Effects of various vase solutions on the life of five selected cut flowers

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Abstract

The vase life experiment was conducted in Department of Botany, University of Yangon from May to July 2018. The cut flowers Shwe-phyu and Padaythar (*Chrysanthemum spp*), Hninsi *(Rosa* spp), Hninpan *(Lilium* spp) and Thitsar-pan (*Gladiolus* spp) were selected. All of which are white color and purchased from Thiri-mingalar market. They were five kinds of cut flowers and each treatment had five replications. The experimental design was arranged in Complete Randomized Design (CRD). In this experiment 2% sucrose were significantly more absorbed than other vase solutions. Among five cut flowers, the longest vase life was resulted from Shwe-phyu, Hninpan and Padaythar (18 days) on T2 (2% sucrose) and also resulted from Padaythar on T4 (2% grape solution). The maximum diameter of cut flower was found in T2 (2% sucrose). Among treatments, T2 (2% sucrose) solution gives the longest vase life and lowest costs and highest save amount.

Keywords: vase life, Shwe-phyu and Padaythar (*Chrysanthemum spp*), Hninsi *(Rosa* spp), Hninpan *(Lilium* spp) and Thitsar-pan (*Gladiolus* spp).

Introduction

In Myanmar, the cut flowers are used for home decoration and normally use tap waters as vase solutions. Vase life is the period during which cut flower or cut foliage retains its appearance in a vase. This is a major consideration in identifying plants with a long vase life being far more desirable than those with a short vase life.Water is essential for flowers to develop optimally. Water fills up the growing cells in the cut flower and provides strength (https://en.wikipediawiki, vase-life).

Chrysanthemum belongs to family Asteraceae. It is one of the largest angiosperms families with more than 1620 genera and 23,600 species herbaceous plants, shrubs and trees distributed throughout the world (www.britannica.com/topic/list-of-plant-in-the-family-Asteraceae**).** This genus contains many hybrids and thousands of cultivars developed for horticultural purposes. The cut flower Rosa is belonging to the family Rosaceae. It is a medium-sized family of flowering plant including 4828 species in 91 genera (https://en.wikipedia.org/wiki/Rosaceae). Rose, a universally celebrated flower, has been used as a garden plant since the dawn of civilization. Rose is a symbol of perfection, elegance, romance and love. It was called "The Queen of flowers" (Muhammad *et al*., 1996). *Lilium* belongs to the familyLiliaceae, which consists of 15 genera and about 705 species of flowering plants within the order Liliales. Many Liliaceae are important ornamental plants, widely grown for their attractive flowers and involved in major floriculture of cut flowers and dry bulbs. They are also an economically important product (https://www.en.wikipedia.org/wiki/APG-IV-system). The *Gladiolus* is a genus of Iridaceae family, which has 66 genera and 2244 species worldwide (Christenhusz & Byng, 2016). The Latin word gladius meaning "sword", are name for the sword-like shape of their leaves. *Gladiolus* occurs in Asia, Mediterranean Europe, South Africa and tropical Africa. It is one of the renowned cut flower in the world (Bai*et. al*., 2009**).**

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Sucrose is the major form of photosynthetically assimilated carbon that is transported in the plant and is the major source of carbon for petal growth (Woodson and Wang, 1987). Mature coconut is considered as a rich source of sugars and electrolytes (Jayalekshmy*et al*., 1986). Keeping quality is an important parameter for the evaluation of cut flower quality for both domestic and export markets. One of the greatest problems in postharvest flower physiology is the blockage of vascular system, due to air or bacterial growth, which reduces water uptake and this block xylem vessels leading to water stress (Van Meeteren*et al*., 2001). The main objective of the present study was to find out best solution for enhancing the vase life and save cost of some cut flower so that the flower can be kept for longer period for interior decoration and home users. This experiment can suggest to the home decorators, office decorators, ceremony decorators and landscape decorators etc. to choose the proper vase solutions for their purpose.

Materials And Methods

The experiment was conducted in Department of Botany, University of Yangon, Kamaryut Township, and Yangon Region from May 2018 to July 2018. The cut flower of Shwe -phyu, Padaythar, Hnin-si, Hnin-pan and Thitsa-pan were purchased from the Thiri-mingalar market. The cut flowers were cut about four inches and then placed in the bucket contain tap water. They were four families: Asteraceae, Rosaceae, Liliaceae and Iridaceae. Shwe-phyu and Padaythaare member of genus *Chrysanthemum*.

Preparation of cut flowers

Firstly, vases, which use a drinking water bottle to recycling. The recycled bottle was rinsed in soapy water to eliminate bacteria and fungi. The stems were measured and remain about 16 inches long and the others were cut off. Before arranging in the vase, lower leaves from the stem of cut flowers were gently removed and there should not be left any leaves in the vase water. Then re-cut the stems of 2.5 cm underwater to ensure that there was no air gets into the stems.

Vase solutions which are sucrose, coconut water, grape solution and soda (sodium bicarbonate) were mixed with Clorox (0.3 mL), which are used as germicide for vase solutions. Coconut water was filtered through a clean and sterilized cotton cloth to remove any suspended particles before use. The detailed preparations and treatments are as shown in table 1.

Table1. Preparation of vase solution

Treatments	Vase Solutions	Remark
T1	Tap water + clorox 0.3 mL	3 stalks in a vase. Each treatment had 5 replications.
T2	Sucrose 18 gL^{-1} +clorox 0.3 mL	
T3	Grape solution 18mL^{-1} +clorox 0.3 mL	
T4	50%coconut water + clorox 0.3 mL	
T5	Sodium bicarbonate 18 gL^{-1}+ Sucrose 18 gL^{-1}+ clorox 0.3 mL	

Sucrose alone has not been usually used because Sucrose treatment without germicides and promotes bacterial proliferation, leading to shortening of the vase life (Van Doorn, 1999).

Vase preparation

Three floral stalks were placed in a vase containing prepared vase solution that were maintained under ambient temperature of a room. Vase solutions were changed in every 3 days intervals as well as re-cut the stem.

Data Collection and Statistical analysis

Initial flower diameters and lengths of every species were measured (Figure.1). The total absorbed water, flower diameters, flower length and vase life of each species were collected in every 3 days' interval. The absorbed amount of water was calculated by subtracting the initial volume of solution to the final volume of solution. The vase life of cut flowers was measured by counting the days since the initial vase preparation to final days in the vase. Flower longevity was recorded as the number of days on vase until the flowers showed symptoms.

The experiment was carried out using Completely Randomized Design (CRD) in laboratory. The total of five flowers was carried out in the study. Each treatment consisted of five replications. The data were subjected for analysis of variance according to a CRD design and all calculation was performed using Statistic-8 package and Least Significance Difference (LSD) was used to compare means (Gomez and Gomez, 1984).

Results

Absorbed Water

All kinds of cut flowers more absorbed than their control in 2% sucrose solution. The maximum absorbed 34.6mL was absorbed in 2%sucrose on Hninpan.The second most absorption 30.47 mL was also observed in 2% sucrose on Paday-thar and the third most absorbed water 27.9 mL was shown in 50% coconut water on Hninpan (Table2 and Figure 1).

Table 2. Absorbed amount of water of each cut flower in response to different Vase solution

	Absorbed water (mL)				
Treatments	Shwe-phyu	Padaythar	Hninsi	Hninpan	Thitsar-pan
T1(Control)	19.13	21.00	18.26	25.13	17.73
T2(2% Sucrose)	22.93	30.47	23.3	34.6	21.27
T3 (50% Coconut water)	15.07	16.33	14.80	27.90	18.10
T4(2% Grape solution)	17.73	24.60	14.40	23.30	13.50
T5(2%Soda)	14.73	18.23	18.73	17.75	14.93
F-test	*	**	*	**	*
5% LSD	1.82	2.06	1.87	2.29	1.43
CV %	16.09	14.75	16.57	14.10	13.30

**= 1% level of significance, * = 5% level of significance, ns = non significance

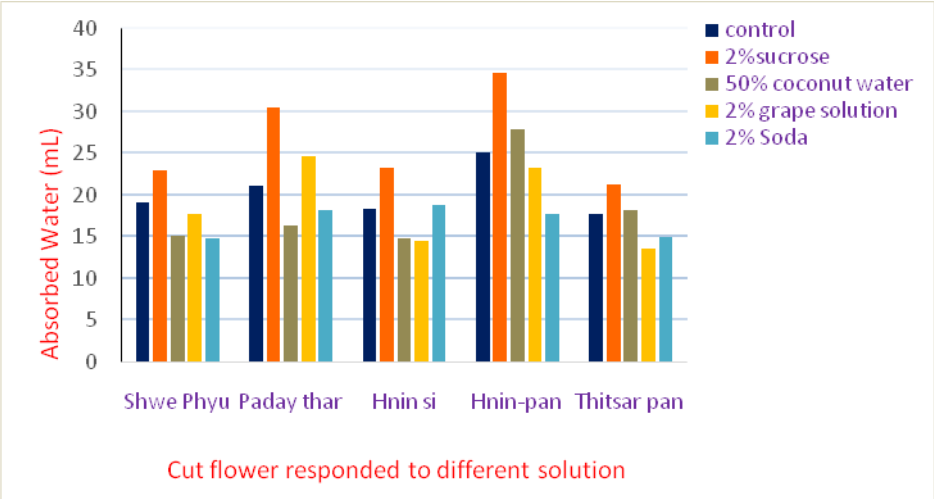

Figure1. Absorbed amount of water of each cut flower in response to different vase solution

Flower Diameter

According to the flower diameter result, the average flower diameter show Shwe-phyu (7.5 cm), Padaythar (6.4 cm), Hninsi (4.6 cm), Hninpan (10.6 cm) and Thitsar-pan (4.1 cm) in T2 (2%sucrose)are more wider than their control (Table 3 and Figure 2).

Table. 3 Average flowers diameter of each cut flower in respond to different vase solution

Treatments	Flower Diameter (cm)				
	Shwe-phyu	Padaythar	Hninsi	Hninpan	Thitsar-pan
T1(Control)	5.4	4.95	4.4	9.0	3
T2(2% sucrose)	7.5	6.4	4.55	10.6	4.1
T3(50% coconut)	5.5	5.35	4.0	9.4	3.6
T4(2% grape solution)	4.6.1	5.1	3.9	9.65	3.55
T5(2% Soda)	4.35	4.2	4.05	7.5	3.0
F-test	**	*	ns	**	ns
LSD %	0.78	0.53	0.43	1.21	0.89
CV %	19.23	14.83	13.91	15.71	25.84

** = 1% level of significance, * = 5% level of significance, ns = non significance

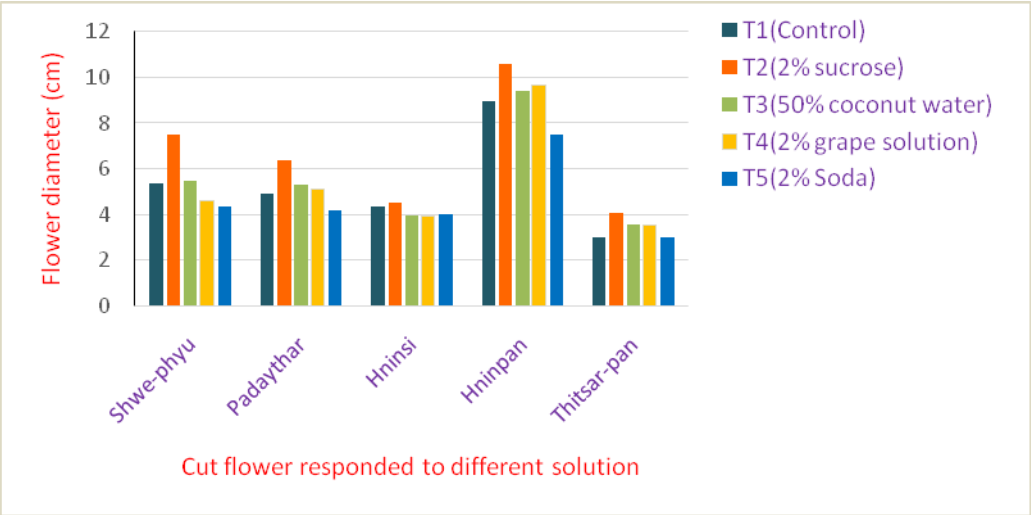

Figure 2. Flowers diameter of each cut flower in respond to different vase solution

Vase Life

The result of the vase life of cut flowers expressed that in decorative type Shwe-phyu, the vase life is 18 days in T2 (2% sucrose)15 days in T4 (2%grape solution) and 14 days in T5 (2% soda) so, more than 13 days in control. In Padaythar, the vase life is 18 days in T2 (2% sucrose) and T4 (2% grape solution) which more than 14 days in control. In Hninsi,the vase life is 15 days in T2 (2% sucrose) more than 13 days in control. For Hninpan, the vase life is 18 days in T2 (2% sucrose), 15 days in T3 (50 % coconut water) that more than 13 days in control. In thitsar-pan, the vase life is 12 days in T2 (2% sucrose) and 10 days in T3 (50% coconut water) more than 9 days in control (Table 4 and Figure 3).

Table 4. Vase life of each cut flower in response to different solution

Treatments	Shwe-phyu	Padaythar	Hninsi	Hninpan	Thitsar-pan
T1(Control)	13	14	13	13	9
T2(2% Sucrose)	18	18	15	18	12
T3 (50% Coconut water)	13	14	13	15	10
T4(2% Grape solution)	15	18	13	10	9
T5(2%Soda)	14	13	14	12	8
F-test	ns	*	ns	**	ns
5% LSD	1.9	2.0	1.3	1.9	1.6
CV %	21.26	21.24	27.10	22.6	34.5

** = 1% level of significance, * = 5% level of significance, ns = non significance

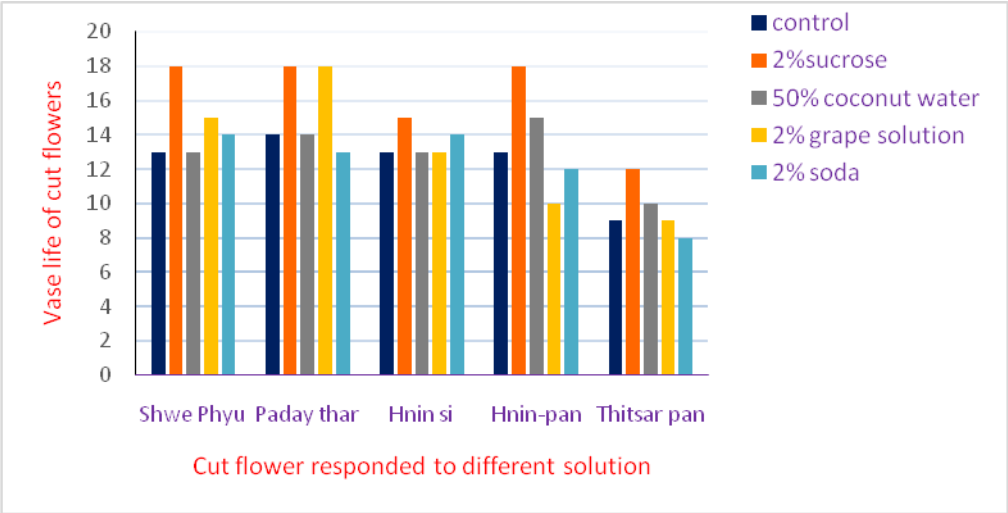

Figure 3. Vase life of each cut flower in response vase solution

Cost Per Year

The cost of each cut flower for annual was also determined in this experiment. The calculation for the cost was carried out based on the vase life of each cut flower.The results revealed that in Shwe-phyu, T2 (2% sucrose) (8319.60 Kyats) is the lowest cost and followed by T4 (2% grape solution) (10140.00kyats) than T5 (2% soda) 10607.10 are lower cost compared to T1 (control) (11353.80 Kyats). In Padaythar, T2 (2% sucrose) (11120.00 Kyats), and T4 (2% grape solution) (11250.00 Kyats) are lower cost compared with T1 (control) (14142.9 Kyat). In Hninsi, T2 (2% sucrose) (15504.00 Kyats) and T5 (2% soda) (16521.40 Kyats) are more low cost than T1(control) (17723.1 Kyats). In Hninpan, T2 (2% sucrose) had the lowest cost (23240.00 kyat), followed by T3 (50% coconut water) (27744.00 kyats) than (32012.30 kyats) in T1 (control). In Thitsar -pan, T2 (2% sucrose) had the lowest cost (25680.00 kyats) and followed by (30600.00 kyats) for T3 (50% coconut water) then (34000.0 kyats) in control.(Table 5 and Figure 4).

Table 5. Cost per year of cut flowers responded to different treatments

Treatments	Cost (%) per year				
	Shwe-phyu	Padaythar	Hninsi	Hninpan	Thitsar-pan
T1(Control)	11353.8	14142.9	17723.1	32012.3	34000.0
T2 (2% Sucrose)	8319.6	11120.0	15504.0	23240.0	25680.0
T3(50% Coconut water)	11353.8	14142.9	17723.1	27744.0	30600.0
T4(2% Grape solution)	10140.0	11250.0	18069.0	42066.0	34500.0
T5 (2% Soda)	10607.1	15300.0	16521.40	34755.0	38362.5

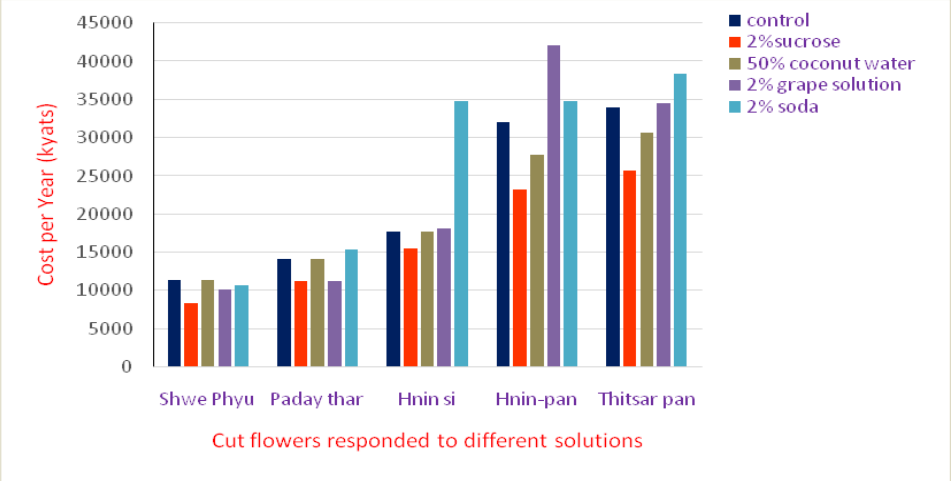

Figure 4. Cost per year of cut flowers responded to different treatments

Hoard Expense

The results of amount of expenses save by cut flowers under different vase solution showed that in Shwe-phyu, T2 (2% sucrose) could save the maximum expanse (26.7%), followed by T4 (2% grape solution) 10.7% and then T5 (2% soda) (6.6%.). In Padaythar, T2 (2% sucrose) and T4 (2% grape solution) could save in 21.4% and 20.5% but T5 (2% soda) could not save. In Hninsi, T2 (2% sucrose) and T5 (2% soda) save 12.5 % and 6.8% respectively.In Hnin-pan, T2 (2% sucrose), 27.4% that is highest save amount among the treatments and T3 (50% coconut solution) could save 13.3%. In Thitsar-pan, T2 (2% sucrose) and T3 (50% coconut water) had save 24.5% and 10.0%. All cut flower could save in T2 (2% sucrose). Moreover the highest save amount is found in T2 (2% sucrose) on Hninpan (Table 6 and Figure 5).

Table6. Save amounts of expenses of cut flowers respond to different vase solution

	Hoard Expanse				
Treatments	Shwe-phyu	Padaythar	Hninsi	Hninpan	Thitsar-pan
T1(Control)	0.00	0.00	0.00	0.00	0.00
T2 (2% Sucrose)	26.7	21.4	12.5	27.4	24.5
T3(50% Coconut water)	0.00	0.00	0.00	13.3	10.0
T4(2% Grape solution)	10.7	20.5	-2.0	-8.7	-1.5
T5 (2% Soda)	6.6	-8.2	6.8	-8.6	-12.8

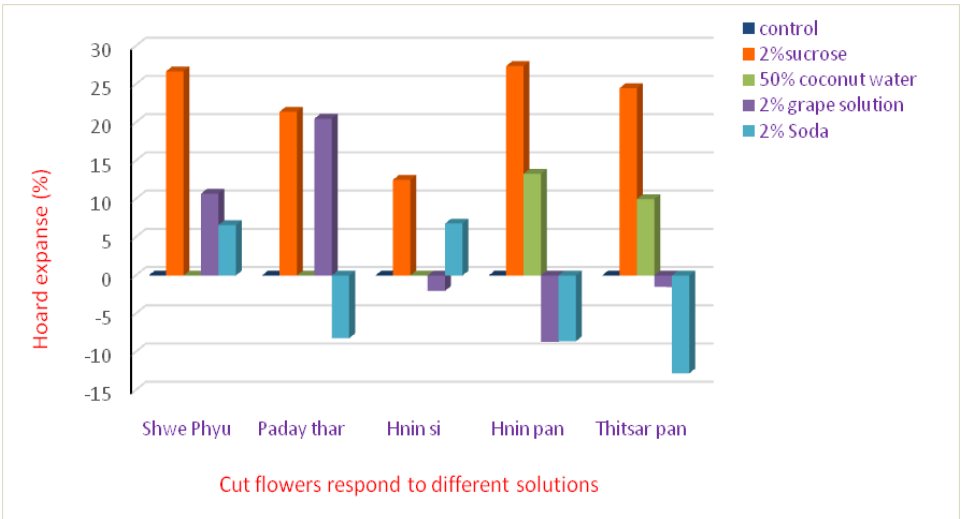

Figure 5. Save amount of expanses of cut flowers in response to different vase solution

Figure Cut flowers in initial day of vase life
A. Shwephyu, B. Padaythar, C. Hninsi, D. Hnin pan and E. Thitsar pan

Discussion and Conclusion

Most of the people like to enjoy beauty and attractive of flowers. Although the same amount and composition of vase solution, the difference may occur due to the types of flower, petal size and texture. In this experiment 2% sucrose were significantly more absorbed than other vase solution. Sucrose is the most commonly used as sugar for prolonging the vase life of cut flowers (Mehraj*et al*., 2013). The maximum absorbed 34.6 mL was observed in 2% sucrose on Hnin-pan. The second most absorption 30.47 mL was also observed in 2% sucrose on Padaythar and the third most absorbed water 27.9 mL was shown in 50% Coconut water on Hnin-pan. In Padaythar, the maximum absorption 30.47 mL in 2% sucrose and 24.6 mL in 2% grape solution were observed compared with its control 21.0 mL. It is observed that sucrose, coconut water and grape solution is effective for vase solution because of grape solution and coconut water contains sucrose. Jayalekshmy *et al*., 1986 reported that mature coconut water is considered as a rich source of sugars, electrolytes. It is agreed with Ho and Nichole (1977) that sucrose is taken up from the vase medium and transported in both the xylem and phloem. Maximun diameter of cut flower were found on T2 (2% sucrose). Woodson and Wang, 1987 and Lalonde *et al*., 1999 reported that sucrose is the major source of carbon for petal growth and is the major form of photosynthetically assimilated carbon that is transported in plants.The vase life dependent on the water balance is the relation between the capacity of the flower for water uptake, water transport and transpiration. The longest vase life 18 days were observed in Shwe-phyu, Padaythar, and Hninpan in 2% sucrose solution. Similarly 18 days are also observed in 2% grape solution in Padaythar. The second longest vase life 15 days were observed in 2% sucrose on Hninsi , 50% coconut water on Hninpan and 2% grape solution on Shwe-phyu. So the longest days 18 and 15 days were also observed in 2% sucrose, 50% coconut water and 2% grape solution. Halery and Mayak (1974) reported that the translocated sucrose accumulates in the flowers, increasing their osmotic concentration and improving their absorb water and maintain turgidity. The maintains of an optimal water status was the most important factor in cut flower longevity (Halery and Mayak, 1981). Depends on the duration of the vase life the expense of the each cut flower was calculated.

In Shwe - phyu, T1 (control) and T3 (50% coconut water) were highest cost 11353.8 kyats per year compared with T2 (2% sucrose) was lowest cost 8319.6 kyats. In Padaythar, T1 (control) and T3 (50% coconut water) were also highest cost 14142.9 kyats per year compared with lowest cost 11120.0 kyats in T2 (2% sucrose) solution. In Hnin-si and Hnin-pan, T4 (2% Grape solution) was the highest cost 18069.2 kyats and 42066,0 kyats but (2% sucrose) was lowest cost 15504.0 kyats and 23240.0 kyats respectively. In Thitsar pan, T5 (2%soda) was highest cost 38362.5 kyats but T2 (2% sucrose) was lowest cost 25680.0 kyats. Although all cut flower with different treatment shows different cost, T2 (2% sucrose) solution was the lowest cost among all treatments and which had maximum save 27.4 % in Hninpan. Followed by 26.7% in Shwe-phyu then 24.5% inThitsar-pan, 21.45 % in Padaythar and 12.5% in Hninsi respectively. According to the results among four treatments T2 (2% sucrose + clorox) gave the best result on all 5 cut flowers and followed by T3

(50% coconut water +clorox) and T4 (2% grape solution clorox). In concluded that using 2% sucrose solution with clorox was recommended for all cut flowers.

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