International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2018; 6(4): 368-372

Received: 11-05-2018
Accepted: 12-06-2018

Hemant Kumar
Department of Floriculture and Landscape Architecture, K.N.K. College of Horticulture, Mandsaur, RVSKVV Madhya Pradesh, India

Hemant Kr Meravi
Department of Floriculture and Landscape Architecture, K.N.K. College of Horticulture, Mandsaur, RVSKVV Madhya Pradesh, India

Anuj Kumar
Department of Floriculture and Landscape Architecture, K.N.K. College of Horticulture, Mandsaur, RVSKVV Madhya Pradesh, India

Vidhya Sankar M
Department of Floriculture and Landscape Architecture, K.N.K. College of Horticulture, Mandsaur, RVSKVV Madhya Pradesh, India

Correspondence
Hemant Kumar
Department of Floriculture and Landscape Architecture, K.N.K. College of Horticulture, Mandsaur, RVSKVV Madhya Pradesh, India

Post-harvest studies of different varieties of gladiolus

Hemant Kumar, Hemant Kr Meravi, Anuj Kumar and Vidhya Sankar M

Abstract
A study was carried out to post harvest studies of different varieties of gladiolus. Swapnil recorded the best performance with respect of most of the post-harvest parameters i.e. days to opening 5th florets, days to withering of 5th florets, numbers of florets open at a time, percentage of open florets/spike, water uptake on 5th day, total water uptake (ml), vase- life (days) and pigment content. Regency show the best performance with respect of days to opening of 3rd and 4th florets, days to withering of 3rd and 4th florets. The maximum diameter of 3rd, 4th, 5th florets and reducing sugar was recorded with c.v. Pricilla. The maximum non- reducing sugar and total sugar was recorded with c.v. Friendship, while dry weight of cut spikes at senescence was recorded with c.v. Punjab Dawn.

Keywords: Gladiolus, cultivars, post-harvest, biochemical and spike

Introduction
Flowers not only offer aesthetical beauties, but also have become commercial object. Flower production is a branch of horticultural cultivation today in several countries and can contribute to national economies providing millions of dollars (Bulut, 1994). Cut flower cultivation is a part of ornamental plant production having the largest part either in production or economic value. Gladiolus is an important commericial flower crop and is very popular as cut flower both in domestic and international market. The flower is popular for it majestic spikes, which contain attractive elegant, dazzling and delicate florets. Generally, flowers remain turgid condition when harvested at proper stage of development. Flowers cut at advanced stage have shortened longevity then younger ones. Optimum harvesting stage of gladiolus is at the stage when 2-5 buds showing colors. At present it has been come imperative to find out suitable varieties for post-harvest life, post-harvest senescence is an integral part of normal development cycle of plants and is highly regulated process that involves structural, biochemical and molecular changes in the plant tissue**.** Different flowers and varieties are reported to differ in their vase life due to genetic, physiological or anatomical characteristics. However the information on comparative performance of gladiolus cultivars for post-harvest attributes is very meagre. Hence this experiment was carried out to get information on comparative performance of gladiolus cultivars for various post-harvest attributes so that specific type of cultivars may be identified (Ahmed *et al.*, 2014) [1]

Materials and Methods
The present experiment was undertaken at Horticulture Research Farm and post-harvest studies was carried out in the laboratory of the Department of Floriculture and Landscape Architecture, The study will be conducted in the PG Lab, K.N.K. College of Horticulture, Mandsaur (M.P.). In this experiment 09 cultivars namely African Star, Friendship, Hunting Song, Priscilla, Punjab Dawn, Regency, Sancere, Sunayana and Swapnil were used as experiment material. These varieties grow in the field, standard packages of cultural practices were followed during the field experiment. For post-harvest study the cut spikes were harvested in the morning when two lower florets of spike shows color are harvested with the help of sharp knife and placed in bucket containing water and immediate brought to the laboratory. Spikes were placed in 250 ml conical flasks which contain distilled water. During the experiment basel ends of spikes were re-cut 1.00 cm, with the help of sharp knife to proper uptake of distilled water solution. Different observations were recorded with the help of essential tools and equipments and these data statistically analyzed.

Results and Discussion

19 post harvest studies of nine varieties were collected and presented in Tables 1, 2 Gladiolus cultivars varied significantly for postharvest studies of different varieties of gladiolus. Data revealed that among the different varieties studies, there was a significant difference in the days to opening of 3rd floret. The maximum days to opening of 3rd floret registered with cultivars Friendship (4.05 days) followed by Friendship (4.00 days) and African Star (3.60 days). Minimum duration required to opening of 3rd floret was recorded with cultivars Sunayana (2.93 days) followed by cultivars Sancere (3.13 days),Pricilla (3.17 days), Swapnil (3.20 days), Hunting Song (3.27 days) and Punjab Dawn (3.27 days) all of these are statistically at par to each other. Maximum duration required to opening of 4th floret registered with cultivars Regency (4.60 days), which was statistically at par with cultivars Friendship (4.50 days), Pricilla (4.47 days), Sancerre (4.33 days) and Minimum duration required to opening of 4th floret was recorded with cultivars Hunting Song (3.40 days) followed by Punjab Dawn (3.67 days), Swapnil (3.93 days), Sunayana (4.13 days) and African Star (4.17 days).Maximum duration required to opening of 5th floret registered with cultivars Swapnil (7.80 days), followed by Sancerre (6.87 days), Regency (6.67 days), Sunayana (6.53 days). Minimum duration required to opening of 5th floret was recorded with cultivars Friendship (5.27 days) followed by cultivars African Star (5.33 days), Hunting Song (5.67 days), Punjab Dawn (5.80 days) and Pricilla (6.13 days).The maximum days taken to withering of 3rd floret was recorded with Regency (7.40 days) which was statistically at par with Pricilla (7.33 days) and Sunayana (7.13 days) and significant to other cultivars. However, the minimum days taken to withering of 3rd floret was recorded in cultivar Friendship (6.27 days) followed by with cultivars African Star (6.47 days), Hunting Song (6.60 days), Swapnil (6.73 days) and Punjab Dawn (6.87 days).The maximum days taken to withering of 4th floret was recorded with Regency (8.67 days) which was statistically at par with Sunayana (8.60 days), Sancerre (8.53 days) and Hunting Song (8.20 days) and significant to other cultivars. However, the minimum days taken to withering of 4th floret was recorded in cultivar African Star (7.60 days) which was at par with cultivars Pricilla (7.66 days), Swapnil (7.80 days) and Punjab Dawn (7.93 days) and significant to other cultivars.The maximum days to withering of 5th floret was recorded with Swapnil (11.40 days) which was statistically at par with Regency (11.00 days) and significant to other cultivars. However, the minimum days to withering of 5th floret was recorded in cultivar Hunting Song (10.13 days) which was at par with cultivars African Star (10.20 days), Friendship (10.33 days), Sancerre (10.40 days) and Pricilla (10.53 days).The maximum diameter of 3rd floret was found in Priscilla (9.26 cm) followed by Punjab Dawn (8.94 cm), Swapnil (8.84 cm), Pricilla show the statistically significant result with respect of all other cultivar under this experiment. The minimum floret diameter was recorded in Hunting Song (7.55 cm) followed by Regency (7.77 cm), Sunayana (8.06 cm) and African Star (8.37 cm).The maximum diameter of 4th floret was found in Priscilla (9.31cm) followed by cultivars Punjab Dawn (8.98 cm) and Swapnil (8.88 cm). However the minimum floret diameter (7.66 cm) was recorded in Hunting Song followed by Regency (7.87 cm), Sunayana (8.09 cm) and African Star (8.39 cm) all of these cultivars are statistically differ to eachother.The maximum diameter of 5th floret was found in Priscilla (9.36 cm) which was statistically significant to other cultivars. However the minimum floret diameter was recorded in Hunting Song (7.72 cm) which was statistically at par with Regency (7.93 cm) and differs to Friendship (8.29 cm), African Star (8.46 cm), Sancerre (8.85 cm) and other cultivars.The maximum number of florets open at a time were recorded in Swapnil (7.31 florets) which was statistically superior to other cultivar of this experiment. However, the minimum number of florets open at a time was recorded in cultivars Pricilla (4.19 floret) followed by Regency (5.36 florets) African Star (6.11 florets), followed by Sunayana (6.44 florets), Punjab Dawn (6.62 florets). The maximum percentage of open florets was found with cultivars Swapnil (74.3%) followed by Sancerre (73.47%) both of these are statistically similar to each other and superior to other cultivars i.e. Friendship (72.53%), Punjab Dawn (68.36%), Hunting Song (69.48%). However, the minimum percentage of open florets/spike was recorded with cultivars Priscilla (62.59%) Regency (64.51%), African Star (65.54%) and Sunayana (66.79 %). The higher amount of water uptake on 5th day of vase was recorded with cultivar Swapnil (68.35 ml) which was statistically significant to other cultivars. However the minimum water uptake on 5th day of vase was recorded with cultivars Sancerre (43.47 ml) followed by Sunayana (46.34 ml), Regency (48.54 ml), Priscilla (56.67 ml).The higher amount of water uptake was recorded with cultivar Swapnil (91.81 ml) which was statistically significant to other cultivars. However, the minimum water uptake was recorded with cultivar Sancerre (67.91 ml) followed by Regency (72.97 ml), Sunayana (73.02 ml), Friendship (74.01 ml).The maximum dry weight of cut spikes at senescence was recorded with cultivar Punjab Dawn (8.30 g) which was significantly superior to other cultivars. However, the minimum dry weight of cut spikes at senescence was recorded with cultivar African Star (4.42 g) followed by Pricilla (4.66 g), Swapnil (4.87 g), Friendship (5.21 g) and Sunayana (5.34 g).The longest vase- life of cut spike was found with cultivar Swapnil (16.47 days) and African Star (15.75 days) both of these are statistically at par to each other and differe to other cultivars. However, the shortest vase- life of cut spikes was recorded with cultivar Sancerre (10.44 days), which was at par with Regency (11.42 days), Friendship (12.47 days), Sunayana (12.78 days) and Hunting Song (13.30 days) was significant to other cultivars.The highest reducing sugars was found with cultivar Priscilla (0.99 mg/g) which was statistically superior to other cultivars. However, the lowest reducing sugars was recorded with cultivar African Star (0.67 mg/g) followed by Friendship both of these are statistically at par to each other and different to other cultivars.The highest non- reducing sugars was found with cultivar Friendship (0.71 mg/g) which was significantly difference to other cultivars. However, the lowest non- reducing sugars was recorded with cultivar Sancerre (0.16 mg/g) followed by Swapnil (0.18 mg/g) both of these were at par with each other and significant to other cultivars.The highest total sugars was found with cultivar Friendship (1.44 mg/g) which was at par with cultivar Hunting Song (1.32mg/g) and significant to other cultivars. However the lowest total sugars was recorded with cultivar African Star (0.92 mg/g) followed by Sancere (1.05 mg/g) both of these were statistically similar to each other and differ to other cultivars.The highest pigment content was found with cultivar Swapnil (1.83 mg/100g) followed by with cultivars Sancere (1.77 mg/100 g) Regency (1.70 mg/100g), Pricilla (1.65 mg/100g). However, the lowest pigment content was recorded with cultivar African Star (0.27 mg/100 g) followed by Hunting Song (1.06 mg/100g), Friendship (1.15 mg/100g), Sunayana (1.28 mg/100g), Punjab Dawn (1.46 mg/100g).

Table 1: Performance of gladiolus cultivars for post-harvest studies

Treatment	Days to opening of 3rd 4th and 5th floret			Days to withering of 3rd 4th and 5th floret			Diameter of 3rd floret (cm)	Diameter of 4th floret (cm)	Diameter of 5th floret (cm)
	3rd floret	4th floret	5th floret	3rdfloret	4th floret	5th floret			
T_1 – African Star	3.60	4.17	5.33	6.47	7.60	10.20	8.37	8.39	8.46
T_2 - Friendship	4.00	4.50	5.27	6.27	8.13	10.33	8.20	8.25	8.29
T_3 – Hunting Song	3.27	3.40	5.67	6.60	8.20	10.13	7.55	7.66	7.72
T_4 - Priscilla	3.17	4.47	6.13	7.33	7.66	10.53	9.26	9.31	9.36
T_5 – Punjab Dawn	3.27	3.67	5.80	6.87	7.93	10.87	8.94	8.98	8.9
T_6 – Regency	4.05	4.60	6.67	7.40	8.67	11.00	7.77	7.87	7.93
T_7 - Sancere	3.13	4.33	6.87	6.93	8.53	10.40	8.72	8.81	8.85
T_8 - Sunayana	2.93	4.13	6.53	7.13	8.60	10.73	8.06	8.09	8.16
T_9 – Regency	3.20	3.93	7.80	6.73	7.80	11.40	8.84	8.88	9.02
S.EM.±	0.14	0.11	0.13	0.11	0.17	0.14	0.06	0.07	0.07
C.D. at 5%	0.41	0.32	0.38	0.34	0.51	0.43	0.18	0.20	0.22

Table 2: Post harvest studies of different varieties of gladiolus

Treatment	Number of florets open at a time			Total water uptake (ml)		Vase – life of cut spike (days)				
	Number of florets open at a time	Percentage of open florets/spike	Water uptake on 5th day of vase		Dry weight of cut spikes at senescence (g)	Vase- life of cut spike (days)	Reducing sugars (mg/g)	Non-reducing sugars (mg/g)	Total Sugars (mg/g)	Pigment Content (mg/100g)
T_1 – African Star	6.11	65.54	60.65	83.26	4.42	15.75	0.67	0.25	0.92	0.27
T_2 - Friendship	7.13	72.53	47.32	74.01	5.21	12.57	0.73	0.71	1.44	1.15
T_3 – Hunting Song	6.70	69.49	62.47	80.55	6.31	13.30	0.88	0.44	1.32	1.06
T_4 - Priscilla	4.19	62.59	56.67	82.15	4.66	13.40	0.99	0.27	1.26	1.65
T_5 – Punjab Dawn	6.62	68.36	58.37	83.48	8.30	14.40	0.82	0.28	1.1	1.46
T_6 – Regency	5.36	64.51	48.54	72.97	7.37	11.42	0.90	0.33	1.23	1.7
T_7 - Sancere	7.18	73.47	43.47	67.91	6.41	10.44	0.89	0.16	1.05	1.77
T_8 - Sunayana	6.44	66.79	46.34	73.02	5.34	12.78	0.86	0.28	1.14	1.28
T_9 – Regency	7.31	74.30	68.35	91.81	4.87	16.47	0.88	0.18	1.16	1.83
S.EM.±	**0.03**	**0.25**	**1.00**	**0.83**	**0.05**	**0.26**	**0.03**	**0.02**	**0.05**	**0.01**
C.D. at 5%	**0.09**	**0.73**	**2.97**	**2.46**	**0.14**	**0.77**	**0.08**	**0.05**	**0.13**	**0.04**

Conclusions

Swapnil recorded the best performance with respect of most of the post-harvest parameters i.e. days to opening of 5th florets, days to withering of 5th florets, number of florets open at a time, percentage of open florets/spike, water uptake on 5th day (ml), total water uptake (ml), vase- life (days) and pigment content. Regency show the best performance with respect of days to opening of 3rd and 4th florets, days to withering of 3rd and 4th florets. The maximum diameter of 3rd, 4th 5th florets and reducing sugar was recorded with cv. Priscilla. The maximum Non- reducing sugar & total sugar was recorded with cv. Friendship while dry weight of cut spikes at senescence was recorded with cv. Punjab Dawn.

References

1. Ahmed Z, Dhatt KK, Sing K. Comparative performance of cultivars for post-harvest attributes of gladiolus (*Gladiolus hybridushort* L.). Indian Journal of Applied Research. 2014; 4(12):246-248.
2. Acharya AK, Baral DR, Gautam, Pun UK. Influence of seasons and varieties on vase- life of gerbera (*Gerbera jamesonii* Hook) cut flower. Nepal Journal of Science and Tech. 2010; 11:41-46.
3. Bala TU, Sekhar RC, Reddy YN. Effect of pre harvest sprays of zinc and planting time on flowering, flower quality and vase- life of gladiolus cultivars. Journal of Research ANGRAU. 2007; 35(3):8-12.
4. Baskaran V, Jayanthi R, Janakiran T, Abirami K. Evaluation of post-harvest quality of some cultivars of chrysanthemum. Journal of Horticulture Sciences. 2010; 5(1):81- 83.
5. Bieleski RL, Reid MS. Physiological changes accompanying senescence in the ephemeral daylily flower. Plant Physiology. 1992; 98:1042-1049.
6. Chowdhuri TK, Rout B, Sadhukhan R, Mondal T. Performance evaluation of different varieties of China aster (*Callistephus chinesis* L. Ness.) in sub- tropical belt of West Bengal. International Journal of Pharmacutical Science Inventry. 2016; 5(8):15-18.
7. Choudhary M, Moond SK, Kumari A, Beniwal BS. Performance of some gladiolus varieties under sub-humid conditions of Rajasthan. Crop Research. 2011; 41:127-130.
8. Ezhilmathi K, Singh VP, Arora A, Sairam RK. Effect of 5- sulfosalicylic acid on antioxidant activity in relation to vase- life of gladiolus cut flowers. Plant Growth Regulation. 2007; 51:99-108.
9. Faraji S, Naderi R, Ibadli OV, Basaki T, Gasimov SN, Hosseinova S. Effect of post harvesting on biochemical changes in gladiolus cut flower cultivars (White prosperity). Middle East Journal of Scientific Research. 2011; 9:572-577.
10. Gupta P, Pathak AC, Banafar RNS. Studies on the performance of gladiolus (*Gladiolus hybridus* Hort.)

cultivars in Malwa Region of Madhya Pradesh. South Indian Horticulture. 2002; 50(4/6):641-644.
11. Gawali RP, Neha C, Panchbhai DM, Mahajan YA. Performance of gladiolus varieties under Nagpur conditions (Maharashtra, India).Journal of soils and crops. 2012; 22(1):197-200.
12. Grover J, Gupta AK, Singh K, Kumar A, Singh P. Studies on passive modified atmosphere storage of gladiolus spikes. Advances Horticultural Sciences. 2006; 20:175-80.
13. Ghildiyal H, Chand S, Shrivastava R. Effect of packaging materials and storage on post-harvest life of tuberose (*Polianthestuberosa* L.) cv. Kalyani Double. Pantnagar Journal of Research. 2012; 10(2):153-158.
14. Horo P, Mishra S, Kispotta LM. Evaluation of gladiolus cultivars for cut flower production in Jharkhand. Journal of Ornamental Horticulture. 2009; 12:206-207.
15. Javed NM, Ahmed K, Mostafa A, Roya K. Post-harvest evaluation of vase- life stem bending and screening of cultivars of cut gerbera (*Gerbera jamesonii* bolus ex. Hook) flowers. African Journal of Biotechnology. 2011; 10(4):560-566.
16. Jana BR, Das Bikash. Evaluation of tropical gladiolus under eastern plateau and hill region of India. International Journal of Science and Research. 2015, ISSN (Online):2319-7064.
17. Kamble BS, Reddy BS, Gangadharappa PM, Kulkarni BS. Evaluation of gladiolus varieties for quality parameters, flower and corm yields. Haryana Journal of Horticultural Sciences. 2004; 33(1/2):74-75.
18. Kumar P, Kumar M, Naresh RK, Kumar N, Choudhary P, Sharma S. Evaluation of genetic diversity among gladiolus (*Gladiolus hybridus* hort.) Germplasm using IISR markers. International Journal Agriculture. Statistics Science. 2016; 12(1):277-283.
19. Kumar R, Yadav DS. Evaluation of gladiolus cultivars under sub- tropical hills of Meghalaya. Journal of Ornamental Horticulture. 2005; 8(2):86-90.
20. Kumbhari AV, Yamgar, Pawar AU. Studies on vase- life of different genotypes of Rose (Rosa hybrida) grown under polyhouse condition. IOSR. Journal of Agriculture and Veterinary Science. 2015; 8(1):39-40.
21. Kim Young A, Choi Sung Ryul, Kweon Oh Keun, Joung Hyang Young, Shin Hak Ki, Jong Suk Lee. Characteristic and vase life in 36 cultivar of cut gerbera flowers. Korean Journal of Horticultural Science & Technology. 2004; 22(2):228-235.B.S.
22. Mahesh C, Moond SK, Anop K, Beniwal BS. Response of vase solution on keeping quality of cut spikes of gladiolus cv. Priscilla. Asian Journal of Horticulture. 2011; 6(2):319- 321.
23. Mahawer TC, Mahawer LN, Bairwa HL. Performance of gladiolus cultivars under sub- humid southern plains of Rajasthan. Journal of Horticulture Science. 2013; 8(2):204-209.
24. Mishra P. Post-harvest flowering behavior of some gladiolus varieties grown under Faizabad climatic condition. Horticulture Flora Research. Spectrum. 2015; 4(1):64-66.
25. Nair SA, Shiva KN. Performance of selected gladiolus (*Gladiolus floribundus*) varieties under Bay Island conditions. Indian Journal of Agricultural Sciences. 2003; 73(7):397-398.
26. Negi R, Kumar S, Dhiman SR. Evaluation of different cultivars of gladiolus (*Gladiolus grandiflorus* L.) suitable for low hills of Himachal Pradesh. Indian Journal Science Research and Technology. 2014; 2(6):6-11.
27. Naresh S, Dorajeerao AVD, Vijaya Bhaskar V, Umakrishna K, Paratpara Rao M. Evaluation of gladiolus (*Gladiolus hybrida* L.) hybrids under coastal Andhra Pradesh conditions. Plant Archives. 2015; 15(1):451-454.
28. Pratap M, Roa AM. Assessment and variability studies in gladiolus. Journal of Ornamental Horticulture. 2006; 9(2):145-147.
29. Patil AA, Manjula B, Naik BH. Evaluation of gladiolus hybrids for cut- flower production under transitional tract of Karnataka. Journal of Ornamental Horticulture. 2004; 7(3-4):63-66.
30. Patil KB. Study of exotic varieties of Gladiolus. Annals of Plant Physiology. 2001; 13(2):147-150.
31. Patra SK, Mohanty CR. Vase- life study in different varieties of gladiolus. International Journal of Agricultural Science. 2015; 5(2):27-32.
32. Punetha P. Response of pulsing, wraping materials and antitranspirants on the postharvest attributes of cut Rose cv. "Naranja". International Journal of basic and applied agricultural research. 2013; 13(3):103-108.
33. Rao TM, Janakiram T. Performance of exotic Orchidiolas and I.I.H.R. gladiolus cultivars. Journal of Ornamental Horticulture. 2006; 9(1):61-62.
34. Rajan P, Attri JK, Das BL, Krishna BH, Ahmed N. Performance of gladiolus genotypes for cut flower and corm production under high altitude of Uttarakhand. Indian Journal Horticulture. 2010; 67:386- 390.
35. Ramachandrudu K, Thangam M. Response of plant growth regulators, coconut water and cow urine on vegetative growth, flowering and corm production in gladiolus. Journal of Ornamental Horticulture. 2007; 10(1):38-41.
36. Rupa Rani, Singh C. Evaluation of different gladiolus cultivars for quality flower production. Journal of Research, Birsa Agricultural University. 2005; 17(2):227-230.
37. Rai SK, Katiyar RS, Singh SPS. Prospects of gladiolus crops on sodicwasteland. Proceedings of the National conference on gladiolus. 2000, 104-106.
38. Rani R, Singh C. Evaluation of different gladiolus cultivars for quality flower production. Journal of Researches Birsa Agriculture University. 2005; 17(2):227- 230.
39. Ram RB, Tomar KS, Datta SK. Performance of certain gladiolus varieties under sodic conditions. Journal of Ornamental Horticulture (New Series). 2005; 8(1):77-78.
40. Singh K, Singh R. Technological advances in post-harvest biology of different cut flower crops. Journal of Agriculture Science &Technololgy. 2009; 1(1):80- 85.
41. Shaukat SA, Alishah SZ, Shaukat SK, Shoukat SW. Evaluation of different gladiolus cultivars under union council Bangain in poonch K condition.Journal of Agriculture Science and Applied. 2012, 138- 141.
42. Shahrin S, Jamal AFM. Varietal study of Anthurium (Anthuriumandreanum) as a cut flower in Bangladesh. Journal of Bangladesh Academy of Sciences. 2013; 37(1):103-107.
43. Sindhu GS, Arora JS. Evaluation of gladiolus varieties for summer flower production. Proceeding of the National Conference on gladiolus. 2000, 115- 117.
44. Sankari A, Anand M, Arulmozhiyan R. Evaluation of gladiolus cultivars in Eastern ghats of Tamil Nadu. Journal of Horticulture Science. 2012; 7(2):206-208.

45. Sarvade SA, Ranpise SA, Thorat AR. Evaluation of different varieties of lilium (*Lilium* spp.) for flowering and flower quality under shade net conditions. National Academy of Agriculture Science. 2015; 2(33):499-501.
46. Singh AK, Kumar A, Ghimire NR. Studies of gladiolus cultivars for post-harvest characters. Environment &Ecology. 2013; 31(2):418- 421.
47. Shaukat SA, Alishah SZ, Shaukat SK, Shoukat. Performance of gladiolus (*Gladiolus grandiflora.* L.) cultivars under the climate conditions of Bagh Pakistan. Journal of central European Agriculture. 2013; 14(2):158-167.
48. Saleem M, Ahmad, Khan AM. Cultivars effect on growth, yield and cormel production of gladiolus (*Gladiolus grandiflorus* L.). Journal of Ornamental and Horticultural plants. 2012; 3(1):39-48.
49. Varu DK, Barad AV. Effect of stem length and stage of harvest on vase- life of cut flowers in tuberose (*Polianthestuberosa* Linn.) cv. Double. Journal of Horticultural Sciences. 2010; 5(1):42-4.