VASE LIFE OF DENDROBIUM SONIA UNDER VARIOUS HOLDING SOLUTIONS AND PACKING MATERIALS

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***ABSTRACT*:** *The following study has been undertaken to evaluate the performance of cut flower Dendrobium Sonia under various holding solutions and packing materials at 22°C with 16h illuminating tube lights at the postgraduate laboratory, Department of Horticulture, Bangladesh Agricultural University Mymensingh during 2013. Completely randomized design was set with three replications using 10 spikes in each replication. Results of various holding solutions showed highly significant differences among treatments. However, the maximum opened flower buds (100.00 % at 10 days), minimum flower drop % age (0.00%), maximum days to flower color retention (23.15 days), flower diameter (30.32 cm), vase life (23.15 days) and water uptake (13.80 ml) were recorded in holding solution containing 30 mM $AgNO_3$ + 225 mM HQC + 400 mM glucose. Similarly results pertaining to packing materials had also significant effect on various parameters of Dendrobium Sonia. Among different packing materials; newspaper proved to be the ideal packing material for Dendrobium Sonia which reduced flower drop % age to 0.02 %, enhanced days to color retention (21.95 days), flower diameter (27.00cm) and vase life of 31.28 days with water uptake of 21.67 ml.*

Key words: Dendrobium Sonia, $AgNO_3$, HQC, newspaper and brown paper

INTRODUCTION

In the present cut flower industry, Dendrobium Sonia has taken a prominent place due to variety of colors,, attractiveness and long season of bloom. Dendrobium's market share as cut flower is about 94.7 % [1]. Orchid's import have been increased about 13.06 per cent in 2011 ranging from US$944,370 in 2010 to US$1.07 million [1]. Vase life of D. Sonia has been much influenced by ethylene production and respiration which are the major physiological processes that are responsible for deterioration and short life of harvested D. Sonia. It is generally accepted that ethylene production increases during flower senescence [2]. In cut flower industry about10-30 % losses occur due to postharvest damage ad mishandling practices. Further, they said that it could be possible to extend the postharvest life of flowers by using different preservative solutions, among them; Sucrose, Silver Thiosulfate and Aluminum sulfate enhanced the postharvest quality of cut roses as compared to control (distilled water). Sucrose and STS (Silver thiosulphate) have better performance when used in combination [3]. Silver nitrate at 50 to 100 mg L^{-1}, 200 mg L^{-1} 8-hydroxiquinoline citrate (8-HQC) extended shelf-life of Dendrobium Pompadour cut flowers [4]. The holding solution containing 225 mg L^{-1} HQC, 50 mg L^{-1} Al and glucose 4% significantly enhanced the vase life of Dendrobium ('Sonia Red Joe' and Dendrobium 'Walter Oumae Taba 4N' flowers) [5]. [6] Investigated the effect of $AgNO_3$ on enhancing vase life and bud opening percent of cut flowers of *Dendrobium* var; 'Pompadour'. $AgNO_3$ must be present along with 8-hydroxyquinoline citrate and glucose for more water uptake and vase life enhancement.

In tropical areas orchids after harvesting could be stored at 12 to 18°C (54 to 64°F) to avoid loss [7], while flowers produced in temperate regions (*Cymbidium*) might be stored at 5°C (41°F) [8]. Spikes packed in low-gauge polyfilm recorded the highest values for all postharvest quality parameters, i.e. flower longevity (206.66%) at days 12, 27 and 30, flower diameter (8.11 cm), percentage of bud opening at day 27 (66.66%), vase life (31.66 days), flower freshness (206.66 at days 15 and 27) and color quality (55.56% color fading) [9]. *Phalaenopsis* orchids harvested during the warm period of the year should be held above 20°C (68°F), and preferably closer to 25°C (77°F), during shipping [10]. Most of the Dendrobiums are transported as unpacked due to which spikes become injured and loss occurs during transportation. Therefore, the present research was based on two factors; holding solutions and packing materials to improve the spike quality and vase life of D. Sonia.

MATERIALS AND METHODS

This study was undertaken to evaluate the performance of cut Dendrobium Sonia under various holding solutions and packing materials at 22°C with 16h laminating lights at the postgraduate laboratory, Department of Horticulture, Bangladesh Agricultural University Mymensingh, during 2013. Completely randomized design was set with three replications having 10 spikes in each replication. Postharvest observations including; bud open (%), flower drop (%), flower color retention (days), flower diameter (cm), vase life and water uptake (ml). bud open and drop % were recorded by counting the days and thereof taking %, flower color was observed in days and terminated when 25% color was faded, flower diameter was determined through vernier caliper and water uptake was recorded daily by measuring weight of flask without spikes and of spikes separately. Average daily water uptake was calculated as: Water uptake (g $stem^{-1}$ d^{-1}) = (s_{t-1}-st), where st is weight of vase solution (g) at *t*= days 1, 2, 3, etc., and st_{-1} is weight of vase solution (g) on the previous day. Vase life (days) was noted when 50 % of the flowers have dropped or wilted finally the data was statistically analyzed and interpreted according to MSTAT-C software.

RESULTS

Significant results had been generated from various postharvest parameters of Dendrobium Sonia at 22°C±2°C with various holding solutions (Table 1). Maximum bud

opening percent were observed with holding solutions 30 mg L^{-1} $AgNO_3$ + 225 mg L^{-1} HQC + 4% Glucose (T_2) and 50mg $ALSO_4$+ 4% Glucose (T_7) that opened 100 % buds followed by 50 mg $ALSO_4$ + 225 mg L^{-1} HQC + 4% (T_6) opeed 93.33 %, maximum flower diameter 31.89 cm was noted with 30 mg L^{-1} $AgNO_3$ + 225 mg L^{-1} HQC + 4% Glucose (T_2) followed by 4mM STS + 225 mg L^{-1} HQC + 4% Glucose (T_3) and 30 mg L^{-1} $AgNO_3$ + 4% Glucose (T_4) (30.32 cm), maximum days to color retention 23.15 days were improved with 30 mg L^{-1} $AgNO_3$ + 225 mg L^{-1} HQC + 4% Glucose (T_2) followed by 4mM STS + 225 mg L^{-1} HQC + 4% Glucose (T_3) that increased16.31 days, maximum vase life 23.15 days was observed with 30 mg L^{-1} $AgNO_3$ + 225 mg L^{-1} HQC + 4% Glucose (T_2) followed by 18.85 days with 30 mg L^{-1} $AgNO_3$ + 4% Glucose (T_4), zero flower drop percent (0.00) was noted with 30mg L^{-1} $AgNO_3$ + 225 mg L^{-1} HQC + 4% Glucose (T_2) followed by 50 mg $ALSO_4$+ 4% Glucose (T_7) minimizing flower drop up to 8.88%, maximum water uptake 13.80 ml and 11.03 ml was recorded with 4mM STS + 225 mg L^{-1} HQC + 4% Glucose (T_3) and 30 mg L^{-1} $AgNO_3$ + 225 mg L^{-1} HQC + 4% Glucose (T_2), respectively at 22°C±2°C.

Results regarding different packing materials and temperatures on bud open percentage (Table 2) were highly significant. Spikes of Dendrobium Sonia in newspaper (T_2) and control (unpacked) induced maximum bud open percentage of 100 %, while minimum result was observed with Butter paper (T_4) that opened buds about 61.15%. Dendrobium Sonia had highly significant results with control and newspaper (0.02 % & 0.03% respectively) for minimum flower drop % followed by Corrugated thin sheet (0.38 %) while, maximum drop percentage was noted with Butter paper (22.17%) for flower drop %. Dendrobium Sonia proved best with control (21.95 days) followed by corrugated thin sheet and newspaper (17.69 & 17.23 days) for maximum days to color retention. The best results with flower diameter were observed with newspaper (28.17 cm) and control (27.00cm). Control (unpacked) and newspaper improved vase life of Dendrobium Sonia (31.28 & 29.25 days, respectively) while minimum vase life was noted with Low gauge polyfilm (10.87 days). Maximum water uptake was noted with newspaper and control (19.66 & 18.33 ml, respectively) minimum water uptake was noted with Low gauge polyfilm (9.00 ml).

Table 1: Effect of holding solutions on various postharvest parameters of Dendrobium Sonia 22±2°C

Treatments	Bud open (%)	Flower drop (%)	Color retention (days)	Flower diameter (cm)	Vase life (days)	Water uptake (ml)
T_1	72.77 **d**	29.72 **a**	10.21 **f**	17.86 **f**	10.44 **f**	7.60 **bc**
T_2	100.00 **a**	0.00 **c**	23.15 **a**	31.89 **a**	23.15 **a**	11.03 **b**
T_3	74.44 **cd**	28.96 **a**	16.31 **b**	30.32 **b**	16.78 **c**	13.80 **a**
T_4	80.00 **c**	13.90 **b**	15.76 **c**	30.32 **b**	18.85 **b**	9.76 **c**
T_5	80.55 **c**	12.86 **b**	12.36 **e**	26.09 **d**	13.70 **e**	9.76 **c**
T_6	93.33 **b**	10.54 **b**	14.68 **d**	23.44 **e**	15.70 **d**	10.53 **d**
T_7	100.00 **a**	8.88 **b**	15.56 **c**	28.32 **c**	16.61 **c**	9.70 **c**
Level of Sig	*	*	*	*	*	*
LSD@0.05	6.43	5.78	0.21	0.10	0.17	1.23

T_1= Control (Distilled water), **T_2**=30 mg L^{-1} $AgNO_3$ + 225 mg L^{-1} HQC + 4% Glucose, **T_3**= 4mM STS + 225 mg L^{-1} HQC + 4% Glucose, **T_4**=30 mg L^{-1} $AgNO_3$ + 4% Glucose, **T_5**=225 mg L^{-1} HQC + 4% Glucose, **T_6**=50 mg $ALSO_4$ + 225 mg L^{-1} HQC + 4% Glucose, **T_7**= 50 mg $ALSO_4$+ 4% Glucose.

Table 2: Response of Dendrobium Sonia to various packing materials at 22±2°C

Treatments	Bud open %	Drop %	Flower color retention (days)	Flower diameter (cm)	Vase life (days)	Water uptake (ml)
T_1	100.00 **a**	0.02 **d**	21.95 **a**	27.00 **a**	31.28 **a**	18.33 **a**
T_2	100.00 **a**	0.03 **d**	17.23 **b**	28.17 **a**	29.35 **a**	19.66 **a**
T_3	75.14 **bc**	10.89 **b**	8.72 **c**	16.32 **c**	10.87 **c**	9.00 **b**
T_4	61.15 **d**	22.17 **a**	13.39 **b**	20.13 **b**	14.78 **b**	10.33 **b**
T_5	81.70 **b**	0.38 **c**	17.69 **b**	23.78 **b**	18.36 **b**	16.33 **a**
Sig. Level	*	*	*	*	*	*
LSD @ 0.05	1.72	1.50	1.21	2.48	1.40	3.38

T_1= Control (un-packed), **T_2**= Newspaper, **T_3**= Low gauge poly-film, **T_4**= Butter paper, **T_5**= Corrugated thin sheet.

DISCUSSION

Treatments with various holding solutions were evaluated to determine the reasons of the short vase life of cut orchids; results regarding various holding solutions (Table 1) were significant. 30 mM $AgNO_3$ + 225 mM HQC + 400 mM glucose significantly improved postharvest behavior in Dendrobium Sonia. Presence of HQC in the treatments increased water uptake, which might be due to the physical and biological changes of the stem [11]. This gives an idea about reduction in stem cell conductivity and water transportation among orchids that induced stem occlusions rather than occlusions of microbial origin. The presence of STS in holding solutions shortly increased the percent of flowers decay which were kept in holding solution. However, water uptake also increased in comparison to control. This behavior of STS seemed to be the result of its effect on stem and water relations rather than acting as an anti-ethylene response. The vase life was markedly enhanced by 400 mM glucose combined with HQC and $AgNO_3$ [12]. This suggested that the sugar status of the spikes had an economic role on the postharvest decay of orchids. Sugars used in preservative solutions often extend the vase life of flowers. They contribute to the osmotic pressure of tissues maintain the respiration rate and cell membrane integrity [13]. The present study has confirmed previous research work that the shorter vase life is the result of the rapid decline in water uptake and the presence of different nutrients in the solution. Glucose reduced the rate of senescence and its combined effect with HQC, enhanced and improved the vase life of cut orchids. This showed that the short vase life of orchid spike was the result of the various anti ethylene chemicals as well as the water relations of spikes and temperature. Same observations were made by [14,4,2,6,5,15,16,17].

Results obtained from the response of different packing materials (Table 2) were highly remarkable with D. Sonia. At 22^0C, newspaper, brown paper and un-packed (control) packing enhanced vase life along with other postharvest quality parameters in Dendrobium Sonia. Newspaper proved best because it has moisture balancing capacity, which reduces the risk of fungal diseases and chilling injury and maximized water uptake which ultimately extended vase life of orchid, newspapers are easily available, low cost and have no harm or pollution to environment. Other packing materials were plastic based due to which moisture was not balanced and those might increase the risk of fungal diseases. Similar observations were also made by [9,8,18].

CONCLUSION

$AgNO_3$ inhibited ethylene production by acting as a competitive inhibitor with HQC and glucose for Dendrobium Sonia. Other orchids should be treated with these treatments in order to get the orchid specific solution for enhancing vase life. Newspaper as packaging material at 22^0C allows slight dehydration for packing more spikes, avoided breaking buds and flowers, and reduced moisture buildup which might weaken transportation boxes. Newspapers packing are very cheap and pose no environmental pollution as they are readily degraded into the soil without harming its properties. The present findings may support to develop orchid industry at national and international level.

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