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Improvement of vase life of cut rose, sunflower and lisianthus with sodium nitroprusside

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ABSTRACT

In order to study the effect of sodium nitroprusside on vase life of cut rose, sunflower and lisianthus, a factorial experiment carried out based on RCD with two factors: SNP (0, 20, 40 and 60 µM) and cut flowers (rose, sunflower and lisianthus) in 12 treatments, 3 replications, 36 plots and 180 cut flowers. In this experiment characteristics such as: flower diameter and floret counting, vase life and leaf chlorophyll content were evaluated. Highest vase life showed in cut rose treated with 20 µM SNP and cut sunflower treated with 60 µM SNP. Results showed that SNP can increase vase life of cut rose, sunflower and lisianthus.

Keywords: sodium nitroprusside, vase life, rose, sunflower, lisianthus

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INTRODUCTION

Rose (*Rosa hybrida*) belongs to Rosaceae family is the most important cut flower that is sensitive to ethylene [10]. Sunflower (*Helianthus annus*) belongs to Asteraceae family which is ethylene sensitive. Lisianthus with the scientific name of *Eustoma grandiflorum* (Raf.) Shin. belongs to the family *Gentianaceae*. This flower gradually (about 6 day after harvest) is ethylene sensitive [6]. Nitric oxide is effective in increasing the postharvest life of cut flowers. It regulates the internal ethylene activity [4]. Therefore, treatment with appropriate preservative solutions such as sodium nitroprusside is recommended to prolong the life of cut flowers. Due to the high price of NO gas, NO-releasing compounds such as SNP, SNAD and DETA/NO are considered by most researchers [2]. In the cut flowers, often metabolic processes that are involved in aging are irreversible and this is more related to the production of ethylene which its value is maximized in flower senescence stage [9]. So, treatment with appropriate preservative solution is recommended to prolong the life of cut flowers [8]. Thus, the aim of this experiment is to introduce the best concentration of sodium nitroprusside and its effect in increasing the vase life of cut rose, sunflower and lisianthus.

MATERIALS AND METHODS

In November 2012, cut rose, sunflower and lisianthus were harvested at the commercial stage and immediately transported to the post-harvest laboratory for treating and evaluation the traits. First, 5 cut flowers were placed in a 2 liter plastic pots. Conditions of the vase life room was including the 12 hour lighting and 12 hours dark that was provided by white fluorescent lamps. Light intensity was 12 µmol $m^{-2}s^{-1}$, room temperature 20±2°C and relative

humidity (RH) was 60-70%. 24 hours pulse treatment carried out in sodium nitroprusside. Then cut flowers were transferred into 300 mgl^{-1} 8-hydroxyquinoline sulfate and 3% sucrose. The factorial experiment carried out based on randomized complete block design in three replications. Sodium nitroprusside factor at 4 levels (0, 20, 40 and 60 µM), respectively. Analysis of variance was performed with SAS software and mean comparison was done with LSD test. Vase life defined as the distance between to start treatment to flower senescence which associated with petals wilt and the leaves changing color and was expressed as days. Measurement of flower diameter was done with caliper every other day. For measurement of chlorophyll a content in leaves, leaf sampling was done in 5th day and chlorophyll a was evaluated (2012).

RESULTS AND DISCUSSION

Mean comparison showed that the highest vase life was found in the concentration of 40 µM sodium nitroprusside in sunflowers with 14.5 days and in the concentration of 20 µM sodium nitroprusside in rose with 14.33. According to the results, application of SNP increases vase life significantly compared to the control (Figure 1). Some researchers reported that application of 50 µmol sodium nitroprusside increased the vase life of cut roses, however, at 100 and 200 µmol vase life is not increased [5]. Application of 0.1 M sodium nitroprusside increase the longevity of cut chrysanthemum [7]. Similar results reported cut rose, lisianthus and gerbera [1].

According to the ANOVA, significant difference was observed between treatments in rose, sunflower and lisianthus ($p<0.05$). Mean comparison between the different data showed that flower and florets opening in 60 µM sodium nitroprusside and control has occurred and in N0F2 treatment due to lack of sodium nitroprusside in lisianthus opened faster than other flowers (Figure 2). Since flower requires ATP consumption to opening and to provide the required ATP, it needs to breakdown sugar molecules during the process of respiration, Therefore, each factor that can reduce the amount of plant respiration, can delay the opening of cut flowers [3]. Ethylene production especially in the climacteric plants increases the respiration. Thus, anti-ethylene compounds indirectly delays the flowers opening by reducing the respiratory rate.

The ANOVA showed that sodium nitroprusside, types of flowers and their interaction had no significant effect on the amount of chlorophyll a. Mean comparisons between the different data showed that the highest chlorophyll a was observed in the treatment N1F3 (sunflowers treated with 20 µmol sodium nitroprusside) with the 1.291 ml/liter and the lowest chlorophyll a was observed in N3F3 (sunflowers with 60 µmol SNP). Among the different flowers, the highest chlorophyll a was observed in lisianthus and among the various concentrations of sodium nitroprusside; the highest chlorophyll a was found in 20 µmol (Figure 3).

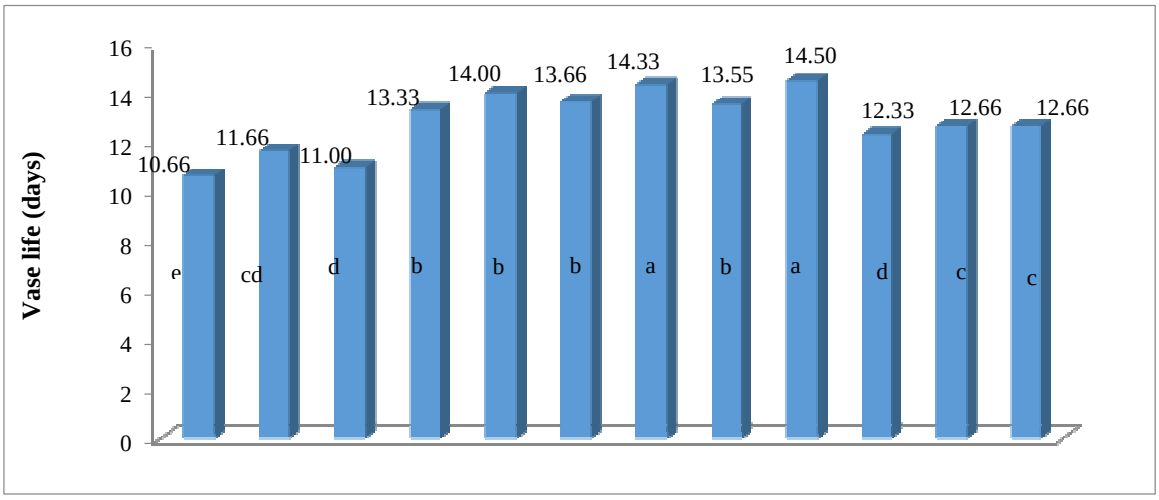

Figure 1: Effect of SNP on vase life of rose, sunflower and lisianthus
N0: 0 µM SNP, N1: 20 µM SNP, N2: 40 µM SNP, N3: 60µM SNP
F1: Rosa hybrid, F2: Eustoma grandiflorum, F3: Helianthus annus

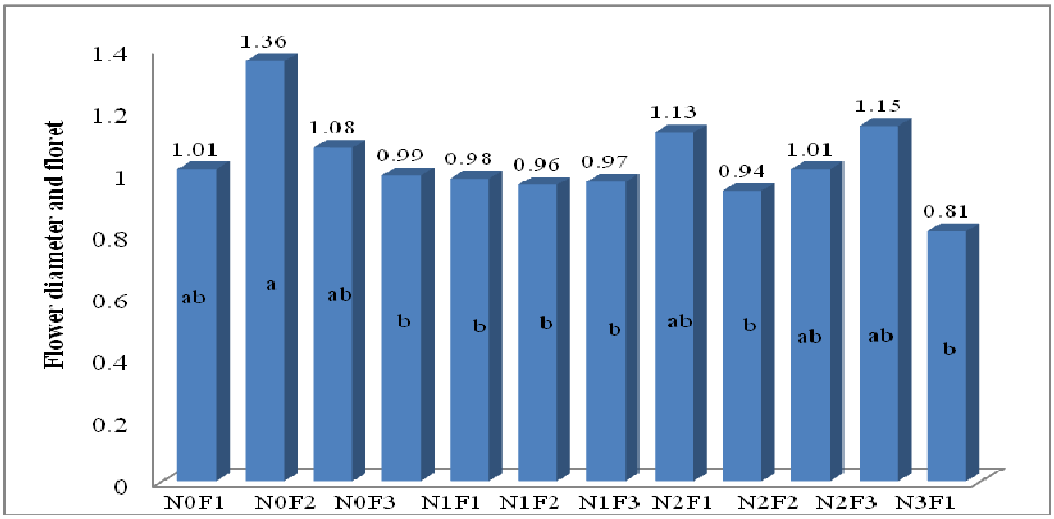

Figure 2: Effect of SNP on flower diameter and number of florets in rose, sunflower and lisianthus
N0: 0 µM SNP, N1: 20 µM SNP, N2: 40 µM SNP, N3: 60µM SNP
F1: Rosa hybrida, F2: Eustoma grandiflorum, F3: Helianthus annus

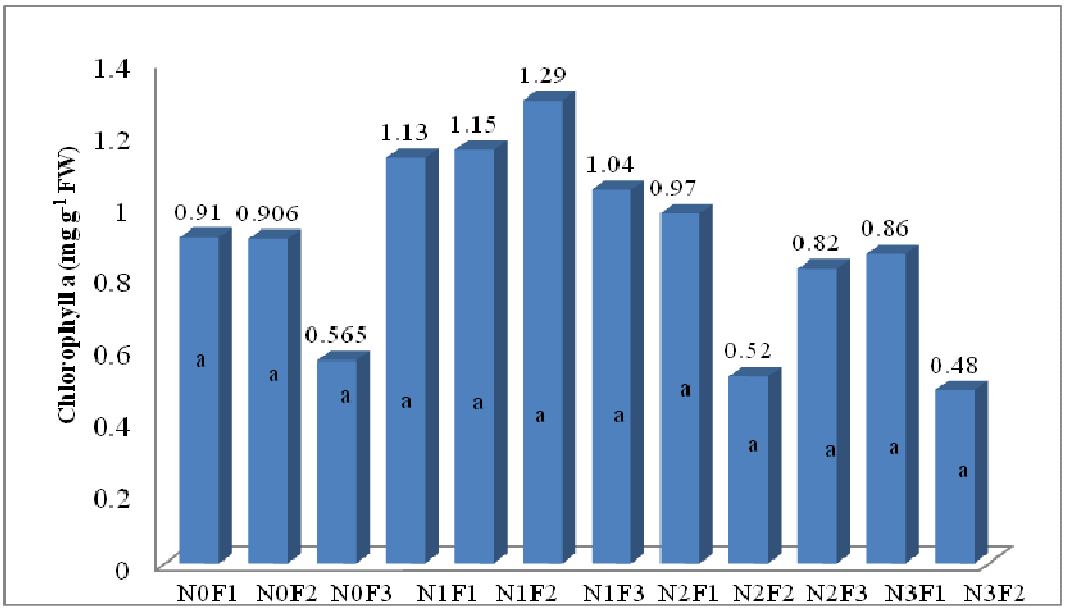

Figure 3: Effect of SNP on chlorophyll a of rose, sunflower and lisianthus
N0: 0 µM SNP, N1: 20 µM SNP, N2: 40 µM SNP, N3: 60µM SNP
F1: Rosa hybrid, F2: Eustoma grandiflorum, F3: Helianthus annus

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