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Full Research Article

Effects of γ Irradiation on Leaf Blight Disease of Some Taro (*Colocasia esculenta* L. Schott) Genotypes

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Abstract

The healthy mature seed cormels of 10 diverse genotypes of taro were subjected to 10Gy γ- irradiation. The mutant populations were evaluated for Phytophthora leaf blight disease under *in vitro* and *in vivo* disease conditions along with their non-irradiated mother genotypes. The results revealed that variability (range and standard deviation) in mutant populations were more than their mother populations. Under *in vitro Phytophthora* leaf blight conditions, the blight incidence such as spot diameter and number of sporangia produced was minimized with γ-irradiation as compared to the non-irradiated leaf samples. It indicated that γ-rays suppressed the growth of *Phytophthora* spores in the leaf tissues of taro. The genotypes TSL and Duradim showed resistance consistently against leaf blight both under irradiated and non-irradiated conditions. The disease incidence was also minimized in the tested susceptible lines under γ-irradiation under artificial epiphytotic conditions. The yield reduction due to blight infestation in irradiated plants was lower, compared with the non-irradiated plants. Association of desirable mutations with undesirable mutations led to the problem of linkage drag as these cannot be separated because of vegetative propagation. γ-irradiation in high yielding susceptible lines such as Telia and Satasankha Local may help in inducing resistance against leaf blight with no/low yield loss due to infestation of *Phytopthora colocasiae.*

1. Introduction

Taro [*Colocasia esculenta* (L.) Schott], an important tuber crop is very popular in developing countries for its edible underground stem (rhizome called corm) with excellent source of carbohydrate (Ivancic, 1992). The area and production of taro in the world were 1.3 mha and 9.9 mt, respectively (FAOSTAT, 2013). In spite of its high yield potentiality and wide adaptability, taro is severely threatened due to devastating leaf blight disease (*Phytophthora colocasiae* Raciborski) first reported in 1913 in India and later in other countries (Packard, 1975; Gurr, 1996). Initial symptoms of the disease are small brown water-soaked flecks on the leaf that enlarge to form dark brown lesions, often with a yellow margin. The secondary infections lead to rapid destruction of the leaf, which may occur in 10-20 days or less in susceptible varieties (Misra et al., 2008). In India, taro is severely affected by leaf blight disease with the onset of monsoon and almost 100% of taro gets infected with the disease (Misra, 1991). Moreover, the crop lost its yield to the tune of 22.75-46.75% in tolerant and susceptible varieties (Misra, 1996). The progress in developing taro cultivars for stress tolerance has been slow because of lack of knowledge in mechanisms of tolerance, poor understanding of the inheritance of tolerance, low heritability, paucity of flowering as well as non-availability of efficient techniques for genetic improvement. Development of resistant/tolerant lines against this disease through mutations is one of the major alternative tools and techniques. The main advantage of mutation induction in vegetatively propagated crops is the ability to change one or a few characters without altering the remaining unique characters. The effect of γ rays on morpho-physio-biochemical properties of taro against *Phytophthora* leaf blight is documented (Sahoo et al., 2012). The capability of physical mutagen, γ-rays in particular, in inducing desirable mutations in *Colocasia* through γ-irradiation (1.0 kR) has already been achieved (Vasudevan and Jos, 1990). Studies on morphological traits of taro genotypes and their irradiated populations under epiphytotic blight stress condition would help to develop/isolate tolerant genotypes.

2. Materials and Methods

The experiments were carried out at Krishi Vigyan Kendra, Balasore, located at latitude of 21^0 39′ N, longitude of 86°16′ E and an altitude of 28.3 metre above mean sea level (MSL) and Krishi Vigyan Kendra, Bhadrak, Odisha, which is located at latitude of 21°03'10″ N, longitude of 86°31′12″ E and an altitude of 18 (MSL) of the north east coastal plain zone (NECPZ) during warm wet season of 2010-11 and 2011-12, respectively. Healthy matured cormels (weighing 30-40 g) of 10 selected genotypes viz., BBSL (BBSR×Satasankha Local), Bhubaneswar Local (BBSR), DP-25, Duradim, Jhankri, Muktakeshi, Satasankha Local, Telia, Topi and TSL (Topi×Satasankha Local) were irradiated with γ-rays from ^{60}Co source for 13 seconds to obtain 10 Gray (Gy) at the specific activity of 283 Gy hour^{-1} in the γ-irradiation Chamber-5000 at the Quality Control Laboratory, Acharya N. G. Ranga Agricultural University (ANGRAU), Hyderabad. The sprouting behaviour of irradiated cormels was evaluated along with the non-irradiated control plants. The field experiments were conducted in Randomized Block Design (RBD) with 3 replications in a ten-row plot of 4.5 m length for each genotype, five rows for irradiated cormels and rest five rows for non-irradiated cormels. Cormels were planted on ridges with a spacing of 45×45 cm^2 in the 3rd week of July during 2010-11 (MV_1 generation) and 2011-12 (MV_1 generation). Each plot was divided into two halves: one for disease inoculation and other for fungicide treatment to maintain disease free control. Half of each block was separated with 2 m high polythene sheet for this purpose. Disease was inoculated by spraying of spore suspension (15000 ml^{-1}) at 45 days after planting. Control plots were maintained by spraying 0.2% Ridomil (Metalaxyl+Mancozeb) at fortnightly intervals to prevent the crop from fungal infections. The crop was given a fertilizer dose of 80 kg N, 25 kg P_2O_5 and 100 kg K_2O ha^{-1}. Standard package of practices were followed throughout the crop growth period.

Irradiated populations were carefully observed and plants suspected to be mutant on the basis of leaf and petiole characters were marked and taken for further study. Six leaf discs of 8 cm diameter from 10 selected lines were collected from the disease free plant and placed between moist blotting papers in Petri dishes for disease scoring *in vitro* (Dey et al . 1993) under artificial epiphytotic conditions. Ten micro litre of standard spore suspension (15000 ml^{-1}) was inoculated at the centre of each leaf disc. The leaf discs were incubated with inoculums at room temperature (25-30ºC) for 96 hours. Appearance of disease was observed at 24 hours intervals. Observations on time taken for infection were recorded at 24, 48, 72 and 96 hours of incubation. Size of the lesion (diameter in cm) and number of sporangia produced per microscopic field (10×) were recorded after 96 hours of incubation. For counting of spores, the sporulated leaf pieces were washed in distilled water. A drop of washed suspension was observed under a microscope. Observations on 10 plants replication^{-1} were recorded for some morphological parameters such as plant height from the ground level to the apex of the largest leaf, number of functional leaves plant^{-1}, and number of infected leaves plant^{-1} at 45 and 90 days after planting (DAP). Per cent number of leaves infected was calculated at 45 and 90 days after planting (DAP). Plants were harvested carefully from field under irradiated and non-irradiated conditions at 120 DAP. Corms and cormels were separated from the rest of the plant debris and weighed immediately to obtain the yield plant^{-1}. Data

Table 1: Time taken for infection (hours) MV_1 generation

Sl. No.	Genotypes (G)	Time taken (hours)						
		Control (T_1)			Mutant (T_2)			
		Range	Mean	Sd	Range	Mean	Sd	Mean
1.	BBSL	24-48	40.0	±10.04	36-72	56.0	±11.80	48.0
2.	Bhubaneswar Local	36-48	40.0	±6.20	48-72	48.0	±9.80	44.0
3.	DP-25	36-48	44.0	±6.20	36-72	60.0	±18.07	52.0
4.	Duradim	36-48	36.0	±4.90	48-72	56.0	±13.15	46.0
5.	Jhankri	36-36	36.0	±0.00	48-72	72.0	±12.39	54.0
6.	Muktakeshi	24-48	36.0	±9.03	48-72	56.0	±12.39	46.0
7.	Satasankha Local	24-36	28.0	±6.57	24-48	40.0	±7.59	34.0
8.	Telia	24-24	24.0	±0.00	48-48	44.0	±4.90	34.0
9.	Topi	36-48	40.0	±6.20	34-72	64.0	±19.22	52.0
10.	TSL	36-48	40.0	±6.20	48-72	72.0	±13.15	56.0
	Mean		36.4			56.8		46.6
	SEm±		3.79			1.70		NS
	CD (p=0.05)		10.95			4.90		NS

on different characters were analyzed using standard statistical methods (Gomez and Gomez, 1984).

3. Results and Discussion

Analysis of variance of non-irradiated and irradiated population under diseased condition indicated that significant difference was present among genotypes for all the morphological parameters. The variation was due to the effects of radiation and differential response of the genotypes to radiation treatment in MV_1 generation. The results revealed that under *in vitro* condition irradiated populations took longer time for infection with wider range and higher standard deviation as compared to corresponding non-irradiated control genotypes (Table 1). The radiation treatment revealed delayed appearance of spot (infection) on leaf discs of Jhankari and TSL (72 hr), followed by Topi (64 hr) and DP-25 (60 hr). However, ingenotypes like BBSL, Duradim and Muktakeshi, the infection was observed within 56 hours of inoculation although there was no significant difference among genotypes in time taken for appearance of infection on the leaf disc. However, in the genotypes like Duradim, Jhankari and Muktakeshi, the infection was observed in 36 hours of inoculation with no significant difference. In MV_2 generation similar observation was recorded. Paharia and Mathur (1964) and Dey et al. (1993) pointed out similar kind of result while working with taro genotypes. The mean spot diameter (Table 2) under *in vitro* condition of irradiated

Table 2: Time taken for infection (hours) in MV_2 generation

Sl. No.	Genotypes (G)	Time taken for infection (hours)						
		T_1			T_2			
		Range	Mean	Sd	Range	Mean	Sd	Mean
1.	BBSL	36-48	40.0	±6.20	48-72	56.0	±12.39	48.0
2.	Bhubaneswar Local	24-36	36.0	±6.20	36-72	44.0	±11.80	40.0
3.	DP-25	24-48	36.0	±9.80	36-72	52.0	±13.15	44.0
4.	Duradim	36-48	40.0	±4.90	48-72	64.0	±13.15	52.0
5.	Jhankri	36-48	40.0	±6.57	72-72	72.0	±0.00	56.0
6.	Muktakeshi	36-48	40.0	±6.20	48-72	64.0	±13.15	52.0
7.	Satasankha Local	24-24	24.0	±0.00	24-72	52.0	±16.54	38.0
8.	Telia	24-36	28.0	±4.90	36-48	40.0	±4.90	34.0
9.	Topi	24-48	40.0	±9.03	48-72	64.0	±12.39	52.0
10.	TSL	36-48	36.0	±6.20	36-72	72.0	±14.70	44.0
	Mean		36.0			56.0		46.0
	SEm±		4.39			1.96		NS
	CD (p=0.05)		12.69			5.67		NS

Table 3: Spot diameter in MV_1 generation

Sl. No.	Genotypes	Spot diameter (cm)						
		Control (T_1)			Mutant (T_2)			
		Range	Mean	Sd	Range	Mean	Sd	Mean
1.	BBSL	1.5-3.9	3.1	±0.97	1.3-5.6	2.9	±0.56	3.0
2.	Bhubaneswar Local	3.2-5.1	3.9	±0.63	1.8-3.3	2.7	±0.33	3.3
3.	DP-25	1.2-1.9	1.6	±0.24	1.0-2.0	1.6	±0.38	1.6
4.	Duradim	1.6-2.2	1.8	±0.24	1.3-2.4	1.7	± 0.28	1.8
5.	Jhankri	1.6-3.5	1.7	±0.88	1.0-2.9	1.7	±0.62	1.7
6.	Muktakeshi	1.1-3.7	3.4	±1.23	0.9-2.6	1.6	±0.50	2.5
7.	Satasankha Local	3.7-4.3	4.0	±0.22	1.8-3.9	2.8	±0.63	3.4
8.	Telia	3.4-4.2	4.0	±0.36	2.3-4.1	3.4	±0.23	3.7
9.	Topi	1.6-4.0	2.1	±1.04	1.0-4.0	2.0	±0.58	2.1
10.	TSL	2.5-3.7	3.2	±0.43	1.5-3.9	1.8	±0.54	2.5
	Mean		2.9			2.2		2.5
	SEm±		0.22			0.10		0.31
	CD (p=0.05)		0.64			0.28		0.90

populations was, in general, lower with wider range of variation and greater standard deviation than the corresponding values of non-irradiated populations. Significant variations in size of the lesion (spot diameter) among the mother genotypes and mutant populations were observed after inoculation of disease spores. The lesion size after inoculation of *Phytopthora* disease spores in mutant plants was highest in Telia (3.4). But reduction was more in mutants of Muktakeshi and TSL. Mutants of BBSL, DP-25, Duradim, Jhankari and Topi had mean values of spot diameter similar/close to their mother genotypes, although their range indicated appearance of individual with less spot diameter.

The number of sporangia produced under *in vitro* condition in the leaf discs per microscopic field (Table 3) showed greater variation in mutagen treated populations. The mean of each irradiated populations was either close to or a little less than corresponding non-irradiated populations. However, the mean values of sporangia count per microscopic field in irradiated population (10.9 and 11.6, respectively in MV_1 and MV_2) were significantly lower than the non-irradiated ones (16.5 and 12.5, respectively in MV_1 and MV_2).

Under irradiated condition highest number of sporangia was observed in Telia (19.0) followed by BBSL (17.0), Bhubaneswar Local and Satsankha Local (15.7) and Topi (13.3). The lowest number of sporangia was recorded in DP-25, Duradim and TSL (1.7), followed by Muktakeshi (10.7)

Table 4: Spot diameter (cm) in MV_2 generation

Sl. No.	Genotypes (G)	Spot diameter (cm)						
		T_1			T_2			
		Range	Mean	Sd	Range	Mean	Sd	Mean
1.	BBSL	3.0-3,6	3.5	±0.23	1.9-3.0	2.0	±0.44	2.8
2.	Bhubaneswar Local	3.3-3.6	3.3	±0.12	2.6-3.0	2.6	±0.15	3.0
3.	DP-25	1.4-2.5	1.7	±0.40	1.6-2.9	2.6	±0.50	2.2
4.	Duradim	1.6-3.5	3.4	±0.94	1.6-3.1	2.9	±0.70	3.2
5.	Jhankri	1.7-2.8	2.6	±0.38	1.4-3.0	1.7	±0.73	2.2
6.	Muktakeshi	2.4-3.7	2.6	±0.58	2.6-3.1	2.9	±0.20	2.7
7.	Satasankha Local	3.4-4.2	3.8	±0.34	2.6-3.8	3.6	±0.45	3.7
8.	Telia	3.3-4.1	3.7	±0.29	2.4-3.6	2.7	±0.48	3.2
9.	Topi	3.3-3.7	3.4	±0.13	2.7-3.1	3.0	±0.14	3.2
10.	TSL	1.4-2.7	1.7	±0.60	2.5-3.0	2.8	±0.18	2.2
	Mean		3.0			2.7		2.8
	SEm±		NS			NS		0.15
	CD (p=0.05)		NS			NS		0.42

Table 5: Number of sporangia under in MV_1 generation

Sl. No.	Genotypes	No. of sporangia						
		Control (T_1)			Mutant (T_2)			
		Range	Mean	Sd	Range	Mean	Sd	Mean
1.	BBSL	9-22	17.7	±5.32	9-20	17.0	±4.04	17.3
2.	Bhubaneswar Local	14-23	21.3	±3.31	11-17	15.7	±2.64	18.5
3.	DP-25	1-2	1.7	±0.41	1-2	1.7	±0.55	1.7
4.	Duradim	1-12	11.0	±5.16	1-2	1.7	±0.52	6.3
5.	Jhankri	10-19	10.0	±4.41	8-15	12.7	±2.80	11.3
6.	Muktakeshi	8-20	18.3	±5.95	3-13	10.7	±4.08	14.5
7.	Satasankha Local	22-33	26.3	±4.42	12-25	15.7	±4.62	21.0
8.	Telia	22-30	25.7	±2.99	18-24	19.0	±2.42	22.3
9.	Topi	10-22	15.7	±4.93	3-17	13.3	±5.01	14.5
10.	TSL	2-20	17.7	±8.87	1-3	1.7	±0.82	9.7
	Mean		16.5			10.9		13.7
	SEm±		1.25			0.56		1.76
	CD (p=0.05)		3.59			1.61		5.08

Table 6: Number of sporangia under in MV_2 generation

Sl. No.	Genotypes (G)	No. of sporangia						
		T_1			T_2			
		Range	Mean	Sd	Range	Mean	Sd	Mean
1.	BBSL	13-17	13.5	±2.04	11-15	11.2	±2.04	12.3
2.	Bhubaneswar Local	14-18	13.9	±1.86	12-16	11.8	±1.86	12.9
3.	DP-25	9-13	9.1	±1.72	9-15	9.9	±2.42	9.5
4.	Duradim	10-14	10.4	±2.04	9-14	9.7	±2.07	10.0
5.	Jhankri	10-15	10.6	±1.87	11-15	11.2	±1.90	10.9
6.	Muktakeshi	13-17	13.5	±1.86	12-16	12.0	±1.72	12.7
7.	Satasankha Local	14-19	15.0	±2.25	12-18	13.7	±2.35	14.4
8.	Telia	14-19	14.6	±1.97	11-16	12.5	±2.32	13.5
9.	Topi	14-18	14.2	±2.04	12-16	12.3	±1.90	13.3
10.	TSL	10-15	10.5	±2.25	11-16	11.9	±2.07	11.2
	Mean		12.5			11.6		12.1
	SEm±		0.28			0.12		0.39
	CD (p=0.05)		0.80			0.36		1.13

Table 7: Plant height (cm) MV_1 generation

Sl. No.	Genotypes	Plant height (cm) 45 DAP			Plant height (cm) 90 DAP		
		T_1	T_2	MEAN	T_1	T_2	Mean
1.	BBSL	35.7	29.7	32.7	75	55.6	65.3
2.	Bhubaneswar Local	37.6	32.9	35.25	83.2	64.9	74.05
3.	DP-25	31.5	28	29.75	65.4	51.3	58.35
4.	Duradim	31	30.5	30.75	67.2	55.1	61.15
5.	Jhankri	40.3	30.6	35.45	86.5	64.8	75.65
6.	Muktakeshi	41.6	32.8	37.2	84.9	61.7	73.3
7.	Satasankha Local	41.5	28.3	34.9	84.4	55.2	69.8
8.	Telia	38	32.1	35.05	83.9	62.7	73.3
9.	Topi	41.8	32	36.9	82	58.8	70.4
10.	TSL	38.8	32.8	35.8	78.8	60.3	69.55
	Mean	37.8	31	34.4	79.1	59	69.05
	CD (p=0.05)	2.17	1.01		2.69	1.2	

Table 8: Plant height (cm) in MV_2 generation

Sl. No.	Genotypes	Plant height (cm) 45 DAP			Plant height (cm) 90 DAP		
		T_1	T_2	MEAN	T_1	T_2	Mean
1.	BBSL	36.1	29.1	32.6	68.6	65.3	66.95
2.	Bhubaneswar Local	35.8	29.1	32.45	68.0	57.2	62.6
3.	DP-25	43.6	35.5	39.55	62.7	56.6	59.65
4.	Duradim	35.9	31.3	33.6	50.2	47.0	48.6
5.	Jhankri	32.1	24.2	28.15	62.9	53.8	58.35
6.	Muktakeshi	33.7	28.5	31.1	61.4	54.8	58.1
7.	Satasankha Local	37.7	27.1	32.4	73.1	54.0	63.55
8.	Telia	43.5	28.8	36.15	66.7	58.4	62.55
9.	Topi	37.1	25.4	31.25	61.8	58.7	60.25
10.	TSL	37.1	33.4	35.25	56.9	52.6	54.75
	Mean	37.3	29.2	30.44	63.2	55.8	53.7
	CD (p=0.05)	2.02	0.90		5.18	2.32	

Table 9: Number of infected leaves in MV_1 generation

Sl. No.	Genotypes	No. of infected leaves (45 DAP)			No. of infected leaves (90 DAP)		
		T_1	T_2	MEAN	T_1	T_2	Mean
1.	BBSL	1.3	0.7	1	4.9	3.7	4.3
2.	Bhubaneswar Local	1.3	1.0	1.15	4.8	4.3	4.55
3.	DP-25	0.7	0.7	0.7	3.6	3.7	3.65
4.	Duradim	0.7	0.7	0.7	3.6	3.7	3.65
5.	Jhankri	1.7	0.7	1.2	5.4	3.7	4.55
6.	Muktakeshi	0.7	0.7	0.7	3.4	0.7	2.05
7.	Satasankha Local	2.3	1.0	1.65	6.7	4.4	5.55
8.	Telia	2.3	1.3	1.8	6.8	5.0	5.9
9.	Topi	1.7	1.7	1.7	5.4	5.6	5.5
10.	TSL	0.7	0.7	0.7	3.5	3.6	3.55
	Mean	1.3	0.9	1.01	4.8	3.8	3.87
	CD (p=0.05)	0.85	0.38		NS	0.64	

Table 10: Number of infected leaves in MV_2 generation

Sl. No.	Genotypes	No. of infected leaves (45 DAP)			No. of infected leaves (90 DAP)		
		T_1	T_2	MEAN	T_1	T_2	Mean
1.	BBSL	0.3	0.7	0.5	0.7	0.7	0.7
2.	Bhubaneswar Local	1.0	0.7	0.85	1.3	0.7	1
3.	DP-25	0.3	0.3	0.3	0.7	0.3	0.5
4.	Duradim	0.7	0.7	0.7	1.3	0.7	1
5.	Jhankri	0.7	0.7	0.7	0.7	0.7	0.7
6.	Muktakeshi	0.7	0.7	0.7	0.7	0.7	0.7
7.	Satasankha Local	1.3	1.0	1.15	2.0	1.0	1.5
8.	Telia	2.7	1.0	1.85	2.7	1.0	1.85
9.	Topi	0.7	0.7	0.7	1.0	0.7	0.85
10.	TSL	0.3	0.7	0.5	0.7	0.7	0.7
	Mean	0.9	0.7	0.73	1.2	0.7	0.88
	CD (p=0.05)	0.74	NS		0.77	0.34	

Table 11: Yield and in MV_1 generation

Sl. No.	Genotypes	Tuber yield (g) plant^{-1}		
		T_1	T_2	MEAN
1.	BBSL	381.2	340.9	317.7
2.	Bhubaneswar Local	312.8	301.7	274.1
3.	DP-25	431.3	428.1	388.2
4.	Duradim	343.7	336.4	308.9
5.	Jhankri	260.8	240.3	217.2
6.	Muktakeshi	336.5	330.5	299.9
7.	Satasankha Local	328.4	311.5	265.9
8.	Telia	430.0	332.5	307.5
9.	Topi	381.6	285.6	262.3
10.	TSL	370.9	349.9	327.5
	Mean	357.7	325.7	296.9
	CD (p=0.05)	32.31	14.45	

Table 12: Yield and in MV_1 generation

Sl. No.	Genotypes	Tuber yield (g) plant^{-1}		
		T_1	T_2	MEAN
1.	BBSL	317.4	254.8	268.4
2.	Bhubaneswar Local	309.3	255.0	248.7
3.	DP-25	382.2	311.7	326.7
4.	Duradim	315.2	273.5	283.7
5.	Jhankri	275.2	209.7	224.3
6.	Muktakeshi	294.3	247.3	251.0
7.	Satasankha Local	317.2	234.8	215.3
8.	Telia	368.4	249.1	242.0
9.	Topi	318.5	217.6	214.1
10.	TSL	325.5	291.0	288.1
	Mean	322.3	254.5	256.2
	CD (p=0.05)	17.59	7.87	

and Jhankari (12.7).

Plant height was severely affected by radiation treatment and disease incidence (Table 4). Jhankri, Satsankha Local and Topi were largely affected by γ-radiation with 25% reduction in height, while DP 25 and Duradim were less affected. Reduction in plant height due to disease is more in non-mutated plants, and at 90 DAP which might be due to progression of disease. Various explanations have been offered for growth inhibition due to mutagenic treatment like auxin distraction (Joshi and Gour, 1974) or inhibition of auxin synthesis, disbalance in the maintenance of nutritional level, failure of assimilation mechanism, inhibition of mitosis and chromosomal damage with associated physiological changes (Riley, 1953). Numbers of infected leaves had significant mean squares due to genotypes at both growth stages and due to irradiation at 90 DAP. It indicated differences in genotypes, effects of radiation and differential response of the genotypes to radiation treatment in MV_1 and MV_2 generation during 2010-11 and 2011-12, respectively. Number of leaves was severely affected by radiation and disease incidence (Table 5). In control populations, number of leaves increased in Satsankha Local, Telia and BBSL under diseased condition, probably as an attempt to cope with the disease. It was reduced due to radiation treatment except in DP 25 and Muktakeshi.

The tuber yield was observed to be varied significantly in irradiated plants while compared with the non-irradiated control plants (Table 6). However, the degree of reduction in yield was less under induced epiphytotic conditions in irradiated plant populations as compared to the non-irradiated control. Each of the 10 mutated populations showed variability in number and size of corms and cormels, mostly in negative direction. Hardly there could be any mutant plant surpassing the yield of non-mutated plants. The results of *in vivo* (field) evaluation revealed increased variability for morphological characters including tuber yield and disease parameters in irradiated populations compared to non-irradiated mother populations. Induction of variability following γ-irradiation has been reported by Vasudevan and Jos (1998).

Taro, being vegetative propagated crops, has the advantage of retaining mutant characters in subsequent clonal generations, if mutants are solid mutants, not putative mutants. Careful observations of radiated populations revealed that many plants resembled mother genotypes, while many others carried undesirable mutations. Association of desirable mutations with undesirable mutations led to the problem of linkage drag as these cannot be separated because of vegetative propagation and hence are unwanted mutants. Selection in irradiated populations can certainly help in identifying progenies that are likely to show better response to selection and simultaneously reduce the volume of unwanted material (un-mutated and unwanted mutants) by rejecting the "roughage" (Sharma, 1986). Only few plants appeared to be productive mutants. Under *in vitro Phytophthora* leaf blight conditions, the blight incidence such as spot diameter and number of sporangia produced was minimized with γ-irradiation as compared to the non-irradiated populations. It indicated that γ-rays could suppress the growth of *Phytophthora* spores in the leaf tissues of taro. The genotypes TSL and Duradim showed resistance consistently against leaf blight both under irradiated and non-irradiated conditions. The disease incidence was also minimized in the tested susceptible lines under γ-irradiation while investigated under artificial epiphytotic conditions. γ-irradiation in high yielding susceptible lines of taro such as Telia and Satasankha Local may help in inducing resistance against leaf blight with no/low yield loss due to infestation of *P. colocasiae*.

4. Conclusion

Irradiation with γ-rays from Co^{60} source increased the phenotypic variability of mutant populations, minimize spread of disease, yielded higher. High yielding susceptible lines such as Telia and Satasankha Local may be used for γ-irradiation for inducing resistance/tolerance to leaf blight disease. Highly susceptible Telia shown induction of resistance at MV_1 and MV_2 generation**.** The hybrid TSL showed resistance. This information would be helpful to develop resistant lines using mutagenesis at a faster pace.

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