Improvement of postharvest vase life and flower bud opening in Polianthes tuberosa using different concentration of Kand Ca

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Abstract: An experiment was conducted to evalute the effect of fertilization Polianthes tuberosa by K and Ca fertilizers at growing season in postharvest vase life and flower bud opening. Application of both Ca and K followed by continuos sucrose treatment enhanced flower longevity and flower bud opening in cut Polianthes tuberosa L.Related to the Ca and K concentration the resulths were different.Highest amount of Vase life,maximum flowering height,number of floret and shoot weight were observed at the presence of the K300Ca100 but,the lowest amounts of those factors were variable.It is suggested that K300Ca100 aplication treatment at growing season be recommended to growers for extending the Vase life and enhancing flower bud opening in cut P.tuberosa.
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Introduction

Tuberose (fragrant tuberose) with scientific name of Polianthes Tuberose L.Var Double is a Mexican flower and is a permanent and bulb plant (8). This plant is considered as one of the most important fragrant truncated (cut branch) flowers of tropical and semitropical areas (8). As Iran is better than other major global producers due to weather and light conditions, but due to lack nutrition principles and application of appropriate cultivation area the quality of plant production is low and they are not permitted to export successfully (9). Therefore, using approaches improving the flowers quality and increasing the flowers life has a special position. The plant's appearance and longevity depends on plant breeding conditions (light, temperature, irrigation, fertilization, and feeding), true time of harvest and post-harvest cares, such as method of harvesting, temperature, humidity and protective solution (1). A new approach for improving the quality and quantity of truncated flowers is using appropriate fertilizers (9). The most important fertilizers in this regard are calcium and potassium which play a key role in various physiological processes of plant development (6). Potassium plays an essential role inprotein synthesis, water balance and adhesion, and calcium has an essential role in maintenance of membrane integrity and selective permeability, increasing the cell adhesion and prevention of cell wall destruction (14 & 15). Therefore, potassium and calcium deficiency accelerate aging and reduce flower life and application of these elements can delay or prevent from aging (15).

Anjamet al. (2001) observed that difference concentrations of calcium chloride salts shall delay in blossoming truncated tuberose. This was associated with a delay in aging and dejection of flowers. Also, breathing rate shall be decreased and water absorption shall be increased by inflorescences (10). Rasmussen (1997) showed that in the leaves of rose flower which have the greatest calcium concentration, the number of blossoms was doubled (13). By caring petals and complete flowers of rose, Mercedes and Barons Types, by calcium chloride, Tour et al. (1999) observed that this salt shall motivate the flower blossoming and by delaying Ionic sedimentation in membrane of petals and delaying protein reduction in membrane and phosphatides of petals their life time shall be increased (17). Jerasopolus and Shebli (1999) reported that caring with 1.0 calcium chloride on floating basis shall increase vase life jebrela and decrease abnormal steam curvature. By analyzing the effect of various concentration of Calcium Nitrate in rose truncated flower it is determined that caring with calcium increases lifetime after flower harvesting but no differences were observed in solution absorption rate and blossoming in cared flowers (12).Potassium consumption increased the diameter of the flower stalk, Podajeh & Podajak weight per unit area, truncated flower lifetime, and resistance to dehydration (7). Potassium intake in chrysanthemum, clove pink, French marigold, Sinvia and tuberose floweres shall improve their qualitative and quantitative characteristics (2, 5, 4, 3). In this research the effect of application of calcium and potassium chlorides during tuberose development

was analyzed on quality and lifetime after harvesting its truncated.

Materials and Methods:

This research was performed in second half of Esfand 2010 in Tis Botanical Garden in Chabahar. In the first stage of experiment, tuberose bulbs, double type, which were similar to each other from viewpoint of weight and diameter were selected and prepared for harvesting. Environment of each used bulb was 11-13 centimeter and 80-100 grams. These bulbs were located in 2 gram/liter binomial for one minutes and then were planted in pots containing a mixture of sand, garden soil and rotted farmyard manure in equal proportions with depth of 3-4 centimeters and irrigated once every two days. PH of the used water was 6-7 with 1000 DS/Sqm. Salinity and the used garden soil texture were determined loamy clay or loamy.

Pots are located in a greenhouse equipped by fog scattering systems with a temperature between 25-32 ˚C. Weeding, and if necessary plant Thinned to one Plant were performed during the growthof flower in the soil. In this stage, 2 g/liter nitrogen fertilizerwas given to plant by irrigation. Fertilizer breeding including calcium chloride with density of 0, 50, 100 & 150 mg./liter and potassium chloride with density of 0, 100, 200 & 300 mg./literwere donein two times of 60 and 75 days after planting of bulbs. The flowers shall be harvested after emergence of inflorescence at the time that 2 or 3 florets open that is recognized as the best time for harvesting of flowering stems harvesting (8). For harvesting the flowering stems, they will be clipped by garden dipper from the lowers area near the bottom leaves in the early morning when the inflorescences are fresher. After harvesting and weighting them, the stems shall be cut from a height of 75±2 cm. diagonally under the water and then they shall be located in pots including distilled water containing 250 mg./liter Citric Acid, 50 mg./liter silver nitrate, 250 mg./liter hydroxyl coenolyne and 1% sucrose in home temperature of 25±2. During the lifetime of truncated tuberose, the end of stems shall be cut from a length of one centimeter once every two days for preventing from pollution and the pots' solution shall be changed once every four days. At the time that at least four healthy and open buds were observed in the flower stem, it is considered the end of vase life of flower. During the trial, various characteristics were measured and noted. Note taking includes the number of leaves up to emergence of the first inflorescence, number of florets in each inflorescences, and the required days for opening the florets from emergence of inflorescences, final height of plant at the time of harvesting, and length of inflorescence cluster from the first flower on the cluster to end of flowering stem in meter, weight and diameter of flowering stem in the height of 75 cm. with precise scales and calipers and vase life of flower. This project was repeated four times based on factorial plan in framework of completely random blocks. Data were analyzed by MSTAT-C software and the averages were compared with New Duncan's multiple range test.

Results:

Analysis of the measurement results before harvesting:

1- ***Plant Height:*** The results showed that flowering height of tuberose flower, double type, influenced by Potassium and calcium fertilizers before harvesting significantly increased at 5% (chart 1). The maximum height of the plant was 111 centimeter in length in interaction between calcium fertilizer with concentration of 100 mg./liter and potassium with concentration of 300 mg./liter. With the exception of treatment with 50 & 150 mg. calcium along with 300 mg./liter potassium, this amount showed a significant difference of 5% in area in comparison with other treatments. The minimum height in 150 mg./liter calcium with no potassium was 75 centimeter which shows no significant difference with other treatments including those with calcium or potassium fertilizer (chart 1).

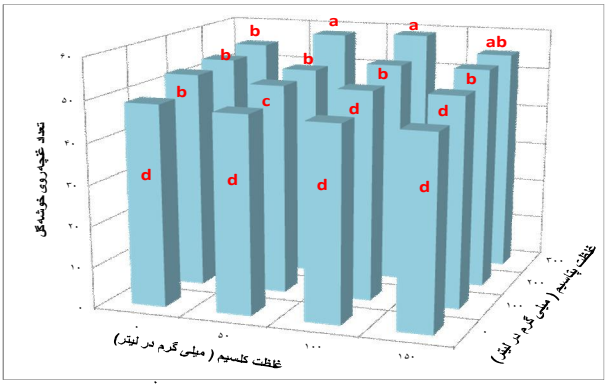

Chart 1- Effect of various treatments of calcium and potassium fertilizers on tuberose flower height before flowering stem harvesting

2- Number of Buds on Flower Cluster: The results showed that the highest potassium concentration of 300 mg./liter along with 50, 100 & 150 mg./liter calcium has a significant effect on increasing the tuberose flower buds, double type, in 5% area (chart 2). The average of the most flower buds increased to 4.20 percent in comparison with the sample. The lowest tuberose flower buds in treatments with no potassium and or the least potassium concentration was 100 mg./liter which show no significant difference.

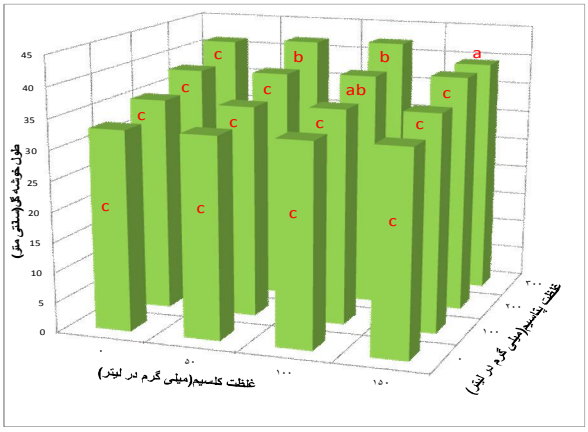

Chart 2- Effect of Various Concentration of Calcium and Potassium Fertilizers on Number of Tuberose Buds on Flowering Stem

3- Shoot Weight: The results of application of calcium and potassium fertilizer on increase of shoot weight of tuberose flower, double type, was significant. The most shoot weight was gained in potassium treatments with concentration of 200 & 300 mg./liter along with calcium with concentration of 200 and 150 mg./liter which showed 5% difference with other treatments (chart 3). The least shoot weight was observed in treatments with no calcium (chart 3). Also the average of the most shoot weight increased 5.21% in comparison with sample.

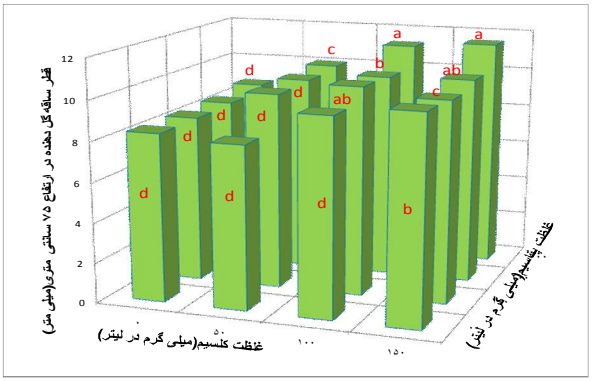

Chart 3- Effect of Various Concentrations of Calcium & Potassium Fertilizers on Shoot Weight of Tuberose Flower, Double Type

4- Stem Diameter: Results showed that in result of interaction of the highest concentration of the used fertilizers, the most flowering stem diameter in the height of 75 cm. was 9.11 mm. Interaction of potassium fertilizer with 300 mg/liter concentration gained the most diameter of flowering stem which was 5% (chart 4). The average of the most diameter of flowering stem increased 7.37% in comparison with sample. It is also observed that the least diameter of flowering stem was 50 mg./liter in treatments with no calcium or the least calcium concentration which showed no significant difference (chart 4).

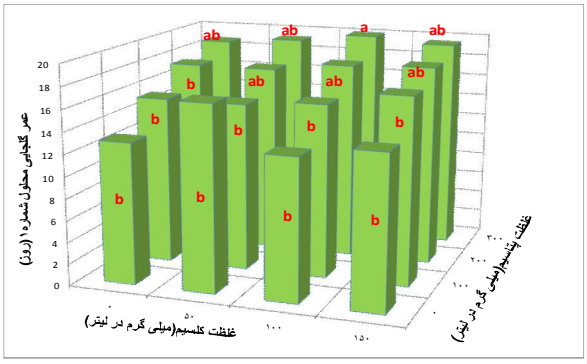

Chart4- Effect of Various Concentrations of Potassium and Calcium Fertilizers on Diameter of Flowering Stem of Tuberose Flower, Double Type in the height of 75 cm.

5- Length of Flower Cluster: The results showed that the maximum potassium concentration of 300 mg./liter with calcium concentration of 100 & 150 mg./liter increased 5% in the length of flower cluster (chart 5). The maximum average of cluster length increased 7.27% in comparison with the sample. It is worth mentioning that the potassium concentrations lower that 300 mg./liter in shorter flower cluster showed 5% difference (chart 5).

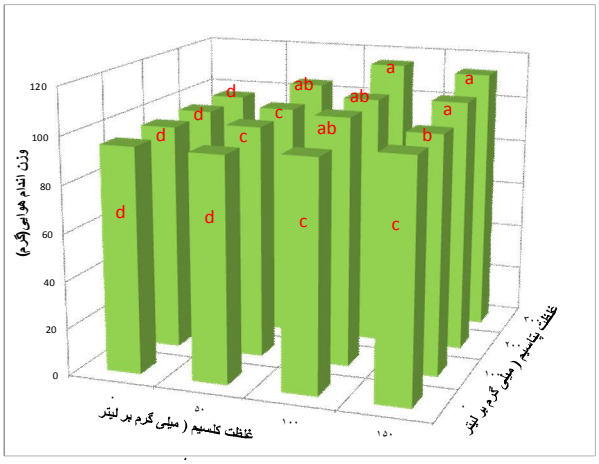

Chart 5- Effect of Various Concentrations of Calcium and Potassium Fertilizers on the Length of Tuberose Flower Cluster, Double Type, The analysis of measurement results after harvesting of Truncated Tuberose Flower, double type in produced Solution

6- Vase life of flower: According to the results of vase life of Tuberose flower, double type, it is determined that interaction of calcium fertilizer with

concentration of 100 mg./liter along with potassium with concentration of 300 mg./liter gained the maximum vase life of Flower which showed 7.66% increase in comparison with the sample. Also the minimum vase life of Flower were observed in sample treatment without both of consumed fertilizers.

Discussion:

The results of this research showed that the height of flowering stem, number of flower buds on cluster, shoot weight, cluster length and diameter of flowering stem were increased by using potassium and calcium fertilizers. Also by increasing the fertilizer concentration, the measured characteristics were increased, too.The results was similar with the results of Banijamali's Research (4,3,2,5,6,7) on tuberose, gladiolus, long French marigold, clove pink, sinvia, and chrysanthemum flowers by using the similar potassium fertilizer. In research performed in jouquil flower by L Nagar et al (2009) the best quality of Verd flower was gained fo 5 g. per month by application of NPK (11). Estarki (1997) reported that by adding calcium fertilizer to nutrient content of rose flower, their quality was improved after harvesting. It is also reported that the application of calcium has a positive effect on some of particulars such as diameter of stem and shoot weight and this is due to the role of calcium in cellular division (13). This research showed the similar effect with the performed research. It seems that the increase in measured characteristics in comparison with increase of potassium and calcium concentration is due to their role on material transfer, evapotranspiration control, enzyme activity increase and cellular division.

In this research after harvesting of flowering stem and placing it in maintenance solution it is showed that lifetime of truncated Jai flower of tuberose flower was increased. Gramopolus et al (1999) reported that calcium shall increase the lifetime of Jail Flower of Gerbera truncated flower (12). Vijaya et al (1999) and Tour et al (1999) observed that nutrient elements such as calcium shall delay aging and increase lifetime of tuberose flower after harvesting (17, 18). Optimal nutrition with potassium fertilizer shall strengthen the stem and thickness of leaves and in result increase the resistance against the tensions after harvesting and delay in aging and fall of florets (2,3,5,6& 7). The results of this research confirmed the results of the previous researches. Anjam et al (2001) acknowledged that one of the reasons for increasing the vase life of flower is decrease in flower breathing (10). Also it is mentioned that preventing from ethylene production in flowers are among the positive effect of calcium chloride on increasing the lifetime of Jai flower of rose& Gerbera(12 & 17). It is likely that increasing the supply of plants, catalytic role of potassium, increasing photosynthesis and tissue strength, protection against mechanical stresses by calcium can be considered as the factors for increasing vase life of flower of Tuberose flower.

As observed in this research potassium and calcium has a positive role in increase of quality and quantity of tuberose flower. Therefore, for increasing the lifetime of Jai Flower and delay in truncated tuberose flower aging it is recommended to take care to nutrient of this flower before harvesting.

Resources:

1- Barzegar, T.A., Khalighi& R. Naderi, 2006 "Effect of Harvesting History and Various Amounts of Nitrogen azote on Length and Some Qualitative Characteristics of truncated Gladiolus Flower, Oscar Type, in Karaj". Iranian Agricultural Sciences Journal. 37 (1). Pp. 17-19

2- Banijamali, S.M. 2000. "Analysis of Effect of Various Amount and Resources of Potassium on Operation and Quality of French Marigold Flower", IPI National Plan. Markazi Province Natural Resources& Agricultural Research Center, PP. 19-21

3- Banijamali, S. M. 1999. "Analysis of Effect of Elemental Sulfur, Ferrous Sulphate and Zinc Sulphate on the Absorption of Nutrients in Gladiolus and Cloves." Approved Plan No. 121-12-15-76075. Markazi Province Natural Resources & Agricultural Research Center, PP. 53-55

4- Banijamali, S. M. 2001. "Analysis of Effect of Various Levels of Nitrogen Azote and Potassium on Qualitative and Quantitative Characteristics of Cloves." Approved Plan No. 121-(12-15)-76-8. Markazi Province Natural Resources & Agricultural Research Center, PP. 55-60

5- Banijamali, S. M. 2001. "FeedingSinvia with Various Resources & Amounts of Potassium on its Qualitative and Quantitative Characteristic". IPI National Plan. Markazi Province Natural Resources & Agricultural Research Center, PP. 14-16

6- Banijamali, S. M. 2001. "Effect of Feeding of Various Resources and Amounts of Potassium and Micronutrients on Qualitative and Quantitative Characteristic of Chrysanthemums Flower". IPI National Plan. Markazi Province Natural Resources & Agricultural Research Center, PP. 17-20

7- Banijamali, S. M. 2003. "Analysis of Effect of Feeding of Various Resources and Amounts of Potassium and Micronutrients on Qualitative and Quantitative Characteristic of Pedajeh & Pedajak of Gladiola Flower, Oscar Type". IPI National Plan. Markazi Province Natural Resources & Agricultural Research Center, PP. 134-136

8- Jokar, M.M. & H. Salehi, 2006. "The Effect of Various Preservative Solutions on Lifetime of Jai Flower of Truncated Tuberose Flower, Large Flower Type of Mahalat". Natural Resources & Agricultural Science & Technique: 3, 299-308

9- Malakouti, J, 2003 "Necessity of Sulfur Nutrient Position Promotion". Technical Journal of Water & Soil Research Institute. PP. 14-16

10. Anjum, M. A., N. Farrukh, S. Fariha and A. Shazia. 2001. Effect of some chemicalson keeping quality and Vase-life of Tuberose (*Polianthes tuberosa* L.) cut flowers. Journal of research. 12 (1): 1- 7.

11. El-Naggar, A.H. and El-Nasharty, A.B. 2009. Effect of growing media andents mineral fertilization on growth, flowering, bulbs productivity and chemical constituents of *Hippeastrum vittatum*, Herb.American-Eurasian J. Agric&Environ.Sci:6(3):360-371

12. Gerasopoulos,D.andB.Chebli1999.Effects of pre- and post –harvest Calcium applications on the vase life of cut gerberas. J. Hort. Sci. Biotech. 47:781-788.

13. K. R. Starkey. 1997. Increased levels of Calcium in the nutrient solution improves the postharvest life of potted Rosses. Amer. Soc. Hort. Sci. 122(6): 863-868.

14. Pearson-mims, C. and V. Lohr. 1990. Fluoride injury to cut Samantha roses may be reduced by pulsing with calcium nitrate. HortScience. 25: 1270-1271

15. Poovaiah, B.W. 1988. Molecula and cellular aspects of calcium action in plants Hort Science. 23: 267-271.

16. Reddy, B.S., K. Singh and A.Singh.1995.Effect of Sucrose, Citric acid and 8-hydroxyquinoline sulphate on the postharvest physiology of tuberse cv. single. Advances Agric. Res.India.3:161-167.

17. Torre, S., A. Borochov and A.H.Halevy.1999. Calcium regulation of senescence in rose petals. Physiol. plant. 107:214-219.

18.Vijaya, B., R. Venkata and Reddy, Y.N. 1999. Effect of minerals on post –harvest vase –life of cut tuberose (Polianthes Tuberosa L.) Cv. double. Indian journal of horticulture. Vol 56. Issue:4.

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