Madras Agric. J., 85(10-12): 608 - 611 October - December 1998
https://doi.org/10.29321/MAJ.10.A00815

EFFECT OF SEED IRRADIATION ON SOME PLANT CHARACTERISTICS OF *Vigna marina* Merr. AND SIRATRO (*Macroptilium atropurpureum* (DC) Urb.)

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ABSTRACT

Dry seeds of *Vigna marina* Merr. and Siratro were exposed to different doses of gamma rays to study their effect on various plant characters like germination, seedling height, leaf number, number of branches and plant height. The results revealed that there was more reduction at higher doses compared to lower doses for all the characters for both the crops. The results obtained in the present study clearly indicate that different doses of gamma rays can be effectively utilized to create variability for various quantitative traits in both the crops.

KEY WORDS: Gamma rays, *Vigna marina* Merr., Siratro

INTRODUCTION

Genetic variation must exist in the material under study for selection to be effective in a plant breeding programme. Radiation and other mutagens may be used to produce new genetic combinations or to increase variability in populations. It has been experimentally proved that the induced mutations can increase yield as other quantitative characters in crop plants (Khan, 1983 and Verma and Singh, 1984). Induced mutations therefore supplement plant breeding and confer specific improvement without significantly altering the otherwise acceptable phenotype.

The value of induced mutations in crop improvement has however not been fully determined and utilized. Especially in lesser known crops like *Vigna marina* Merr., which is a sparsely hairy, short lived summer growing perennial legume and Siratro (*Macroptilium atropurpureum* (DC) Urb.) it has not been tried at all as the recent literatures suggests. The present study was undertaken to create wider genetic variability in these fodder legumes and to investigate the effects of gamma irradiation on the dry seeds of *Vigna marina* Merr. and Siratro by determining the value of ionizing radiation.

MATERIALS AND METHODS

The experiment was conducted at the Forage Crops Research Farm of Tamil Nadu Agricultural University, Coimbatore. One hundred and fifty dry, healthy and uniform seeds of both *Vigna marina* Merr. and Siratro were treated with 10, 20, 30, 40, 50, 60, 70 and 80 kR of $^{60}C_o$ gamma rays in the gamma chamber of School of Genetics, Tamil Nadu Agricultural University, Coimbatore. The irradiated seeds were sown in March, 1996 in single row plot replicated thrice along with control to study the effect on different characters. Observations on quantitative characters viz., germination per cent, number of days taken for the germination and survival percentage (at 30 and 45 days), seedling height, leaf numbers, number of branches, plant height, etc., were recorded on ten randomly selected plants from each plot in all the three replications. The significance was tested following standard procedure.

RESULTS AND DISCUSSION

Germination

Germination percentage was found to be progressively reduced with increasing doses of gamma rays in both the crops (Table 1 and 2). Lower doses of gamma rays (10 kR and 20 kR) showed stimulatory effect while the higher doses (70 kR and to 80 kR) showed gradual inhibition. The highest germination was 100 per cent at 10 kR, both in *Vigna marina* Merr. and *Siratro*, while it was 95.00 per cent and 96.00 per cent respectively in *Vigna marina* Merr. and siratro in control. The maximum inhibitory effect on germination was at 80 kR in both the crops, which was 29.00 per cent and 30.67 per cent in *Vigna marina* Merr. and siratro respectively. Similar results with stimulatory effect at lower doses and inhibitory effect at higher doses following gamma irradiation were reported by Vadivelu (1979) in bengalgram, Manju (1981) in

Table 1. Effect of gamma rays on germination of seed and plant survival in M1 generation of *Vigna marina* Merr.

Treatment	No. of seeds treated	Period taken for germination (days)	Germination (%)	Survival (%) At 30 days	Survival (%) At 45 days	Seedling height (cm) (15th day)
Control	150	6.67	95.00	100.00	100.00	5.67
10 kR	150	6.00	100.00	100.00	97.00	5.84
20 kR	150	6.00	96.67	98.33	98.00	6.00
30 kR	150	8.33	84.00	95.00	64.70	4.84
40 kR	150	8.67	76.33	94.00	48.70	4.12
50 kR	150	9.33	70.67	80.70	40.33	3.91
60 kR	150	10.00	46.33	69.00	12.00	3.12
70 kR	150	11.33	44.00	54.54	3.8 (lethal)	3.00
80 kR	150	11.33	29.00	40.00	0.00 (lethal)	2.44
SE(d)		0.98	1.64	1.55	1.72	0.71
CD (0.05)		1.96	3.28	3.10	3.44	1.42

horsegram, Jayanthi (1986) in redgram and Veeresh *et al.* (1995) in winged bean.

LD_{50} was calculated on the basis of parameters listed in Table 1 and 2. In case of *Vigna marina* Merr. it was (Table 1) found to be between 50 kR and 60 kR as there was sudden reduction in germination to 46.33 per cent in 60 kR but further investigation is required to find the exact LD_{50} dose for *Vigna marina* Merr.

In case of Siratro the LD_{50} was found to be between 60 kR and 70 kR doses (Table 2). Sudden reduction of germination to 41.33 per cent was observed in 70 kR. LD_{50} was between 40 and 50 kR for mungbean, cowpea and bengalgram as reported by Louis and Kadambavanasundaram (1973), Palaniswamy (1975) and Vadivelu (1979) respectively.

Period taken for germination

Period taken for germination showed significant difference between dosages. The germination was early by one day in the lower doses (10 and 20 kR) when compared to control in case of *Vigna marina* Merr. (Table 1). But the period taken for germination increased gradually in the higher doses. In case of higher doses (70 kR and 80 kR) it took nearly twelve days for germinatio:

In case of Siratro the germination was earl by one day in the lower dose of 10 kR. but th period increased gradually in the higher dose (Table 2).

These results are in conformity with Suma B and Sunil (1993) in winged bean and Borah (199 in Mungbean.

Survival percentage

Linear reduction in survival percentage wit increasing doses of gamma rays were observed i both the crops (Table 1 & 2). The survival was 10 per cent in control and in the lower dose of 10 k in both the crops at 30 days after sowing. At 4 days after sowing it was slightly reduced to 9 and 96 per cent for *Vigna marina* Merr. and siratr respectively in the 10 kR treatment. After this th survival percentage decreased progressively wit the increase in treatment doses in both the crop

The survival percentage was reduce drastically to 5.60 per cent and 4.00 per ce respectively for 70 kR and 80 kR treatments aft 45 days of sowing in case of siratro. The surviv percentage was reduced to 3.8 per cent for 70 k treatment in *Vigna marina* Merr. after 45 days

Table 2. Effect of gamma rays on germination of seed and plant survival in M1 generation of *Siratro*

Treatment	No. of seeds treated	Period taken for germination (days)	Germination (%)	Survival (%) At 30 days	Survival (%) At 45 days	Seedling height (cm) (15th day)
Control	150	5.67	96.00	100.00	100.00	6.64
10 kR	150	5.00	100.00	100.00	96.00	7.00
20 kR	150	6.00	98.00	94.00	92.33	6.92
30 kR	150	7.33	84.33	90.00	85.33	5.64
40 kR	150	7.33	72.33	76.67	70.33	5.12
50 kR	150	8.00	60.00	64.00	54.00	4.96
60 kR	150	8.33	54.00	39.33	34.67	4.50
70 kR	150	9.33	41.33	24.67	5.60 (lethal)	4.21
80 kR	150	10.00	30.67	35.67	4.00 (lethal)	3.46
SE(d)		1.02	1.31	1.43	1.02	0.74
CD (0.05)		2.04	2.62	2.86	2.04	1.48

sowing. There was not a single surviving plant for 80 kR treatment after 45 days of sowing in *Vigna marina* Merr.

Seedling height

Seedling height showed a gradual reduction with increased dosage of gamma rays in both the crops (Table 1 and 2). The effect was more drastic in the higher doses than lower doses. Lower doses of gamma rays (10 kR and 20 kR) showed stimulating effect in both the crops with respect to seedling height. The seedling height in 80 kR treatment was significantly lower than any other treatment in both the crops. The reduction in seedling growth may be attributed to changes in the level of auxin and ascorbic acid content and physiological and biochemical changes (Gorden, 1957). The results are in agreement with that of Rajput and Quereshi (1973) in greengram and Kulkarni (1976) in horsegram.

Polygenic traits

The two crops showed marked increase in mean values for plant height, number of branches and number of leaves in the lower doses (10, 20 and 30 kR). After this the mean values for these characters were gradually reduced with the increase in the treatment doses (Table 3 and 4), in comparison to the control.

Table 3. Mean values of different characters following gamma irradiation in *Vigna marina* Merr. at 45 days after sowing.

Characters	Irradiation doses (kR)										
	Control (0)	10	20	30	40	50	60	70	80*	SE_d	CD (0.05)
Plant height (cm)	49.44	51.62	51.20	53.00	44.69	42.00	39.00	34.61	26.40	1.41	2.82
Number of branches	4.73	4.94	5.00	5.14	4.60	4.23	4.12	3.96	3.00	0.42	0.84
Number of leaves	19.60	22.00	24.60	24.00	18.64	18.00	16.23	14.12	5.00	0.61	1.22

* Data pertains to 40 days after sowing, since the survival at 45 days was nil.

Table 4. Mean values of different characters following gamma irradiation in *Siratro* Merr. at 45 days after sowing.

Characters	Irradiation doses (kR)										
	Control (0)	10	20	30	40	50	60	70	80*	SE(d)	CD (0.05)
Plant height (cm)	38.10	43.93	39.80	41.00	40.60	38.00	33.00	31.33	30.00	0.84	1.68
Number of branches	4.67	5.00	5.12	5.67	5.00	4.12	4.67	4.00	4.12	0.33	0.66
Number of leaves	28.40	30.00	32.60	32.40	26.60	25.00	24.00	24.00	14.00	1.03	2.06

In M1 generation, the lower doses (10, 20 and 30 kR) of gamma rays stimulated plant height but higher doses were significantly inhibitory. Similar was the case with number of branches and number of leaves in both the crops. These results are in conformity with Karikari (1981) in winged bean and Borah (1991) in mungbean. The present study showed that both *Vigna marina* Merr. and siratro are very sensitive to gamma ray treatments in early stages of growth. Following irradiation, the mean values for all the characters studied registered a swift. Thus the results obtained in the present study clearly indicate that these doses of gamma rays may be effectively utilized to create variability for various quantitative traits.

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(Received: July 1997 Revised: Feb. 1998)