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Effect of gamma radiation treatment on growth and morphology of red *Amaranthus*

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Abstract
A field experiment was conducted during *Rabi* season 2020-21 at Instructional cum Research Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur, (C.G.) to study the effect of gamma radiation treatment on growth and morphology of red *Amaranthus.* The red *Amaranthus* was grown and treatments were replicated three times in randomized block design. The experiment consists of eleven doses of gamma radiation *viz.,* 600, 650, 700, 750, 800, 850, 900, 950, 1000, 1050 GY and control. The result revealed that growth parameters *viz.,* number of functional leaves plant^{-1}, Number of branches plant^{-1}, dry weight (g) plant^{-1}, Weight of inflorescence (g) plant^{-1} and Seed yield (g) plant^{-1} was recorded in 850 dose of gamma radiation which was at par to 1000 doses of gamma radiation. The lowest growth parameters were recorded under with out treated with gamma radiation (control).

Keywords: Amaranthus, gamma radiation, dry weight, morphology, seed yield

Introduction
Red Amaranth (*Amaranthus tricolor* L.) (2n=34) belongs to family Amaranthaceae, originated from Central America is a promising vegetable crop for its resistance to heat, drought, diseases and pests, as well as high nutritional value (Sreelathakumary and Peter, 1993) [7] India is a well know for the production of vegetables crop growing areas among other countries. After china, India is the second largest producer of the vegetables crop. India produced 1, 88, 907 thousand million tonnes of fresh vegetables from 10,303 thousand ha areas (Ministry of agriculture and farmers Welfare, 2019-20) [1]. In Chhattisgarh, total area comes under the vegetable cultivation is 489.27 thousand ha and total production of vegetables is about 6,868.12 million tonnes out of which the area comes under the leafy vegetables is about 9.95 thousand ha and total production of vegetables is about 97.581 million tonnes (Ministry of agriculture and farmers Welfare, Govt. of India, 2019-20) [1]. Induced mutation is one of the most important method for the crop improvement technologies which played a significant role in the improvement and play a major role for the understanding regarding the nature and mechanism of mutation processes. They provide good results in most of crops for the improvement of their yield performance. The major importance of the mutation breeding is an improvement of specific target characters in the different adopted and durable genotypes breaking tight linkages thus helping in obtaining rare recombinations and in enlarging variability for quantitative characters. The success of the induced mutation breeding programme mostly depends on the numbers of useful mutants produced by the induced mutation. Naturally, an enlarged mutation spectrum as well as increased mutation frequency would enhance the chances of isolating beneficial mutants (Joseph *et al*., 2015) [3].

Material and Methods
A field experiment was conducted during *Rabi* season 2020-21 at Instructional cum Research Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur, (C.G.). The red *Amaranthus* was grown and treatments were replicated three times in randomized block design. The soil of the experiment field was clay-loam. Gamma ray irradiated seeds were obtained from the Bhabha Atomic Research Centre (BARC), Trombay, Mumbai (M.H.). Ten different absorbed doses of gamma rays were used *viz*., 600 Gy, 650 Gy, 700 Gy, 750 Gy, 800 Gy, 850 Gy, 900 Gy, 950 Gy, 1000 Gy and 1050 Gy. (Gray is the S.I. unit of absorbed dose). The irradiated seeds are considered as treated and the untreated seeds are termed as control. A week after the treatment, seeds were sown in the field along with control. Observation was recorded on the five randomly selected plants were used for calculating the mean. Observation was recorded number of functional leaves plant^{-1}, Number of branches plant^{-1}, dry weight (g) plant^{-1}, Weight of inflorescence (g) plant^{-1} and Seed yield (g) plant^{-1}.

Results and Discussion

Number of functional leaves plant^{-1}

The data on number of functional leaves plant^{-1} was significantly influenced by different doses of gamma radiation and presented in Table-1 and illustrate in fig-1. number of functional leaves plant^{-1} at 20, 40 60, 80 DAS and at harvest was significantly influenced by different doses of gamma radiation. The highest number of functional leaves plant^{-1} was recorded in 850 GY which was at par to 1000 GY and 750 GY at all the stages of crop growth and 20 DAS. However, the lowest number of functional leaves plant^{-1} was noted under control plot. Ochatt *et al.* (2007) [6] reported that the production of the growth regulator, kinetin, might have been stimulated, which may be responsible for the increased number of leaves. Dubey *et al.* (2007) [2] showed an increase in the number of leaves when okra seeds were irradiated with different doses of gamma rays. Indeed, the number of leaves positively correlated with leaf length (r = 0.970) and leaf width (r = 0.931). Minisi *et al.* (2013) [5] reported that the increased number of branches and number of leaves may be due to the enhanced production of IAA and kinetin which stimulates the production of large number of leaves and branches.

Number of branches plant^{-1}

The data on number of branches plant^{-1} are presented in table 2 and illustrate in fig- 2 Revealed that the various doses of gamma radiation are significantly influenced number of branches plant^{-1} of red *Amaranths* at 60, 80 DAS and at harvest. Significantly the highest number of branches plant^{-1} of red *Amaranths* was noted under 850 dose of gamma radiation (14.47). However it was statistically at par with 1000 and 600 radiations of gamma rays at 60 DAS (12.83 and 17.56) and at harvest (12.66 and 18.50). Significantly the lowest number of branches plant^{-1} was recorded under control plot (2.73).

Dry weight (g) plant^{-1}

The data regarding crop dry matter accumulation at 20, 40, 60, 80 DAS and at harvest are presented in table- 3 illustrate in fig- 3. The data reveals increased dry matter accumulation with the advancement of crop growth stages, irrespective of treatments.

Among the different doses of gamma radiation significantly higher dry matter accumulation plant^{-1} was recorded under 850 dose of gamma radiation (0.96, 1.96, 18.28, 26.39 and 34.68 g) as compared to others.

Table 1: Number of functional leaves of red *Amaranthus* as influenced by different doses of gamma radiations

S. no.	Treatment	Number of functional leaves plant^{-1}				
		20 DAS	40 DAS	60 DAS	80 DAS	At harvest
1.	600 GY	5.20	26.43	42.28	60.54	68.48
2.	650 GY	5.77	38.56	53.27	73.38	86.51
3.	700 GY	6.04	44.94	63.74	82.19	92.06
4.	750 GY	6.54	52.29	85.68	105.77	115.73
5.	800 GY	5.48	29.66	49.71	68.42	79.13
6.	850 GY	7.86	73.73	134.10	136.24	147.92
7.	900 GY	4.39	19.97	35.91	48.62	58.45
8.	950 GY	6.04	50.14	73.14	92.47	102.23
9.	1000 GY	7.11	68.65	126.27	119.13	125.24
10.	1050 GY	4.73	23.15	40.76	56.31	65.40
11.	Control	3.97	18.90	31.93	39.57	51.88
	S.Em ±	0.11	0.17	0.19	0.21	0.23
	CD (P=0.05)	0.31	0.51	0.55	0.62	0.67

Table 2: Number of branches of red *Amaranthus* as influenced by different doses of gamma radiations

S. no.	Treatment	Number of branches plant^{-1}		
		60 DAS	80 DAS	At harvest
1.	600 GY	11.40	14.47	14.47
2.	650 GY	7.60	11.50	11.50
3.	700 GY	3.93	6.51	6.51
4.	750 GY	5.43	8.73	8.73
5.	800 GY	3.20	6.07	6.07
6.	850 GY	14.47	18.40	18.40
7.	900 GY	2.90	5.63	5.63
8.	950 GY	5.13	8.00	8.00
9.	1000 GY	12.20	15.30	15.30
10.	1050 GY	5.07	7.40	7.40
11.	Control	2.73	4.23	4.23
	S.Em ±	0.13	0.15	0.15
	CD (P=0.05)	0.38	0.43	0.43

Table 3: Dry weight of red *Amaranthus* as influenced by different doses of gamma radiations

S. no.	Treatment	Dry weight (g) plant^{-1}				
		20 DAS	40 DAS	60 DAS	80 DAS	At harvest
1.	600 GY	0.52	1.49	10.47	17.08	22.64
2.	650 GY	0.72	1.74	13.26	20.37	28.59
3.	700 GY	0.53	1.45	9.01	16.14	20.75
4.	750 GY	0.47	1.41	8.37	15.75	18.85
5.	800 GY	0.42	1.26	7.21	14.48	16.24
6.	850 GY	0.96	1.96	18.28	26.39	34.68
7.	900 GY	0.44	1.18	6.63	10.36	14.46
8.	950 GY	0.68	1.54	12.33	18.35	25.57
9.	1000 GY	0.82	1.82	16.56	22.95	31.42
10.	1050 GY	0.44	1.13	6.21	8.19	11.51
11.	Control	0.45	1.09	3.65	4.28	5.46
	S.Em ±	0.03	0.3	0.13	0.17	0.18
	CD (P=0.05)	0.09	0.10	0.37	0.50	0.53

Table 4: Weight of inflorescence and seed yield of red *Amaranthus* as influenced by different doses of gamma radiations

S. no.	Treatment	Weight of inflorescence (g) plant^{-1}	Seed yield (g) plant^{-1}
1.	600 GY	4.29	15.55
2.	650 GY	5.31	10.72
3.	700 GY	3.13	12.90
4.	750 GY	2.61	8.44
5.	800 GY	2.47	4.15
6.	850 GY	6.57	20.38
7.	900 GY	3.17	5.97
8.	950 GY	3.88	7.85
9.	1000 GY	7.66	17.86
10.	1050 GY	2.30	5.44
11.	Control	2.07	2.63
	S.Em ±	0.14	0.16
	CD (P=0.05)	0.41	0.48

However it was statistically at par with 1000 dose of gamma radiation (0.82, 1.82, 16.56, 22.95 and 31.42 g). Significantly the least dry matter production was found under control plot (0.45, 1.09, 3.65, 4.28 and 5.46 g) at all the time intervals.

Weight of inflorescence (g) plant^{-1}

The weight of inflorescence was recorded at 20, 40, 60, 80 DAS and at harvest was significantly influence by various doses of gamma radiation are presented in Table-3. Among all the doses of gamma radiation significantly the maximum weight of inflorescence was recorded under 1000 dose of gamma radiation (7.66 g) which was superior over rest of treatment. However it was statistically at par with 850 and 650 dose of gamma radiation (6.57 and 5.31 g). The lowest weight of inflorescence was found under control plot (2.07 g).

Seed yield (g) plant^{-1}

The data given in table 4 reveal that the seed yield plant^{-1} was significantly influenced by various doses of gamma radiation. Among all the different doses of gamma radiation maximum seed yield plant $^{-1}$ was recorded under 850 dose of gamma radiation (20.38 g) which was significantly superior over rest of the treatment. However it was statistically at par with 1000 dose of gamma radiation (17.86 g). The lowest seed yield plant $^{-1}$ was found under control pot (2.63 g). The impact of gamma radiations on *Pisum sativum* L. was examined by exposing Pea seeds to gamma rays of 50, 100, 150, and 200Gy. Result reveals the highest plant yield was recorded in 50Gy and 100Gy as compared to control while 200Gy had the lowest yield (Khan *et al.*, 2021) [4].

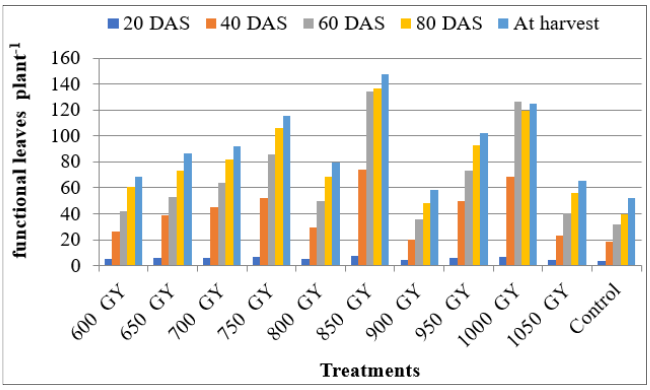

Fig 1: Number of functional leaves of red *Amaranthus* as influenced by different doses of gamma radiations

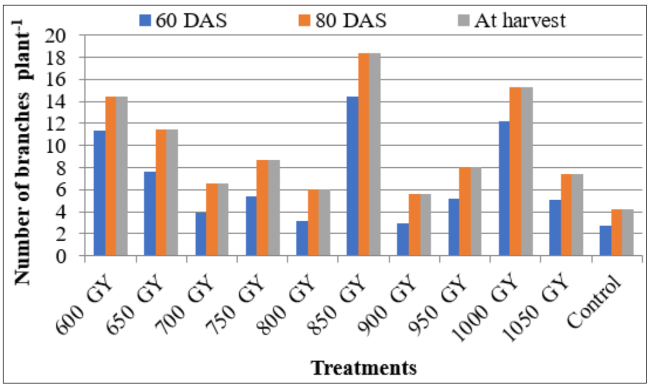

Fig 2: Number of branches of red *Amaranthus* as influenced by different doses of gamma radiations

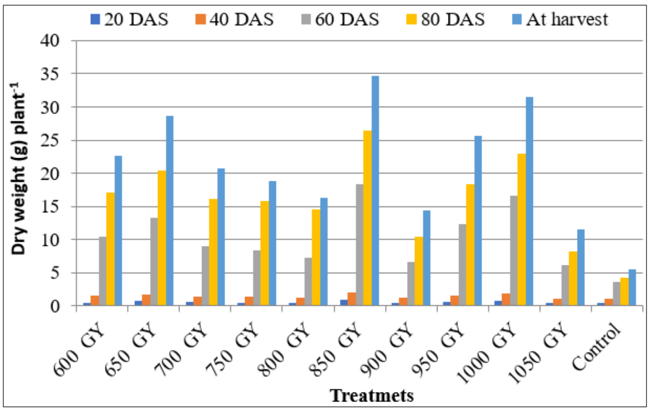

Fig 3: Dry weight of red *Amaranthus* as influenced by different doses of gamma radiations

Reference

1. Anonymous. Ministry of Agriculture and Farmers' welfare Govt. of India; c2020.
2. Dubey AK, Yadav JR, Singh B. Studies on induced mutations by gamma irradiation in okra (*Abelmoschus esculentus* (L.) Monch.). Progressive Agriculture. 2007;7(1, 2):46-48.
3. Joseph XK, Baba S, Nelson O. Potential of gamma rays to improve grain yield and nutritional quality of pearl millet (*Pennisetum glaucum* L.): A review. Elixir Agriculture. 2015;79:30667-30671.
4. Khan SA, Sahani RM, Tripathi RP, Akhtar MS, Srivastava A. Influence of gamma-irradiation on the optical and structural properties of nano-thin chalcogenide films. Radiation Physics and Chemistry. 2021;188:1096-1102.
5. Maisi VF, Lotkhov SV, Kemppinen A, Heimes A, Muhonen JT, Pekola JP. Excitation of single quasiparticles in a small superconducting Al island connected to normal-metal leads by tunnel junctions. Physical Review Letters. 2013;111(14):123-130.
6. Ochatt SJ, Koné M, Patat OEM, Conreux C, Sangwan RS 2007. In vitro morphogenesis from cotyledon and epicotyl explants and flow cytometry distinction between landraces of Bambara groundnut [*Vigna subterranea* (L.) an under-utilised grain legume. Plant cell, tissue and organ culture 88(1): 61-75.
7. Sreelathakumary I, Peter KV. *Amaranth Amaranthus* spp. In: Genetic Improvement of Vegetable Crops. Pergamon Press; c1993. p. 315-323.