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STANDARDIZATION OF WRAPPING MATERIALS AND STORAGE TREATMENTS FOR THE POSTHARVEST LIFE OF CHINCHERINCHEE (*ORNITHOGALUM THYRSOIDES* JACQ.) CUT FLOWERS

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ABSTRACT

The investigation entitled "Studies on postharvest handling of chincherinchee (*Ornithogalum thyrsoides* Jacq.)" were carried out at the Experimental Farm and Laboratory of Department of Floriculture and Landscape Architecture, Dr. Y. S. Parmar University of Horticulture and Forestry, Nauni, Solan in the year 2012-2013. The experiment on wrapping material and storage durations was laid out in Factorial Completely Randomized Design and replicated thrice. A total of seven wrapping materials *viz*. Polyethylene (W_1), newspaper (W_2), cellophane sheet (W_3), butter paper (W_4), low density polyethylene (LDPE) (W_5) and high density polyethylene (HDPE) (W_6) as different treatments by keeping unwrapped (W_0) cut stems as control and 4 storage durations at 4^o C having relative humidity 70 per cent in 3 (D_1), 6 (D_2), 9 (D_3) and 12 (D_4) days. Wrapping of cut stems in cellophane combined with 3 days storage durations at a temperature of 4^oC improved postharvest life parameters of chincherinchee *viz*. Floret size, the percentage of unopened florets, appearance, vase life, and the amount of holding solutions consumed.

KEYWORDS: Chincherinchee, Wrapping Material, Cellophane and Vase Life

INTRODUCTION

Chincherinchee (*Ornithogalum thyrsoides* Jacq.) are an ornamental bulbous plant and belongs to the family Hyacinthaceae. It is native to South Africa. Its generic name *Ornithogalum* came from two Greek words, 'ornis' meaning bird and 'gala' means milk *i.e.* 'Bird's milk'. The sound made by the dry stalk of *Ornithogalum thyrsoides* rubbing in the wind has coined it the name 'Chincherinchee'. The genus *Ornithogalum* comprised of about 100 species distributed all over Europe, Asia and Africa and most of them produce long–lasting cut flowers. Besides cut flowers, chincherinchee are also suitable for herbaceous border, naturalizing wild gardens, rockery, pot culture, bouquets and flower arrangements. Scapes even if cut after complete drying on the plant, look beautiful, lasted long and can be used in dry decoration. It possesses relatively longer vase life too than most of the other commercial cut flowers.

Appropriate packaging of cut flowers for optimum duration offers the potential advantage of extending their vase life and maintaining flower quality. It is often an advantage to wrap bunches of cut flowers within a suitable material and then to place these flower bunches in corrugated fiberboard boxes for protecting them against physical damage, water loss and external environmental conditions. Cut flowers respond for various storage durations differently depending upon

species, growing conditions and postharvest handling. Storage of flowers beyond the optimum period leads to considerable loss of vase life and flower quality. It is immensely important to determine the optimum duration for storage of cut flowers that keeps the quality and potential vase life at its best. Low temperature storage also enables to keep the flowers in good conditions for long duration which indirectly helps growers to regulate the supply of its flower in the market.

MATERIAL AND METHODS

Cut stems of 20 cm length were selected to conduct this experiment. Fresh weight of cut stems was recorded and wrapped in different wrapping materials and then stored in the cold store at 4^{o}C for various durations. Prior to storage, the weight of each cut stem was recorded in order to determine weight loss during storage. Basal two centimeters portion of cut stem was given a slant cut after storage to facilitate absorption of the solution in the vase. The stored cut stems were placed in distilled water to determine vase life.

The cut stems of Ornithogalum were wrapped with polyethylene (W_1), newspaper (W_2), cellophane sheet (W_3), butter paper (W_4), low density polyethylene (LDPE) (W_5) and high density polyethylene (HDPE) (W_6) as different treatments by keeping unwrapped (W_0) cut stems as a control. These wrapped and unwrapped cuts stems were stored in cold store at a temperature of 4^{o}C having relative humidity 70 per cent in 3 (D_1), 6 (D_2), 9 (D_3) and 12 (D_4) days. The vase life and other postharvest parameters were evaluated at room temperature in normal distilled water. The experiment was laid out in a Completely Randomized Design (factorial) with 7 treatments and replicated thrice.

RESULTS AND DISCUSSIONS

Wrapping Materials

The maximum amount of holding solution (14.72 ml) consumed in cut stems of Ornithogalum wrapped in cellophane (W_3) (Table 1). This may be due to the cut stems in this wrapping material created optimum conditions that maintain physiological systems healthy and finally led to the normal absorption of the solution in the vase after storage. The present finding got the support from the findings of Sharma *et al.* (2008) while working with Asiatic hybrid lily CV. 'Apeldoorn'.

Cut stems took minimum days (0.95 days) for opening of first floret, low percentage of unopened florets (3.69 %), longest vase life (14.02 days), largest floret size (4.00 cm) and the best appearance of retaining maximum color and freshness scoring 4.67 when wrapped in cellophane (W_3) (Table 1)**.** This might be due to the fact that this wrapping material reduces the rate of respiration by creating a sort of modified atmosphere with limited oxygen and higher carbon dioxide concentrations. The limited oxygen concentration can retard the rate of respiration as oxygen is needed for this process. This condition in turn reduces depletion of stored food and helped to supply adequate energy to the florets for successfully opening and to be larger in diameter (Nowak and Rudnicki, 1984). The more stored food in the cut stems the longer the vase life, as vase life is a function of stored food as well. The moisture retentive nature of cellophane wrapping material prevents moisture loss and increase the relative humidity inside the wrapped cut stems. This helps to maintain turgidity of cut stems by retaining the moisture level in the tissue even after harvest. Normally, cut stems deteriorate from the original appearance and reduced the vase life when there is excessive loss of moisture apart from lack of photosynthates. When moisture loss is minimized by using cellophane wrapping material, there will be better maintenance of appearance and extended vase life of cut stems (Goszczynska and Rudnicki, 1988).

The modified atmosphere created by wrapping material inhibits ethylene synthesis in the stored materials. This helps to delay senescence of flowers that lead to flower fading and shortening of vase life as ethylene causes senescence. The results are in line with the other worker's reports *viz*. Joti and Balakrishnamoorthy (1999); Singh and Mirza (2004); Jain *et al*. (2006) in rose; Bhat *et al*. (1999) in chrysanthemum; Beura and Singh (2003) in gladiolus; Sindhu and Pathania (2003) in Asiatic hybrid lily; Sharma *et al.* (2008) in Asiatic hybrid lily CV. 'Apeldoorn'.

Minimum percent weight loss (1.90 %) was recorded in cut stems wrapped in cellophane (W_3). Reduction of weight loss in storage might be due to the reason that these wrapping materials prevented the water loss and maintained high relative humidity which helped in reducing weight loss from cut stems (Beura and Singh, 2003). The present finding got the support from the findings of Sharma *et al.* (2008) while working with Asiatic hybrid lily CV. 'Apeldoorn'.

Storage Duration

Freshly harvested, cut stems with 3 days (D_1) storage consumed maximum amount of holding solution (17.46 ml) followed by 6 (D_2) and 9 (D_3) days storage (14.40 and 11.70) respectively. This result was in accordance with the findings of Waithaka *et al*. (2001) in tuberose; Sharma *et al.* (2008) who worked on the Asiatic hybrid lily CV. 'Apeldoorn'.

Cut flowers took minimum days to open (0.70 days) when stored for 12 days. However, cut flowers stored for 3 days taken maximum days (1.72 days) for opening of first floret. This may be due to the fact that even at low temperature, cut stems slowly continue metabolic activities that advance their aging and they become on the verge of opening when kept in best holding solution after storage as compared to freshly harvested cut stems. Minimum percentage of unopened florets (3.79 %) observed in the freshly harvested, cut stem stored for 3 days (D_1) whereas, maximum percentage of unopened florets (4.72 %) recorded in cut stem being stored for 12 days (D_4) (Table 1). The increase in the percentage of unopened florets may be related to the depletion of stored food material in store cut flowers. Similar results are reported by Waithaka *et al*. (2001) in tuberose; Sharma *et al.* (2008) in Asiatic hybrid lily CV. 'Apeldoorn'.

Cut stems stored for 3 days (D_1) exhibited maximum vase life (13.89 days) and large floret size (3.95 cm) respectively. The behavior of cut stems with respect to floret size and vase life might be due to the fact that the senescence processes continue even during the cold storage of cut stems (Faragher *et al*., 1986). The senescence processes undergo with the expense of stored food of the cut stems. The longer the periods of storage of those cut stems more the depletion of stored food is there. Hence, cut stems stored for longer periods with reduced amount of energy resulted in flowers of smaller diameter and shorter vase life as compared to those stored for short term durations. The present findings got support from the findings of Sharma *et al.* (2008) who worked with Asiatic hybrid lily CV. 'Apeldoorn'.

Minimum weight loss (2.58 %) from cut stems stored for 3 days (D_1) was recorded and found to be highly significant over other storage durations. This may be due to the weight loss was more as stored for longer period. The flowers undergo life activities such as respiration and transpiration even in the cold store after harvest as they are living entities. But the respirable substrate and transferable moisture are from the tissue itself that exhibit weight loss. These results got support from the works of Vinod Kumar *et al.* (2003) in tuberose; Sharma *et al.* (2008) in Asiatic hybrid lily CV. 'Apeldoorn'.

Cut stems with 3 days (D_1) storage were recorded best appearance (4.30) with respect to better retention of color and freshness during vase life. The appearance of cut stems got deteriorated as the storage period increased. Storage of cut stems for 12 days (D_4) significantly reduced their appearance as compared to other storage periods under the study (Table 1). This explains that flowers stored for longer duration cannot score well for freshness and color as compared to short term stored flowers. Similar results are reported by Waithaka *et al*. (2001) in tuberose; Sharma *et al.* (2008) in Asiatic hybrid lily CV. 'Apeldoorn'.

Interaction Effects

Interaction between wrapping materials and storage durations showed that cut stems wrapped in cellophane (W_3) and stored for 3 days (D_1) consumed amount of solution (19.60 ml), minimum percentage of unopened florets (3.53 %), longest vase life (14.40 days) and minimum percent weight loss (1.11 %) (Table 1). This may be due to the fact that shorter durations did not significantly depleted the stored food and the modified atmosphere created by these wrapping materials retarded life processes such as respiration and moisture loss. It can be inferred out that shorter storage duration maximized the benefits from wrapping materials than longer durations. The results are in close proximity with the findings of Sharma *et al.* (2008) who worked with Asiatic hybrid lily CV. 'Apeldoorn'.

The interaction effect showed that cut stems took minimum days to open (0.47 days) when wrapped in cellophane (W_3) and stored for 12 days (D_4) (Table 1). This may be due to the fact that even at low temperature, cut stems slowly continue metabolic activities that advance their aging and they become on the verge of opening when kept in best holding solution after storage as compared to freshly harvested cut stems. Similar results are reported by Waithaka *et al*. (2001) in tuberose; Sharma *et al.* (2008) in Asiatic hybrid lily CV. 'Apeldoorn'.

The Interaction effect of wrapping materials and storage durations was found to be nonsignificant on flower diameter and appearance of cut bloom (freshness and color).

CONCLUSIONS

Different wrapping materials and storage durations has marked effect on various parameters of post harvest life of Ornithogalum. Among different wrapping materials, cut stems wrapped in cellophane observed to be best for all the quality parameters. When coming to the storage durations, cut stems stored at 4^0 C for 3 days resulted good for all the parameters except for days taken to open first floret. Therefore, wrapping of cut stems in cellophane and stored for 3 days at 4^0C increased the floret quality and longevity in Ornithogalum.

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Table 1: Effect of Wrapping Materials and Storage Durations on Various Parameters in Ornithogalum Cut Flowers

Wrapping Materials	Amount of Solution Consumed (Ml/Stem)	Days Taken for First Flower Opening	Per Cent of Unopened Florets	Vase Life (Days)	Weight Loss in Storage (%)	Floret Size (Cm)	Appearance of Cut Bloom (Freshness and Colour)
Control (without wrapping) (W_0)	10.98	1.57	4.28	12.57	11.75	3.79	3.22
Polyethylene (W_1)	14.33	1.12	4.00	13.75	2.68	3.97	4.47
Newspaper (W_2)	12.25	1.38	4.08	13.13	5.05	3.87	3.63
Cellophane (W_3)	14.72	0.95	3.69	14.02	1.90	4.00	4.67
Butter paper (W_4)	14.17	1.15	3.85	13.68	3.01	3.96	4.23
Low density polyethylene (W_5)	13.60	1.23	3.92	13.47	3.57	3.92	3.93
High density polyethylene (W_6)	13.40	1.33	3.97	13.25	4.06	3.91	3.77
$CD_{0.05}$	0.29	0.12	0.28	0.15	0.21	0.02	0.17
Storage duration							

Table 1: Condt.,							
3 Days (D_1)	17.46	1.72	3.79	13.89	2.58	3.95	4.30
6 Days (D_2)	14.40	1.45	3.88	13.65	4.17	3.93	4.05
9 Days (D_3)	11.71	1.12	3.99	13.26	5.23	3.90	3.91
12 Days (D_4)	9.84	0.70	4.22	12.85	6.31	3.88	3.71
$CD_{0.05}$	0.22	0.09	0.21	0.11	0.16	0.02	0.13
Interactions							
W_0 X D_1	14.20	1.93	4.08	13.00	4.04	3.81	3.67
W_1 X D_1	19.00	1.60	3.62	14.13	1.92	4.01	4.73
W_2 X D_1	16.07	1.80	3.92	13.80	3.54	3.90	3.93
W_3 X D_1	19.60	1.53	3.53	14.40	1.11	4.05	4.87
W_4 X D_1	18.60	1.67	3.75	14.20	2.14	4.02	4.47
W_5 X D_1	17.53	1.73	3.77	14.00	2.48	3.95	4.33
W_6 X D_1	17.20	1.80	3.86	13.67	2.85	3.94	4.07
W_0 X D_2	11.93	1.73	4.21	12.93	11.25	3.79	3.27
W_1 X D_2	15.33	1.33	3.69	13.93	2.48	3.98	4.60
W_2 X D_2	13.20	1.67	4.03	13.40	4.30	3.87	3.67
W_3 X D_2	15.73	1.07	3.62	14.20	1.68	4.02	4.73
W_4 X D_2	15.20	1.33	3.81	13.87	2.69	3.97	4.33
W_5 X D_2	14.80	1.40	3.89	13.67	3.18	3.93	3.93
W_6 X D_2	14.60	1.60	3.90	13.53	3.64	3.92	3.80
W_0 X D_3	9.73	1.53	4.36	12.33	15.06	3.79	3.07
W_1 X D_3	12.60	0.93	3.80	13.67	2.89	3.95	4.47
W_2 X D_3	10.33	1.27	4.15	12.87	5.33	3.86	3.53
W_3 X D_3	12.73	0.73	3.75	13.93	2.07	3.99	4.60
W_4 X D_3	12.47	1.07	3.89	13.53	3.10	3.94	4.20
W_5 X D_3	12.07	1.13	3.95	13.33	3.84	3.91	3.80
W_6 X D_3	12.00	1.20	4.03	13.13	4.35	3.89	3.67
W_0 X D_4	8.07	1.07	4.46	12.00	16.65	3.77	2.87
W_1 X D_4	10.40	0.60	4.89	13.27	3.44	3.92	4.07
W_2 X D_4	9.40	0.80	4.21	12.47	7.04	3.84	3.40
W_3 X D_4	10.80	0.47	3.87	13.53	2.72	3.96	4.47
W_4 X D_4	10.40	0.53	3.95	13.13	4.11	3.92	3.93
W_5 X D_4	10.00	0.67	4.05	12.87	4.76	3.89	3.67
W_6 X D_4	9.80	0.73	4.10	12.67	5.41	3.88	3.53
$CD_{0.05}$	**0.58**	**0.24**	**0.55**	**0.29**	**0.42**	**NS**	**NS**