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EFFECT OF GAMMA IRRADIATION ON POST-HARVEST PARAMETERS IN DIFFERENT CULTIVARS OF GLADIOLUS

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ABSTRACT

An experiment was conducted at Horticulture Research Farm and at Post-harvest laboratory, Department of Horticulture, Banaras Hindu University, Varanasi, India, during winter (*rabi*) season 2021-2022 and 2022-2023 to find out effect of various gamma irradiation doses (30 Gy, 40 Gy, 50 Gy, 60 Gy, 70 Gy) and control (untreated corms) in thirty-four varieties of gladiolus on post-harvest parameters along with their interaction for different characters. Experiment was laid down in Factorial Randomized Block Design with three replications. The results were observed that various parameters during first year and second year of post-harvest parameters *i.e.*, maximum vase life of spike (days), maximum vase life of 1st, 2nd and 3rd florets per spike were observed under control, while minimum was observed with the highest dose of gamma irradiation (70 Gy) during the investigation. Maximum water uptake (ml), maximum number of florets per spike in vase, maximum number of florets per spike open in vase, maximum length of spike at 1st, 3rd, 5th and 7th days under the control whereas, minimum was observed at higher dose 70 Gy. Maximum percentage of florets opened in vase was recorded in the control and lowest under 30 Gy during 1st year. In contrast, during 2nd year, maximum percentage was recorded in 60 Gy, while the minimum was recorded in 70 Gy.

Key words: Flower, gladiolus, gamma rays, mutation, vase life.

Introduction

Gladiolus (*Gladiolus grandiflorus* L.) is a commercially important cut flower widely traded in both domestic and international markets. It belongs to the family Iridaceae and originated from South Africa and Asia Minor. Owing to its attractive spikes, elegant florets and diverse colour forms, it is often referred to as the queen of bulbous flowers. Gladiolus is easy to cultivate and well suited for garden beds, landscape use and floral displays (Singh and Kumar, 2013). The genus comprises approximately 180 species, with chromosome numbers ranging from $2n = 2x = 30$ to $2n = 12x = 180$, although most modern cultivars are tetraploids derived from few group of wild species. The currently cultivated gladiolus varieties originated from 20 to 25 species and are grown in nearly all countries where spring and summer climatic conditions are favourable (Datta, 2020). The crop is propagated vegetative means (corms and cormels) and

induced mutagenesis offers considerable potential for varietal improvement. Mutation breeding has been successfully used to develop novel ornamental traits, with gamma irradiation contributing to nearly 70% of the mutant varieties released globally (Sisodia and Singh, 2014). Although several studies have examined the influence of gamma rays on gladiolus, relatively few improved cultivars have been released through radiation breeding. Therefore, the present investigation was undertaken to evaluate the effect of different gamma irradiation doses on post-harvest parameters of selected gladiolus cultivars, with the aim of inducing favourable change in vase life attribute.

Materials and Methods

Present investigation was carried out at Horticulture Research Farm and at Post-harvest laboratory, Department of Horticulture, Banaras Hindu University, Varanasi, (25°10' N latitude and 83°03' E longitudes;

Table 1: Effect of gamma irradiation on spike length (cm) on 1st day in different gladiolus varieties during postharvest studies.

Gamma dose Variety	I Year							II Year						
	Ctrl	30 Gy	40 Gy	50 Gy	60 Gy	70 Gy	Mean	Ctrl	30 Gy	40 Gy	50 Gy	60 Gy	70 Gy	Mean
Aldebran	52.67	48.17	45.50	43.93	38.50	36.43	44.20	50.83	49.40	46.60	45.73	41.27	38.23	45.34
American Beauty	72.17	63.00	59.33	55.33	49.33	43.13	57.05	77.57	67.23	64.17	57.10	48.33	46.10	60.08
Arka Amar	71.27	70.40	63.83	57.00	53.83	51.43	61.29	66.27	64.33	63.50	57.27	54.10	51.73	59.53
Arka Darshan	49.27	46.80	48.73	43.00	44.00	38.10	44.98	49.60	48.47	48.43	44.10	44.73	36.27	45.27
Arka Sapna	67.10	64.63	53.73	55.47	52.90	-	58.77	59.17	61.60	53.10	44.77	45.27	-	52.78
Arka Shobha	68.50	71.70	65.60	62.93	59.33	56.50	64.09	74.10	68.23	63.83	57.93	56.83	54.17	62.52
Arka Ayush	59.00	57.17	54.50	51.50	44.10	-	53.25	52.17	51.83	44.70	45.50	38.53	-	46.55
Big Time Supreme	47.50	46.43	43.53	44.50	42.67	-	44.93	52.50	42.43	42.67	44.83	42.33	-	44.95
Charisma	47.60	42.10	45.43	45.90	-	-	45.26	52.50	52.00	53.03	53.67	-	48.83	52.01
Dhanvantri	65.03	64.53	63.07	58.17	44.00	-	58.96	65.50	57.83	51.10	53.33	51.67	-	55.89
Flavour Souvenir	70.47	67.57	60.40	55.17	44.50	41.93	56.67	56.93	50.90	50.83	50.77	50.93	49.77	51.69
Fortuna	50.60	49.53	46.83	43.60	41.33	39.10	45.17	53.43	50.83	47.10	45.93	43.60	41.00	46.98
GS-2	59.90	53.17	54.30	52.70	41.50	40.43	50.33	48.97	45.77	42.90	53.67	39.83	41.50	45.44
Hunting Song	57.50	48.20	45.83	48.60	43.20	42.27	47.60	57.00	53.17	46.93	48.77	42.43	44.17	48.74
Novalux	70.27	67.67	58.33	54.50	48.40	-	59.83	60.93	58.60	54.67	53.47	49.90	45.67	53.87
Nathan Red	71.67	67.07	63.60	63.00	56.17	-	64.30	70.17	65.43	65.00	62.27	56.80	-	63.93
Priscilla	50.43	46.63	45.07	40.50	41.37	38.67	43.78	56.50	53.93	49.50	46.67	41.10	38.67	47.73
Pusa Manmohak	65.37	55.27	50.60	55.33	41.60	-	53.63	64.93	59.50	57.93	52.20	49.33	44.43	54.72
Peter Pears	54.37	55.90	56.37	54.77	53.17	-	54.91	58.77	57.83	56.50	52.60	49.33	44.67	53.28
Prince of Orange	64.37	63.37	53.50	51.77	48.50	45.00	54.42	52.17	51.17	47.33	40.93	-	-	47.90
Punjab Dawn	66.90	54.93	54.17	48.33	45.77	-	54.02	60.97	59.67	46.43	43.60	43.73	-	50.88
Punjab Glance	58.27	54.37	54.57	56.20	47.17	45.33	52.65	54.33	53.77	51.17	46.07	45.33	41.77	48.74
Shagun	64.40	56.33	53.50	44.77	37.27	-	51.25	64.77	54.37	49.17	46.33	42.93	-	51.51
Pusa Shubham	64.07	-	50.20	54.17	41.67	-	52.53	64.23	-	62.17	45.67	46.17	-	54.56
Pusa Suhagin	57.17	57.33	56.33	50.67	41.67	-	52.63	53.93	49.57	54.40	47.83	45.10	-	50.17
Red Majesty	76.83	72.17	66.17	64.57	63.43	61.83	67.50	66.57	57.50	60.00	51.80	52.87	48.97	56.28
Shubhangini	75.67	66.23	64.60	45.60	52.27	52.00	59.39	71.23	71.03	56.33	51.67	48.83	-	59.82
Suchitra	69.33	58.77	69.60	66.07	61.17	50.10	62.51	63.50	57.83	60.43	-	-	-	60.59
Tiger Flame	68.60	74.90	71.33	67.73	60.00	52.00	65.76	61.13	56.67	50.43	52.43	48.50	45.17	52.39
True Love	75.00	76.00	72.17	65.10	63.67	57.17	68.18	73.17	63.00	63.00	61.00	51.43	45.43	59.51
Vedio	57.67	49.50	59.50	-	-	-	55.56	55.93	55.83	44.90	49.67	-	-	51.58
Vinks Glory	71.17	64.50	62.40	61.60	-	-	64.92	67.00	61.83	58.73	58.00	-	-	61.39
White Prosperity	76.50	75.17	75.17	72.67	67.83	57.50	70.81	74.83	71.67	65.90	68.83	56.67	58.17	66.01
Yellow Stone	69.17	64.17	70.73	56.33	51.70	-	62.42	63.10	61.50	55.00	49.50	47.67	-	55.35
Mean	63.70	59.81	57.60	54.29	54.48	44.68		61.02	57.11	53.76	51.03	47.43	45.51	
C.D. (5%)														
T	0.55							0.78						
V	1.31							1.87						
T×V	3.20							4.57						
Ctrl: Control														

elevation of 123.23 m amsl) Uttar Pradesh, during 2021-2022 and 2022-2023. The climate of Varanasi is humid subtropical with large variation between summer and winter temperature. During the experiment the maximum temperature ranges from 14.2°C to 43.0°C in summer and minimum temperature 7.1°C to 28.1°C in winter. Healthy and uniform corms of 34 gladiolus varieties *i.e.* Aldebran, American Beauty, Arka Amar, Arka Darshan, Arka Sapna, Arka Shobha, Arka Ayush, Big Time

Supreme, Charisma, Dhanvantri, Flavour Souvenir, Fortuna, GS-2, Hunting Song, Nova Lux, Nathan Red, Priscilla, Pusa Manmohak, Peter Pears, Prince of Orange, Punjab Dawn, Punjab Glance, Punjab Shagun, Pusa Shubham, Pusa Suhagin, Red Majesty, Shubhangini, Suchitra, Tiger Flame, True Love, Vedio, Vinks Glory, White Prosperity, Yellow Stone were selected and exposed to gamma doses of 30 Gy, 40 Gy, 50 Gy, 60 Gy, 70 Gy at Division of Floriculture, Botanic Garden and

Table 2: Effect of gamma irradiation on spike length (cm) on 3rd day in different gladiolus varieties during postharvest studies.

Gamma dose Variety	I Year							II Year						
	Ctrl	30 Gy	40 Gy	50 Gy	60 Gy	70 Gy	Mean	Ctrl	30 Gy	40 Gy	50 Gy	60 Gy	70 Gy	Mean
Aldebran	53.80	49.37	46.97	45.27	39.80	37.83	45.51	52.67	51.10	47.83	47.17	42.23	39.60	46.77
American Beauty	73.50	64.97	61.17	56.83	51.17	44.67	58.72	78.83	68.43	65.77	58.33	53.17	47.00	61.92
Arka Amar	72.00	72.17	64.93	58.47	55.27	52.40	62.54	67.17	65.00	64.50	58.40	54.93	53.03	60.51
Arka Darshan	50.33	48.57	50.83	44.67	45.33	40.33	46.68	51.10	49.83	49.77	45.17	46.17	37.33	46.56
Arka Sapna	68.73	66.17	54.93	56.83	54.50	-	60.23	60.67	62.27	54.17	45.93	46.13	-	53.83
Arka Shobha	69.67	73.67	66.77	64.17	61.27	58.57	65.68	75.13	69.33	64.67	59.40	57.83	55.63	63.67
Arka Ayush	60.60	59.07	56.40	53.33	45.17	-	54.91	53.37	52.77	45.73	46.33	39.63	-	47.57
Big Time Supreme	49.00	47.67	44.83	45.67	43.83	-	46.20	53.93	43.83	44.40	46.17	43.33	-	46.33
Charisma	48.83	43.67	46.67	46.97	-	-	46.53	53.90	53.30	54.33	54.83	-	50.33	53.34
Dhanvantri	66.67	66.00	64.07	59.50	44.93	-	60.23	66.53	58.77	52.50	54.37	52.73	-	56.98
Flavour Souvenir	72.00	68.67	61.67	56.60	45.67	42.93	57.92	57.80	52.00	51.60	51.83	51.63	50.50	52.56
Fortuna	52.73	50.43	48.17	44.67	42.33	40.50	46.47	54.93	52.10	48.27	47.07	44.50	42.27	48.19
GS-2	60.40	54.50	55.67	53.67	42.83	43.50	51.76	50.30	47.17	50.93	55.00	41.10	42.83	47.89
Hunting Song	58.70	49.50	47.17	49.63	44.50	43.40	48.82	58.03	54.27	47.80	49.77	43.53	45.33	49.79
Novalux	71.50	68.67	59.80	55.67	49.33	-	60.99	62.00	59.67	56.20	54.90	51.17	46.83	55.13
Nathan Red	73.23	68.07	65.00	64.00	57.17	-	65.49	71.40	66.67	66.00	63.43	57.83	-	65.07
Priscilla	51.33	47.67	46.17	41.33	42.33	39.73	44.76	57.67	55.00	50.40	47.90	42.20	40.00	48.86
Pusa Manmohak	65.77	56.50	51.77	56.47	42.83	-	54.67	66.17	60.33	58.67	53.33	50.43	45.17	55.68
Peter Pears	55.67	56.67	57.40	56.33	54.33	-	56.08	59.83	58.67	57.43	53.67	50.67	46.07	54.39
Prince of Orange	64.83	64.10	54.40	52.33	49.17	45.70	55.09	53.40	52.33	48.50	42.17	-	-	49.10
Punjab Dawn	68.03	56.17	55.43	49.27	47.00	-	55.18	62.00	61.00	47.50	44.67	44.67	-	51.97
Punjab Glance	59.40	55.33	55.60	57.67	48.40	46.33	53.79	55.50	61.00	52.33	47.17	46.43	42.77	50.87
Shagun	65.17	57.17	54.50	45.50	38.50	-	52.17	65.67	55.33	50.17	47.23	44.00	-	52.48
Pusa Shubham	65.33	-	51.33	55.17	43.00	-	53.71	65.50	-	63.50	46.83	47.50	-	55.83
Pusa Suhagin	58.00	58.17	55.97	46.43	36.83	-	51.08	54.83	50.50	52.00	48.83	46.17	-	50.47
Red Majesty	78.23	73.23	67.40	66.00	64.50	63.00	68.73	67.67	59.17	61.00	53.33	54.17	49.50	57.47
Shubhangini	76.17	67.07	59.73	47.67	53.80	53.17	59.60	72.17	72.23	57.33	52.83	49.83	-	60.88
Suchitra	72.43	59.53	70.07	66.83	62.33	48.03	63.21	64.50	59.17	61.73	-	-	-	61.80
Tiger Flame	71.30	75.00	74.17	69.77	61.50	53.27	67.50	62.43	58.43	51.57	54.00	49.67	46.00	53.68
True Love	76.83	77.17	72.83	66.00	64.30	57.83	69.16	74.00	64.33	64.00	62.17	52.67	46.67	60.64
Vedio	59.17	50.67	61.17	-	-	-	57.00	57.10	57.17	46.17	51.00	-	-	52.86
Vinks Glory	72.67	65.67	63.67	63.17	-	-	66.29	68.33	62.83	60.00	59.50	-	-	62.67
White Prosperity	77.33	75.97	76.00	73.33	69.10	58.43	71.69	71.27	73.57	67.00	70.23	57.67	59.00	66.46
Yellow Stone	71.00	65.17	71.77	57.33	53.03	-	63.66	64.17	62.67	56.00	50.90	48.67	-	56.48
Mean	65.01	60.98	58.66	55.35	53.59	45.77		62.06	58.49	54.99	52.24	48.64	46.62	
C.D. (5%)														
T	0.58							0.83						
V	1.37							1.98						
T×V	3.36							4.84						
Ctrl: Control														

Eco-education, C.S.I.R.- National Botanical Research Institute, Lucknow (India). Irradiated corms were planted in beds on the following day with spacing of row to row 30 cm and corm to corm 20 cm during November month of 2021 under open field condition. The experimental design adopted a Factorial Randomized Block Design with three replications. Untreated plants (0 Gy) were considered as control. Corms were harvested during April

and stored in cold storage at 4°C. These corms were again planted during November of 2022-2023. Various parameters were observed during 1st and 2nd years on post-harvest parameters i.e., length of spike (cm) at 1st, 3rd, 5th and 7th days, number of florets in vase, number of florets open in vase, vase life of spike (days), vase life of 1st, 2nd and 3rd floret (days), water uptake per spike (ml), percentage of florets opened in vase. The analysis of variance of data was done as per design of the experiment

Table 3: Effect of gamma irradiation on spike length (cm) on 5th day in different gladiolus varieties during postharvest studies.

Gamma dose Variety	I Year							II Year						
	Ctrl	30 Gy	40 Gy	50 Gy	60 Gy	70 Gy	Mean	Ctrl	30 Gy	40 Gy	50 Gy	60 Gy	70 Gy	Mean
Aldebran	55.17	50.83	48.40	46.73	41.67	39.07	46.98	54.00	52.50	49.17	47.10	42.17	41.10	47.67
American Beauty	74.27	66.00	62.77	57.50	52.83	46.43	59.97	79.57	67.67	66.83	59.17	50.83	48.17	62.04
Arka Amar	72.77	74.00	66.00	59.17	57.10	54.00	63.84	68.67	66.37	65.50	60.23	56.07	54.17	61.83
Arka Darshan	52.13	49.67	51.30	45.67	46.83	41.40	47.83	52.33	51.00	50.83	45.83	46.83	38.67	47.58
Arka Sapna	69.73	67.40	56.33	57.83	55.57	-	61.37	61.57	63.00	55.03	47.33	47.00	-	54.79
Arka Shobha	70.93	74.73	65.00	66.00	63.17	59.97	66.63	76.17	70.27	65.83	60.33	58.83	56.33	64.63
Arka Ayush	62.27	60.77	58.33	54.37	45.83	-	56.31	54.00	53.67	46.50	47.50	40.50	-	48.43
Big Time Supreme	50.33	49.00	46.00	46.83	45.33	-	47.50	55.17	45.10	45.67	47.50	44.77	-	47.64
Charisma	50.33	45.23	47.83	48.33	-	-	47.93	54.83	54.33	55.33	56.33	-	51.50	54.47
Dhanvantri	68.43	67.23	64.77	60.83	45.83	-	61.42	67.83	60.00	53.67	55.33	53.67	-	58.10
Flavour Souvenir	73.13	69.90	62.90	57.93	46.90	44.00	59.13	59.10	52.83	52.77	53.07	52.83	51.67	53.71
Fortuna	52.83	51.83	49.17	45.83	43.33	41.67	47.44	56.37	53.40	49.83	48.00	45.50	43.33	49.41
GS-2	62.50	55.67	56.67	54.67	44.00	44.83	53.06	51.73	48.57	52.33	56.33	45.50	44.00	49.74
Hunting Song	60.00	50.83	48.33	50.73	45.73	44.10	49.96	59.23	55.00	49.07	50.90	44.50	46.67	50.89
Novalux	72.77	69.67	61.00	56.50	50.40	-	62.07	60.00	60.67	56.83	55.67	52.33	48.00	55.58
Nathan Red	74.00	68.17	66.67	65.20	58.40	-	66.49	72.50	67.67	67.00	64.33	59.50	-	66.20
Priscilla	52.23	48.60	46.77	42.00	43.00	41.00	45.60	59.50	56.00	51.67	49.00	43.33	41.00	50.08
Pusa Manmohak	67.67	57.50	52.67	57.33	43.83	-	55.80	67.33	61.40	60.17	54.33	51.67	46.00	56.82
Peter Pears	56.83	57.83	58.17	57.17	55.50	-	57.10	61.67	59.67	58.50	54.83	51.83	47.33	55.64
Prince of Orange	65.67	64.60	54.33	52.77	50.00	46.73	55.68	54.67	53.73	49.50	43.33	-	-	50.31
Punjab Dawn	69.17	57.17	56.43	50.83	48.43	-	56.41	63.00	62.00	48.67	45.77	45.67	-	53.02
Punjab Glance	61.13	56.43	56.03	58.10	49.50	47.17	54.73	56.67	55.67	53.33	48.33	47.43	43.83	50.88
Shagun	66.17	57.77	55.33	46.67	39.30	-	53.05	67.07	56.67	51.40	48.33	45.17	-	53.73
Pusa Shubham	66.50	-	52.33	56.17	44.10	-	54.78	66.67	-	64.73	48.10	48.83	-	57.08
Pusa Suhagin	59.33	59.70	57.33	48.20	42.33	-	53.38	56.17	51.90	53.00	49.83	47.00	-	51.58
Red Majesty	79.27	74.00	68.17	67.00	65.40	63.90	69.62	68.67	60.43	62.27	54.23	55.33	50.33	58.54
Shubhangini	76.83	68.00	60.67	48.73	54.67	53.63	60.42	73.33	73.73	58.33	53.67	51.33	-	62.08
Suchitra	75.00	60.67	70.83	67.67	63.00	49.00	64.36	65.97	60.33	62.67	-	-	-	62.99
Tiger Flame	72.17	75.93	74.93	70.67	62.17	54.00	68.31	64.17	59.77	52.33	55.33	51.17	47.23	55.00
True Love	78.00	77.83	73.83	67.33	64.93	59.00	70.16	75.10	66.17	65.33	62.93	53.33	48.00	61.81
Vedio	60.50	51.67	62.33	-	-	-	58.17	58.50	59.00	47.27	52.00	-	-	54.19
Vinks Glory	74.00	67.00	64.83	64.17	-	-	67.50	69.50	64.17	61.33	61.00	-	-	64.00
White Prosperity	78.67	76.50	76.93	73.83	69.67	59.50	72.52	77.67	74.83	68.00	71.23	59.17	60.17	68.51
Yellow Stone	71.50	66.00	72.50	58.50	54.33	-	64.57	65.27	63.67	56.97	52.10	49.97	-	57.59
Mean	66.24	62.06	59.59	56.40	54.93	46.81		63.35	59.43	56.11	53.31	49.73	47.76	
C.D. (5%)														
T	0.57							0.84						
V	1.36							2.01						
T×V	3.33							4.92						
Ctrl: Control														

as suggested by Panse and Sukhatme (1985).

Results and Discussion

Length of spike

Gamma irradiation, varietal differences and their interactions were effects statistically significant on spike length at 1st, 3rd, 5th and 7th days during both years of evaluation. The maximum spike length on the first day was recorded under control treatment in both years (63.70

cm and 61.02 cm, respectively). Among the cultivars White Prosperity produced the greatest spike length in both years (70.81 cm and 66.01 cm, respectively). The interaction between control with cv. Red Majesty (76.83 cm) produced longest spike among all treatment combinations (Table 1).

Maximum length of spike in vase on 3rd day control showed (65.01 cm and 62.06 cm, respectively) during

Table 4: Effect of gamma irradiation on spike length (cm) on 7th day in different gladiolus varieties during postharvest studies.

Gamma dose Variety	I Year							II Year						
	Ctrl	30 Gy	40 Gy	50 Gy	60 Gy	70 Gy	Mean	Ctrl	30 Gy	40 Gy	50 Gy	60 Gy	70 Gy	Mean
Aldebran	56.17	52.40	49.57	48.47	44.33	40.33	48.54	55.50	53.67	50.50	48.63	43.50	42.17	48.99
American Beauty	74.90	67.10	63.67	58.67	54.17	49.90	61.40	80.33	68.57	67.67	59.87	51.67	49.00	62.85
Arka Amar	73.27	74.57	66.90	60.83	58.67	55.67	64.98	70.73	68.00	67.30	62.43	57.57	55.27	63.55
Arka Darshan	53.30	51.00	52.40	46.57	48.23	42.83	49.06	53.17	52.33	52.17	46.83	48.00	39.67	48.69
Arka Sapna	70.83	68.60	57.50	58.83	57.83	-	62.72	62.17	64.00	56.00	48.33	48.00	-	55.70
Arka Shobha	71.67	76.33	69.50	68.27	65.17	62.00	68.82	77.00	71.00	67.00	61.33	60.17	57.33	65.64
Arka Ayush	63.73	63.33	60.40	55.50	46.50	-	57.89	56.33	54.83	48.00	48.77	42.00	-	49.99
Big Time Supreme	51.83	50.40	47.33	48.00	46.83	-	48.88	56.77	46.33	46.83	49.00	45.67	-	48.92
Charisma	51.83	46.50	49.00	49.77	-	-	49.28	56.33	55.50	56.83	57.43	-	52.67	55.75
Dhanvantri	70.67	68.50	65.90	61.73	46.60	-	62.68	69.50	61.33	55.10	56.87	55.00	-	59.56
Flavour Souvenir	74.60	71.33	63.83	59.43	48.10	44.67	60.33	60.70	54.17	54.00	53.93	54.17	52.83	54.97
Fortuna	53.83	52.67	50.73	46.90	44.47	42.50	48.52	58.07	54.50	50.97	49.83	46.80	44.67	50.81
GS-2	63.93	57.17	58.00	55.93	45.40	46.17	54.43	53.33	50.63	47.17	57.83	43.50	45.17	49.61
Hunting Song	61.50	51.93	49.73	51.43	47.17	45.17	51.16	61.17	56.43	50.67	51.67	45.50	48.33	52.29
Novalux	73.50	71.00	60.67	57.17	51.33	-	62.73	64.50	61.67	58.00	56.83	53.93	49.67	57.43
Nathan Red	75.40	69.17	67.93	66.17	59.77	-	67.69	73.70	68.83	68.40	65.83	60.67	-	67.49
Priscilla	53.40	49.57	48.00	43.00	43.43	41.93	46.56	60.83	57.17	53.13	50.00	44.50	42.17	51.30
Pusa Manmohak	68.50	58.47	53.57	58.50	45.10	-	56.83	68.83	62.67	61.53	55.33	53.00	47.00	58.06
Peter Pears	58.07	59.00	59.33	58.30	56.77	-	58.29	63.17	60.67	59.33	56.33	53.00	48.67	56.86
Prince of Orange	66.83	65.27	56.17	53.40	51.50	47.83	56.83	55.33	54.67	50.67	44.60	-	-	34.21
Punjab Dawn	70.77	58.00	57.33	51.83	49.17	-	57.42	64.03	62.83	50.07	46.43	46.67	-	45.01
Punjab Glance	62.17	57.00	56.67	58.57	49.90	47.83	55.36	57.60	56.83	54.00	49.33	48.33	44.67	51.79
Shagun	68.00	59.00	56.83	47.67	41.67	-	54.63	68.00	58.17	52.60	49.33	46.33	-	54.89
Pusa Shubham	68.00	-	53.67	57.83	45.33	-	56.21	68.23	-	66.00	49.33	50.17	-	58.43
Pusa Suhagin	60.17	61.00	56.50	49.33	44.00	-	57.20	57.50	52.83	53.93	51.33	49.97	-	53.11
Red Majesty	80.27	75.07	68.83	68.10	67.00	64.50	70.63	69.67	61.33	63.33	55.50	57.17	51.93	59.82
Shubhangini	77.83	69.40	62.57	49.83	55.73	54.43	61.63	74.50	75.33	60.00	55.00	54.33	-	63.83
Suchitra	75.67	62.50	72.67	69.10	63.83	50.17	65.66	68.00	61.33	64.00	-	-	-	64.44
Tiger Flame	75.00	77.33	75.67	71.33	63.17	54.73	69.54	66.17	61.30	53.43	56.33	52.50	49.00	56.46
True Love	79.60	79.17	74.17	69.33	66.50	60.00	71.46	76.33	67.00	66.50	63.83	54.67	49.00	62.89
Vedio	62.07	53.17	63.33	-	-	-	59.52	60.00	60.00	48.43	53.23	-	-	55.42
Vinks Glory	75.33	68.47	66.00	65.50	-	-	68.83	70.97	65.67	62.67	62.50	-	-	65.45
White Prosperity	79.43	77.50	78.00	74.67	70.67	60.27	73.42	78.60	76.83	69.17	72.50	61.67	61.33	70.02
Yellow Stone	72.67	67.17	73.50	59.17	55.50	-	65.60	66.37	65.33	58.33	53.00	51.00	-	58.81
Mean	67.49	63.31	60.76	57.55	56.34	47.94		64.81	60.66	57.17	54.53	51.02	48.98	
C.D. (5%)														
T	0.58							0.79						
V	1.39							1.87						
T×V	3.41							4.58						
Ctrl: Control														

both the years, while the minimum was recorded under 70 Gy (45.77 cm and 46.62 cm, respectively). Among cultivars White Prosperity showed maximum length of spike on 3rd day (71.69 cm and 66.46 cm, respectively) during both the years. Interaction of control with cv. Red Majesty showed maximum length (78.23 cm) of spike in vase on 3rd day during 1st year. Second year of investigation showed different results where control with

cv. American Beauty found to be the best in reference to spike length (78.83 cm) (Table 2).

Maximum spike length on 5th day was found with control during both the years (66.24 cm and 63.35 cm, respectively). Among cultivars White Prosperity resulted in maximum spike length on 5th day in vase during both years (72.52 cm and 68.51 cm, respectively). Interaction effect also found significant with combination of control

Table 5: Effect of gamma irradiation on vase life of spikes (days) in different gladiolus varieties during postharvest studies.

Gamma dose Variety	I Year							II Year						
	Ctrl	30 Gy	40 Gy	50 Gy	60 Gy	70 Gy	Mean	Ctrl	30 Gy	40 Gy	50 Gy	60 Gy	70 Gy	Mean
Aldebran	2.67	2.33	3.00	2.33	3.00	2.00	2.56	3.00	2.33	2.67	2.33	2.33	2.67	2.56
American Beauty	2.33	2.33	2.67	2.67	2.33	3.00	2.56	3.00	2.33	2.33	3.00	2.33	2.67	2.61
Arka Amar	2.67	2.33	2.00	3.00	2.67	3.00	2.61	2.67	2.33	2.67	2.00	2.33	2.33	2.39
Arka Darshan	2.33	2.33	2.33	2.33	2.00	2.33	2.28	2.33	2.33	2.33	2.00	2.00	2.00	2.17
Arka Sapna	2.67	2.33	2.33	3.33	3.00	-	2.73	2.67	2.67	2.67	2.67	2.67	-	2.67
Arka Shobha	2.67	3.00	2.67	3.33	2.33	2.00	2.67	3.00	2.67	2.33	2.33	2.33	2.33	2.50
Arka Ayush	3.67	2.33	2.67	3.33	2.33	-	2.87	3.00	2.67	2.33	2.33	2.33	-	2.53
Big Time Supreme	2.67	2.67	2.33	2.33	2.33	-	2.47	3.00	2.33	2.33	2.00	2.33	-	2.40
Charisma	2.67	2.67	2.67	2.33	-	-	2.58	3.33	2.67	2.33	2.00	-	2.00	2.47
Dhanvantri	3.00	2.33	2.33	2.00	2.33	-	2.40	2.67	2.67	2.33	2.33	2.33	-	2.47
Flavour Souvenir	2.67	2.33	3.00	2.33	2.67	2.33	2.56	2.33	2.67	2.67	2.67	2.67	2.33	2.56
Fortuna	2.67	3.00	3.00	2.00	2.00	2.00	2.44	2.67	2.33	3.00	2.00	1.67	2.33	2.33
GS-2	2.67	2.00	2.33	2.33	2.00	2.00	2.22	2.33	2.33	2.33	2.33	2.00	1.67	2.17
Hunting Song	3.00	2.00	2.67	2.67	2.67	2.67	2.61	2.33	2.67	2.67	2.33	2.00	2.00	2.33
Novalux	2.33	3.00	2.33	2.33	3.00	-	2.60	3.33	2.67	2.67	2.33	2.67	2.33	2.67
Nathan Red	2.33	2.33	2.33	2.33	3.00	-	2.47	2.67	2.33	2.67	2.00	2.33	-	2.40
Priscilla	2.33	2.33	2.67	2.33	2.33	2.33	2.39	2.00	2.33	2.67	2.33	2.33	1.67	2.22
Pusa Manmohak	3.00	2.67	2.67	2.33	2.67	-	2.67	2.67	2.33	2.33	2.33	2.33	2.00	2.33
Peter Pears	2.33	3.00	2.33	3.00	2.00	-	2.53	2.33	2.67	2.33	2.33	2.33	2.00	2.33
Prince of Orange	3.00	2.00	2.33	2.00	2.33	2.67	2.39	2.67	2.33	2.33	2.33	-	-	2.42
Punjab Dawn	2.67	3.00	2.67	2.67	2.00	-	2.60	3.00	2.67	2.33	2.33	2.33	-	2.53
Punjab Glance	2.33	2.33	2.33	2.67	2.67	2.00	2.39	2.67	3.00	2.33	2.33	2.33	2.33	2.50
Shagun	2.33	2.33	2.67	2.00	2.00	-	2.27	2.67	2.33	2.33	2.67	2.00	-	2.40
Pusa Shubham	3.33	-	2.33	2.67	2.00	-	2.58	3.00	-	2.67	2.67	2.33	-	2.66
Pusa Suhagin	3.33	2.33	3.33	3.33	2.67	-	3.00	2.67	2.33	2.67	2.33	2.33	-	2.47
Red Majesty	2.33	2.67	2.33	2.33	2.67	2.67	2.50	3.33	2.33	3.33	2.33	2.67	2.00	2.67
Shubhangini	2.67	2.33	2.33	2.67	2.00	2.33	2.39	3.33	2.67	2.67	2.33	2.33	-	2.67
Suchitra	2.67	2.33	2.33	2.00	2.67	2.67	2.44	3.00	3.00	2.67	-	-	-	2.89
Tiger Flame	2.67	2.67	2.33	3.00	3.00	2.00	2.61	3.00	2.33	2.00	2.33	2.00	2.00	2.28
True Love	2.33	2.67	3.00	2.33	2.67	2.00	2.50	2.33	2.33	2.33	2.33	2.33	2.00	2.28
Vedio	2.67	2.33	2.00	-	-	-	2.33	2.67	2.67	2.33	2.33	-	-	2.50
Vinks Glory	2.67	2.33	1.67	2.00	-	-	2.17	2.67	2.33	2.00	2.00	-	-	2.25
White Prosperity	3.00	3.00	2.33	2.00	2.33	2.00	2.44	2.67	3.00	2.33	2.33	2.33	2.00	2.44
Yellow Stone	3.33	2.33	3.00	2.33	2.67	-	2.73	3.00	3.00	2.00	2.00	2.67	-	2.53
Mean	2.71	2.48	2.51	2.50	2.63	2.21		2.77	2.54	2.47	2.31	2.31	2.14	
C.D. (5%)														
T	0.19							0.16						
V	0.46							0.38						
T×V	1.13							0.92						
Ctrl: Control														

with cv. Red Majesty (79.27 cm) resulted in maximum length of spike on 5th day in vase. However, during 2nd year, maximum spike length was achieved with the combination of control and cv. American Beauty (79.57 cm) (Table 3).

Maximum spike length on 7th day was found with control during both the years (67.49 cm and 64.81 cm, respectively). Among varieties, cv. White Prosperity

resulted in maximum spike length on 7th day in vase during both years (73.42 cm and 70.02 cm, respectively). Interaction effect of control with cv. White Prosperity resulted maximum spike length (80.27 cm) during 1st year and combination of control with cv. American Beauty (80.33 cm) resulted in maximum length of spike on 7th day during 2nd year (Table 4).

These results close conformity with earlier reports

Table 6: Effect of gamma irradiation on vase life of 1st floret (days) in different gladiolus varieties during postharvest studies.

Gamma dose Variety	I Year							II Year						
	Ctrl	30 Gy	40 Gy	50 Gy	60 Gy	70 Gy	Mean	Ctrl	30 Gy	40 Gy	50 Gy	60 Gy	70 Gy	Mean
Aldebran	10.33	9.67	10.00	8.67	6.67	8.00	8.89	11.00	10.00	10.33	9.00	9.00	8.67	9.67
American Beauty	14.00	11.00	12.00	9.00	8.00	8.67	10.44	13.67	12.33	12.00	11.67	10.67	9.00	11.56
Arka Amar	14.00	14.67	13.00	11.67	9.00	9.00	11.89	11.67	10.33	11.00	10.33	9.33	8.33	10.17
Arka Darshan	13.00	12.00	10.00	11.00	9.67	9.00	10.78	11.00	11.00	10.33	11.00	9.00	7.33	9.94
Arka Sapna	13.00	11.00	8.33	8.33	10.33	-	10.20	12.33	12.00	10.00	10.33	9.00	-	10.73
Arka Shobha	12.33	13.67	9.00	10.00	9.00	8.33	10.39	13.33	12.00	11.00	9.67	9.33	8.00	10.56
Arka Ayush	11.33	9.67	10.33	10.67	8.33	-	10.07	12.00	11.00	12.00	11.00	9.00	-	11.00
Big Time Supreme	10.33	10.00	9.33	9.00	9.33	-	9.60	11.00	9.67	9.00	9.67	9.00	-	9.67
Charisma	9.67	8.67	9.00	8.67	-	-	9.00	10.33	9.00	9.00	8.33	-	8.33	9.00
Dhanvantri	11.33	10.00	9.00	10.67	8.00	-	9.80	11.33	10.33	10.00	9.00	8.00	-	9.73
Flavour Souvenir	11.00	11.67	9.00	9.67	9.00	8.33	9.78	11.33	11.00	11.00	9.00	9.67	9.33	10.22
Fortuna	11.67	11.00	9.33	9.33	9.00	8.00	9.72	11.00	11.00	10.33	8.67	8.00	9.00	9.67
GS-2	11.00	10.33	9.00	9.00	9.00	8.67	9.50	9.67	9.00	10.00	8.33	8.67	8.00	8.94
Hunting Song	10.00	10.00	8.33	9.00	9.00	8.67	9.17	11.00	10.00	10.00	11.00	9.33	8.67	10.00
Novalux	13.33	11.00	11.67	11.00	9.00	-	11.20	11.67	10.33	9.00	9.00	8.00	8.00	9.33
Nathan Red	11.33	11.00	10.00	9.00	8.67	-	10.00	12.00	11.00	12.00	9.67	9.00	-	10.73
Priscilla	11.67	12.33	12.33	9.00	9.00	9.00	10.56	11.67	11.00	11.00	12.33	11.00	10.00	11.17
Pusa Manmohak	11.00	11.00	9.00	9.00	9.33	-	9.87	13.00	12.00	10.67	10.00	11.67	8.00	10.89
Peter Pears	9.33	8.00	8.33	8.67	8.00	-	8.47	11.00	11.33	12.33	9.67	10.00	8.67	10.50
Prince of Orange	10.00	8.00	8.67	9.33	8.00	8.67	8.78	11.00	9.33	11.00	11.00	-	-	10.58
Punjab Dawn	13.00	11.33	11.00	10.00	9.00	-	10.87	13.00	12.00	11.00	10.00	8.67	-	10.93
Punjab Glance	9.33	9.00	8.33	9.00	8.00	8.00	8.61	14.00	13.00	11.33	10.67	9.00	9.33	11.22
Shagun	9.33	8.33	8.00	9.00	8.33	-	8.60	11.00	11.00	9.00	11.00	9.00	-	10.20
Pusa Shubham	10.67	-	10.67	9.00	9.00	-	9.83	11.33	-	11.33	9.67	9.67	-	10.50
Pusa Suhagin	10.33	10.00	8.00	9.00	7.67	-	9.00	10.33	9.00	11.33	11.00	10.33	-	10.40
Red Majesty	11.00	11.00	11.33	10.00	9.00	8.67	10.17	13.67	13.00	13.00	11.00	11.33	9.67	11.94
Shubhangini	13.67	13.00	12.00	10.33	10.00	9.00	11.33	14.00	12.00	11.67	12.00	11.00	-	12.13
Suchitra	13.00	14.33	11.67	12.00	12.00	10.00	12.17	13.00	11.67	11.00	-	-	-	11.89
Tiger Flame	12.67	12.00	12.33	12.67	11.00	9.33	11.67	11.00	11.00	10.00	8.33	9.67	8.00	9.67
True Love	12.00	12.00	10.33	11.33	8.00	9.67	10.56	11.00	11.00	9.00	9.00	10.33	9.00	9.89
Vedio	9.33	8.67	8.33	-	-	-	8.78	10.33	9.33	10.00	9.00	-	-	9.67
Vinks Glory	10.67	9.67	9.00	9.00	-	-	9.58	9.33	9.00	8.67	8.00	-	-	8.75
White Prosperity	13.33	13.00	11.67	13.00	11.00	10.33	12.06	13.00	11.67	11.00	9.33	9.00	8.00	10.33
Yellow Stone	13.67	13.67	12.00	12.33	10.00	-	12.33	12.00	12.67	10.67	9.00	9.67	-	10.80
Mean	11.52	10.93	10.01	9.92	9.63	8.39		11.71	10.91	10.62	9.90	9.49	8.60	
C.D. (5%)														
T	0.32							0.30						
V	0.76							0.71						
T×V	1.86							1.74						
Ctrl: Control														

that lower doses of gamma irradiation stimulate cellular activity, enhance antioxidant capacity and support the plant in overcoming physiological and environmental stresses. Conversely, higher doses of gamma irradiation are known to arrest the cell cycle at G2 or M phase, which caused cumulative oxidative damage to cellular components and DNA (Preussa and Britta, 2003). Similar results were also reported in gladiolus by Sisodia *et al.*, (2015) and Singh and Sisodia (2015). Padhi and Singh

(2022) who observed that higher irradiation doses negatively affect growth attributes, whereas lower doses may promote physiological enhancement.

Vase life of spike

Gamma irradiation, varietal differences and their interactions exerted significant effect on the vase life of gladiolus spikes during both years of investigation (Table 5). The control (0 Gy) consistently recorded the maximum

Table 7: Effect of gamma irradiation on vase life of 2nd floret (days) in different gladiolus varieties during postharvest studies.

Gamma dose Variety	I Year							II Year						
	Ctrl	30 Gy	40 Gy	50 Gy	60 Gy	70 Gy	Mean	Ctrl	30 Gy	40 Gy	50 Gy	60 Gy	70 Gy	Mean
Aldebran	2.00	2.67	3.00	3.00	2.67	2.33	2.61	2.33	2.00	2.33	2.00	2.00	2.00	2.11
American Beauty	3.33	2.33	2.67	2.67	3.00	2.33	2.72	2.67	2.33	2.33	2.33	2.67	2.33	2.44
Arka Amar	3.33	2.00	2.33	2.33	2.33	2.00	2.39	2.33	2.33	2.33	2.00	2.33	2.00	2.22
Arka Darshan	2.33	2.67	2.33	2.33	2.33	2.00	2.33	2.33	2.00	2.33	2.33	2.00	1.67	2.11
Arka Sapna	2.33	2.00	2.33	2.00	2.33	-	2.20	2.67	2.67	2.00	2.33	2.33	-	2.40
Arka Shobha	3.00	2.67	2.67	2.67	2.67	2.33	2.67	3.00	2.33	2.67	2.33	2.33	2.00	2.44
Arka Ayush	2.33	2.67	2.67	3.00	2.67	-	2.67	2.67	2.33	2.67	2.33	2.33	-	2.47
Big Time Supreme	2.33	2.33	2.33	2.33	2.00	-	2.27	2.67	1.67	2.00	1.67	2.33	-	2.07
Charisma	2.67	2.33	2.33	2.33	-	-	2.42	2.67	2.33	2.33	2.00	-	2.00	2.66
Dhanvantri	3.33	2.67	3.67	2.67	2.67	-	3.00	2.33	2.33	2.33	2.00	2.00	-	2.20
Flavour Souvenir	2.67	3.33	3.00	2.67	2.33	2.33	2.72	2.67	2.33	2.33	2.00	2.33	2.00	2.28
Fortuna	3.33	3.00	3.33	2.67	2.33	2.33	2.83	2.67	2.67	2.00	2.00	2.00	2.33	2.28
GS-2	2.33	2.33	2.33	2.33	2.33	2.00	2.28	2.33	2.00	2.33	2.33	2.00	1.67	2.11
Hunting Song	3.33	2.67	2.67	3.00	2.67	2.33	2.78	2.33	2.33	2.33	2.33	2.33	2.00	2.28
Novalux	3.33	2.67	3.00	2.33	2.67	-	2.80	2.67	2.33	2.33	2.33	2.00	2.00	2.28
Nathan Red	2.33	2.67	2.67	2.67	2.67	-	2.60	2.67	2.33	2.67	2.00	2.00	-	2.33
Priscilla	2.67	2.67	2.33	2.33	2.67	2.67	2.56	2.67	2.33	2.33	2.67	2.00	2.00	2.33
Pusa Manmohak	3.00	2.67	2.67	2.67	2.33	-	2.67	2.67	2.33	2.33	2.33	2.33	2.00	2.33
Peter Pears	2.67	2.33	2.67	2.67	2.33	-	2.53	2.33	2.33	2.33	2.33	2.33	2.00	2.28
Prince of Orange	2.67	2.67	2.33	2.33	2.33	2.33	2.44	2.33	2.33	2.33	2.33	-	-	2.33
Punjab Dawn	3.00	2.67	3.33	2.67	2.33	-	2.80	3.00	2.67	2.33	2.33	2.33	-	2.53
Punjab Glance	2.67	2.67	2.33	2.67	2.67	2.67	2.61	2.67	2.67	2.33	2.33	2.00	1.67	2.28
Shagun	2.67	2.67	2.67	2.33	2.33	-	2.53	2.33	2.67	2.00	2.33	2.00	-	2.27
Pusa Shubham	2.67	-	2.33	2.33	2.33	-	2.42	3.00	-	2.67	1.67	2.33	-	2.42
Pusa Suhagin	3.00	2.67	2.67	2.67	2.33	-	2.67	2.33	2.33	2.33	2.33	2.00	-	2.27
Red Majesty	2.67	2.67	2.67	2.33	2.67	2.67	2.61	2.33	2.67	2.33	2.00	2.33	2.33	2.33
Shubhangini	3.00	2.67	2.67	2.67	2.33	2.00	2.56	2.67	2.67	2.67	2.00	2.67	-	2.53
Suchitra	3.00	2.67	2.67	2.33	2.33	2.33	2.56	2.67	2.67	2.33	-	-	-	2.56
Tiger Flame	2.67	2.33	2.67	2.67	2.67	2.00	2.50	2.33	2.67	2.33	2.00	2.00	2.33	2.28
True Love	2.67	2.67	2.67	2.33	2.33	2.33	2.50	2.33	2.33	2.00	2.33	2.33	2.33	2.28
Vedio	2.67	2.33	2.00	-	-	-	2.33	2.33	2.00	2.33	1.67	-	-	2.08
Vinks Glory	2.33	2.33	2.67	2.00	-	-	2.33	2.33	2.33	2.00	2.00	-	-	2.17
White Prosperity	3.00	2.67	2.67	2.33	2.33	2.00	2.50	3.00	2.33	2.33	2.00	2.33	2.00	2.33
Yellow Stone	3.00	2.33	2.67	2.33	2.67	-	2.60	2.67	2.67	2.33	2.00	2.00	-	2.33
Mean	2.78	2.57	2.65	2.51	2.64	2.16		2.56	2.37	2.32	2.15	2.21	2.04	
C.D. (5%)														
T	0.14							0.13						
V	0.34							0.31						
T×V	0.82							0.76						
Ctrl: Control														

vase life (11.52 and 11.71 days, respectively). Among cultivars Yellow Stone resulted in maximum vase life during 1st year (12.33 days) whereas cv. Shubhangini showed the maximum vase life in during the second year (12.13 days). For the interaction of gamma doses and varieties, combination of 30 Gy with cv. Arka Amar produced maximum vase life in the first year (14.67 days) whereas in the 2nd year, the interaction of control with cv. Punjab Glance resulted maximum vase life (14.00

days). The results are aligning with reduction in vase life at higher irradiation doses may be attributed to physiological disturbances and potential toxicity effects, such as altered respiration and photosynthesis, reported by Pranom *et al.*, (1986). Similar finding was also documented by Sisodia and Singh (2014).

The vase life of the first floret also reflected a significant influence of treatments. The control recorded

Table 8: Effect of gamma irradiation on vase life of 3rd floret (days) in different gladiolus varieties during postharvest studies.

Gamma dose Variety	I Year							II Year						
	Ctrl	30 Gy	40 Gy	50 Gy	60 Gy	70 Gy	Mean	Ctrl	30 Gy	40 Gy	50 Gy	60 Gy	70 Gy	Mean
Aldebran	2.33	2.33	2.67	2.67	2.33	2.33	2.44	2.33	2.33	2.33	2.00	2.00	1.67	2.11
American Beauty	3.00	2.33	2.33	2.33	2.33	2.00	2.39	3.00	2.67	2.33	2.33	2.33	2.33	2.50
Arka Amar	3.00	2.33	2.33	2.00	2.00	2.00	2.28	2.33	2.00	2.33	2.00	2.00	1.67	2.06
Arka Darshan	2.33	2.33	2.33	2.33	2.33	2.00	2.28	2.33	2.33	2.33	2.33	2.00	1.67	2.17
Arka Sapna	2.33	2.33	2.00	2.33	2.33	-	2.27	2.67	2.33	2.00	2.00	2.00	-	2.20
Arka Shobha	2.67	2.33	2.33	2.33	2.33	2.00	2.33	2.33	2.33	2.00	2.00	2.00	1.67	2.06
Arka Ayush	2.67	2.33	2.33	2.33	2.33	-	2.40	2.33	2.33	2.33	2.00	2.00	-	2.20
Big Time Supreme	2.67	2.33	2.33	1.67	2.00	-	2.20	2.33	2.33	1.67	2.33	1.67	-	2.07
Charisma	2.33	2.67	2.33	2.00	-	-	2.33	2.33	2.33	2.00	2.33	-	1.67	2.13
Dhanvantri	2.67	2.67	2.33	2.00	2.00	-	2.33	2.33	2.33	2.00	2.00	1.67	-	2.07
Flavour Souvenir	2.33	2.33	2.33	2.33	2.67	2.00	2.33	2.33	2.67	2.33	2.00	2.00	2.00	2.22
Fortuna	2.67	2.33	2.67	2.33	2.33	2.33	2.44	2.33	2.33	2.00	1.67	2.00	2.00	2.06
GS-2	2.33	2.33	2.00	2.33	1.67	1.67	2.06	2.33	2.00	1.67	1.67	2.33	1.67	1.94
Hunting Song	2.67	2.33	2.33	2.33	2.33	2.33	2.39	2.33	2.33	2.00	2.33	2.00	2.00	2.17
Novalux	3.00	2.67	2.33	2.33	2.33	-	2.53	2.67	2.33	2.00	1.67	2.33	2.00	2.17
Nathan Red	2.33	2.67	2.00	2.33	2.33	-	2.33	2.33	2.33	2.67	2.00	2.00	-	2.27
Priscilla	2.33	2.33	2.33	2.33	2.33	2.33	2.33	2.33	2.33	2.33	2.67	2.00	2.33	2.33
Pusa Manmohak	2.67	2.33	2.33	2.33	2.33	-	2.40	2.67	2.33	2.00	1.67	2.33	2.00	2.17
Peter Pears	2.67	2.33	2.67	2.33	2.33	-	2.47	2.33	2.33	2.33	2.00	1.67	1.67	2.06
Prince of Orange	2.33	2.33	2.33	2.33	2.33	2.00	2.28	2.33	1.67	1.67	2.00	-	-	1.92
Punjab Dawn	2.67	2.33	2.67	2.33	2.33	-	2.47	2.67	2.33	2.00	2.00	1.67	-	2.13
Punjab Glance	2.67	2.67	2.00	2.33	2.33	2.33	2.39	2.67	2.33	2.00	2.00	1.67	1.67	2.06
Shagun	2.67	2.67	2.33	2.00	1.67	-	2.27	2.33	2.33	2.00	1.67	2.33	-	2.13
Pusa Shubham	2.67	-	2.33	2.33	2.33	-	2.42	2.33	-	2.33	2.00	2.00	-	2.17
Pusa Suhagin	2.67	2.33	2.33	2.33	1.67	-	2.27	2.33	1.67	2.00	2.00	1.67	-	1.93
Red Majesty	2.67	2.67	2.33	2.33	2.33	2.00	2.39	2.67	2.33	2.00	2.33	2.00	1.67	2.17
Shubhangini	3.00	2.67	2.33	2.33	2.00	2.00	2.39	2.33	2.33	2.33	2.00	1.67	-	2.13
Suchitra	2.67	2.33	2.33	2.33	2.33	2.00	2.33	2.33	2.33	2.00	-	-	-	2.22
Tiger Flame	2.67	2.67	2.67	2.67	2.67	2.33	2.61	2.33	2.33	2.33	1.67	1.67	1.67	2.00
True Love	2.67	2.33	2.33	2.33	2.33	2.00	2.33	2.33	2.33	2.00	2.00	2.00	1.67	2.06
Vedio	2.33	2.00	2.33	-	-	-	2.22	2.00	2.33	2.00	1.67	-	-	2.00
Vinks Glory	2.67	2.33	2.00	1.67	-	-	2.17	2.00	2.33	2.00	1.67	-	-	2.00
White Prosperity	2.67	2.67	2.33	2.33	2.33	2.33	2.44	2.33	2.33	2.00	1.67	2.00	1.33	1.94
Yellow Stone	2.67	2.33	2.67	2.33	2.67	-	2.53	2.33	2.33	2.00	1.67	1.67	-	2.00
Mean	2.61	2.42	2.34	2.33	2.41	2.00		2.39	2.29	2.10	1.98	1.95	1.81	
C.D. (5%)														
T	0.13							0.13						
V	0.30							0.30						
T×V	0.74							0.74						
Ctrl: Control														

the maximum vase life in both years (2.71 and 2.77 days, respectively). Among cultivars, Pusa Suhagin exhibited the maximum vase life during the first year (3.00 days) whereas cv. Suchitra showed maximum in the second year (2.89 days). Interaction effects revealed that in the first year, control with cv. Arka Ayush produced maximum vase life (3.67 days) while during 2nd year, maximum vase life was obtained in control with cv. Red Majesty., control with cv. Nova Lux and control with cv.

Shubhangini (3.33 days each) (Table 6).

Effect of doses of gamma irradiation and varieties found significant on vase life of 2nd floret during both years of experimentation (Table 7). The control treatment recorded the maximum vase life during both years (2.78 and 2.56 days, respectively). Among varieties, cv. Dhanvantri showed the maximum vase life in the first year (3.00 days), while cv. Charisma exhibited maximum

Table 9: Effect of gamma irradiation on number of florets in vase in different gladiolus varieties during postharvest studies.

Gamma dose Variety	I Year							II Year						
	Ctrl	30 Gy	40 Gy	50 Gy	60 Gy	70 Gy	Mean	Ctrl	30 Gy	40 Gy	50 Gy	60 Gy	70 Gy	Mean
Aldebran	9.00	8.33	8.00	8.33	8.00	8.33	8.33	9.67	9.33	9.33	9.00	9.00	8.67	9.17
American Beauty	11.00	10.67	10.00	8.00	8.00	9.00	9.44	14.00	13.00	11.33	12.00	10.67	10.00	11.83
Arka Amar	11.00	12.00	9.67	11.33	11.00	11.00	11.00	12.00	10.67	11.00	12.33	10.33	10.33	11.11
Arka Darshan	11.33	10.00	10.33	10.67	12.00	9.00	10.56	11.67	10.67	11.00	11.00	10.33	9.00	10.61
Arka Sapna	12.67	12.00	9.00	9.67	10.33	-	10.73	14.33	13.00	11.00	9.33	10.67	-	11.67
Arka Shobha	12.00	12.33	10.33	10.33	10.00	9.00	10.67	15.00	12.33	12.67	12.33	12.00	12.33	12.78
Arka Ayush	12.67	11.00	10.33	10.33	9.67	-	10.80	14.67	12.00	11.00	12.00	10.67	-	12.07
Big Time Supreme	10.33	9.33	9.67	9.67	9.33	-	9.67	9.00	8.33	9.33	9.00	8.67	-	8.87
Charisma	10.00	9.33	9.33	9.00	-	-	9.42	9.67	10.00	10.00	10.00	-	8.33	9.60
Dhanvantri	11.00	11.00	9.00	9.67	9.00	-	9.93	12.33	11.00	11.00	11.33	10.33	-	11.20
Flavour Souvenir	11.00	11.00	9.67	9.67	8.67	9.00	9.83	13.67	12.33	11.00	10.33	12.33	9.67	11.56
Fortuna	8.33	8.67	7.67	9.33	9.00	8.67	8.61	11.00	11.67	10.00	9.67	9.33	7.67	9.89
GS-2	9.67	8.67	8.33	8.33	7.33	7.67	8.33	9.67	9.00	9.67	9.67	8.33	7.67	9.00
Hunting Song	10.33	8.33	8.67	9.67	9.67	9.00	9.28	13.00	12.67	9.33	10.00	10.33	9.33	10.78
Novalux	13.00	12.67	11.33	11.00	9.33	-	11.47	13.33	12.67	11.67	11.00	10.33	9.33	11.39
Nathan Red	9.00	8.00	9.67	9.67	9.33	-	9.13	11.33	11.00	10.67	10.33	9.67	-	10.60
Priscilla	9.33	7.67	8.33	8.00	9.33	7.67	8.39	10.67	9.67	9.00	8.67	9.33	7.67	9.17
Pusa Manmohak	12.33	12.33	9.00	11.33	9.00	-	10.80	12.00	11.67	10.00	11.00	9.33	9.33	10.56
Peter Pears	10.67	10.67	10.00	9.00	9.00	-	9.87	11.33	11.00	10.33	9.33	9.33	8.67	10.00
Prince of Orange	11.33	10.67	10.67	8.67	8.33	8.33	9.67	12.00	11.00	10.67	9.00	-	-	10.67
Punjab Dawn	13.00	10.00	9.67	9.00	8.67	-	10.07	13.00	11.00	10.67	11.33	9.33	-	11.07
Punjab Glance	11.00	9.67	10.00	9.00	9.67	9.00	9.72	11.33	10.67	11.00	9.67	10.00	8.67	10.22
Shagun	10.00	9.00	9.67	9.33	9.33	-	9.47	10.67	9.67	10.00	9.33	8.67	-	9.67
Pusa Shubham	11.33	-	9.33	11.00	9.33	-	10.25	11.00	-	9.67	9.67	10.67	-	10.25
Pusa Suhagin	10.00	9.67	10.33	11.00	10.00	-	10.20	11.67	10.33	10.67	10.33	9.67	-	10.53
Red Majesty	13.00	12.00	10.00	10.00	10.00	10.00	10.83	12.67	11.67	10.33	9.67	10.33	10.67	10.89
Shubhangini	14.00	11.00	11.00	10.33	10.33	10.33	11.17	14.33	11.67	11.00	10.33	10.33	-	11.53
Suchitra	11.00	10.00	9.00	10.00	9.33	10.00	9.89	11.33	10.33	10.00	-	-	-	10.56
Tiger Flame	13.00	11.00	11.00	10.67	9.00	9.67	10.72	13.67	12.67	11.00	10.67	9.67	9.00	11.11
True Love	13.00	12.00	10.67	10.33	9.00	9.67	10.78	14.00	12.33	11.33	11.00	10.00	9.00	11.28
Vedio	9.33	9.33	8.67	-	-	-	9.11	11.00	11.00	11.00	10.67	-	-	10.92
Vinks Glory	8.67	8.00	7.67	7.33	-	-	7.92	9.00	8.33	8.00	8.00	-	-	8.33
White Prosperity	12.67	11.67	11.33	10.00	10.67	11.00	11.22	15.00	15.00	13.00	11.67	10.00	9.33	12.33
Yellow Stone	13.00	10.33	11.67	9.67	9.67	-	10.87	12.33	11.67	11.00	10.67	9.67	-	11.07
Mean	11.15	10.25	9.68	9.68	10.05	8.75		12.10	11.19	10.55	10.31	8.51	9.19	
C.D. (5%)														
T	0.27							0.25						
V	0.64							0.59						
T×V	1.56							1.44						
Ctrl: Control														

vase life during second year (2.66 days). Interaction effect during 1st year, maximum vase life of 2nd floret was obtained in 40 Gy with cv. Dhanvantri (3.67 days), whereas, during 2nd year, the combination of control with cv. Punjab Dawn produced maximum vase life (3.00 days).

Similarly, vase life of 3rd floret was maximum under control in both years (2.61 and 2.39 days, respectively)

Among varieties, during 1st year maximum vase life of 3rd floret was recorded in cv. Tiger Flame (2.61 days) while during 2nd year, observed in cv. American Beauty (2.50 days). Interaction effects during 1st year, maximum vase life of 3rd floret was exhibited with the interaction of Control with cv. American Beauty (3.00 days), Control with cv. Arka Amar (3.00 days), Control with cv. Shubhangini (3.00 days) and Control with cv. Nova Lux (3.00 days). Whereas, during 2nd year, interaction of 3rd

Table 10: Effect of gamma irradiation on number of florets open in vase in different gladiolus varieties during postharvest studies.

Gamma dose Variety	I Year							II Year						
	Ctrl	30 Gy	40 Gy	50 Gy	60 Gy	70 Gy	Mean	Ctrl	30 Gy	40 Gy	50 Gy	60 Gy	70 Gy	Mean
Aldebran	7.67	6.33	7.00	6.33	7.00	6.33	6.78	7.67	8.00	7.33	7.67	7.67	7.00	7.56
American Beauty	9.00	8.00	8.00	7.00	7.67	7.33	7.83	11.33	10.67	9.33	10.33	9.33	7.67	9.78
Arka Amar	9.00	8.33	7.67	8.33	9.00	8.00	8.39	10.00	9.00	9.67	11.00	8.33	9.00	9.50
Arka Darshan	7.67	7.67	8.00	8.33	9.00	7.00	7.94	9.33	9.33	9.00	9.00	9.00	7.67	8.89
Arka Sapna	9.00	9.00	7.00	7.33	7.33	-	7.93	12.00	10.67	9.33	8.33	8.33	-	9.73
Arka Shobha	9.00	9.00	8.33	8.33	8.00	7.00	8.28	11.67	10.00	10.00	9.67	9.67	9.00	10.00
Arka Ayush	9.33	8.00	7.67	7.67	7.00	-	7.93	10.67	10.00	9.33	9.67	8.33	-	9.60
Big Time Supreme	9.00	7.67	8.00	8.33	8.00	-	8.20	8.33	7.00	7.33	7.67	7.67	-	7.60
Charisma	9.00	8.00	8.00	7.67	-	-	8.17	8.00	8.00	8.33	8.00	-	6.67	7.80
Dhanvantri	9.33	8.67	7.33	8.33	7.67	-	8.27	10.00	9.67	9.00	9.33	8.67	-	9.33
Flavour Souvenir	9.00	9.00	7.67	7.67	7.00	7.33	7.94	10.33	10.00	9.67	9.00	10.00	8.00	9.50
Fortuna	7.33	7.67	6.67	8.33	8.00	7.67	7.61	9.00	9.33	8.33	8.00	8.00	7.00	8.28
GS-2	8.00	7.33	7.00	7.33	6.67	6.00	7.06	8.00	7.67	8.00	8.33	6.67	5.67	7.39
Hunting Song	9.00	7.33	7.33	8.67	8.33	8.00	8.11	11.00	10.33	8.33	9.00	9.00	8.00	9.28
Novalux	10.67	11.00	9.67	8.67	7.67	-	9.53	11.00	10.67	10.33	9.33	8.67	8.33	9.72
Nathan Red	8.00	5.67	7.67	8.33	7.33	-	7.40	9.67	9.00	9.33	9.33	8.67	-	9.20
Priscilla	7.67	6.33	7.67	7.33	8.33	6.67	7.33	9.67	8.67	8.00	7.67	8.33	6.67	8.17
Pusa Manmohak	10.00	10.00	7.33	9.00	8.00	-	8.87	10.33	10.00	9.00	9.67	8.33	8.00	9.22
Peter Pears	8.67	8.33	8.00	7.33	7.33	-	7.93	9.67	9.33	9.33	8.33	8.00	7.33	8.67
Prince of Orange	8.33	8.33	7.33	7.00	7.33	6.33	7.44	10.33	9.33	9.33	7.33	-	-	9.08
Punjab Dawn	11.33	8.33	8.00	7.00	7.00	-	8.33	11.00	9.33	9.00	9.67	8.67	-	9.53
Punjab Glance	9.00	8.00	8.33	8.00	8.33	7.33	8.17	9.67	9.33	9.67	8.67	9.00	7.33	8.94
Shagun	8.00	7.33	8.00	7.33	7.67	-	7.67	9.00	8.33	8.33	7.67	7.33	-	8.13
Pusa Shubham	10.00	-	8.00	9.67	8.00	-	8.92	9.67	-	8.33	8.00	9.33	-	8.83
Pusa Suhagin	8.00	8.00	8.33	9.00	6.67	-	8.00	10.00	9.00	9.00	8.67	7.67	-	8.87
Red Majesty	10.00	9.67	8.33	8.00	7.33	8.67	8.67	10.67	10.00	9.00	8.00	9.33	8.67	9.28
Shubhangini	10.67	9.00	8.33	7.67	7.33	8.33	8.56	12.00	10.67	9.67	9.33	9.33	-	10.20
Suchitra	9.00	7.67	7.67	7.67	6.67	8.33	7.83	10.00	9.00	8.33	-	-	-	9.11
Tiger Flame	11.00	10.67	8.33	9.67	7.67	8.00	9.22	11.67	11.00	9.00	9.00	8.67	7.67	9.50
True Love	10.33	9.33	9.00	9.00	6.67	7.67	8.67	11.33	10.67	9.67	9.67	9.00	8.00	9.72
Vedio	8.00	8.00	7.00	-	-	-	7.67	9.67	9.00	9.00	9.33	-	-	9.25
Vinks Glory	7.67	6.00	6.00	5.67	-	-	6.33	8.00	7.00	6.33	7.00	-	-	7.08
White Prosperity	10.67	9.33	9.00	8.33	9.00	9.00	9.22	12.67	12.67	10.00	9.67	8.33	7.67	10.17
Yellow Stone	10.33	8.33	9.33	7.33	7.33	-	8.53	10.67	10.33	9.00	9.00	8.00	-	9.40
Mean	9.08	8.22	7.85	7.93	8.15	7.11		10.12	9.48	8.90	8.80	8.53	7.65	
C.D. (5%)														
T	0.25							0.25						
V	0.59							0.59						
T×V	1.44							1.45						
Ctrl: Control														

floret was again obtained in Control with cv. American Beauty (3.00 days) (Table 8).

These findings corroborate earlier reports observed that vase life decreases with increasing gamma irradiation doses. Tiwari *et al.*, (2010) and Sisodia and Singh (2015) reported that higher doses adversely affect vase life due to disruptions in plant metabolism, flowering physiology and hormonal balance (Kim *et al.*, 2009). Additionally,

they discovered that the flowers had greater TSS and lower total free amino acid content than the untreated flowers (control group), which may have contributed to the flowers' longer vase life. Fjeld *et al.*, (1994) also observed enhanced the optimal irradiation level in cut roses.

Number of florets in vase

Maximum number of florets in vase was recorded

Table 11: Effect of gamma irradiation on percentage of florets opened in vase in different gladiolus varieties.

Gamma dose Variety	I Year							II Year						
	Ctrl	30 Gy	40 Gy	50 Gy	60 Gy	70 Gy	Mean	Ctrl	30 Gy	40 Gy	50 Gy	60 Gy	70 Gy	Mean
Aldebran	85.46	75.93	87.37	75.48	87.37	75.93	81.25	79.26	85.83	78.89	85.09	85.46	80.56	82.52
American Beauty	81.72	74.85	80.54	87.37	87.96	81.76	82.37	80.72	82.39	82.32	85.40	87.58	76.84	82.54
Arka Amar	81.72	69.76	78.70	73.22	81.97	73.15	76.42	83.26	84.44	88.08	88.89	80.37	86.97	85.33
Arka Darshan	67.68	76.84	77.59	78.23	74.88	77.59	75.47	79.87	87.71	81.72	81.72	86.97	85.46	83.91
Arka Sapna	70.94	74.88	77.59	75.91	70.91	-	74.05	83.65	82.17	85.05	89.10	78.18	-	83.63
Arka Shobha	75.10	72.86	80.37	80.91	79.87	77.59	77.78	77.86	81.20	78.85	78.46	80.94	72.86	78.36
Arka Ayush	73.81	72.58	74.82	74.82	72.59	-	73.72	72.92	83.47	84.80	80.69	78.33	-	80.04
Big Time Supreme	86.97	82.59	82.59	86.30	85.56	-	84.80	92.96	83.80	78.52	85.46	88.43	-	85.83
Charisma	89.93	85.56	85.56	85.09	-	-	86.54	82.59	79.87	83.33	79.87	-	80.09	81.15
Dhanvantri	85.30	78.94	81.76	86.30	85.46	-	83.55	80.98	88.08	81.72	82.32	84.24	-	83.47
Flavour Souvenir	82.02	81.72	79.26	79.26	81.02	81.30	80.76	76.19	80.98	87.83	86.97	80.98	82.59	82.59
Fortuna	87.96	88.43	86.90	82.96	89.17	88.33	87.29	81.72	80.05	83.57	82.59	86.07	91.67	84.28
GS-2	83.33	84.72	84.26	88.89	90.47	77.98	84.94	82.59	85.09	83.41	86.35	80.56	74.40	82.07
Hunting Song	87.41	87.96	84.50	89.56	86.14	88.80	87.39	84.55	81.62	89.26	84.24	87.27	85.56	85.42
Novalux	82.17	86.75	85.35	79.24	82.22	-	83.15	82.86	84.40	88.89	85.05	83.94	89.17	85.72
Nathan Red	89.17	69.97	79.26	86.30	78.52	-	80.64	85.35	81.72	87.58	90.30	89.63	-	86.92
Priscilla	82.50	82.74	91.67	92.13	89.17	87.50	87.62	90.61	89.63	88.80	88.33	89.26	86.90	88.92
Pusa Manmohak	80.98	81.24	81.76	79.29	88.80	-	82.41	86.29	85.98	89.93	88.08	89.17	85.83	87.55
Peter Pears	80.56	78.18	80.24	81.76	81.76	-	80.50	85.35	85.05	90.30	89.17	85.83	84.72	86.74
Prince of Orange	73.99	79.13	69.36	80.56	87.96	75.93	77.82	86.50	85.05	87.58	81.76	-	-	85.22
Punjab Dawn	87.12	82.90	83.11	78.74	80.83		82.54	84.55	85.05	84.24	85.18	92.96	-	86.40
Punjab Glance	81.72	83.11	83.61	88.80	86.53	81.39	84.19	85.35	87.58	88.08	89.63	89.93	84.17	87.46
Shagun	79.87	81.30	83.11	78.52	82.50	-	81.06	84.24	86.30	82.90	81.85	85.00	-	84.06
Pusa Shubham	88.13	-	85.83	88.08	85.56	-	86.90	88.08	-	86.14	82.59	87.78	-	86.15
Pusa Suhagin	79.87	82.96	80.37	82.02	66.77	-	78.40	85.61	86.97	84.43	83.64	79.26	-	83.98
Red Majesty	76.83	80.69	83.27	79.87	73.50	88.89	80.51	84.52	85.98	87.27	82.96	90.61	80.98	85.39
Shubhangini	76.27	81.72	75.91	74.55	70.91	80.93	76.71	83.81	91.33	88.08	90.30	90.19	-	88.74
Suchitra	81.72	76.16	85.09	77.21	71.67	83.57	79.24	88.38	86.97	82.90	-	-	-	86.08
Tiger Flame	84.55	91.16	76.47	79.80	85.46	82.96	83.40	85.35	86.75	82.53	84.24	90.00	85.09	85.66
True Love	79.79	77.91	84.24	87.96	75.09	79.80	80.80	81.06	86.32	85.35	88.08	89.93	88.80	86.59
Vedio	85.83	85.56	80.56	-	-	-	83.98	88.08	82.02	82.02	87.22	-	-	84.84
Vinks Glory	88.43	74.74	77.98	77.38	-	-	79.63	88.80	83.80	78.90	87.83	-	-	84.83
White Prosperity	84.05	79.80	79.88	82.90	84.44	81.97	82.17	84.54	84.09	76.83	82.65	77.58	81.85	81.26
Yellow Stone	79.61	80.91	80.08	75.61	75.93	-	78.43	86.65	88.55	81.72	84.93	83.41	-	85.05
Mean	81.84	80.14	81.44	81.67	81.32	81.41		83.97	84.86	84.47	85.18	85.51	83.40	
C.D. (5%)														
T	1.66							1.51						
V	3.96							3.59						
T×V	9.70							8.80						
Ctrl: Control														

under control (11.15 and 12.10, respectively) which was found statistically significant over all other treatments (Table 9). Varietal effect during 1st year, maximum number of florets in vase was recorded in cv. Nova Lux (11.47) while during 2nd year, observed in cv. Arka Shobha (12.78). Interaction effect during 1st year, maximum number of florets in vase was recorded in combinations of control with cv. Shubhangini (14.00). Whereas, during 2nd year, maximum was recorded in control with cv. White

Prosperity (15.00), 30 Gy with cv. White Prosperity (15.00) and control with cv. Arka Shobha (15.00) all of which were statistically at par. These findings are in agreement with the observations of Sisodia and Singh (2014) reported that the number of florets opening simultaneously was significantly affected by different gamma irradiation doses indicating that varietal response and radiation doses play important roles in regulating floret retention and opening behaviour.

Table 12: Effect of gamma irradiation on total water uptake (ml) in different gladiolus varieties during postharvest studies.

Gamma dose Variety	I Year							II Year						
	Ctrl	30 Gy	40 Gy	50 Gy	60 Gy	70 Gy	Mean	Ctrl	30 Gy	40 Gy	50 Gy	60 Gy	70 Gy	Mean
Aldebran	60.00	40.00	40.00	43.33	40.00	38.33	43.61	70.00	55.00	45.00	48.33	46.67	38.33	50.56
American Beauty	80.00	71.67	53.33	56.67	48.33	51.67	60.28	90.00	68.33	53.33	48.33	48.33	48.33	59.44
Arka Amar	68.33	48.33	46.67	43.33	36.67	36.67	46.67	70.00	55.00	50.00	53.33	43.33	40.00	51.94
Arka Darshan	63.33	55.00	40.00	51.67	46.67	31.67	48.06	65.00	58.33	50.00	51.67	51.67	38.33	52.50
Arka Sapna	56.67	55.00	40.00	46.67	50.00	-	49.67	58.33	60.00	43.33	51.67	40.00	-	50.67
Arka Shobha	70.00	68.33	63.33	53.33	53.33	45.00	58.89	75.00	66.67	63.33	55.00	51.67	46.67	59.72
Arka Ayush	68.33	63.33	50.00	46.67	48.33	-	55.33	66.67	61.67	48.33	50.00	45.00	-	54.33
Big Time Supreme	63.33	65.00	58.33	48.33	43.33	-	55.67	66.67	63.33	55.00	50.00	48.33	-	56.67
Charisma	68.33	58.33	55.00	48.33	-	-	57.50	65.00	56.67	55.00	46.67	-	43.33	53.33
Dhanvantri	55.00	45.00	45.00	46.67	46.67	-	47.67	56.67	51.67	50.00	50.00	40.00	-	49.67
Flavour Souvenir	65.00	50.00	53.33	60.00	50.00	46.67	54.17	70.00	63.33	56.67	50.00	50.00	40.00	55.00
Fortuna	76.67	58.33	50.00	50.00	55.00	41.67	55.28	78.33	65.00	61.67	53.33	60.00	40.00	59.72
GS-2	53.33	48.33	45.00	45.00	46.67	43.33	46.94	60.00	50.00	60.00	46.67	48.33	46.67	51.94
Hunting Song	73.33	70.00	45.00	50.00	55.00	36.67	55.00	85.00	76.67	55.00	50.00	58.33	41.67	61.11
Novalux	70.00	70.00	63.33	45.00	40.00	-	57.67	75.00	73.33	65.00	51.67	50.00	41.67	59.44
Nathan Red	48.33	55.00	48.33	43.33	40.00	-	47.00	56.67	53.33	50.00	45.00	40.00	-	49.00
Priscilla	66.67	61.67	55.00	41.67	38.33	43.33	51.11	70.00	63.33	58.33	45.00	45.00	43.33	54.17
Pusa Manmohak	68.33	61.67	50.00	41.67	43.33	-	53.00	71.67	63.33	51.67	46.67	48.33	38.33	53.33
Peter Pears	61.67	50.00	46.67	40.00	48.33	-	49.33	65.00	51.67	50.00	41.67	48.33	38.33	49.17
Prince of Orange	53.33	46.67	50.00	35.00	41.67	38.33	44.17	60.00	56.67	50.00	40.00	-	-	51.67
Punjab Dawn	63.33	51.67	56.67	46.67	45.00	-	52.67	65.00	56.67	55.00	48.33	38.33	-	52.67
Punjab Glance	50.00	38.33	41.67	33.33	38.33	45.00	41.11	58.33	46.67	43.33	40.00	38.33	36.67	43.89
Shagun	51.67	56.67	43.33	35.00	35.00	-	44.33	56.67	58.33	48.33	40.00	36.67	-	48.00
Pusa Shubham	65.00	-	61.67	50.00	48.33	-	56.25	61.67	-	58.33	46.67	45.00	-	52.92
Pusa Suhagin	58.33	53.33	41.67	36.67	40.00	-	46.00	70.00	56.67	45.00	43.33	40.00	-	51.00
Red Majesty	65.00	60.00	46.67	40.00	45.00	46.67	50.56	66.67	65.00	48.33	43.33	43.33	41.67	51.39
Shubhangini	70.00	56.67	45.00	60.00	48.33	36.67	52.78	71.67	56.67	48.33	61.67	55.00	-	58.67
Suchitra	35.67	30.00	38.33	40.00	43.33	35.00	37.06	41.67	36.67	40.00	-	-	-	39.44
Tiger Flame	61.67	60.00	50.00	53.33	38.33	41.67	50.83	75.00	58.33	46.67	40.00	38.33	36.67	49.17
True Love	51.67	46.67	51.67	40.00	36.67	35.00	43.61	60.00	50.00	53.33	43.33	38.33	35.00	46.67
Vedio	55.00	50.00	46.67	-	-	-	50.56	56.67	50.00	51.67	43.33	-	-	50.42
Vinks Glory	60.00	50.00	48.33	46.67	-	-	51.25	53.33	50.00	46.67	43.33	-	-	48.33
White Prosperity	70.00	58.33	48.33	50.00	48.33	40.00	52.50	75.00	80.00	53.33	53.33	46.67	36.67	57.50
Yellow Stone	65.00	51.67	53.33	50.00	43.33	-	52.67	63.33	53.33	51.67	45.00	48.33	-	52.33
Mean	62.13	54.69	49.17	46.01	47.64	38.60		66.18	58.54	51.81	47.47	45.92	40.61	
C.D. (5%)														
T	2.12							1.55						
V	5.05							3.70						
T×V	12.38							9.05						
Ctrl: Control														

Number of florets open in vase

During both years, maximum number of florets open in vase was recorded under control (9.08 and 10.12, respectively) significantly superior over all other treatments (Table 10). Varietal effect during 1st year, maximum number of florets open in vase was recorded in cv. Nova Lux (9.53) whereas, during 2nd year, maximum was recorded in cv. Shubhangini (10.20).

Significant effect was observed in the interaction of control with cv. Punjab Dawn (11.33) producing maximum number of florets open in vase during 1st year. While during 2nd year, maximum number of florets open in vase was recorded in the combinations of control and 30 Gy with cv. White Prosperity (12.67 each). These findings align with earlier reports with beneficial effect of lower doses of irradiation were reported to enhance the post-harvest life of cut roses (De *et al.*, 1997; Singh *et al.*, 2017). The

response suggests that low irradiation dose may stimulate physiological processes that promote synchronized floret opening, whereas higher doses caused adverse effects.

Percentage of florets opened in vase

Significant observation was recorded maximum percentage of florets opened in vase with control (81.84%) whereas, during 2nd year, maximum was recorded in 60 Gy (85.51%) (Table 11). Among varieties, during 1st year, maximum percentage of florets opened in vase was recorded in cv. Priscilla (87.62%) while 2nd year, cv. Priscilla again recorded the maximum percentage (88.92%). Interaction effect during 1st year, highest percentage of florets opened in vase was observed in treatment combination of 50 Gy with cv. Priscilla (92.13%). During 2nd year, maximum percentage of florets opened in vase was recorded in control with cv. Big Time Supreme (92.96%) and 60 Gy with cv. Punjab Dawn (92.96%). The results are in close conformity with findings of Anu *et al.*, (2003) and Singh *et al.*, (2017) who reported that lower doses of gamma irradiation in different varieties of tuberose enhanced vase life of cut spikes and reduced at higher doses of gamma rays. In a study, differentiation of the conductive tissues increased as kinetin and gibberellins concentration increased. The flower spike elongated and differentiation of the individual flower occurred as a result of low doses of gamma irradiation in gladiolus.

Water uptake

Total water uptake by gladiolus spikes was significantly influenced by gamma irradiation doses, varietal differences and their interactions during both years of evaluation (Table 12). Among gamma doses, control resulted in maximum uptake of water during both years (62.13 ml and 66.18 ml, respectively). Among varieties of gladiolus during 1st year, cv. American Beauty resulted in maximum water uptake in vase (60.28 ml). During 2nd year, cv. Hunting Song resulted in maximum water uptake (61.11 ml). Interaction effect of during 1st year, the combination of control with cv. American Beauty (80.00 ml) resulted in maximum water uptake. During 2nd year, combination of control with cv. American Beauty resulted with maximum uptake of water in vase (90.00 ml). The life processes of cut flowers are sustained by reserve nutrients that have been accumulated in the form of proteins, lipids and carbohydrate (Jain *et al.*, 2021). Differences in genetic makeup among cultivars likely contributed to the observed variability in water uptake. The present findings are in conformity with the earlier findings of Pandey *et al.*, (2012), Kadam *et al.*, and (2014) Rawat *et al.*, (2024), who noted similar genotypic

differences in post-harvest water relations. Lower gamma irradiation is reported to be less destructive to plant cells, preventing cellular collapse and maintaining membrane integrity, thereby enhancing water uptake (Buanong and Kanlayanarat, 2010). Conversely, higher irradiation doses can cause tissue dehydration, cellular shrinkage and impaired vascular function, ultimately reducing water absorption. The results are in congruence with the observations of Hayashi and Todoriki (1996) in chrysanthemum and Sisodia and Singh (2014) in gladiolus, who also reported reduced water uptake under higher irradiation levels.

Conclusion

Gamma irradiation significantly influenced the post-harvest quality of gladiolus, with the control (0 Gy) consistently showed than irradiated treatments for spike length, water uptake, floret opening and vase life during both years of experimentation. Higher doses (70 Gy) adversely affected most of the parameters, while considerable varietal differences and gamma irradiation interactions were observed. Some cultivars such as White Prosperity, Priscilla, Shubhangini and American Beauty showed comparatively better post-harvest performance. Overall, lower doses showed that useful variation, but excessive irradiation reduces post-harvest quality. The study highlights the potential of induced mutagenesis for identifying promising gladiolus variants with improved vase life attributes.

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