Potassium Aluminum Sulfate Solution on the Vase life of Sampaguita (Jasminum Sambac) Flowers

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***Abstract*—This experiment was carried out to investigate the effect of potassium aluminum sulfate (Alum) on vase life of *Sampaguita* (*Jasminum sambac)* flowers. Flowers were sprayed with potassium aluminum sulfate solutions (0, 0.5 g/l, 1.0 g/l, and 1.5g./l) until the end of vase life as a standard treatment and tap water was used as control treatment. Each treatment was comprised by 3 groups, which were subjected to different spraying frequency (once a day, twice/day and three times a day). Treatments with Potassium Aluminum sulfate prolong the vase life of flowers. Final weight is significantly higher in group 2-all treatments (0.5, 1.0 and 1.5 gram/liter Potassium Aluminum Sulfate) sprayed twice a day compared with other treatments and groups. Potassium Aluminum sulfate (0.5, 1.0 and 1.5 gram/liter), sprayed twice /day resulted in a higher diffusion of solution until the end of the vase life.**

***Index Terms*—jasminum *sambac*, potassium aluminum sulfate, vaselife, cutflowers**

I. Introduction

Flowers play an important role in making the life of a human being meaningful. People use flowers in several forms and on several occasions. Flowers are used for decorating homes, to freshen the air in the environment, as ingredient in teas and herbal medicines, as religious offering, as well as a symbol of mourn and tribute on loved ones funeral. In the Philippines, flowers play an important role in religious activities. One of the flowers demanded in the floriculture market is *Sampaguita (Jasmine sambac).* Its heavenly smell is lingering thus it is primarily use as offering in churches and as scents for perfume and air fresheners. For Filipinos, it symbolizes hope, purity, devotion, fidelity, strength, and dedication. *Sampaguita* is sold as garlands in the streets of Manila. These garlands are also given to foreign visitors, special guest, new graduates, and competition winners either as traditional welcome and offerings or as honorary symbols for their achievements. Its complex chemical composition makes it a worthwhile option for medicinal and ornamental purposes. According to a Filipino legend, a jasmine shrub grew on the grave of an ill-fated lover who waited for the other to fulfil a promise. Thus, the name sampaguita is derived from the words "sampai kita", which means "I promise you"[1].

Sampaguita, the national flower of Philippines, is grown in the tropics, mostly for its rich fragrance. It grows on a woody vine or semi-climbing shrub, which reaches a height of 1, 2 meters. The leaves are ovate or rounded in shape and 6 to 12 cm long. The leaves and Sampaguita flowers grow on short stalks. It blooms either singly or as bundles of blossoms at the top of the branches. Blooming all through the year, Sampaguita are pure white, small, dainty, star-shaped blossoms. The flowers open at night and wilt in less than a day. The Sampaguita flower has about 8-10 calyx teeth that are very slender, and 5 to 8 mm long. The Sampaguita's corolla tube is slender and 1 to 1.5 cm long, the limb is usually double and 1.5 to 2 cm in diameter. The 2 stamens on the Sampaguita are included with a 2-celled ovary. Another perfect use of Sampaguita is aroma therapy. Sometimes, flowers of Sampaguita are collected for its scents. But other than in scents, Sampaguita is also used in as ingredient for one of China's most popular teas, the Jasmine tea [2].

Sampaguita are being applied as a poultice to the breasts of women to act as a lactifuge. The flowers also yield an essential oil similar to that of jasmine (Jasminum grandiflorum). The roots present several uses. They may be used to treat venereal diseases when given fresh, while a tincture made from them is reported to be used as sedative, anaesthetic, and vulnerary. The leaves are being used as a lactifuge, applied externally to the breasts. The leaves can also be given internally in decoction for fevers. If boiled in oil, they exude a balsam which is used by the natives to alleviate eye complaints. The dried leaves, on the other hand, are soaked in water and made into a poultice, then applied to indolent ulcers [3].

Cut flowers vase life is affected by several factors such as: cell programmed death, ethylene induced senescence, dehydration, or loss of assimilates and substrates [4]. Among the above mentioned, water relation and balance play a major role in postharvest quality and longevity of cut flowers and water relation interruption during this period is often the reason of short vase life for cut flowers Water relation interruption is mostly due to microorganism proliferation in vase solution and occlusion in the basal end of the cut flower stem by

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microbes. Therefore, controlling and reducing microbial proliferation is a prerequisite for extending quality and longevity of cut flowers [5].

In order to prevent microbial proliferation in vase solutions of cut flowers non toxic materials like Potassium Aluminum sulfate can be used as spraying materials. It is commonly used in water treatment plants to clarify drinking water. It is inexpensive and effective for a broad range of treatment problems because it can function as a coagulant, flocculants, precipitant and emulsion breaker. As a coagulant and flocculants, alum removes turbidity, total organic carbon (TOC) which can be disinfected by product precursors, suspended solids and colloidal color, reduces biochemical oxygen demand (BOD) and clarifies potable, process and wastewater [6].

II. Objectives of the Study

This study will encourage Filipinos to use their own national flower instead of using imported flowers for their special occasion. This study will also help floriculturist and Sampaguita growers to prolong vase life of their products thereby increase productivity in their farm. Specifically it will determine the vase life of *Sampaguita* flowers sprayed with different solutions with Potassium Aluminum sulfate with different spraying frequency. It also seeks to find out the final weight after 5 days of observation per treatment.

III. Materials and Methods

A. Materials

This research employed experimental research method with 4 treatments and 150 grams of *Sampaguita* flowers as samples per treatment. Each treatment was grouped into three and subject to different frequency of spraying the solution (once a day, twice/day and three times a day). Treatment 1 (control) 50 grams of flowers were sprayed with tap water. Treatment 2, 50 grams of flowers was sprayed with 0.5 g/l solution of Potassium aluminum sulfate and tap water. Treatment 3, 50 grams of *Sampaguita* sprayed with 1.0 g/l solution of Potassium aluminum sulfate and tap water, and; treatment 4, 50 g. *Sampaguita* was sprayed with 1.5 g/l solution of potassium aluminum sulfate and tap water. Prior to the conduct of the study materials such as mini-garden sprayers, small plastic baskets as containers, powdered potassium aluminum sulfate, digital weighing scale, graduated cylinder, and tap water were prepared.

B. Methods

1) Collection of the sampaguita flowers

Six hundred grams *Sampaguita* flowers was harvested at stage 1 when the buds were tight and the sepals enclosed in the floral bud. It was purchased from Floriculture Farm in San Pedro Laguna Philippines early in the morning (from 7:00-8:00 A.M). It was transported to Manila Philippines on the experimental site.

2) Preparation of the solution.

Using a graduated cylinder and weighing scale the following solutions were prepared; treatment 1 (control) pure tap water, treatment 2, 0.5 g/l solution of potassium aluminum sulfate and tap water, treatment 3, 1.0 g/l solution of aluminum sulfate and tap water, and treatment 4, 1.5 g/l solution of aluminum sulfate and tap water. Each solution per treatment was distributed equally in 3 groups to avoid bias in the result.

3) Groupings of the sampaguita flowers

Aside from the different dilution of the solution, each treatment was grouped into three. The group per treatment is composed of 50 grams *Sampaguita* flowers. First group of each treatment was sprayed with the desired solution once a day. The second group was sprayed with the desired solution twice a day until senescence, and the third group was sprayed three times a day with the solutions. The same amount (10 ml) of solution was sprayed per treatment per group every spraying time.

4) Experimental layout

T1-Control (0% Potassium Aluminum sulfate)	T2 (0.5 g/l) Potassium Aluminum sulfate)	T3 (1.0 g/l) Potassium Aluminum sulfate)	T4 (1.5 g/l) Potassium Aluminum sulfate)
T1G1 (50 grams Sampaguita flower sprayed once a day with tap water	T2G1 (50 grams Sampaguita flower sprayed once a day with the solution.	T3G1 (50 grams Sampaguita flower sprayed once a day with the solution.	T4G1 (50 grams Sampaguita flower sprayed once a day with the solution.
T1G2 (50 grams Sampaguita flower sprayed twice a day with tap water	T2G2 (50 grams Sampaguita flower sprayed twice a day with the solution.	T3G2 (50 grams Sampaguita flower sprayed twice a day with the solution.	T4G2 (50 grams Sampaguita flower sprayed twice a day with the solution.
T1G2 (50 grams Sampaguita flower sprayed three times a day with tapwater	T2G2 (50 grams Sampaguita flower sprayed three times a day with the solution.	T3G2 (50 grams Sampaguita flower sprayed three times a day with the solution.	T4G2 (50 grams Sampaguita flower sprayed three times a day with the solution.

5) Data gathered

To obtain accurate result, observation was done daily. The following data needed to support the claims in this study are as follows; Average initial weight in grams of the flowers per group per treatment. Number of days the flowers undergone senescence/dropping (vase life). Final weight in grams after 5 days of observation was also recorded.

IV. Results and Discussion

A. Average Initial Weight in Grams of Sampaguita Flowers

Table I shows the average initial weight in grams per treatment. To ensure uniformity and avoid bias on the result, sample per treatment came from one source (Floriculture Farm in San Pedro *Laguna*, Philippines). The average initial weight per treatment was 50 grams. It means that all samples were treated equal on the start of the study**.**

TABLE I. AVERAGE INITIAL WEIGHT IN GRAMS OF *SAMPAGUITA* FLOWERS

	T1	T2	T3	T4
G1 (sprayed once a day)	50 g	50 g	50 g	50 g
G2 (sprayed twice a day)	50 g	50 g	50 g	50 g
G3 (sprayed three times a day	50 g	50 g	50 g	50g

B. Vase Life of Sampaguita Flowers

Flower longevity was recorded as the number of days on vase until the flowers showed symptoms of bent neck or advanced signs of fading on all petals [7]. *Sampaguita* flowers if kept without addition or spraying of water, starts to darken which is a sign of senescence after six hours of detachment from its peduncle. Spraying it with water could prolong its senescence up to 12-24 hours.

TABLE II. VASELIFE OF SAMPAGUITA FLOWERS (DAYS)

Treatment	Group	Number of Days (Vase life)
T1	1	3
	2	3.5
	3	3.5
T2	1	3
	2	3.5
	3	3.5
T3	1	3
	2	3.5
	3	3.5
T4	1	3
	2	3.5
	3	3.5

Table II describes the number of days the *Sampaguita* flowers starts signs of senescence. Treatments 2, 3, 4 (any group) had the same average number of days which is 3.5. *Sampaguita* in the control treatment shows early sign of senescence which is 3 days. Seyf *et al* [8] in their study on the study about the effect of Aluminum phosphate in rose cuttings obtained similar findings. The vase life of aluminum sulfate treated flowers (150, 300 mgl-1) were 12 and 12.3 days respectively whereas the vase life of control treatment was 9 days.

C. Final Weight in Grams of Sampaguita Flowers

Table III exhibits the final weight in grams of *Sampaguita* per treatment per group after 5 days. Group 2 (all treatments) had the highest mean weight in grams (17.5) after five days, followed by Group 1 (all treatments) with a mean of 10.1 grams, the least in group 3 (all treatments) with a mean of 8.95 grams. Two factorial Analysis of Variance revealed no significant difference among the treatments (percentage of Potassium Aluminum sulfate). However, significant difference in the result among the groups (frequency of spray) was obtained. To determine what group is significant over the other groups Duncan Multiple Range Test was used. Flowers in group 2 (all treatments) is significant over the flowers in group 3 and group 1 in all treatments. The result further implied that the vase life of *Sampaguita* flowers as indicated in their final weight could be prolonged up to four days if it is sprayed twice a day with any of the percentage of Potassium Aluminum sulfate.

TABLE III. AVERAGE FINAL WEIGHT IN GRAMS OF SAMPAGUITA FLOWERS

	T1	T2	T3	T4	Total	Mean
G1 (sprayed once a day)	9.4	8.8	9.1	13.1	40.4	10.1 [a]
G2 (sprayed twice a day)	18	15	23	14	70	17.5 b
G3 (sprayed 3x a day)	5.8	8.9	10.2	10.9	35.8	8.95 a

Legend: aa, not significant at P0.05
ab, significant at p0.05

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Rows	172.25	2	86.123	9.216528[*]	0.01481	5.143253
Columns	20.4035	3	6.801	0.727824[n.s]	0.57169	4.757063
Error	56.0665	6	9.344			
Total	248.71	11				

The result of this study revealed that KAl $(SO_4)_2$ significantly prolong senescence of *Sampaguita* flower if sprayed twice a day. Treatments with different percentage of KAl $(SO_4)_2$ and sprayed once and thrice a day did not significantly affects the vase life as indicated in the final weight since these are govern by several factors. The presence of moisture such as water and solutions with different levels of Potassium Sulfate somehow maintains the temperature needed by the flower to delay senescence. KAl2 $(SO_4)_2$ has been recommended for maintaining the vase life of several cut flowers and is used as an antimicrobial compound in commercial preservative solutions [9]. Aluminum sulfate acidifies vase solution, diminishes bacterial proliferation and enhances water uptake [10].

In group 1 (all treatments) flowers were sprayed once a day, tend to undergo rapid transpiration, since the frequency of spraying is once a day. The water and solutions did not stay for 24 hours due to transpiration. Wilting is the most common reason for the termination of vase life, not their natural senescence. The important factor which causes wilting is water stress which occurs when rate of transpiration exceeds the rate of water uptake. The principle of *adhesion* of water molecules to each other will also attract water to solid surfaces. This keeps the water drops on the surfaces of leaves and flowers in place [11].

In the case of flowers in group 3 (all treatments) sprayed thrice a day, the water and solutions tends to hastens rotting of the flowers since the liquid stays in the petals for longer time. The liquid tends to cause invagination of the tonoplast, which later can be broken down, causing autolysis of the cell [12].

V. Conclusion/Recommendation

The result of this study expressed that the $KAl(SO_4)_2$ at .5 g/l, 1.0g/l and 1.5 g/l, sprayed twice a day increase final weight of the *Sampaguita* flowers, thereby increasing the vase life from 1-2 days to 3.5 days. To prolong the vase life of *Sampaguita* flower, growers and floriculturist could use $KAl(SO_4)_2$ as spray solution to increase productivity in their *Sampaguita* farm and flower shops. A follow-up study on comparing the use $KAl(SO_4)_2$ and other methods to prolong the vaselife of *Sampaguita* should be done.

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