International Journal of Advanced Biochemistry Research 2024; 8(4): 521-524

International Journal of Advanced Biochemistry Research

ISSN Print: 2617-4693
ISSN Online: 2617-4707
IJABR 2024; 8(4): 521-524
www.biochemjournal.com
Received: 19-01-2024
Accepted: 27-02-2024

DB Chatse
Horticulture Section, Dr. PDKV, University, College of Agriculture, Nagpur, Maharashtra, India

RP Gajbhiye
Horticulture Section, Dr. PDKV, University, College of Agriculture, Nagpur College of Agriculture, Mul, Dist. Chandrapur, Maharashtra, India

DP Kedar
Floriculture and landscape Architecture Department, Dr. PDKV, University, Akola, Maharashtra, India

EP Ningot
Horticulture Section, Dr. PDKV, University, College of Agriculture, Nagpur, Maharashtra, India

PV Shende
Agriculture Botany Section, Dr. PDKV, University, College of Agriculture, Nagpur, Maharashtra, India

Corresponding Author:
DB Chatse
Horticulture Section, Dr. PDKV, University, College of Agriculture, Nagpur, Maharashtra, India

Impact of gamma radiation on bougainvillea varieties root parameters in the vM_1 and vM_2 generation

DB Chatse, RP Gajbhiye, DP Kedar, EP Ningot and PV Shende

DOI: https://doi.org/10.33545/26174693.2024.v8.i4g.1001

Abstract
The Bougainvillea is a popular plant for landscapes because of its lovely color ful bracts and growing habit. The experiment was laid out in Factorial Completely Randomized Design with four replications with two factors *viz*., Factor A consist of six levels of gamma rays' treatments i.e., control (No irradiation), 0.25 kR, 0.75 kR, 1.25 kR, 1.75 kR and 2.0 kR. Factor B consist of three varieties i.e., Shubhra (White colour flowers), Partha (Pink colour flowers) and Lady Mary Baring (Orange colour flowers). When gamma rays were applied to cuttings of different varieties, the number of roots per plant, length of the roots, fresh weight of the shoots, dry weight of the shoots and the fresh weight of the roots were all reduced. The findings additionally show that a drop in root parameter values occurred with each increment in gamma irradiation dosage.

Keywords: Gamma rays, Shubhra, Partha, Lady Mary Baring, root parameters etc.

Introduction

Bougainvillea is a popular plant for landscapes because of its lovely colorful bracts and growing habit. It is utilized as ground cover on banks, as shrubs or bushes, and in massive plantings. Bougainvillea offers slope covers, obstacles, and hedges. Bougainvillea makes a great ground cover for large, unmaintainable areas. Due to its variety of uses, bougainvillea is a crucial crop in floriculture. The bushy, evergreen, shrubby bougainvillea vine is found in tropical and subtropical regions. It is usually multitrunked or has clumping stems, and it can grow up to 20 feet tall and wide in a spreading, rounded form (Kobayashi *et al.* 2007) [6]. There are many different varieties that come in a wonderful array of color. The vivid "flowers" on them are actually modified leaves, or bracts, which are 1-2 inch long structures to which the actual flowers are joined at the midrib. Showy, colorful petaloid bracts envelop the petite, tubular, true, beautiful flowers.

A mutation is an abrupt, heritable alteration that takes place in an organism. It can be brought on naturally or by deliberate induction and resulting mutant exhibits chromosomal or gene changes (De and Bhattacharjee, 2011) [2]. Wide variety can be produced by the use of induced mutation. In high frequencies, physical or chemical mutagens produce mutations because spontaneous mutations happen at a very low frequency and frequently do not include the whole range of variability (Konzak *et al.*, 1961) [7]. Mutation breeding holds the key advantage of capacity to alter one or a couple of characters of an something else extraordinary assortment without changing the special portion of the genotype (Datta, 2014) [1].

Mutation breeding is one the important methods to create variability in flower crops and it also reduces the time required to develop a new variety (Kannan *et al.*, 2002) [5]. In view of the above the present investigation have been planned to assess the effect of gamma rays on root parameters of bougainvillea varieties in vM_1 and vM_2 generation.

Materials and Methods

The experiment was conducted in July 2020–2021 and 2021-2022 at the Maharaj Bagh Nursery, Horticulture Section, College of Agriculture, Nagpur, Maharashtra. The experimental materials consist of 13-15 centimetres long stem cuttings collected from middle portion of one-year-old shoots. While preparing the cuttings a smooth slanting cut in each cutting was given one centimetre above the upper node (Distal end) and another smooth straight cut was given one centimetre below the lower node (Proximal end). The cuttings were treated with the different doses of gamma rays (Cobalt-60) at the Bhaba Atomic Research Centre, Trombay, Mumbai, Maharashtra, India, using gamma rays machine Blood irradiator-2000 during July 2020. In this experiment cuttings of three varieties (Shubhra, Partha, Lady Mary Baring) were taken to expose the gamma doses (0.25 kR, 0.75 kR, 1.25 kR, 1.75 kR, 2.0 kR gamma rays). Untreated cuttings of bougainvillea were taken as control. The gamma rays treated cuttings along with the control were planted in polybags (6" x 8") containing media i.e., soil + FYM + sand (2:1:1) by making a hole at the centre then cuttings were buried in the media in such a way that two third basal part of all the cuttings was kept under the soil while planting and the soil around cuttings were pressed firmly and kept under shade for rooting. The cuttings obtained from variants of vM_1 generation along with control of three varieties used as planting material and planted as a vM_2 generation. The experiment was laid out in Factorial Completely Randomized Design with four replications for vM_1 and vM_2 generation. The observations were recorded on root parameters of bougainvillea varieties in vM_1 and vM_2 generation.

Results and Discussion

Data regarding number of roots per plant, root length, fresh weight of shoots and roots, dry weight of shoots and roots as influenced by different irradiation doses and varieties are presented in Table 1,2,3 and showed the significant differences in vM_1 and vM_2 generation.

Effect of irradiation doses

During both the generation vM_1 and vM_2, at 120 days after planting irradiation doses recorded significant differences. The highest number of roots per plant (4.33) and (5.01) was recorded in the treatment T_1 (Control). Among the irradiated treatments, the maximum number of roots per plant (3.58) and (4.22) was recorded in the treatment T_2 (0.25 kR). The minimum of number of roots per plant (2.28) and (3.04) was recorded in the treatment T_6 (2.00 kR). The number of roots per plant decreased as the dose of gamma rays increased in both generations. Lower amounts of growth promoting substances in leaves and improper mobilization of food reserves in cuttings and late rooting, may be the reason for less number of roots in cuttings. The presence of optimal growing conditions, which helped in the activation of root promoting substances, may be the reason for increased number of roots per plant in lower concentrations.

During both the generation vM_1 and vM_2, at 120 days after planting irradiation doses recorded significant differences. The highest root length (27.94 cm) and (31.64 cm) was recorded in treatment T_1 (Control). Among the irradiated treatments, the maximum root length (25.43 cm) and (28.56 cm) was recorded in the treatment T_2 (0.25 kR). The minimum of root length (4.61 cm) and (6.11 cm) was recorded in the treatment T_6 (2.00 kR). The results obtained during this investigation are in close agreement with the Ellyfa *et al*. (2007) [3] in anthurimum.

During both the generation vM_1 and vM_2, at 120 days after planting irradiation doses recorded significant differences. The highest fresh weight of shoots (28.81 g) and (30.19 g) was recorded in treatment T_1 (Control). Among the irradiated treatments, the maximum fresh weight of shoots (26.56 g) and (26.82 g) was recorded in the treatment T_2 (0.25 kR). The minimum fresh weight of shoots (11.56 g) and (12.21 g) was recorded in the treatment T_6 (2.00 kR). Fresh weight of shoot was decline by increasing irradiation. The results obtained during this investigation are in close agreement with the Hasbullah *et al*. (2012) [4] in gerbera.

During both the generation vM_1 and vM_2, at 120 days after planting irradiation doses recorded significant differences. The highest fresh weight of roots (13.52 g) and (12.74 g) was recorded in treatment T_1 (Control). Among the irradiated treatments, the maximum fresh weight of roots (11.76 g) and (12.45 g) was recorded in the treatment T_2 (0.25 kR). The minimum fresh weight of roots (5.32 g) and (4.56 g) was recorded in the treatment T_6 (2.00 kR).

During both the generation vM_1 and vM_2, at 120 days after planting irradiation doses recorded significant differences. The highest dry weight of shoots (10.76 g) and (12.18 g) was recorded in treatment T_1 (Control). Among the irradiated treatments, the maximum dry weight of shoots (10.31 g) and (11.37 g) was recorded in the treatment T_2 (0.25 kR). The minimum dry weight of shoots (4.53 g) and (5.98 g) was recorded in the treatment T_6 (2.00 kR).

During both the generation vM_1 and vM_2, at 120 days after planting irradiation doses recorded significant differences. The highest dry weight of roots (5.07 g) and (7.52 g) was recorded in treatment T_1 (Control). Among the irradiated treatments, the maximum dry weight of roots (4.14 g) and (5.76 g) was recorded in the treatment T_2 (0.25 kR). The minimum dry weight of roots (1.28 g) and (2.42 g) was recorded in the treatment T_6 (2.00 kR).

Effect of varieties

During both the generation vM_1 and vM_2, the results revealed that varieties had a significant influence on number of roots per plant. The observation recorded at 120 days after planting, variety Shubhra (V_1) recorded significantly maximum number of roots per plant (3.33) and (4.00). However, minimum number of roots per plant (3.02) and (3.72) was recorded in the variety Partha (V_2).

During both the generation vM_1 and vM_2, the results revealed that varieties had a significant influence on root length. The observation recorded at 120 days after planting, variety Lady Mary Baring (V_3) recorded significantly maximum root length (17.92 cm) and (20.76 cm). However, minimum root length (17.00) and (19.60 cm) was recorded in the variety Shubhra (V_1).

During both the generation vM_1 and vM_2, the results revealed that varieties had a significant influence on fresh weight of shoots. The observation recorded at 120 days after planting, variety Lady Mary Baring (V_3) recorded significantly maximum fresh weight of shoots (21.14 g) and (21.88 g). However, minimum fresh weight of shoots (19.93 g) and (20.48 g) was recorded in the variety Shubhra (V_1).

During both the generation vM_1 and vM_2, the results revealed that varieties had a significant influence on fresh weight of roots. The observation recorded at 120 days after planting, variety Lady Mary Baring (V_3) recorded significantly maximum fresh weight of roots (9.66 g) and (9.54 g). However, minimum fresh weight of roots (8.59 g) and (8.42 g) was recorded in the variety Shubhra (V_1).

During both the generation vM_1 and vM_2, the results revealed that varieties had a significant influence on dry weight of shoots. The observation recorded at 120 days after planting, variety Lady Mary Baring (V_3) recorded significantly maximum dry weight of shoots (8.44 g) and (9.85 g). However, minimum dry weight of shoots (7.70 g) and (9.01 g) was recorded in the variety Shubhra (V_1).

During both the generation vM_1 and vM_2, the results revealed that varieties had a significant influence on dry weight of roots. The observation recorded at 120 days after planting, variety Lady Mary Baring (V_3) recorded significantly maximum dry weight of roots (3.27g) and (5.73 g). However, minimum dry weight of roots (2.73 g) and (4.66 g) was recorded in the variety Shubhra (V_1).

Interaction effect: The data presented in Table 1,2 and 3 revealed that, interaction effect of irradiation doses and varieties on root parameters of bougainvillea was found non- significant in vM_1 and vM_2 generation.

Table 1: Effect of gamma rays on number of roots per plant and root length of bougainvillea varieties in vM_1 and vM_2 generation

Treatments	Number of roots per plant		Root length (cm)	
	120 DAP	120 DAP	120 DAP	120 DAP
	vM_1 generation	vM_2 generation	vM_1 generation	vM_2 generation
A. Irradiation doses				
T_1-Control (No irradiation)	4.33	5.01	27.94	31.64
T_2 - 0.25 kR gamma rays	3.58	4.22	25.43	28.56
T_3 - 0.75 kR gamma rays	3.37	4.13	19.87	22.56
T_4 - 1.25 kR gamma rays	2.61	3.39	15.70	18.53
T_5 - 1.75 kR gamma rays	2.74	3.21	11.73	14.02
T_6 - 2.0 kR gamma rays	2.28	3.04	4.61	6.11
F test	Sig	Sig	Sig	Sig
SE(m)+	0.10	0.10	0.37	0.37
CD at 5%	0.29	0.28	1.06	1.04
B. Varieties				
V_1 – Shubhra	3.33	4.00	17.00	19.60
V_2 – Partha	3.02	3.72	17.07	20.35
V_3 – Lady Mary Baring	3.10	3.78	17.92	20.76
F test	Sig	Sig	Sig	Sig
SE(m)+	0.07	0.07	0.27	0.26
CD at 5%	0.21	0.20	0.75	0.73
Interaction				
F test	NS	NS	NS	NS
SE(m)+	0.18	0.17	0.65	0.63
CD at 5%	-	-	-	-

Table 2: Effect of gamma rays on fresh weight of shoots and roots of bougainvillea varieties in vM_1 and vM_2 generation

Treatments	Fresh weight of shoots (g)		Fresh weight of roots (g)	
	120 DAP	120 DAP	120 DAP	120 DAP
	vM_1 generation	vM_2 generation	vM_1 generation	vM_2 generation
A. Irradiation doses				
T_1-Control (No irradiation)	28.81	30.19	13.52	12.74
T_2 - 0.25 kR gamma rays	26.56	26.82	11.76	12.45
T_3 - 0.75 kR gamma rays	22.71	22.96	7.59	8.51
T_4 - 1.25 kR gamma rays	18.74	19.39	9.30	8.55
T_5 - 1.75 kR gamma rays	14.68	15.30	7.27	7.28
T_6 - 2.0 kR gamma rays	11.56	12.21	5.32	4.56
F test	Sig	Sig	Sig	Sig
SE(m)+	0.28	0.32	0.26	0.28
CD at 5%	0.78	0.92	0.73	0.79
B. Varieties				
V_1 – Shubhra	19.93	20.48	8.59	8.42
V_2 – Partha	20.47	21.08	9.12	9.08
V_3 – Lady Mary Baring	21.14	21.88	9.66	9.54
F test	Sig	Sig	Sig	Sig
SE(m)+	0.20	0.23	0.18	0.20
CD at 5%	0.55	0.65	0.52	0.56
Interaction				
F test	NS	NS	NS	NS
SE(m)+	0.48	0.56	0.45	0.48
CD at 5%	-	-	-	-

Table 3: Effect of gamma rays on dry weight of shoots and roots of bougainvillea varieties in vM_1 and vM_2 generation

Treatments	Dry weight of shoots (g)		Dry weight of roots (g)	
	120 DAP	120 DAP	120 DAP	120 DAP
	vM_1 generation	vM_2 generation	vM_1 generation	vM_2 generation
A. Irradiation doses				
T_1-Control (No irradiation)	10.76	12.18	5.07	7.52
T_2 - 0.25 kR gamma rays	10.31	11.37	4.14	5.76
T_3 - 0.75 kR gamma rays	8.91	10.30	2.93	4.69
T_4 - 1.25 kR gamma rays	6.94	8.18	2.60	6.40
T_5 - 1.75 kR gamma rays	6.50	7.51	1.87	4.37
T_6 - 2.0 kR gamma rays	4.53	5.98	1.28	2.42
F test	Sig	Sig	Sig	Sig
SE(m)+	0.25	0.32	0.21	0.25
CD at 5%	0.70	0.91	0.59	0.72
B. Varieties				
V_1 – Shubhra	7.70	9.01	2.73	4.66
V_2 – Partha	7.83	8.89	2.95	5.19
V_3 – Lady Mary Baring	8.44	9.85	3.27	5.73
F test	Sig	Sig	Sig	Sig
SE(m)+	0.17	0.22	0.15	0.18
CD at 5%	0.49	0.64	0.42	0.51
Interaction				
F test	NS	NS	NS	NS
SE(m)+	0.42	0.56	0.36	0.44
CD at 5%	-	-	-	-

Conclusion

The study demonstrated significant variations in root parameters, shoot and root weights influenced by both irradiation doses and plant varieties in vM1 and vM2 generations. Irradiation doses showed a clear dose-response relationship, with lower doses generally resulting in higher root number, length, and shoot and root weights compared to higher doses. Varieties also played a significant role, with certain varieties consistently outperforming others across various parameters. However, the interaction effect between irradiation doses and varieties on root parameters was found to be non-significant, indicating that the effects of irradiation and variety were independent of each other. Overall, these findings contribute to our understanding of how irradiation and variety selection can impact root and shoot development in bougainvillea plants.

References

1. Datta SK. Induced mutagenesis: Basic knowledge for technological success. National Botanical Research Institute (NBRI-CSIR), Lucknow, Uttar Pradesh, India. 2014:97-139.
2. De LC, Bhattacharjee SK. Ornamental crop breeding. Jaipur: Aavishkar Publishers, Distributors; c2011. p. 40-41.
3. Ellyfa K, Ahmed OH, Shahllrudin S, Abdul Rahman D. Gamma radio sensitivity study on bean (*Phaceolus vulgaris*). Int. J Agric. Res. 2007;2(9):844-848.
4. Hasbullah NA, Taha RM, Saleh A, Mahmad N. Irradiation effect on *in vitro* organogenesis, callus growth and plantlet development of *Gerbera jamesonii*. Hortic Bras. 2012;30:252-257.
5. Kannan M, Sathiyamurthy VA, Shanker V. Mutagenic studies on *Jasminum sambac*. In: Floriculture Research Trend in India. New Delhi: Indian Society of Ornamental Horticulture, Division of Floriculture and Landscaping, IARI; c2002. p. 209-211.
6. Kobayashi KD, McConnelll J, Griffis J. Bougainvillea. University of Hawaii. 2007. 12 p. (Ornamentals and Flowers, OF-38).
7. Konzak CF, Nilan RA, Legault RR, Heiner RE. Modification of induced genetic damage in seeds. In: Proc. Symp. Karisrune. I.A.E.A. and F.A.O, Vienna; c1961. p. 150-169.