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Preliminary Investigation of Preservation Methods to Produce Dried Flowers of Rose and Statice

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ABSTRACT. *An experiment was carried out to investigate methods which preserve rose and statice to retain its high quality standards as dried flowers. Air-drying, glycol preservation and use of desiccants were applied as preserving methods. Colour of petals, dryness of petals and overall appearance of the flower at the end of the drying process were evaluated as quality standards.*

The highest quality standard in rose was shown within 2 weeks by the preservation method using silica gel as a desiccant. Air drying showed better results than glycol when preserving rose. In statice, air drying was the best method which retained quality standards. The highest score was obtained in the 4th week. Statice exposed to glycol preservation did not show high quality standards. This experiment revealed the best preservation methods for rose and statice are silica gel desiccant and air drying, respectively.

INTRODUCTION

Flowers being perishable in nature are very difficult to store for a long period. When a flower reaches the end of its growth cycle, the rate of transpiration exceeds that of water absorption. This results in shrivelling and dying. If it was to be used in an arrangement, the shrivelling which is unattractive must somehow be prevented or kept to a minimum. At certain times of the year, such as the winter months and hot summers in some parts of the world, fresh plant materials are scarce or are in poor condition causing difficulties to find materials for flower arrangements.

Flower drying is one of the alternative techniques that could be used to overcome this problem. There are several methods of preservation available and in many cases their results last for years and may be used for many occasions. Air drying method, glycol preservation, solvent dehydration and freeze-drying are some of these methods (Taylor, 1979). Except for freeze-drying others are low cost and effective. Drying gives long lasting results in plants with strong tissue, but those with weak tissue may be very fragile to handle. Preserved flowers and plant material can be arranged in containers either on its own or combined with fresh plant material. It can be made into permanent or semi-permanent decorations for home preserved flowers and plant material can be sprayed with metallic paints and glittered (Plourden, 1989; Foster, 1988).

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Dried flowers do not have to be used in arrangements immediately. They can be stored for several months without deteriorating. Flowers have to be stored in a damp free atmosphere to prevent mildew and losing rigidity (Stokes, 1987). Dried flowers and plant materials can be stored by taking loose bunches or separate larger dried flowers. They are packed into cardboard boxes in layers supporting the flower heads if necessary with crumpled newspaper or tissue paper to minimize crushing (Chase, 1975; Cornish, 1980).

Well dried flowers retain their natural appearance and can be exported to countries such as the United States, United Kingdom, Italy and Germany where our fresh flowers are unable to reach due to their short vase life (EDB, Personnel communication). There is a big demand for dried flowers and dried flower arrangements during winter and summer in temperate countries. By investing in this industry the country is still able to increase its export earnings.

Information on preserving flowers to retain quality standards such as colour, lack of shrivelling are limited. Since Sri Lanka is rich in biodiversity due to prevailing climatic conditions of both tropical and temperate, flower preservation can become a profitable venture. Therefore, this study was conducted with the objective of investigating possible methods that could be used to dry rose and statice, which are in high demand in both local and export markets.

MATERIALS AND METHODS

The two flower types; rose (*Rosa spp.*) and statice (*Limonium sinuatum*) were used in this study to investigate the best method for flower preservation. These 2 types are very popular flowers in dry as well as fresh arrangements. Statice is often used as a filler in arrangements and available in many colours.

Rose spp.

Fresh cut rose cv. 'Cherish' which was pink in colour were brought from Nuwara Eliya and exposed to preserving methods. Air drying (T1), Glycol preservation (T2) and desiccants (T3) were used as treatments for preserving the flowers. Treatments were arranged according to a Completely Randomized Design (CRD) with 3 replications.

Statice

Fresh cut statice cv. white flowers were also brought from Nuwara Eliya and 2 preserving methods, air drying (T1) and glycol preservation (T2) were applied. Statice being very small in nature, desiccants were not used to preserve these flowers (Taylor, 1979).

Air drying

Leaves were removed and stems were tied into small bunches of 3 stems. These stems were arranged at different lengths, a way in which they do not get crushed. Flowers were hung, upside down to help the preservation of the shape and to avoid drooping stems, in a warm place with a free circulation of air.

Glycol preservation

Glycerin solution was prepared by using 1 part of glycerin and 2 parts of hot water. Flowers were placed in jam jars and glycerin mixture was added to cover 5 cm of the stem. Since rose stems were hard, stem ends were hammered before placing them in the glycerin solution.

Desiccants/Solvent drying

Stems of rose flower were cut to a length of 1–3 cm. Dried silica gel beads were poured into an air tight container for a depth about 2.5 cm and levelled. Flowers were placed on top of the silica gel to cover the stems. Then more silica gel beads were poured in carefully to cover the flower completely. The container was tightened well and placed in dark. Flowers were closely observed and data were collected weekly using a marking scheme (Table 1).

Table 1. Marking scheme for both rose and statice flowers subjected to different preserving methods.

Characteristics	Score
Colour of the petal	
Original colour	4
Slightly fading	3
Moderate fading	2
Severe fading	1
Degree of dryness of the petal	
Completely dry	4
Slightly dry	3
Moderately dry	2
Fresh	1
Flower quality (overall appearance)	
Very good	4
Slightly good	3
Moderately good	2
Poor	1

The above characters were evaluated for each flower and average of 3 replicates were taken and analysed by using a quality index including all characteristics. Evaluation was done by five people since it is very subjective and average values were taken.

RESULTS

Rose

Colour retention in rose petals was high when the silica gel desiccant method was used. The maximum score of 4 did not change throughout the study period of 5 weeks. Petal colour in air dried flowers was good at the 1st few weeks but continuously deteriorated and scored 1 at the end of 5 weeks due to complete colour change. Petals exposed to glycol preservation also did not retain the colour and complete change of colour was observed when they reached the 5th week (Fig. 1a). These results showed that there was no colour fading when silica gel was used for drying roses.

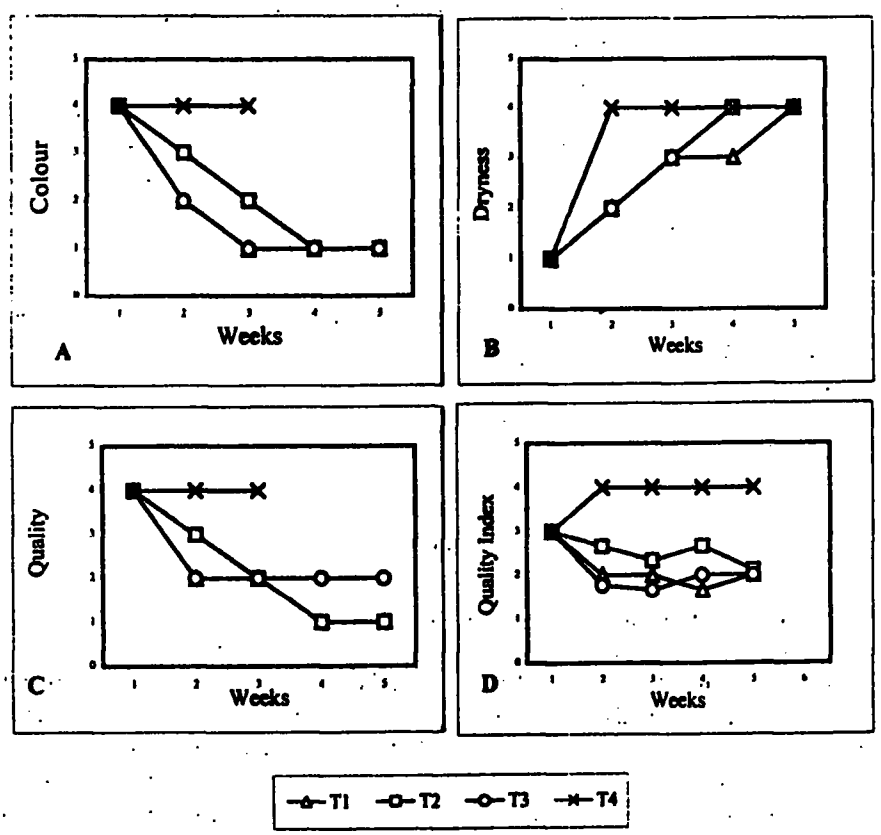


Fig. 1. Performance of a) colour retention, b) dryness, c) overall appearance and d) quality index scores of rose flowers with different treatments.
[Note: T1 - Control, T2 - Air drying, T3 - Glycol preservation].

Dryness in the whole flower was equally high in all 3 methods at the end of 5 weeks. The score was 4 for all situations. However, score stabilized at the 2nd week in the silica gel method whereas it was stabilized in the 4th week for the method of air drying and glycol preservation (Fig. 1b).

Overall appearance was also highest in flowers which preserved with silica gel. The score was 4 through out 5 weeks. Other methods did not give acceptable appearance in flowers and they scored 2 and less (Fig. 1c).

The Quality Index which is the sum of scores obtained for each character was highest at the 5th week with silica gel method. The score was 4, retained through out the experiment. All other methods scored only 2 at the end of the study period (Fig. 1d).

Statice

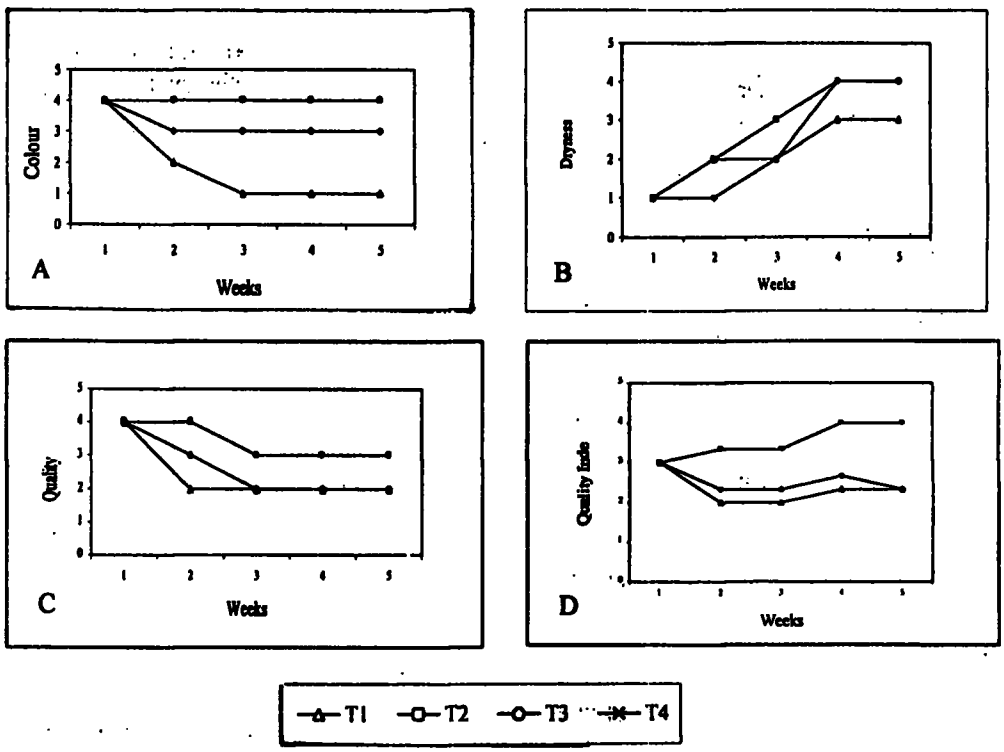
Air drying obtained the highest score for colour retention of statice flowers. Colour did not change and retained throughout the 5 week period. Flowers exposed to glycol preservation scored 3 at the 2nd week and retained up to the 5th week period, whereas the control scored only 1 (Fig. 2a).

Highest score of 4 for dryness was achieved by the air dried flowers in the 4th week and retained. Flowers in glycol preservation scored 3 in the same week. However, the control also scored 4 in the 4th week which was a higher score than the score of one obtained from glycol preservation (Fig. 2b).

Overall appearance of statice flowers gained 3 as the highest score. Appearance retained up to the 2nd week and reduced. However, it did not change after that. Overall appearance of the flowers subjected to glycol preservation scored only 2. In the control it changed from score of 4 to 2 drastically in the 2nd week and retained thereafter (Fig. 2c). Statice was also able to score 4 as the highest Quality Index. This shows that the flowers preserved using air dried method were in high quality as fresh flowers (Fig. 2d).

DISCUSSION

Preserving of rose and statice flowers using 3 methods of flower drying has given promising results. Out of the 3 methods used, desiccant drying was very successful for roses. All 3 important characters evaluated scored the highest and the characteristic pink colour in cv. 'Cherish' retained normal even after 5 weeks made the process of desiccant drying applicable to roses. Also there was no shrivelling and cracking of petals and therefore conical shape of the flower did not change. Foster (1988) stated that desiccant drying could successfully be applied for large feature flowers and herbaceous leaves. Roses exposed to air drying showed colour fading and out of shape due to cracks and shrivelling. Solvent drying also did not give promising outcome probably due to uneven drying.



Figs. 2. Performance of a) colour retention, b) dryness, c) overall appearance and d) quality index scores of statice flowers with different treatments.
[Note: T1 - Control, T2 - Air drying, T3 - Glycol preservation].

In drying process with silica gel water absorption was even as flower petals were evenly surrounded by silica gel beads. Therefore, gradual evaporation takes place. In air drying due to variations in the humidity level of the microclimatic conditions drying process may not have been even. Therefore, cracking and unevenly dried petals may results (Chandha and Bhattacharjee, 1995). This leads to loss of shape in rose. Drying occurs in glycol absorption due to replacement of water by glycerin. However, glycerin absorbs and travels in the xylem then diffuses to cells. In this absorption process due to long distant travelling of the chemical uneven distribution can occur. Also glycerin has higher viscosity than water and transport to petals takes considerable amount of time. Therefore, before glycerin reaches the cells of petals natural air drying process starts due to evaporation of water from the petals. Glycol absorption may not be a suitable method to dry flowers with large number of petals arranged into a cone. Therefore, submerging in glycerin was recommended (Grayston, 1988). Submerging in the solution cannot be applied to delicate flowers as rose and statice as they can be subjected to physical damages which drastically reduces the quality. Also submerging for long periods of time may cause change of the characteristic shape.

Air drying was successful in statice due to the small size of flowers and their papery nature. In air drying, air circulation among petals of statice is much better than the air circulation among rose petals. Thus, water evaporation is even leading to gradual drying process (Foster, 1988; Silhol and Denis, 1994). Apart from the methods applied in this study, freeze drying and polymer coating are 2 other methods of drying of flowers for some other plant materials. However, special equipments such as freeze dryers have to be used for these methods and it is very expensive.

CONCLUSIONS

Retention of qualities as in fresh flowers in dried rose was successfully identified in this study. This technique involved the method using silica gel desiccants. Preservation of statice can be undertaken using the air drying method. This method can be practised with absolutely no cost for chemicals or other materials. Both methods are low cost and non sophisticated and can be applied with little experience. Thus, the developed techniques can be carried out by large scale flower growers and exporters to preserve rose and statice. It is hoped that technique developed will make positive contribution towards the developing economy of Sri Lanka.

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