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# Standardization of Embedding Media and Drying Temperature for Superior Quality of Dry Orchid Flower Production var. Sonia-17

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**ABSTRACT**

*The present study was carried out at Department of Post harvest technology (RHREC), University of Horticultural Sciences campus, GKVK, Bengaluru, during the year 2016-17. The experiment was carried out with fresh spikes by embedding two different desiccants, Silica gel (60- 120 mesh) and borax. The spikes are placed in face up positions and allowed for drying under hot air oven condition at four different temperature at $48^0$C to $54^0$C for 48 hours. The results findings indicated that fresh weight of spike (19.51 g ), dry weight of spike (2.32 g) was observed maximum in silica gel ($D_1$) and minimum in borax ($D_2$). Per cent of moisture loss (88.18 % ) was maximum in borax ($D_2$) and minimum (88.12 %) in silica gel ($D_1$). Among drying temperature, Maximum fresh weight of spike (19.52 g) was recorded in $48^0$ C for 48 hours ($T_1$) and it was minimum (19.43 g) was in $50^0$ C for 48 hours ($T_2$). Dry weight (2.50 g) was recorded maximum at $48^0$ C for 48 hours ($T_1$) and minimum (2.10 g) was noticed at $54^0$ C for 48 hours ($T_4$). Maximum moisture loss of 89.20 % was observed at $54^0$ C for 48 hours ($T_4$) followed by $50^0$ C for 48 hours ($T_2$) and minimum moisture loss of 87.19 % was recorded in $48^0$ C for 48 hours ($T_1$).Color retention (3.82), shape (3.95), texture (3.86) and overall acceptability (3.90) in flower after drying was highest in silica gel ($D_1$) and least (2.43) was observed in borax ($D_2$). Flowers dried under hot air oven exhibited maximum sensory score for color retention (3.79), shape retention (4.09), texture (3.93) and overall acceptability (3.99) was recorded by flowers dried at $50^0$ C for 48 hours ($T_2$).*

***Key words:*** *Sonia-17, Hot air oven, Moisture loss, Quality parameters*

## INTRODUCTION

Value addition means consumers are willing to pay more than they would for a raw product. Flower preservation is as early as the history of man, although deliberate flower preservation is a more recent phenomenon. Many value added products can be made from dried flowers such as collages, flower pictures, flower balls, greeting cards, covers, pomanders, festive decorations, bouquets and wreaths, sweet-smelling pot pourries, etc.

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The flowers or leaves are embedded in a drying medium, sand, silica gel or borax depending upon the plant material. These materials cover flowers in such a way that the original shape of the flower is maintained without altering its original shape[2]. The literature available on drying techniques is mostly related to the flora and fauna of temperate regions. But, nearly 60 per cent of raw material is obtained from natural geographic land that lies close to western, eastern and northern Himalayan ghats and plains, while remaining 40 per cent of the flowers are exclusively cultivated for dry flower industry employing nearly one lakh people[7]. Catching sight of flowers growing in all their grandeur and simplicity makes it tempting to wish the season would go on and that the flowers never fade. In such an attempt, different methods for drying and dehydrating plant materials have been tried to retain their color and form for a very long period. Desiccants like sand, borax, silica gel, saw dust, perlite and combination of these are used as media for embedding. Among these sand and borax are cheaper but they take more time for drying. For delicate flowers like roses, dahlia, carnation, gerbera etc., silica gel is the ideal drying agent[6]. Now a day's hot air and microwave ovens are also being used for faster drying and to improve the quality of dry flowers. In these methods, plant material is kept at controlled temperature for a specified time according to the plant species. Considering the potential of Dendrobium flowers in dry flower trade, the present studies were undertaken to evaluate the color of dried dendrobium flowers of different drying embedding media and drying temperature. Sensory evaluation was also carried with 25 panel of judges for five point hedonic scale. In the present investigation efforts have been made to find out variations in the dried dendrobium flowers for the quality parameter such as color and also to find out the best dying temperatures levels.

## MATERIAL AND METHODS

The experiment was laid out in factorial completely randomized design (CRD) with eight treatments replicated 3 times, during 2016-2017 in the laboratory at Department of Post harvest technology (RHREC), College of Horticulture, Bengaluru. The experiment was carried out with fresh spikes of dendrobium var. Sonia-17 embedding with two different desiccants, Silica gel (60- 120 mesh) ($D_1$) and borax ($D_2$). The spikes are placed in face up positions and allowed for drying under hot air oven condition at four different temperature at $48^0$C ($T_1$), $50^0$C ($T_2$) , $52^0$C ($T_3$) to $54^0$C ($T_4$)for 48 hours. A layer of one centimeter of desiccant was spread over the bottom of the drying tray, small mounds of embedding mixture were made and flowers were placed upright position as per the treatment individually well apart. Desiccant was then gently and gradually poured all around and over the flowers so as to fill all the crevices in between the florets without disturbing the shape of flower. Later the flowers were kept for drying under hot air oven at $48^0$C to $54^0$C for 48 hours. In the present investigation efforts have been made to find out the best dying embedding media and drying temperature for superior quality of dry flower production.

**Sensory evaluation of dried Dendrobium flowers:** Flower color retention after drying is one of the qualitative character to judge overall appearance of the dried flowers. Data pertaining to the response of different embedding media and temperature levels has assessed based on the sensory evaluation using 5 point scale with the weightage of 5 = very good, 4= good, 3 = average, 2 = poor and 1 = very poor.

## RESULTS AND DISCUSSION

The data on fresh weight, dry weight and per cent of moisture loss in dendrobium orchid var. Sonia-17 as influenced by different desiccants, drying temperature and their interaction are presented in Table 1. Influence of different desiccants on fresh weight of spike and dry weight was found to be non-significant. Maximum spike weight of 19.51 g and dry weight of spike was maximum (2.32 g) was recorded in silica gel ($D_1$) and minimum in borax ($D_2$). Desiccants had shown

non- significant results for moisture loss for dried flower, maximum moisture loss of 88.18 % was observed in borax ($D_2$) and it was minimum in silica gel ($D_1$).

Fresh weight of flowers had shown non-significant effect with respect to drying temperature. Maximum weight of spike (19.52 g) was recorded in $48^0$ C for 48 hours ($T_1$) and it was minimum (19.43 g) was at in $50^0$ C for 48 hours ($T_2$). Drying temperature had shown non- significant effect with respect to dry weight of spike. Dry weight (2.50 g) was recorded maximum at $48^0$ C for 48 hours ($T_1$) followed by $50^0$ C for 48 hours ($T_2$) and minimum (2.10 g) was noticed at $54^0$ C for 48 hours ($T_4$). Significant differences were observed on per cent of moisture loss during dehydration of dendrobium spike var. Sonia-17. Maximum moisture loss of 89.20 % was observed at $54^0$ C for 48 hours ($T_4$) followed by $50^0$ C for 48 hours ($T_2$) and minimum moisture loss of 87.19 % was recorded in $48^0$ C for 48 hours ($T_1$). This variation might be due to exposure of the flowers to high temperature in hot air which facilitates faster and higher amount of moisture loss, as a results flowers petals leads to damage with poor quality. Anuropa *et al*.[1], Mahatapati *et al*.[4], Bintory *et al*.[3], reported that the flowers dried with combination of silica gel under hot air oven drying was associated with highest moisture loss in carnation, gerbera and rose, respectively. Interaction between desiccants and drying temperature had shown non-significant effect on fresh weight of spike, dry weight and per cent of moisture loss.

**Quality attributes of dried flowers of dendrobium variety Sonia-17 as influenced by different desiccant and temperature levels in hot air oven.**

Flower color retention, shape, texture and over all acceptability after drying is one of the qualitative character to judge overall appearance of the dried flowers are presented in Table2 and 3. Significant differences were observed for dry flower color, shape, texture and over all acceptability due to drying at varying levels of temperature in hot air oven method.

The color, shape, texture and over all acceptability were recorded highest score in flowers dried under silica gel (3.82, 3.95, 3.86 and 3.90 respectively) and least (2.43, 2.63, 2.44 and 2.42 respectively) was observed in borax. The flowers embedded in silica gel remained intact throughout the drying process which helps to gradual removal of moisture as a result flowers maintained its original color, shape and texture. Similar findings were observed in Carnation[5], Safeena *et al.*[8], in rose and Salam[9], in dendrobium studied the response of silica gel gave best results for color, shape, texture and appearance.

Among the different drying temperature levels, Flowers dried at 50º C for 48 hours better display of color, shape, texture and over all acceptability (3.79, 4.09, 3.93 and 3,99 respectively) followed by flowers dried at 48º C for 48 hour moisture is removed in a steady rate without affecting structural integrity of the flowers. However flowers drying at higher temperature of 54º C for 48 hours significantly damaged the quality parameters of color, shape, texture and acceptability (2.34, 2.55, 2.54 and 2.57 respectively) in dried flowers. Similar effects were observed by Safeena *et al.*[8], and Bintory *et al*.[3], in ducth rose. The results are on line with findings of Salam[9], in dendrobium and Mahatapati *et al*.[4], in gerbera.

Interactions between desiccants and drying temperature had shown significant effect on color, shape, texture and over all acceptability of dried flower. Better quality of color, shape, texture and over all acceptability of dried flowers were exhibited in silica gel for $50^0$ C for 48 hours (4.82, 4.90, 4.94 and 4.89 respectively) and poor quality of dried flowers were noticed in borax for $54^0$ C for 48 hours. This might be due to reason that uniform removal of moisture by the silica gel with optimum temperature in hot air oven during dry process which helps to maintain its original color, shape, texture and appearance of the flower. These findings are in line with previous authors like Safeena *et al.*[8], and Bintory *et al*.[3], in ducth rose, Salam[9], in dendrobium and Mahatapati *et al.*[4], in gerbera.

Thus, from the present study considering the better display of color, shape, texture and overall acceptability of dried dendrobium flower in silica gel embedded flowers dried at 50° C for 48 hours was found superior in terms quality of dry flower as compare to higher temperature.

**Table 1: Effect of embedding media and drying temperature on fresh weight, dry weight and per cent of moisture loss of dendrobium orchid var. Sonia-17**

| | Fresh weight (g) | | | Dry weight (g) | | | Per cent of moisture loss (%) | | |
|---|---|---|---|---|---|---|---|---|---|
| **Treatments** | **Silica gel ($D_1$)** | **Borax ($D_2$)** | **Mean** | **Silica gel ($D_1$)** | **Borax ($D_2$)** | **Mean** | **Silica gel ($D_1$)** | **Borax ($D_2$)** | **Mean** |
| **$T_1$ = 48$^0$C for 48 hours** | 19.48 | 19.56 | 19.52 | 2.48 | 2.52 | 2.50 | 87.26 | 87.13 | 87.19 |
| **$T_2$=50$^0$C for 48 hours** | 19.53 | 19.33 | 19.43 | 2.35 | 2.41 | 2.38 | 87.97 | 87.51 | 87.74 |
| **$T_3$=52$^0$C for 48 hours** | 19.55 | 19.33 | 19.44 | 2.27 | 2.25 | 2.26 | 88.41 | 88.52 | 88.47 |
| **$T_4$=54$^0$C for 48 hours** | 19.47 | 19.52 | 19.49 | 2.17 | 2.03 | 2.10 | 88.83 | 89.57 | 89.20 |
| **Mean** | 19.51 | 19.44 | 19.47 | 2.32 | 2.30 | 2.31 | 88.12 | 88.18 | 88.15 |
| | **D** | **T** | **D x T** | **D** | **T** | **D x T** | **D** | **T** | **D x T** |
| **S.Em.±** | 0.09 | 0.18 | 0.25 | 0.02 | 0.03 | 0.05 | 0.09 | 0.18 | 0.25 |
| **CD @ 1%** | NS | NS | NS | NS | 0.13 | NS | NS | 0.71 | NS |

Desiccants (D) Drying Temperature (T) NS - Non Significant Significant at 1 percent level
Sensory evaluation was done on 5-Point Hedonic scale

**Table 2: Effect of embedding media and drying temperature on color and shape, of dried dendrobium orchid var. Sonia-17**

| | Color retention | | | Shape | | |
|---|---|---|---|---|---|---|
| **Treatments** | **Silica gel ($D_1$)** | **Borax ($D_2$)** | **Mean** | **Silica gel ($D_1$)** | **Borax ($D_2$)** | **Mean** |
| **$T_1$ = 48$^0$C for 48 hours** | 4.05 | 2.69 | 3.37 | 4.31 | 3.12 | 3.72 |
| **$T_2$=50$^0$C for 48 hours** | 4.82 | 2.75 | 3.79 | 4.90 | 3.28 | 4.09 |
| **$T_3$=52$^0$C for 48 hours** | 3.71 | 2.29 | 3.00 | 3.35 | 2.22 | 2.79 |
| **$T_4$=54$^0$C for 48 hours** | 2.70 | 1.97 | 2.34 | 3.21 | 1.90 | 2.55 |
| **Mean** | 3.82 | 2.43 | 3.12 | 3.95 | 2.63 | 3.29 |
| | **D** | **T** | **D x T** | **D** | **T** | **D x T** |
| **S.Em.±** | 0.02 | 0.03 | 0.04 | 0.06 | 0.12 | 0.17 |
| **CD @ 1%** | 0.09 | 0.12 | 0.17 | 0.33 | 0.46 | NS |

Desiccants (D) Drying Temperature (T) NS - Non Significant Significant at 1 percent level
Sensory evaluation was done on 5-Point Hedonic scale

**Table 3: Effect of embedding media and drying temperature on texture and overall appearance of dried dendrobium orchid var. Sonia-17**

| | Texture | | | Overall appearance | | |
|---|---|---|---|---|---|---|
| **Treatments** | **Silica gel ($D_1$)** | **Borax ($D_2$)** | **Mean** | **Silica gel ($D_1$)** | **Borax ($D_2$)** | **Mean** |
| **$T_1$ = 48$^0$C for 48 hours** | 4.07 | 2.69 | 3.38 | 4.10 | 2.68 | 3.39 |
| **$T_2$=50$^0$C for 48 hours** | 4.94 | 2.91 | 3.93 | 4.89 | 3.09 | 3.99 |
| **$T_3$=52$^0$C for 48 hours** | 3.27 | 2.21 | 2.74 | 3.38 | 2.01 | 2.69 |
| **$T_4$=54$^0$C for 48 hours** | 3.15 | 1.93 | 2.54 | 3.24 | 1.89 | 2.57 |
| **Mean** | 3.86 | 2.44 | 3.15 | 3.90 | 2.42 | 3.16 |
| | **D** | **T** | **D x T** | **D** | **T** | **D x T** |
| **S.Em.±** | 0.03 | 0.05 | 0.07 | 0.02 | 0.04 | 0.05 |
| **CD @ 1%** | 0.14 | 0.20 | 0.28 | 0.10 | 0.14 | 0.20 |

Desiccants (D) Drying Temperature (T) NS - Non Significant Significant at 1 percent level
Sensory evaluation was done on 5-Point Hedonic scale

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