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DETERMINATION OF HARVESTING TIME AND PRESERVATIVES SOLUTION TO PROLONG THE VASE LIFE OF CHRYSANTHEMUM

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ABSTRACT

This research was aimed to determine the appropriate harvesting time and preservatives solution to prolong the vase life of chrysanthemum var. Snow White standard. The experiment was done at Hargobinangun Pakem, Sleman-Regency. Two factors randomized block design was used in this experiment. The first factor was harvesting time that expressed as stage of flower development, comprises 3 levels (bud, ½ open flowers, fully open flowers) and the second factor was 3 types of preservatives solution (water, water+2.5% (w/v)sucrose, water+ 2.5%9w/v) sucrose+100 ppm citric acid). The variance of data were analyzed and Duncan Multiple Range Test (DMRT) at 5% was used to determine the significant difference among treatments. The result of this research showed that harvesting time at bud stage maintained vase life until 14 days and the chrysanthemum freshness could prolonged until 16 days by addition preservatives solution water+2.5% (w/v) sucrose+100 ppm citric acid, whereas harvesting Chrysanthemum when the flowers fully open then treated with water maintained the vase life only 10 days.

Keywords: harvesting time; preservatives, vase life, chrysanthemum

INTRODUCTION

Chrysanthemum is one of the popular cut flowers in Indonesia due to their interesting in various colors as well as their disk and ray flower form. This cut flower uses in many ceremonial events as well as personal need. Thus in the last 10 years, chrysanthemum is classified into high economic value commodity.

Marwoto *et. al.*, (1999) stated that chrysanthemum demand increases until 25% every year related with the increasing of the average life standard of the Indonesian community. Almost 50 million stalks of chrysanthemum needed for domestic market every year. These amounts supplied among other by the farmers from Hargobinangun, Pakem Sleman regency that produces about 2500 stalks chrysanthemum every day.

Nevertheless, chrysanthemum belongs to semi perishable commodity based on their respiration rates, therefore, their postharvest quality has been decreasing , rapidly and the vase life is become short if there is no appropriate postharvest treatment applied. Postharvest quality includes vase life of chrysanthemum is influenced by harvesting time and various treatments to prolong the vase life. Harvesting time in appropriate stage of flower development could prolong the vase

life of cut flower (Kader, 1992). Meanwhile, immersion the flower stem into nutritive solution could maintain the cut flower freshness (Halevy and Mayak, 1981). Wiryanto (1993) stated that postharvest treatment for cut flower with sucrose as respiration substrate will supplies an energy endogen and as preservative all at once to prolong the freshness. Beside it, citric acid as bactericide can be used to obtain optimum effect on quality maintain.

Until nowadays, ornamental farmers at Hargobinangun are not applied postharvest treatment, yet. They harvest chrysanthemum at fully open flower then immersion in the water, thus, the optimum vase life only 8 – 9 days.

Based on the explanation above, the objective of this research was to determine the appropriate harvesting time and preservatives solution to prolong the vase life of chrysanthemum.

MATERIALS AND METHOD

Research was done at Hargobinangun, Pakem Sleman Regency from June to October, 2010. Chrysanthemum var. Snow White standard, sucrose, citric acid and water (aquadest) were used as materials.

Two factors randomized block design was used in this experiment. The first factor was harvesting time that expressed as stage of flower development, comprises 3 levels that were bud, ½ open flowers, fully open flowers and the second factor was 3 types preservatives solution that were water, water + 2.5% (w/v) sucrose, water + 2.5% (w/v) sucrose + 100 ppm citric acid. Each treatment uses 9 stalks chrysanthemum and each combination of treatment was repeated 3 times.

Harvested chrysanthemum in 3 stages flower development were then each treated with 3 types of preservatives solution. Furthermore, all treated chrysanthemum store at storage room under controlled temperature at 25^{0}C and 70% Relatives Humidity until chrysanthemum wilted.. The quality parameters observed were the day of initial flower wilted and initial leaf wilted, volume of absorbed preservatives solution, the initial day when chrysanthemum attacked by fungus and duration of chrysanthemum freshness (vase life). The variance of collected data were analyzed and Duncan Multiple Range Test (DMRT) at 5% was used to determine the significant difference among treatments.

RESULTS AND DISCUSSION

Based on the analysis of variance, harvesting time and preservatives solution showed significantly influence to the day when chrysanthemum flower started wilted. Table 1 presents the average day of initial flower wilted.

Table 1. The average day of initial flower wilted (day)

Flower Development Stage At Harvesting Time	Preservatives Solution			
	Water	Water + 2.5% (W/V) Sucrose	Water + 2.5% (W/V) Sucrose + 100 Ppm Citric Acid	Average
Bud	13.53	15.67	18.77	15.99 a
½ Open Flowers	11.00	14.11	16.22	13.78 b
Fully Open Flowers	11.44	13.67	16.33	13.81 b
Average	11.99 c	14.48 b	17.11 a	(-)

Notes: The value in the same row and column followed by the different character shows there is significant difference according to DMRT at 5%. Mark (-) shows there is no interaction among treatments

As shown in table 1, harvesting at bud stage resulted flower wilted longest than other stage, while preservatives solution water+2.5%(w/v) sucrose+100 ppm citric acid resulted flower wilted longest than others. There was no interaction between harvesting time and preservatives solution.

Meanwhile, table 2 shows the day when the chrysanthemum leaf started wilted. Harvesting time and preservatives solution were significantly influence to leaf wilted. As shown in table 2, because of there was interaction between harvesting time and preservatives solution, so the result clearly seen that combination treatment harvesting time at bud stage and preservatives solution water+2.5%(w/v) sucrose+100 ppm citric acid showed the latest leaf wilted. The volume of preservatives solution absorbed during storage significantly influenced Harvesting time and preservatives solution (Table 3).

As shown in the table below, chrysanthemum harvested at bud stage combined by immersion into preservatives solution water+2.5%(w/v) sucrose+100 ppm citric acid absorbed preservative solution smallest volume, Based on the analysis of variance, harvesting time and preservatives solution showed significantly influence to the fungus attack. Table 4 shows the average initial day fungus attacked chrysanthemum

Table 2. The average initial day of leaf wilted (day)

Flower Development Stage At Harvesting Time	Preservatives Solution: Water	Water + 2.5% (W/V) Sucrose	Water + 2.5% (W/V) Sucrose + 100 Ppm Citric Acid	Average
Bud	10.44 c d	12.67 b	14.89 a	12.67
½ Open Flowers	9.00 d	12.44 b	13.55 a b	11.67
Fully Open Flowers	9.33 c d	10.78 c	14.00 a b	11.37
Average	9.59	11.96	14.15	(+)

Notes: The value followed by the different character shows there is significant difference according to DMRT at 5%. Mark (+) shows there is interaction among treatments

Table 3. The average volume of absorbed preservatives solution (cc)

Flower Development Stage At Harvesting Time	Preservatives Solution: Water	Water + 2.5% (W/V) Sucrose	Water + 2.5% (W/V) Sucrose + 100 Ppm Citric Acid	Average
Bud	23.70 c d	22.59 d	18.70 e	21.66
½ open flowers	26.66 b	26.48 b	25.67 b c	26.27
Fully open flowers	35.66 a	28.11 b	26.66 b	30.15
AVERAGE	28.67	25.73	23.68	(+)

Notes: The value followed by the different character shows there is significant difference according to DMRT at 5%. Mark (+) shows there is interaction among treatments

Table 4. The average initial day fungus attacked chrysanthemum (day)

Flower Development Stage At Harvesting Time	Preservatives Solution: Water	Water + 2.5% (W/V) Sucrose	Water + 2.5% (W/V) Sucrose + 100 Ppm Citric Acid	Average
Bud	13.00 d	14.67 c	19.67 a	15.78
½ Open Flowers	11.00 e	13.33 d	15.67 b c	13.33
Fully Open Flowers	11.00 e	11.33 e	16.33 b	12.89
Average	11.67	13.11	17.22	(+)

Notes: The value followed by the different character shows there is significant difference according to DMRT at 5%. Mark (+) shows there is interaction among treatments

As shown in table 4, because of there was interaction between harvesting time and preservatives solution, so the result clearly seen that combination treatment harvesting time at bud stage and preservatives solution water+2.5%(w/v) sucrose+100 ppm citric acid resulted the most capable chrysanthemum hold back from the fungus attack.

Based on the analysis of variance, harvesting time and preservatives solution showed significantly influence to the vase life that expressed as the duration of chrysanthemum freshness. The average duration of chrysanthemum freshness

showed in table 5. Based on the data analysis, harvesting time and preservatives solution significantly influenced all quality parameters observed. Harvesting time in bud stage resulted the best time for harvesting chrysanthemum in order to maintain the freshness because in this stage the transpiration is low than harvesting in ½ open flower and fully open flower stages. It is support Halevy and Mayak (1981). Besides it, ½ open flower and fully open flower produce more ethylene (C_2H_4) from the leaf that that cause leaf and flower wilted, fastly. Likewise, fully open flower will reach senescence rapidly. This result was strengthen statement Zagory and Reid (1986). The chrysanthemum vase life harvested in bud stage reach 14 days, the longest times than other stages.

The vase life could prolong until 16 days by addition preservatives solution that contain sucrose. This result support research hold by Kader (1992). His statement that the freshness of ornamental could prolong by energy supply for maintaining respiration process and sucrose is available for this purpose. As shown in the above tables, in the preservatives solution that contain sucrose showed good result in all quality parameters than without sucrose. However, sucrose is the best suitable media for microorganism growth. Citric acid as bactericides. Addition citric acid will decrease in pH until 3.5 (Zamani *et. al.* 2011). This acid condition will increase absorption of solution. Therefore, preservatives solution contain sucrose and citric acid showed longest vase life of chrysanthemum until 16 days and the latest attacked by fungus. This result may be related with citric acid carried by sucrose through xylem in the stem will transported to the vacuola and distributed to the flower and leaf cell, thus, chrysanthemum has capability for hold out from the fungus attack. This result supported research by Conrado *et. al.*(1980).

Table 5. The average duration of chrysanthemum freshness (day)

Flower Development Stage At Harvesting Time	Preservatives Solution			Average
	Water	Water + 2.5% (W/V) Sucrose	Water + 2.5% (W/V) Sucrose + 100 Ppm Citric Acid	
Bud	11.99	14.33	16.89	14.40 a
½ Open Flowers	10.22	13.22	15.89	13.11 b
Fully Open Flowers	10.55	12.11	15.33	12.67 b
Average	10.92 c	13.22 b	16.04 a	(-)

Notes: The value in the same row and column followed by the different character shows there is significant difference according to DMRT at 5%. Mark (-) shows there is no interaction among treatments

Based on the result from this research, although, there was no interaction between harvesting time and preservatives solution especially on vase life/ freshness, but harvesting time at bud stage followed by immersion in preservatives solution water+2.5% (w/v) sucrose+100 ppm citric acid can be implemented by the ornamental farmers. Nevertheless, the research must be continued to get more suitable treatment that can be applied for various cultivar of chrysanthemum.

CONCLUSION

Based on the analysis of results that an appropriate harvesting time was at bud stage maintained the vase life until 14 days and the chrysanthemum freshness could prolonged until 16 days by addition preservatives solution water+2.5% (w/v) sucrose+100 ppm citric acid .

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