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Genetic Variability in Gerbera (*Gerbera Jamesonii* Bolus Ex Hooker F.) Through Gamma Radiation

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Abstract: *The Suckers of nine gerbera varieties namely RCGH-12, RCGH-22, RCI-12, RCI-18, RCI-7, RCI-19, RCGH-117, RCGH-38, and RCI-10 were exposed to gamma rays treatments (0.5 and 1.5 Kr; Source CO^{60}).These gamma irradiated suckers along with untreated suckers were planted under low cost polyhouse. The radio-sensitivity of these varieties was determined on the basis of various morphological characteristics of the treated plants. The findings indicated that gamma radiation treatment 0.5 Kr had significantly better effect on flower stalk length, flower duration and number of flowers per plant per year whereas higher dose i.e. 1.5Kr was detrimental for floral characters in all varieties studied.*

Keywords: *Gerbera, Gamma rays*

INTRODUCTION

Gerbera (*Gerbera jamesonii* Bolus ex Hooker F.) is very popular and widely used as a decorative garden plant or as cut flower. It is ideal for growing in beds, borders, pots and rock garden. Cut gerberas have a long vase life and are suitable for different floral arrangement. Gerbera can be propagated by both sexual and asexual methods. Seed propagation, however is not satisfactory. It is a diploid species with the somatic chromosome number $2n = 50$. The modern gerbera arose from *G. jamesonii* hybridized with *G. viridifolia* and possibly other species (Leffring 1973). There is a wide range of variation available in this crop. Collection of germplasm and the search for desirable cultivars are of utmost importance in practical flower crop breeding.

There is always a craze for developing new varieties by replacing older varieties with newer ones. Since in flowers a specimen cannot maintain interest for a long time, people have the desire to develop newer forms through various methods of breeding. The possibilities of mutation breeding in vegetatively propagated species are favourable in general for various reasons such as the usually large heterozygosity of the material which allows direct detection of mutations in the irradiated material. In the vegetatively propagated material in which the intention is often improvement in visible characteristics, selection of potentially useful mutations is generally easy (Broertjes, 1968). The main advantage of mutagenesis in gerbera is the ability to change one or a few characters of an excellent variety without changing rest of the genotypes. The present study was aimed to ascertain the radio- sensitivity of nine gerbera varieties as well as to induce somatic mutations.

MATERIALS AND METHODS

The experiment was conducted at Model Floriculture Center of Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, district Udham Singh Nagar, Uttarakhand during 2009 and 2010. The experimental material comprised of the uniform sized suckers of the 9 gerbera varieties *viz*;

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RCGH-12, RCGH-22, RCΓ-12, RCΓ-18, RCΓ-7, RCΓ-19, RCGH-117, RCGH-38, and RCΓ-10. These suckers were exposed to 0.5 and 1.5 Kr of gamma rays doses at gamma chamber facility of NBRI, Lucknow. The gamma irradiated suckers along with the untreated suckers were planted in low cost polyhouse using factorial control randomized block design with three replications. Twenty suckers per variety were exposed to radiation treatment @ 10 suckers per treatment. All the recommended package of practices were followed throughout the year. The data were recorded on growth and flowering parameters and statistically analyzed (Table 1).

RESULTS AND DISCUSSION

Table 1 reveals that all the floral characters significantly affected by gamma radiation treatments among all gerbera varieties studied. Suckers treated with 0.5 Kr of γ-rays exhibited maximum flower diameter similarly treatment T_2 *i.e.* suckers treated with 1.5 Kr of γ-ray treatment recorded minimum flower diameter. Among the variety minimum flower diameter observed in variety RCΓ-10(6.90 cm) whereas variety RCGH-22 had maximum flower diameter (9.43cm).0.5 Kr g-rays treated corms recoded maximum flower stalk length (37.42cm).Varietal differences on flower stalk length exhibited maximum flower stalk length in Variety RCGH-22 (53.21 cm). Misra (1990) in dahlia reported an increase in floral parameters after 0.5 Kr treatment.

A perusal of the data reveals that untreated plants took less time for first floret opening. Plants raised from suckers treated with 1.5 Kr of γ-rays (T_2) took maximum number of days for first floret opening. Among the varieties variety RCΓ-10 took minimum number of days for first floret opening (9.94 days) while variety RCΓ-19 recorded maximum days to first floret opening (18.27 days). Plants treated with 0.5 Kr of gamma rays maintained freshness for maximum duration (14.33 days) whereas 1.5 Kr γ-rays treatment exhibited shortest flower duration (9.81 days). Among the different varieties irrespect of γ-rays treatment doses, variety RCGH-22 maintained freshness for maximum duration. The results obtained by Dilta *et al.* (2003) in chrysanthemum who observed an increase in number of days taken for bud formation were taken by gamma rays treated plants as compared to control. Increase in floret longevity at lower doses of gamma rays but decreased with higher doses of gamma rays were recorded by Srivastava and Singh (2002) in gladiolus.

Maximum numbers of flowers per plant per year were recorded by plants with 0.5 Kr γ-rays treatment (27.40) while Plants treated with 1.5 Kr of γ-rays exhibited minimum number of flowers per plant per year (16.38). Varietal differences on number of flowers per plant per year exhibited maximum number of flowers per plant per year in Variety RCGH-12 and minimum in variety RCGH-117. Similar results reported by Dwivedi and Banerji (2008) in dahlia cv. 'Pinki'.

RCGH-38(1.5Kr) **RCΓ-12(1.5Kr)**

Figure 1: Morphological variations in different varieties of gerbera

Table 1
Effect of gamma rays on floral characters of gerbera varieties.(Pooled over two years)

Parameters	*Flower diameter (cm)*				*Stalk length (cm)*				*Days to first floret opening (days)*				*Flower duration (days)*				*Number of flowers/ plant/year*			
Variety	T_0	T_1	T_2	*Mean*	T_0	T_1	T_2	*Mean*	T_0	T_1	T_2	*Mean*	T_0	T_1	T_2	*Mean*	T_0	T_1	T_2	*Mean*
RCGH-12	9.21	9.46	8.73	9.13	50.23	51.43	49.46	50.37	14.50	15.16	17.50	15.72	15.33	16.33	11.50	14.38	33.16	34.50	22.66	30.11
RCGH-22	9.50	9.85	8.96	9.43	53.13	53.91	52.58	53.21	15.50	15.83	18.33	16.55	17.66	18.50	12.50	16.22	32.66	33.33	21.16	29.05
RCG-12	8.06	8.40	7.60	8.02	35.33	36.43	34.38	35.38	12.66	13.33	18.00	14.66	12.16	12.50	11.16	11.94	27.83	28.66	17.33	24.61
RCG-18	8.33	8.70	7.86	8.30	32.98	34.45	32.11	33.18	14.16	14.33	19.16	15.88	15.33	16.16	11.83	14.44	31.00	31.33	21.00	27.77
RCG-7	7.48	7.95	7.08	7.50	29.43	30.53	28.68	29.55	11.83	12.50	15.16	13.16	11.33	11.18	7.16	10.11	25.16	26.16	15.33	22.22
RCG-19	8.46	8.98	7.93	8.46	37.78	38.75	36.48	37.67	16.83	17.16	20.83	18.27	14.16	14.83	9.66	12.88	26.50	27.83	15.83	23.38
RCGH-117	7.08	7.46	6.68	7.07	32.90	33.90	31.60	32.80	14.16	15.00	16.33	15.16	11.33	13.16	7.00	10.50	18.83	19.50	9.66	16.00
RCGH-38	8.93	9.33	8.43	8.91	24.75	25.46	23.75	24.65	13.16	13.83	17.16	14.72	15.00	16.50	11.33	14.27	21.16	21.50	11.83	18.16
RCG-10	6.90	7.28	6.51	6.90	31.23	31.90	30.03	31.05	8.33	8.83	12.66	9.94	8.66	9.16	6.16	8.00	23.33	23.83	12.66	19.94
Mean	8.22	8.60	7.76	8.19	36.42	37.42	35.45	36.43	13.46	14.00	17.24	14.90	13.44	14.33	9.81	12.53	26.62	27.40	16.38	23.47
CD at 5%																				
Treatment		0.046				0.083				0.169				0.223				0.254		
Variety		0.080				0.145				0.294				0.387				0.440		
Interaction		0.139				0.251				0.509				0.671				0.762		

T_0 = Control
T_1 = 0.5 Kr
T_2 = 1.5Kr

The differences in the radio sensitivity of the cultivars may be due to the effect of genotypes. However, the stimulatory effects observed may be due to acceleration in the release of certain enzymes or the biological compounds from its bound form to scavenge or due to enhanced biosynthesis of ascorbic acid and sulfhydryl compounds (Khan, 1974). The cause of inhibitory effect can be attributed to the fact that biochemical active substances after a certain dose level may form certain toxic substances (Gordon, 1956) which may cause death of the cells ultimately resulting in the death of the plants. Higher dosages cause harmful effects on auxin and other growth substances, chromosome and cell division therefore, such deleterious effects were observed. In spite of this, mutation can be used as a method of breeding in addition to the existing conventional methods to generate genetic variability for the improvement of gerbera.

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