The Pharma Innovation Journal 2023; 12(9): 2586-2588

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(9): 2586-2588

www.thepharmajournal.com
Received: 28-07-2023
Accepted: 27-08-2023

Harshpreet Singh
Student of MSc, Department of Floriculture and Landscape Architecture, Mata Gujari College, Fatehgarh Sahib, Punjab, India

Dr. Jujhar Singh
Department of Agriculture, Mata Gujari College, Fatehgarh Sahib, Punjab, India

Corresponding Author:
Harshpreet Singh
Student of MSc, Department of Floriculture and Landscape Architecture, Mata Gujari College, Fatehgarh Sahib, Punjab, India

Effect of Gamma Irradiation on production of tuberose Var. Mexican single

Harshpreet Singh and Dr. Jujhar Singh

Abstract
The present research ‘‘Studies on Effect of gamma irradiation on Tuberose (*Polianthes tuberosa* L.) var. Mexican Single’’ was carried out at Experimental Farm, Department of Agriculture, Mata Gujri College, Fatehgarh Sahib, Punjab during summer season 2022-2023. The experiment was laid out in randomized block design with seven treatments such as no- gamma irradiation, 7 gy, 14 gy, 21 gy, 28 gy, 35 gy and 42 gy and the treatments were replicated thrice. Results indicated that lower dose of 7 gy of gamma irradiation show positive result on growth of Tuberose variety Mexican single. As the dose of gamma irradiation increases it affect the vegetative characteristics of tuberose. Early bulb sprouting was observed in 7 gy of gamma irradiation. Maximum plant height, plant canopy, maximum number of leaves were recorded in lowest dose (7 gy) of gamma irradiation Flowering characteristics like days to spike initiation and days taken to opening 1st floret was increased with increases doses of gamma irradiation. Early spike initiation, days taken to opening 1st floret, maximum number of florets/spike and maximum number of spikes/plot was recorded in 7gy of gamma irradiation.

Keywords: Tuberose, gamma irradiation, mutation

Introduction
India's tropical and subtropical regions are home of tuberose (*Polianthes tuberosa* L.). (Trublood, 1973) [16]. It belongs to the family Amaryllidaceae and commonly called Rajanigandha in Bengali and Gulcheri in Hindi. Single, semi-double, double, and variegated varieties of tuberose most widely grown in India. The single-row tuberose has a stronger fragrance than the double-row variety and it is also used in the cosmetics and perfume industries. (Abraham and Desai, 1976) [1]. Tuberose requires both conventional and unconventional breeding methods, and well-planned breeding programs. Due to self-incompatibility, conventional breeding techniques using hybridization in tuberose are limited. (Sreethramu *et al*., 2000) [14]. Various improved tuberose cultivars have been developed through selection, hybridization and mutation breeding. Therefore, it is a large scope of non-conventional breeding methods such as mutation breeding. Mutation breeding is an effective and valuable method. The diversity of biological organisms can be increased by using mutation techniques. It is to be expected that mutations may result in floret color changes because the tuberose leaf bases, particularly crown leafy, contain carotenoid pigments. (Navabi *et al.*, 2016) [10]. Mutation breeding is the most common method used to create mutant cultivars in flower crops, accounting for 90% of the types that are produced, including 22% that are X-ray and 64% that are gamma ray tolerant (Jain, 2005) [5]. Physical mutagens, such as UV light (X-rays, neutrons, and gamma rays) and ionising radiation as well as a number of chemical agents, are well-known examples of mutagens that are highly competent in causing mutation in animals, plants, and microbes. The benefits of physical mutagens include accurate fair repeatability, dissymmetry, greater and uniform penetration of multicellular methods, especially by gamma irradiation. Gamma rays have produced a greater number of beneficial mutants (Predieri, 2001) [11] and continue to exhibit a larger potential for improving vegetatively propagated plants.

Materials and Methods
The experiment entitled ‘‘Effect of gamma irradiation on Tuberose var. Mexican single” was carried out during March 2022- May 2023 at Research Farm of Mata Gujri College, Fatehgarh Sahib, Punjab. Field of experimental site lies at 30.6435° North latitude and 76.3970° East longitudes. The altitude of the location is 246 meter above the mean sea level. The bulb of Mexican single was treated with gamma rays at 7g y, 14 gy, 21 gy, 28 gy, 35 g

and 42 gy in gamma chamber, at PAU, Ludhiana during 19 March 2022. And gamma rays treated bulbs replicated thrice with seven treatments in Randomized Block Design (RBD).

Results and Discussion

It is evident from the table 1 that the different treatments of gamma irradiation influenced significantly on days taken to sprouting of tuberose. The late sprouting was observed in T_7 (93.31 days) i.e. 42 gy which was statistically inferior. It is due to that higher doses cause the severe cell damage, cellular components and genetic materials which causes late sprouting. Similar result was also found by Kainthura *et al.* (2016) [6] in Tuberose. While in T_2 (59.04 days) i.e. 7 gy of gamma irradiation resulted in early sprouting which was statistically at par with T_3 (60.12 days) i.e.14 gy, T_1 (62.28 days) i.e. No gamma irradiation used, T_7 (66.74 days) i.e. 42 gy and T_4 (67.55 days) i.e. 21gy because lower dose of gamma rays increases the metabolism activities and stimulate sprouting of tuberose bulbs (Misra and Bajpai, 1983) [9]. Regar *et al.* (2022) [12] found similar results that slight earliness in sprouting of tuberose bulbs when bulbs treated with lower doses of gamma rays. Maximum plant height was recorded in T_2 (36.28 cm) i.e. 7 gy of gamma irradiation which was statistically at par with treatment T_1 (32.17 cm) i.e.no gamma irradiation used. It is due to that low doses of gamma irradiation increase the metabolism activities in plants and helps in the synthesis of endogenous growth regulators which helps in increase the plant height of tuberose. Similar result was observed by Abraham and Desai (1976) [1] in Tuberose. Maximum plant canopy and maximum number of leaves was recorded in lowest dose of gamma irradiation T_2 (30.29 cm) and T_2 (20.25 cm) i.e. 7 gy which was statistically at par with no gamma irradiation. It is due to the found that the low doses of gamma irradiation increase auxin synthesis in plants and increase the cell division which results in maximum plant canopy and leaves of tuberose. According to Ali (2002) [3], low radiation intensity produced superior results as compared to high radiation intensity in terms of growth characteristics.

Flowering parameters shows that early spike initiation was recorded with T_2 (272.07 days) i.e. 7 gy dose of gamma irradiation which was statistically superior. This is due that gamma irradiation at low dose helps in synthesis of auxin which promotes the cell division in plants. Similar outcomes was observed by Kutty *et al.* (2020) [7] in tuberose. Maximum number of florets/spikes was observed in T_2 (40.66) i.e. 7 gy which was at par with T_1 (37.77) i.e. no gamma irradiation used, T_3 (36.33) i.e. 14 gy and T_4 (33.78) i.e. 21gy. It is due to that low doses helps in increase the plant growth, hence promote the number of florets on spike of tuberose. Similar outcomes were found by Kainthura and Srivastava (2015) [6] in tuberose. Maximum number of spikes/plot was found in T_2 (47.67) i.e. 7 gy which was statistically at par with T_1 (46.33) i.e. no gamma irradiation. The number of spikes was increased with low doses of gamma irradiation. Because lower doses of gamma irradiation help in slightly increasing of photosynthetic activities in plants, hence due to that maximum number of spikes/plot was observed in tuberose. Similar outcomes were noticed by Kainthura and Srivastava (2015) [6] in tuberose.

Table 1: Different treatments of gamma irradiation influenced significantly

Treatments	Days to bulbs sprouting	Plant height (cm)	Plant canopy (cm)	Leaves per plant	Days to spike initiation	Number of florets/spike	Number of spikes/plot
T_1 no gamma irradiation	62.28	32.17	25.86	17.36	287.63	37.77	46.33
T_2 7gy	59.04	36.28	30.29	20.25	272.07	40.66	47.67
T_3 14gy	60.12	28.28	21.67	12.62	290.97	36.33	42.67
T_4 21gy	67.55	23.96	18.71	11.32	287.30	33.78	29.00
T_5 28gy	69.55	15.81	13.07	8.49	308.50	24.00	27.33
T_6 35gy	66.74	8.94	7.99	4.67	397.10	22.89	17.00
T_7 42gy	93.31	4.17	3.67	2.83	407.83	17.77	12.33
Sem±	2.98	2.37	2.28	1.58	1.11	2.28	1.04
CD (0.05)	9.17	7.31	7.03	4.86	3.42	7.03	3.22

Conclusion

From the above study it is concluded that Gamma rays at lowest dose of gamma irradiation (7 gy) is best for growing of tuberose var. Mexican Single. Because 7 gy of gamma irradiation improves the vegetative and flowering parameters of tuberose.

Acknowledgement

I am very thankful to my research advisior Dr. Jujhar Singh, and my friend Puneet kaur to support me during my research.

References

1. Abraham V, Desai BM. Radiation induced mutants in tuberose. Indian Journal of Genetics and Plant Breeding. 1976;36(3):328-331.
2. Abhangrao AK, Yadlod SS, Manisha D. Effect of physical mutagens on reproductive and flowering characters of tuberose (*Polianthes tuberosa* L.). International Journal of Current Microbiology and Applied Sciences. 2020;11:1284-1291.
3. Ali J. Effect of gamma irradiation on vegetative and floral characteristics of tuberose corms (*Poliathes tuberosa* L.) var. Single. Faizabad (Pakistan). UAF; c2002. p. 90
4. Gupta MN, Jugran HM. Mutation breeding of chrysanthemum. Journal of Nuclear Agriculture and Biology. 1978;7(2):50-54.
5. Jain SM. Major mutation-assisted plant breeding programs supported by FAO/IAEA. Plant cell Tissue and Organ Culture. 2005;82:113-123.
6. Kainthura P, Srivastava R. Induction of genetic variability and isolation of mutants in tuberose (*Polianthes tuberosa* L). Tropical Agricultural Research. 2015;26(4):721-732.
7. Kutty NN, Ghissing U, Kumar M, Maiti MK, Mitra A. Intense Floral Scent Emission in *Polianthes tuberosa* L. (Tuberose) Variant Sprouted from γ –Irradiated Tubers. Journal of Plant Growth Regulation. 2020;39(1):112-121.

8. Kaintura P, Srivastava R, Kapoor M. Effect of physical and chemical mutagens on different cultivars of tuberose (*Polianthes tuberosa* Linn.) with particular reference to induction of genetic variability. International Journal of Agriculture Sciences. 2016;8(15):1257-1260.
9. Misra RL, Bajpai PN. Effects of mutagens on shooting, leaf number, heading, plant height and spike length in gladioli. Indian Journal of Horticulture. 1983;40:107-111.
10. Navabi Y, Norouzi M, Arab M, Daylami SD. Mutagenesis via exposure to gamma-rays in tuberose (*Polianthes tuberosa*). Electronic Journal of Biology. 2016;12(2):168-172.
11. Predieri S. Mutation Induction and Tissue Culture in Improving Fruits. Plant Cell Tissue Organ Culture. 2001;64:185-210.
12. Regar AL, Mahawer LN, Bairwa RS, Sharma H, Kumar S, Jat L, *et al*. Response of gamma irradiation on vegetative parameters of tuberose (*Polianthes tuberosa* L.) cv. Pearl Double. The pharma Innovation Journal. 2022;11(6):753-756.
13. Raghava SPS, Negi SS, Sharma TVRS, Balakrishnan KA. Gamma ray induced mutants in gladiolus. Journal of Nuclear and Agriculture Biology. 1981;17(1):5-10.
14. Sreethramu GK, Bhat RN, Ranjanna KM. Studies on pollen viability, pollen germination and seed germination in tuberose hybrids and cultivars. South Indian Horticulture. 2000;48(1):78-82.
15. Singh VN, Banerji BK, Dwivedi AK, Verma AK. Effect of gamma irradiation on African marigold (*Tagetes erecta* L.) cv. Pusa Narangi Gainda. Journal of Horticulture Science. 2009;4(1):36-40.
16. Trublood EWE. Omixocht the tuberose (*Polianthes tuberosa* L.). Economic Botany. 1973;27:157-173.