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Postharvest Keeping Quality of *Lathyrus Odoratus* L. and *Antirrhinum majus* L. Cut Flowers

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THE EFFECT of pulsing treatments with sucrose, silverthiosulphate (STS) and 1-methylcyclopropene (1-MCP) pretreatments combined with or without floral preservative solution on the postharvest quality of *Lathyrus odoratus* and *Antirrhinum majus* cut flowers was studied. All pulsing treatments, floral preservative and their combinations significantly prolonged the vase life and floret longevity of *Lathyrus odoratus* and *Antirrhinum majus* cut flowers compared to the control. The combination between pulsing treatments and floral preservative was better than each of them alone in enhancing the fresh weight of cut flowers. Sucrose, STS and 1-MCP combined with floral preservative suppressed the decrease of glucose, fructose, and sucrose contents of petals for both cut flowers. The treatment of 1-MCP at 0.5 g m^{-3} for 6 h combined with floral preservative resulted in the highest vase life and maximum quality of *Lathyrus odoratus* and *Antirrhinum majus* cut flowers. Applying sucrose or 1-MCP as alternative treatments to STS was discussed.

Keywords: Vase life- Cut flowers- Sucrose- STS- 1-MCP

Sweet pee (*Lathyrus odoratus* L.) is an important ornamental plant because of its wide range of colors as well as very good fragrance. Snapdragon (*Antirrhinum majus* L.) is a popular annual ornamental plant because of its various flower colors. Snapdragons make excellent cut flowers and excel in beds and at the front of borders. *Lathyrus odoratus* and *Antirrhinum majus* cut flowers are sensitive to ethylene and their vase life are short (Kushal and Moore, 1994 and Serek *et al.*, 1995). These cut flowers showed climacteric rise in ethylene production after harvest. A very high amount of ethylene was produced by the staminal sheath which is suggested to play an important role in *Lathyrus odoratus* flower senescence (Kushal and Moore, 1994). Cut flowers are often exposed to ethylene during production, transport, storage or retail marketing. Some deleterious effects of ethylene exposure including leaf yellowing, flower (or petal) drop, irregular opening and premature death were accursed (Nowak and Rudnicki, 1990).

Silver thiosulphate (STS) is the most widely used substance as ethylene binding inhibitor. The benefits of using STS are so great that it is mandatory to be used with many species of flowers entering the flower auctions. STS appears to be having also farther benefits than as a biocide, which makes it an even more popular substance

(Bishop, 2002). STS was very effective in prolonging the vase life of sweet pea (Dole *et al.*, 2005 and Sexton *et al.*, 2005), snapdragon (Lee *et al.*, 1995 and Fukai Uehara 2006) and also extended the vase life of different cut flowers (Beura *et al.*, 2001, Celikel & Reid, 2002, Hassan *et al.*, 2003, Hassan & Schmidt 2004 and Hassan *et al.*, 2004). However, STS contains silver ion, which is considered a potential environmental pollutant, and has some restrictions on its commercial use. In addition, STS treatment accelerated the discoloration of sweet pea flower petals (Watanabe *et al.*, 1998). Therefore, other alternatives to STS should be used.

Sugars play an important role in plants as substrates for respiration, materials for cell wall synthesis, and as an osmolyte. Since the amount of sugars contained in cut flowers is limited, addition of sugars such as sucrose to vase water is effective in improving the vase life of sweet pea cut flowers (Ichimura and Suto, 1999). Continuous treatment with sucrose markedly improved the vase life as well as the flowers quality of sweet pea and snapdragon cut flowers (Ichimura, 1998). The effectiveness of sucrose in promoting bud opening and inhibiting flower senescence could be ascribed to the increase of the sugar concentration in florets, leading to the inhibition of ethylene production (Ichimura *et al.*, 1998). Although sucrose treatment alone can extend the vase life of cut flowers (Ichimura & Hisamatsu 1999, Jaung *et al.* 2001 and Dixit *et al.*, 2003), the vase life was further extended when sucrose is combined with STS (Ichimura & Hiraya 1999 and Beura *et al.*, 2001).

1-methylcyclopropene (1-MCP) is a non-toxic inhibitor of ethylene action which acts as a competitive and irreversible inhibitor of binding of ethylene to its receptor (Sisler *et al.*, 1996). 1-MCP was very effective in extending the vase life of different cut flowers (Celikel & Reid 2002, Picchioni *et al.*, 2002, Hassan *et al.*, 2004 and Uthaichay *et al.*, 2007). 1-MCP treatment extended the vase life of *Lathyrus odoratus* (Dole *et al.*, 2005 and Sexton *et al.*, 2005) and *Antirrhinum majus* cut flowers (Serek *et al.*, 1995). Although both *Lathyrus odoratus* and *Antirrhinum majus* are sensitive to ethylene, the effect of 1-MCP on their postharvest quality was not established well.

Using 8-hydroxyquinoline sulphate (8-HQS) and sucrose in the floral preservatives extended the vase life and enhanced the postharvest quality of sweet pea (Ichimura and Suto, 1999) and snapdragon (Ichimura and Hisamatsu, 1999) cut flowers. Research work for improving quality and prolonging the vase life of these flowers must be taken in consideration. The aim of this investigation was to study the effect of pulsing treatments with sucrose, STS and 1-MCP pretreatments combined with or without floral preservative solution on the postharvest quality of *Lathyrus odoratus* and *Antirrhinum majus* cut flowers.

Material and Methods

Plant material

Lathyrus odoratus and *Antirrhinum majus* were grown in the experimental farm of Faculty of Agriculture, Tanta University, Tanta in two successive seasons (2006/2007 and 2007/2008). All cultural practices were done as needed till plants reached harvesting stage. Flowers were harvested early morning at March 1st in both seasons and immediately brought to the laboratory of Horticulture Department within one hour. Homogenous flowers were chosen and trimmed to 12 cm for sweet pea and 35 cm for snapdragon spikes and directly used for the experiment.

Chemical treatments

The cut flowers of each plant were pulsed with sucrose at 10 %, silver thiosulphate (STS) at 0.4 mM for 6 h and 1-methylcyclopropene (1-MCP) at 0.5 g m^{-3} for 6 h. Every treatment included 30 flowers. The cut spikes of each pretreatment were divided to two equal groups. The first group was kept in distilled water till the end of the experiment. The second group was held in floral preservative solution (F.P) (containing 200 ppm 8-Hydroxyquinoline sulphate + 5 % sucrose) till the end of the experiment. Both groups have 4 subtreatments: without any other chemicals, with 10% sucrose, 0.4mM STS and 0.5 m^{-3} 1-MCP as follows:

First group (without F.P.).	*Second group (with F.P.)*
1- Control (Distilled water)	5- Floral preservative (F.P.) only
2- 10% Sucrose	6- F.P. + 10% Sucrose
3- 0.4mM STS	7- F.P. + 0.4mM STS
4- 0.5 gm^{-3} 1- MCP	8- F.P. +0.5 gm^{-3} 1- MCP

Three replications of five flowers each were used per treatment in this experiment and the cut flowers were arranged in a complete randomize design. 1-MCP (as EthylBloc) was obtained from AgroFresh Inc. Rohm and Haas Company and the treatments of STS and 1-MCP were done as described by Hassan *et al.* (2003).

Evaluation of vase life and floret longevity

The first open florets of *Lathyrus odoratus* after harvest were visually evaluated daily for floret longevity. The longevity of florets was considered as ended when petals lost their turgor. The spikes vase life was determined as the time from the beginning of treatments to the wilting of the last flower. In the case of *Antirrhinum majus* the fourth open florets of spikes were evaluated for floret longevity. The vase life of spikes was determined as the time from harvest to when more than 50 % of florets were wilted. In addition, number of open florets was recorded daily until all florets wilted and the open florets as percentage was calculated. The longevity of *Lathyrus odoratus* and *Antirrhinum majus* cut flowers was determined under laboratory conditions at natural day light at 24 ± 1°C and 65-75 % RH.

Fresh weight measurements

Fresh weight determinations of the flower spikes were done in the second season. Flower spikes of pulsing treatments plus holding in floral preservatives as well as control treatment were weighed daily till all flowers were wilted. The changes in fresh weight of *Lathyrus odoratus* and *Antirrhinum majus* cut flowers were recorded.

Carbohydrate contents

The soluble carbohydrate contents were determined in the petals of flowers pretreated with sucrose, STS or 1-MCP combined with floral preservative for both cut flowers tested in the second season. The samples were taken on the 1st, 3rd, 5th and 7th day, respectively. The carbohydrates were separated by HPLC system. Differential refractometer (Type: RIDK-2, Praha, Czech Republic) was used to detect fructose, glucose and sucrose. Peak identity was confirmed using authentic carbohydrates. Peak area was determined by an integrator and the percent of each carbohydrate fraction in the sample was calculated by a computer. The carbohydrate contents were calculated as mg g^{-1} dry weight.

Statistical analysis of results

Results were analyzed by using SPSS program Base 9, SPSS Inc. USA. The differences between means were performed by using Duncan multiple range test at 0.05 level.

Results

Effect of different pulsing treatments on the vase life and floret longevity

The vase life as well as floret longevity of *Lathyrus odoratus* and *Antirrhinum majus* cut flowers were extended as a result of using sucrose, STS and 1-MCP treatments during the two experimental seasons (Tables 1, 2). Holding flowers in floral preservative solution also increased the vase life and floret longevity. The combination between sucrose, STS and 1-MCP pulsing treatments and floral preservative significantly increased both vase life and floret longevity compared to each of them alone. On the other hand, there were no significant differences between STS and 1-MCP treatments in this respect.

The longest vase life and floret longevity during both experimental seasons were obtained with (8.33 and 5.66 days) and (8.66 and 5.76 days) and were (8.16 and 5.26 days) and (8.58 and 5.33 days) for *Lathyrus odoratus* in both seasons for STS and 1-MCP in combination with floral preservative treatments, respectively (Table 1).

TABLE 1. Effect of pulsing treatments with sucrose, STS and 1-MCP in combination with floral preservative (F.P.) on the vase life and floret longevity of *Lathyrus odoratus* cut flowers during 2006 / 2007 and 2007 / 2008 seasons .

Treatments	2006 / 2007 Season		2007 / 2008 Season	
	Vase life (Days)	Floret longevity (Days)	Vase life (Days)	Floret longevity (Days)
First group (without F.P.)				
Control	2.33 f	1.32 e	2.36 f	1.33 e
Sucrose	5.66 d	2.63 c	5.58 d	2.59 c
STS	7.35 b	3.88 b	7.56 b	3.86 b
1-MCP	7.16 bc	3.96 b	7.33 bc	3.9 b
Second group (with F.P.)				
F.P.	4.38 e	2.13 d	4.33 e	2.11 d
F.P. + Sucrose	6.93 c	2.86 c	6.88 c	2.83 c
F.P. + STS	8.33 a	5.66 a	8.66 a	5.76 a
F.P. + 1-MCP	8.16 a	5.26 a	8.58 a	5.33 a

- Means followed by different letters are significantly differ for each other according to Duncan multiple range test at $P = 0.05$.

The longest vase life and floret longevity of *Antirrhinum majus* cut flowers (14.86 and 7.66 days) and (14.88 and 7.58 days) were obtained by using 1-MCP in combination with floral preservative in both seasons, respectively. Otherwise, there were no significant differences between this treatment and STS + F.P treatment which resulted in (14.73 and 7.36 days) and (14.66 and 7.36 days) in the first and second seasons, respectively (Table 2). However, the untreated flowers resulted in the lowest values in this respect in both seasons for both cut flowers.

Effect of different pulsing treatments on floret opening of Antirrhinum majus

The percentage of open florets of *Antirrhinum majus* cut flowers was positively affected by using different pulsing treatments applied in this experiment. All pulsing treatments significantly increased the percentage of open florets compared to the control during the two experimental seasons. The highest percentage of floret opening was obtained by using either STS or 1-MCP in combination with floral preservative. There were no significant differences between these two treatments (Fig. 1).

TABLE 2. Effect of pulsing treatments with sucrose, STS and 1-MCP in combination with floral preservative (F.P.) on the vase life and floret longevity of *Antirrhinum majus* cut flowers during 2006 / 2007 and 2007 / 2008 seasons.

Treatments	2006 / 2007 Season		2007 / 2008 Season	
	Vase life (Days)	Floret longevity (Days)	Vase life (Days)	Floret longevity (Days)
First group (without F.P.)				
Control	7.66 e	3.11 f	7.54 e	3.22 f
Sucrose	9.33 d	4.66 d	9.11 d	4.43 d
STS	11.88 bc	6.13 bc	11.76 bc	6.11 bc
1-MCP	12.66 b	6.33 b	12.33 b	6.13 b
Second group (with F.P.)				
F.P.	8.86 d	3.88 e	8.77 d	3.66 e
F.P. + Sucrose	11.48 c	5.67 c	11.22 c	5.45 c
F.P. + STS	14.73 a	7.36 a	14.66 a	7.36 a
F.P. + 1-MCP	14.86 a	7.66 a	14.88 a	7.58 a

- Means followed by different letters are significantly differ for each other according to Duncan multiple range test at $P = 0.05$.

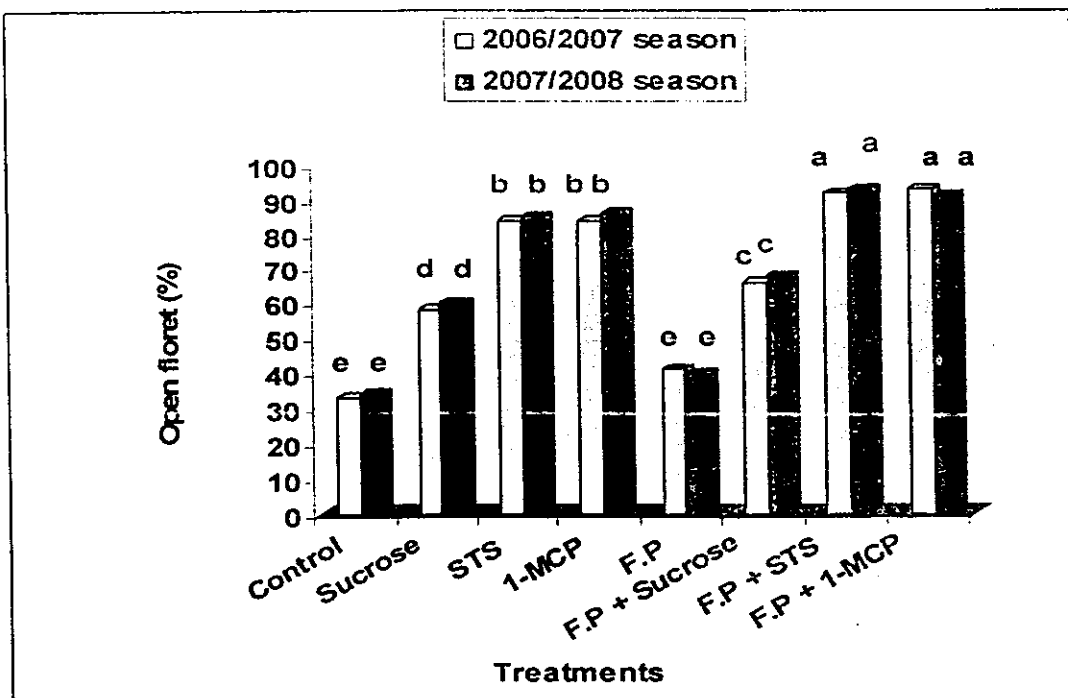

Fig. 1. Effect of pulsing treatments with sucrose, STS and 1-MCP in combination with floral preservative (F.P.) on the open florets as percentage of *Antirrhinum majus* cut flowers during 2006 / 2007 and 2007 / 2008 seasons. Bars having different letters are significantly differ from each other according to Duncan's multiple range test at $P = 0.05$

Effect of different pulsing treatments on the fresh weight

The fresh weight of *Lathyrus odoratus* and *Antirrhinum majus* cut flowers were enhanced as a result of using sucrose, STS or 1-MCP pulsing treatments. The positive effect of these treatments was more and more marked when floral preservative was used in combination with pulsing treatments. The comparison between sucrose, STS or 1-MCP in combination with floral preservative and control flowers is presented in Fig. 2 and 3. The fresh weight of *Lathyrus odoratus* control flowers was increased till the third day and then sharply decreased. However, the fresh weight of flowers treated with sucrose, STS and 1-MCP in combination with floral preservative continuously increased and reached its maximum at day 5, 8 and 9, respectively (Fig. 2). The fresh weight of *Antirrhinum majus* control flowers was gradually increased till day 8 then gradually decreased. Meanwhile, the flower fresh weight which treated with pulsing solutions was increased thereafter up to 14 days. The best treatment in this concern was 1-MCP in combination with floral preservative since the fresh weight increased till day 14 and decreased after that time only (Fig. 3).

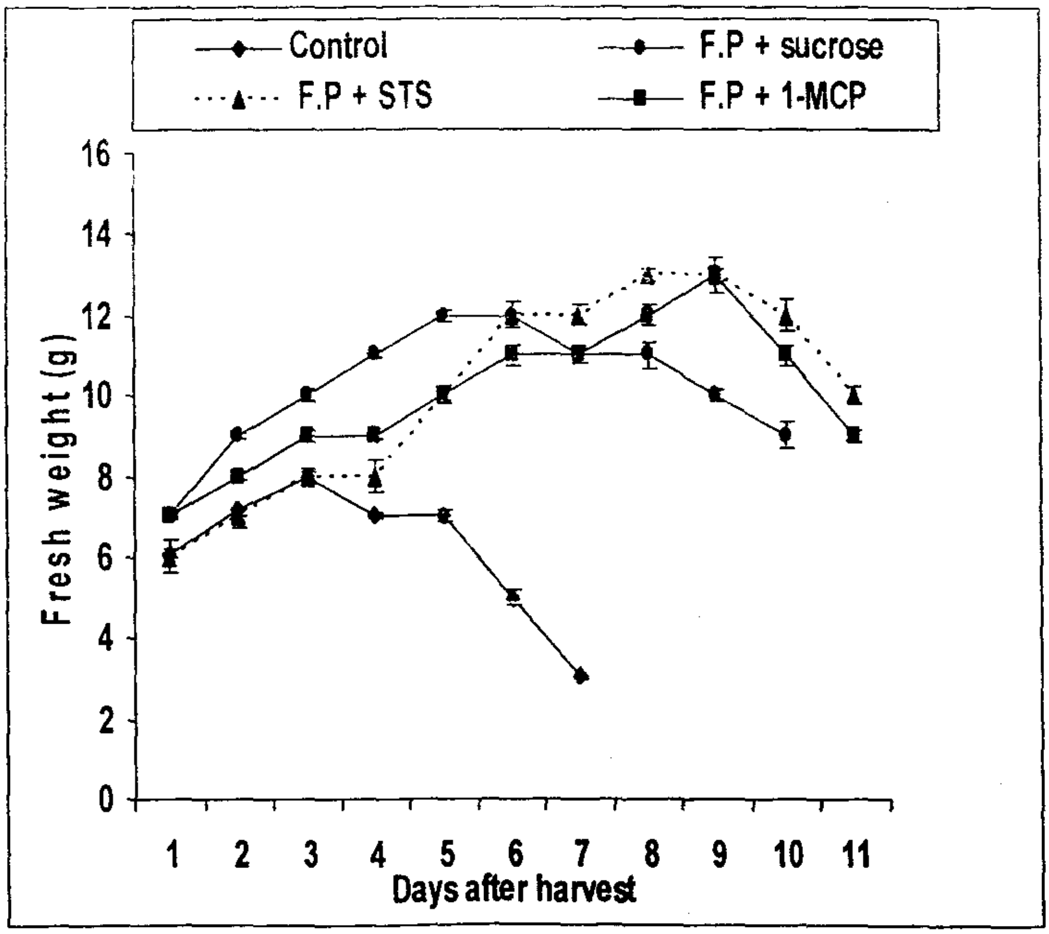

Fig. 2. Effect of pulsing treatments with sucrose, STS and 1-MCP in combination with floral preservative (F.P.) on the fresh weight of *Lathyrus odoratus* cut flowers during 2007 / 2008 season. Values are means of 3 replicates and each point represents mean value ± S.D.

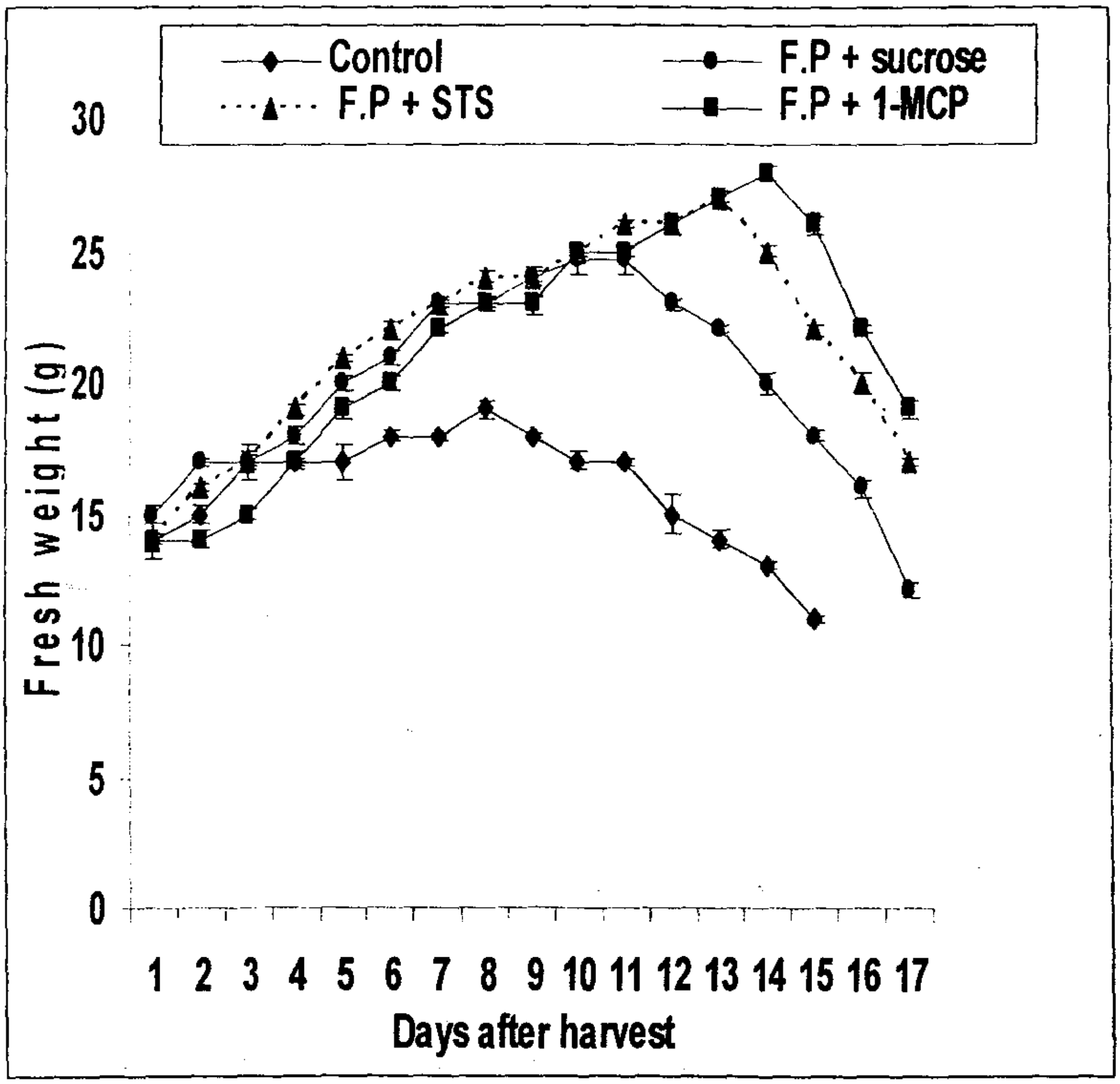

Fig. 3. Effect of pulsing treatments with sucrose, STS and 1-MCP in combination with floral preservative (F.P.) on the fresh weight of *Antirrhinum majus* cut flowers during 2007 / 2008 season. Values are means of 3 replicates and each point represents mean value ± S.D.

Effect of different pulsing treatments on the carbohydrate content

The pretreatments with sucrose, STS and 1-MCP in combination with floral preservative significantly improved glucose, fructose and sucrose contents of petals in both tested cut flowers compared to the control (Fig. 4 & 5). Glucose, fructose and sucrose contents were sharply decreased from the first day and thereafter. However, sucrose, STS and 1-MCP in combination with floral preservative suppressed the decrease of glucose, fructose, and sucrose contents during the shelf life. Generally, there were no differences between pulsing treatments in this respect.

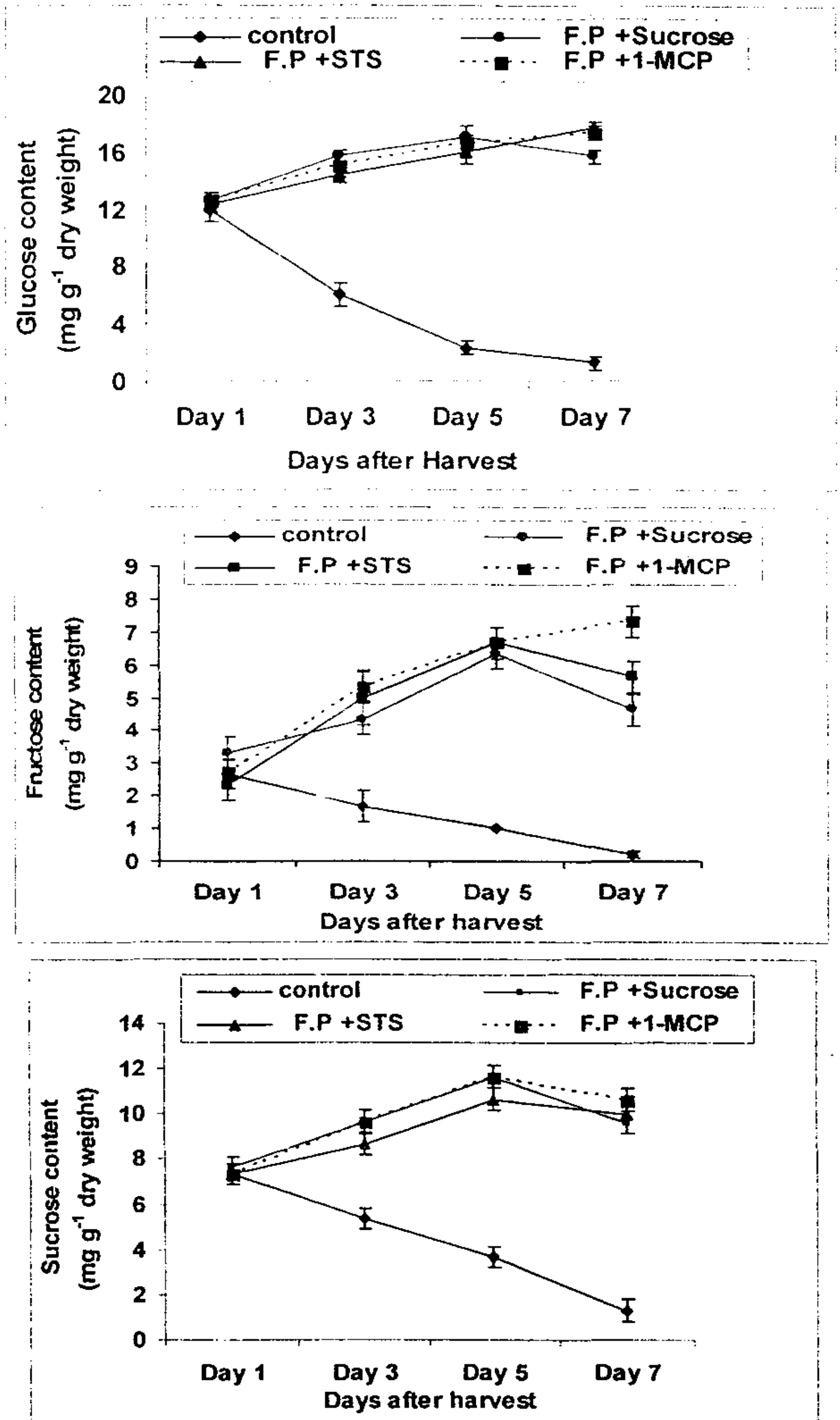

Fig. 4. Effect of pulsing treatments with sucrose, STS and 1-MCP in combination with floral preservative (F.P.) on carbohydrate content in petals of *Lathyrus odoratus* cut flowers during 2007 / 2008 season. Values are means of 3 replicates and each point represents mean ± S.D.

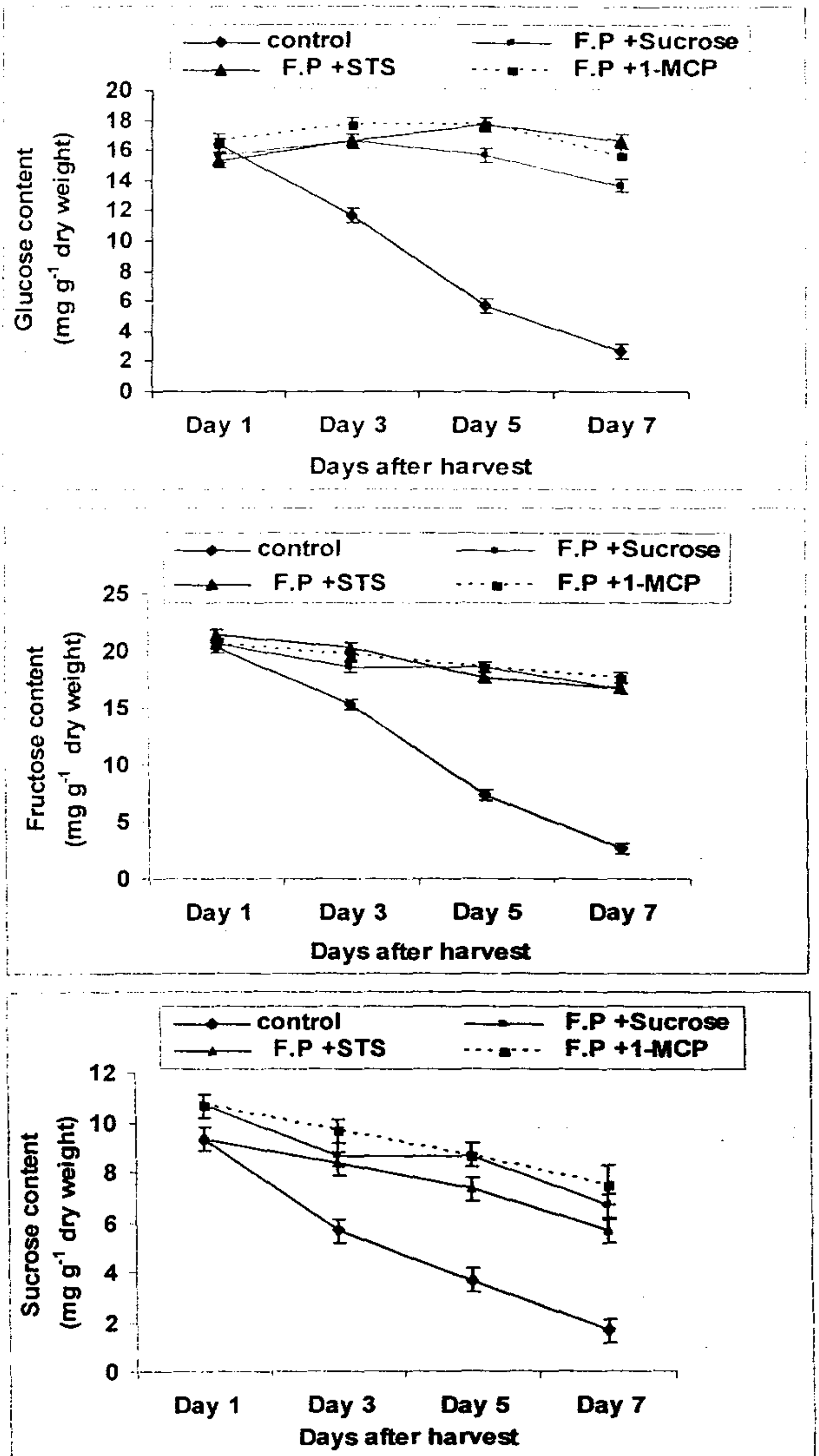

Fig. 5. Effect of pulsing treatments with sucrose, STS and 1-MCP in combination with floral preservative (F.P.) on the carbohydrate content in petal of *Antirrhinum majus* cut flowers during 2007 / 2008 season. Values are means of 3 replicates and each point represents mean ± S.D.

Discussion

The results of this study clearly show the positive effect of pulsing treatments of sucrose, STS and 1-MCP in combination with floral preservative on the vase life as well as floret longevity of *Lathyrus odoratus* and *Antirrhinum majus* cut flowers. The positive effects of sucrose treatment could be explained through its role as a source of nutrition for tissues approaching carbohydrate starvation and it may also act as an osmotically active molecule thereby having a role in flower opening and subsequent water relations and maintain flower turgidity (Kuiper *et al.*, 1995). Sucrose treatment delayed the fresh weight loss (Fig. 2 & 3) and increased the percentage of open florets in *Antirrhinum majus* cut flowers (Fig.1) and consequently the vase life of *Lathyrus odoratus* and *Antirrhinum majus* was increased. Since the sucrose is a source of carbohydrates, sucrose treatment increased the carbohydrates content of petals (Fig. 4 & 5). Therefore, the higher the reducing sugars in the petals, the longer the vase life of *Lathyrus odoratus* and *Antirrhinum majus* cut flowers. These results are in accordance with the findings of Ichimura and Suto (1999) who found positive correlation between sugar concentrations in petals and vase life, whereas that between the sugar concentrations and ethylene production was negative. Ichimura *et al.* (1998) ascribed the effectiveness of sucrose in improving the vase life to the increase of the sugar concentration in florets, leading to the inhibition of ethylene production.

STS treatment was very effective in extending the vase life and enhancing the postharvest quality of *Lathyrus odoratus* and *Antirrhinum majus* cut flowers. These results could be explained through the role of STS in increasing the floret longevity (Tables 1 and 2) and retarding the loss of fresh weight (Fig. 2 & 3). Also, this treatment improved the carbohydrate contents of petals and hence, the vase life of cut flowers was extended. Nowak and Rudnicki (1990) mentioned another explanation for this positive effect of STS that it was a very potent inhibitor of ethylene action in plant tissues. It also provides some antimicrobial activity inside the tissues, thus it is beneficial for ethylene-sensitive flowers. Similar results were obtained by Dole *et al.* (2005), Sexton *et al.* (2005) and Fukai & Uehara (2006).

Extending the vase life of *Lathyrus odoratus* and *Antirrhinum majus* cut flowers by using 1-MCP could be attributed to the role of 1-MCP as an inhibitor of ethylene biosynthesis as well as ethylene binding and consequently preventing the undesirable postharvest effects of ethylene as reported by Sisler *et al.* (1996) and Hassan *et al.*, (2003). Therefore, under this treatment the fresh weight loss as well as carbohydrate degradation were kept at minimum values as shown in Figs. (2 and 3) and (4 and 5), respectively. Similar results were obtained by Sisler and Serek (2001) and Hassan and Schmidt (2004).

The results also show the highest positive effect of combination between sucrose, STS or 1-MCP and floral preservative on improving the postharvest quality of *Lathyrus odoratus* and *Antirrhinum majus* cut flowers. These results could be explained through the role of 8-HQS (component of floral preservative) as anti-microbial agent. And hence, 8-HQS may had prevented the accumulation of microorganisms in xylem vessels and suppressed the xylem occlusion (Henriette and Clerkx 2001) and increased water uptake (Hassan *et al.*, 2003). Floral preservative treatment increased the carbohydrate contents of florets as shown in Figs. (4 and 5) and hence, it may be reflected in increasing the vase life and maintaining high quality of cut flowers. Therefore, the lowest carbohydrate content of untreated flowers resulted in the lowest vase life of *Lathyrus odoratus* and *Antirrhinum majus* (Tables 1 and 2). These results are in agreement with the findings of Ichimura and Hisamatsu (1999) and Ichimura and Suto (1999).

The results suggest that sucrose, STS and 1-MCP act similarly at least on soluble sugar changes that are associated with inhibiting flower senescence. Although the positive effect of STS, its use has been banned in several countries because it contains a heavy metal, a possible environment pollutant (Celikel and Reid, 2002). 1-MCP preconditioning may be a useful alternative technique for delaying senescence and maintaining vase quality of *Lathyrus odoratus* and *Antirrhinum majus* cut flowers. It can be concluded that the treatment of 1-MCP at 0.5 g m^{-3} for 6 h in combination with floral preservative solution containing 200 ppm 8-hydroxyquinoline sulphate + 5 % sucrose is recommended to obtain the highest vase life and maximum quality of *Lathyrus odoratus* and *Antirrhinum majus* cut flowers.

References

Beura, S., Ranvir, S., Beura, S. and Singh, R. (2001) Effect of pulsing before storage on postharvest life of gladiolus. *J. Orn. Hort.*, 4(2), 91-94.

Bishop, C. (2002) Ethylene: What can the grower do? *FloraCulture International*, June. 26-28.

Celikle, F.G., and Reid, M.S. (2002) Postharvest handling of stock (*Matthiola incana*). *HortScience*, **37**, **1**, **144-147**.

Dixit, A.K., Tripathi, V.K., Shukla, P.K., and Pandey, A.K. (2003) Effect of various chemicals on vase life of Antirrhinum and annual Chrysanthemum. *Farm Science Journal*, **12** (2), 179-180.

Dole, J.M., Fonteno, W.C. and Blankenship, S.L. (2005) Comparison of silver thiosulfate with 1-methylcyclopropene on 19 cut flower taxa. *Acta Horticulturae*, **682** (2), 949-956.

Fukai, S. and Uehara, K. (2006) Effects of calcium treatment on vase life of cut snapdragon flowers. *Horticultural Research Japan*, **5** (4) 465-471.

Hassan, F. and Schmidt, G. (2004) Postharvest characteristics of cut carnations as the result of chemical treatments. *Acta Agronomica Hungarica*, **52**, (2), 125-132.

Hassan, F.A.S., Tar, T. and Dorogi, Z.S. (2003) Extending the vase life of *Solidago canadensis* cut flowers by using different chemical treatments. *International Journal of Horticultural Science*, 9 (2), 83-86.

Hassan, F., Schmidt, G., Hafez, Y.M., Pogany, M. and Ankush, J. (2004) 1-MCP and STS as ethylene inhibitors for prolonging the vase life of carnation and rose cut flowers. *International Journal of Horticultural Science,* **10** (4), 101-107.

Henriette, M.C. and Clerkx, A.C.M. (2001) Anatomy of cut rose xylem observed by scanning electron microscope. *Acta Horticulture*, **547**, 329-339.

Ichimura, K. (1998) Improvement of postharvest life in several cut flowers by the addition of sucrose. *Japan Agricultural Research Quarterly*, **32** (4), 275-280.

Ichimura, K. and Hiraya, T. (1999) Effect of silver thiosulfate complex (STS) in combination with sucrose on the vase life of cut sweet pea flowers. *J. Jap. Soci. Hort. Sci.* **68** (1), 23-27.

Ichimura, K. and Hisamatsu, T. (1999) Effects of continuous treatment with sucrose on the vase life, soluble carbohydrate concentrations, and ethylene production of cut snapdragon flowers. *J. Jap. Soci. Hort. Sci.*, **68** (1), 61-66.

Ichimura, K., Mukasa, Y., Fujiwara, T., Kohata, K. and Suto, K. (1998) Improvement of postharvest life and changes in sugar concentrations by sucrose treatment in bud-cut sweet pea. *Bulletin of the Natio Res Inst Vege Orna Plants and Tea*, **13**, 41-49.

Ichimura, K. and Suto, K. (1999) Effects of the time of sucrose treatment on vase life, soluble carbohydrate concentrations and ethylene production in cut sweet pea flowers. *Plant Growth Regulation*, **28** (2), 117-122.

Juang, U., Cho, M. and Kim, H. (2001) Effect of sucrose on the floret senescence and vase life of snapdragon 'Manwall'. *J. Kor. Soci. Hort. Scien.*, **42** (3), 331-335.

Kuiper, D., Ribot, S., van Reen, H.S. and Marissenn, N. (1995) The effect of sucrose on the flower bud ripening of "Madelon" cut roses. *Scientia Horticulturae*, **60**, 325-336.

Kushal, S. and Moore, K.G. (1994) Sites of ethylene production in flowers of sweet pea (*Lathyrus odoratus* L.). *Scientia Horticulturae*, **58** (4), 351-355.

Lee, J., Kim, Y. and Sin, Y. (1995) Effects of harvesting stage, preservative, and storage method on vase life and flower quality of cut snapdragon. *J. Kor. Soci. Hort. Scien.* **36** (6), 926-942.

Nowak, J. and Rudnicki, R.M. (1990) *Postharvest Handling and Storage of Cut Flowers, Florist, Greens and potted plants*. Timber Press, Inc., 39-43.

Picchioni, G.A., Vazquez, M.V. and Murray, L.W. (2002) Calcium and 1-methylcyclopropene delay desiccation of *Lupinus havardii* cut racemes. *HortScience*, **37** (1), 122-125.

Serek, M., Sisler, E. and Reid, M. (1995) Effects of 1-MCP on the vase life and ethylene response of cut flowers. *Plant Growth Regulation*, **16**, (1), 93-97.

Sexton, R., Stopford, A., Moodie, W. and Porter, A. (2005) Aroma production from cut sweet pea flowers (*Lathyrus odoratus*): the role of ethylene. *Physio Plantarum*, **124** (3), 381-389.

Sisler, E.C., Dupille, E. and Serek, M. (1996) Effect of 1-methylcyclopropene and methylcyclopropene on ethylene binding and ethylene action on cut carnations. *Plant Groth Regulation*, **18**, 79-86.

Sisler, E.C. and Serek, M. (2001) New developments of ethylene control compounds interacting with the ethylene receptor. *Acta Horticulturae*, **543**, 33-37.

Uthaichay, N., Ketsa, S. and Van Doorn, W. (2007) 1-MCP pre-treatment prevents bud and flower abscission in *Dendrobium* orchids. *Postharvest physio Tecn*, **43**, 374-380.

Watanabe, T., Adachi, M., Maeda, Y., Kurata, H., Azuma, R. Uchida, Y. and Shimokawa, K. (1998) Effect of STS and allylisothiocyanate on discoloration of cut sweet pea flower (*Lathyrus odoratus* L. cv. Diana). *Bulletin Faculty Agric. Miyazaki University*, Japan, **45** (1/2), 107-110.

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احتفاظ أزهار بسلة الزهور وحنك السبع بجودتها بعد الحصاد

فهمي عبد الرحمن صادق حسن
قسم البساتين – كلية الزراعة – جامعة طنطا – طنطا - مصر.

تم دراسة تأثير معاملة الانباض بكل من السكروز، ثيوسلفات الفضة ومادة ١- ميثيل سيكلوبروبين بالتداخل أو عدم التداخل مع محلول حفظ الأزهار المكون من (٨ – هيدروكسى كينولين سلفات بتركيز ٢٠٠ جزء فى المليون + ٥ ٪ سكروز) على عمر الأزهار وكذلك صفات الجودة بعد القطف لكل من بسلة الزهور وحنك السبع. وقد أظهرت النتائج أن كل معاملات الانباض وكذلك محلول حفظ الأزهار والتداخل بينهما أدت الى زيادة عمر الأزهار بعد القطف وكذلك عمر الزهيرات الموجودة بالزهرة عند مقارنتها بالأزهار الغير معاملة (الكنترول) .

وكان تأثير التفاعل بين محلول حفظ الأزهار والمعاملة بالانباض أفضل من المعاملة بكل منهما علي حده . كما أوضحت الدراسة أن الوزن الطازج للأزهار تحسن معنويا بهذه المعاملات مقارنة بالكنترول .كما أن معاملة الأزهار بأى من معاملات الانباض بالتداخل مع محلول حفظ الأزهار أدى إلي تقليل النقص في محتوى البتلات من الجلوكوز والفركتوز والسكروز. وأدت المعاملة بمادة ١- ميثيل سيكلوبروبين بتركيز ٠,٤ جم م$^{-٣}$ بالتداخل مع محلول حفظ الأزهار إلى الحصول علي أطول عمر للأزهار وكذلك أحسن صفات جودة للأزهار بعد القطف كما أوصت الدراسة بإمكانية استخدام المعاملة بمادة ١- ميثيل سيكلوبروبين كبديل لمادة ثيوسلفات الفضة الملوثة للبيئة.