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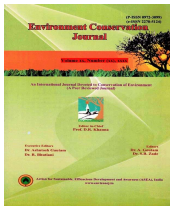

Impact of gamma irradiation on vegetative growth of Gladiolus cv. White prosperity

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ABSTRACT

The present research was carried out at Experimental Farm, Department of Agriculture, Mata Gujri College, Fatehgarh Sahib, Punjab during winter season of 2020-21. The experiment was laid out in randomized block design with seven treatments (Control, 20gy, 40gy, 60gy, 80gy, 100gy and 120gy) and the treatments were replicated thrice. From the experiment it can be concluded that the lower dose (20gy) of gamma irradiation show positive result on growth i.e. maximum plant height (90.03 cm), size of leave (28.44 cm) and take less number of days to sprout (12.65 days) and flowering of Gladiolus cultivar White Prosperity. As the dose of gamma irradiation increases (60gy-120gy), it affect the vegetative characteristic like days taken to sprouting, plant height, number of leaves, size and length of longest leaf, it reduces with the dose increase, but it has no effect on number of sprouts/corm and on size of corm.

Introduction

Gladiolus is a glamorous flower and known for its perfection and known as Queen of the bulbous plants due to its magnificent spikes containing massive form of florets, elegant florets of different shade, attractive shapes, varying in size and marvelous vase life. It is very important ornamental commercial flower cultivated in various parts around the world and most diverse in South Africa, where they originated. Botanically gladiolus belongs to family Iridaceae and propagated through underground corms. Gladiolus improvement through breeding began in England around the beginning of the 18th century. Plant breeding program set a main goal to form variability and to choose the leading recombinants possessing desirable features. Because variations occurred in phenotypic features like Chlorophyll variation in leaves, shade of bloom, shape or size can be easily recognized. Mutation breeding has been successful in ornamental plants. Artificial mutations are used exclusively in mutation breeding. Induced Mutation could be one of the methods for creating hereditary variability.Colchicine therapy, recurrent irradiation, ion beam technology, combined treatment split dosage, space breading, and other unique treatment techniques have been wisely chosen for the effective advancement of novel cultivars (Datta 2012).Gamma rays have shown to be the most successful method of induced mutation, resulting in the creation of one of the many new decorative varieties.

Material and Methods

Present research was carried out during October-March (2020-2021). Experiment was conducted at Research farm, Mata Gujri College, Fatehgarh Sahib, Punjab. Land was brought to a good tilth with the help of plougher and then levelling. Well

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decomposed farm yard manure incorporated in the field at the time of bed preparation. The experiment was laid out in Randomized Block Design (RBD) with three replications. During the month of October, after treatment with gamma rays in the gamma chamber at a distance of 30×30cm, the uniform size (3-5cm) of corms was placed in the beds. Corms of white prosperity variety were exposed to various gamma doses i.e. 20, 40, 60, 80, 100 and 120gy. Total number of plots were 21 and size of each plot was 2×2m and number of plants per plot was 16.

Results and Discussion

Most of the plants who propagated vegetatively and no variation found in them because they are identical to mother plant can also be brought into change with mutation breeding and gladiolus is one of them. Although many varieties in gladiolus created through mutation breeding and gamma rays found to be an effective mutagen among others. Gladiolus is famous for its elegant attractive spike and long lasting keeping quality and that's why cultivated commercially in various regions of India and in foreign countries. Mutation breeding bring change in flower color, size and shape of the plant and create variations in leaves. So on that account present research carried in the Department of Agriculture.Most of the growth parameters significantly influenced because of the application of gamma irradiation at different levels in corms of gladiolus. Numerous doses of gamma irradiation affected the days to sprouting and gave significant results in sprouting. Early sprouting showed in control and 20gy gamma dose. Late sprouting recorded in higher doses (80gy-100gy), as the level of dose increases, the corm takes more time to sprout but it failed to exert any effect on number of sprouts per corm. Less number of sprouts found at higher dose (120gy). An amazing results of gamma dose 20gy found in the number of leaves per corm. Significant results found among various doses of gamma irradiation and also in leaf length and size significant results to be brought because of radiation. As the dose increases the length and especially the width of the leaf decreases and therefore size of leaf is influenced due to application of gamma irradiation.Early sprouting did not respond well to various doses of mutagens, although physical mutagens have an impact on enzyme activity. Enzymes play an important role in numerous plant metabolism processes, resulting in plant growth stimulation, with several growth parameters increasing as gamma irradiation levels increased (Xing *et al*. 2011 on *Catharanthus roseus*, Sahariya *et al*. 2017 on *Gladious hybridus*). Auxin has been shown to play a role in plant development. Growth is stimulated by changes in auxin levels, probably due to inactivation of auxin or destruction of enzymatic activity or due to secondary physical damage, reduction in mitotic activity & chromosomal damage occur or suppression of auxin synthesis (Sathyanarayan *et al*. 2019). At lower doses of gamma irradiation, various growth parameters increased; however as dose of gamma irradiation increased, they decreased. It could be related to increased gibberellins enzyme activity and auxin disappearance of inhibitors, and it could be due to some enzyme activities. The current findings are also experimentally corroborated by previous findings (Kakri *et al*. 2010). Height of plant, leave length and number may have decreased as a result of a drop in the number of vertical cell layers, which resulted in shorter internodes, or a combination of these events. The morphological findings of this experiment corroborated with Patil *et al*. (2010), Singh and Kumar (2013) findings, which stated that most of the growth features were stimulated at lower dosages of gamma radiation. Higher dosages of gamma rays were not shown to be effective in improving plant development in different gladiolus cultivars while lower doses (2 and 3kR) can be effected.

Various researchers found that gamma rays have a significant impact on Gladiolus and other ornamental plants′ growth characteristics. A research conducted by Sathyanarayana *et al*. (2019) on cultivars of *Gladiolus grandiflorus* L. viz. Summer Sunshine, Candy Man, Saffron, Dull Queen and American Beauty, treating corms with gamma rays at 15, 25, 35, 45 and 55gy doses. Cultivars Candy Man and Saffron were found to be influenced by gamma doses. These two kinds have a higher mortality rate than the others. Patil (2011) conducted a detailed investigation on 3 cvs. Eurovision, Nova lux and American beauty in order to create genetic variability. Gamma radiation from

Table 1- Effect of gamma irradiation on different vegetative parameters of Gladiolus cultivar White Prosperity

Treatment doses	Days to sprouting	Plant height (cm)	Number of sprouts per corm	Number of leaves per corm	Length of longest leaf (cm)	Size of longest leaf (cm)
T_1 (Control)	12.50	76.35	1.66	7.98	54.03	28.00
T_2 (20gy)	12.65	90.03	1.47	7.96	54.68	28.44
T_3 (40gy)	13.57	61.46	1.51	6.74	45.70	23.73
T_4 (60gy)	14.43	64.58	1.67	6.94	47.50	24.61
T_5 (80gy)	18.00	41.17	1.42	5.49	37.49	18.48
T_6 (100gy)	14.24	36.42	1.61	5.17	33.65	17.27
T_7 (120gy)	17.78	24.17	1.22	4.86	24.17	12.41
SEm±	0.97	3.84	0.12	0.40	1.87	1.01
$CD_{(0.05)}$	3.00	11.83	NS	1.23	5.75	3.12

1-7kR was used to treat corms. Treatments ranging from 1-3kR of gamma dosages were too low to have an unfavorable impact, and in some cases were even demonstrated stimulating, whereas treatments ranging from 4kr and beyond lowered and slowed most Gladiolus vegetative measures.

Due to doses of gamma rays plant height was affected in the current investigations (Table1). As the doses of gamma irradiation increased, so did the reduction in leaf width. Inhibition or delay in mitosis is thought to be primary cause of growth of plant, leaf size and other vegetative characteristics. The similar thought was expressed by Singh and Kumar (2013), Kumari and Kumar (2015), Sahariya *et al*. (2017). Auxin and DNA synthesis are likely to be involved. The presented experiment findings are likewise consistent with observation of Tiwari *et al*. (2010) who noticed that applying gamma doses to the Gladiolus resulted in lower plant height and shorter leaf length and width. They also discovered that as gamma irradiation doses increased, plant growth in gladiolus declined; however, in the current study, plant height grew at lower doses and decreased at higher doses of gamma rays. Singh and Kumar (2013), Tiwari *et al*. (2018) used gamma doses to treat gladiolus corms and then planted them, finding that different gamma dosages resulted in narrow leaves. At large levels of gamma irradiation, this effect became more pronounced. These findings near to the finding on Gladiolus by Sisodia *et al*. (2015), who found that higher doses of gamma rays resulted in reduced plant growth and a reduction in leaf size in Gladiolus.

Conclusion

The present study concludes that gamma irradiation at a lower dose (20 gy) has a good effect on Gladiolus cultivar White Prosperity growth and flowering. As the dose of gamma irradiation increases, it affects the growth characteristic like height, size of leaf, days to sprout etc.

Conflict of interest

The authors declare that they have no conflict of interest.

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