. The results revealed that, among 10 days to retain the physical characteristics, statice retained well up to 5th day and the quality of the flowers deteriorated significantly from the 6th day onwards, where as in T_1 it remained fresh up to10 days(F-Test Two-Sample for Variance). Among the treatments, treatment T_1 (STS) was found to be significant over other treatments (t-Test: Paired Two Sample for Means) for period of 10 days, thus the null hypothesis is rejected. Flowers treated with laboratory-prepared STS at 250 ppm showed that the maximum vase life of flowers upto 10 days (Serek., 1994 and Al-Humaid., 2004).

Effect of selected pre treatments on Statice

Flowers freeze dried without any treatment appeared pale and dry and among the other treated flowers, T_5 i.e basic composition II blended with polymer I resulted in flower that is more closer to natural though there was change in colour -HSB values, texture, appearance and very minor change in form (Sierra, 1988 and Shirin, 2011).

Colour	Bright Yellow tiny flower petals in gray green calyx
Form	Cluster of calyxes with small flowers on the inside and stiff angular stems.
Texture	Thick but pliable, subtle petal
Appearance	Flowers have a delicate, airy, hazy appearance

Table 1. Effect of hydration treatment on Physical Observation scores on Statice

Days/Treatments	C	T1	T2	T3	T4	T5	T6
Day 1	12	12	12	12	12	12	12
Day 2	12	12	12	12	12	12	12
Day 3	12	12	12	12	10	10	12
Day 4	11	12	9	11	10	10	9
Day 5	10	11	8	11	10	8	8
Day 6	8	11	7	8	7	8	7
Day 7	8	11	6	7	8	8	7
Day 8	8	10	6	7	7	7	7
Day 9	7	8	6	6	5	8	7
Day 10	5	8	5	6	5	7	5

Treatments: C: Control;T1: STS ; T2: SBW; T3:AW; T4:LSBW;T5: SBLW; T6:EBSW

Table 2. F test and t- Test of Physical Observation score on Statice

F-Test Two-Sample for Variances		
	Day 5	*Day 6*
Mean	9.428571	8
Variance	1.952381	2
Observations	7	7
df	6	6
F	0.97619	
P(F<=f) one-tail	0.488706	
F Critical one-tail	0.233434	

t-Test: Paired Two Sample for Means		
Day 6	*CONTROL*	*T2*
Mean	8	12
Variance	1.75	3.5
Observations	9	9
Pearson Correlation	0.202031	
Hypothesized Mean Difference	0	
Df	8	
t Stat	-5.82086	
P(T<=t) one-tail	2.100198	
t Critical one-tail	1.859548	
P(T<=t) two-tail	2.420396	
t Critical two-tail	2.306004	

Table 3. Physical Observation score on Statice

Characteristics	Control	Basic compositions			Improved compositions			Advanced compositions		
		T1	T2	T3	T4	T5	T6	T7	T8	T9
Colour	1	2	2	1	2	2	2	1	1	1
Form	2	2	2	1	2	3	2	1	1	1
Texture	2	1	2	2	2	2	2	1	1	1
Appearance	2	2	2	1	1	2	2	1	1	1
Total	7	7	8	5	7	9	8	4	4	4

Table 4. ANOVA - One way Classification Table on Statice

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	9.1	9	1.011111	6.740741	0.116-05	2.210697
Within Groups	4.5	30	0.15			
Total	13.6	39				

* 5% level of significance

Table 5. Physical Observation score on Statice

Characteristics	T1	T2	T3	T4	T5	T6
colour	3	1	3	2	2	2
Form	3	2	2	2	2	2
Texture	3	2	2	2	2	2
Appearance	3	1	2	2	1	2
Total	12	6	9	8	7	8

Table 6. ANOVA - One way Classification Table on Statice

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	5.333333	5	1.066667	7.68	0.00051	2.772853
Within Groups	2.5	18	0.138889			
Total	7.833333	23				

* 5% level of significance

Expert's panel scores (Table 3.) on qualitative parameters of freeze dried pre-treated Statice had highest score for T_5, T_6 and T_2, over the others. Very peculiar observation in the table is that, the flowers treated with advanced compositions had the least score.

Form: The freeze dried control flower was less pliable in all including the with reference flower. There was a no marked change in the shape and size of the flowers in T_5 and in others it was shrunk. This proves that chemicals used for pretreatment has strong influence on the form of the **flower (**Wang *et al.*, 2011).

Texture: The freeze dried control flower and T_1 treated flower was were over dried and brittle. There was a distinct change in the texture of flowers especially in advanced compositions, petals looked soft and leathery and this may be due to effect of polymer II on flowers.

Appearance: Only four treatments i.e in T_1, T_2, T_5 and T_6 flowers were soft and stiff and these were closer to natural flower. In advanced compositions, flowers appeared dull and unappealing to eyes and this proves that flowers treated certain polymers can spoil the beauty of flower (Sellegaard, 1995 and Shirin, 2011).

Moisture: The moisture loss percentage varied between 86%-96% in all the flowers and it did not remain consistent between experiments. Excessive dryness in all combinations may be due to high vacuum pressure (Singh, 2004). These physical observation scores were statistically analysed to establish the influence of treatments on overall quality of flowers (Table 4). Anova one-way classification table for on Statice revealed that there was very high significant difference in the quality of flowers within treatments and between treatments on the overall quality of freeze-dried exotic flowers. Since calculated value of F is greater than the table value of F, null hypothesis is rejected. The choice of chemicals influenced the quality of freeze dried Statice at 5% level of significance.From the above analysis it can be noted that colour was influenced by the choice of chemicals in the treatments. The improved composition T_5 was found to produce more natural looking flower. This coincided with the research done by Jain (2011) who stated that EVA Emulsion offers good adhesive strength and good thickening response.

Effect of post treatments on Statice

The effect of post-treatment on freeze dried Statice flowers are depicted in Physical observation scores are presented Table 5.

Physical observation scores were higher for T_1 acrylic spray for colour, form, texture and appearance. The flower retained yellow hue with mild sheen texture that were closer to the natural flower. The second best score was for T_3 glazing medium as it improved colour of the flower. Other treatments were found to be less appealing to eye for all the parameters. Lewis (2011) stated that acrylic spray was used to petals which are fragile for added durability and protection, moisture-resistant, dry faster and keeps the dried flowers intact for several years by preventing the petals from easily crumbling, and in some cases, helping to keep colours from fading (Reddy and Kumari, 2011). These scores were statistically analysed to establish the influence of treatments on overall quality of flowers. Table 6. (Anova one-way classification table) on Statice revealed that post treatments has significant difference on the overall quality of freeze-dried exotic flowers. Since calculated value of F is greater than the table value of F, null hypothesis is rejected at 5 % level of significance.

Conclusion

Floral preservation is a time-tested art. Freeze dried flowers are fresh flowers that have been specially dried to preserve their natural shape and colour of the flower. The flowers which remain more lifelike in color and appearance than flowers and foliage preserved in other methods. Hydration treatment with Silverthiosulphate (STS) was found to be effective treatments and flowers remained fresh up to 10 days, pre treatment with improved Composition (T_5) Floral preservative was the best composition which retains inherent qualities of the flowers. This combination included chemicals meant for dehydration solvent, colour fixative, environmental fixer, biofixer and shatter resistant polymer and Post Treatments with acrylic clear spray as sealant was found best to protect flower from external environment and conditions such as dust, light, humidity.

Acknowledgement

The author is gratefully acknowledging the Department of Resource Management and Consumer Sciences for providing all the facilities and extending support to complete this work.

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