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EFFECT OF PHYSICAL AND CHEMICAL MUTAGENS ON SEED GERMINATION AND BIOMASS IN *BRASSICA JUNCEA*

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Effect of various doses of gamma-rays and different concentrations of EMS, streptomycin, acriflavin and ethidium bromide in *Brassiea juncea* var. Push bold was studied. All the treatments reduced the time taken for germination, germination percentage, seedling growth and total biomass except ethidium bromide which enhanced the size of cotyledonary leaves.

Key Words: *Brassica juncea*, mutagens, seed germination, biomass.

Brassica juncea (Indian mustrad and brown mustard) of family Brassicaceae is an important oil yielding crop of India. Although, India occupies the second position in the World with regard to the production of olieferous *Brassicas*, the average yield in the country is considerably lower than the world average yield (Kumar and Yadav, 1988). Gupta *et al.* (1991) have recommended that development of genetic variability in relation to growth rythm and biosynthesis of chemical constituents should be exploited for evolving better quality genotypes. Present paper is part of study undertaken to evaluate the afficiency of gamma-rays and some new chemical mutagens in *Brassica juncea* var. Pusa bold.

MATERIALS AND METHODS

Dry seed of *Brassica juncea* var. Pusa bold were irradiated with 40, 60 and 80 kR gamma-rays at the Division of Genetics, I.A.R.I., New Delhi. The presoaked seed in distilled water for 6 h were treated for 12 h in 500, 750 and 1000 ppm EMS (Ethyl-methanesulphonate) and 1000, 1500 and 2000 ppm streptomycin, acriflavin and ethidium bromide, while for control seeds were soaked in distilled water 18 h at room temperature. The irradiated, chemically treated and untreated seeds were sown in sterilized sand. Data on germination percentage, time taken for germination, seedling length and total biomass of seedling were recorded after 10 days and analysed statistically.

RESULTS AND DISCUSSION

The effect of seed treatment with gamma-rays and chemical mutagens on germination, seedling size and total biomass is show in Table 1. Table 1 shows clearly that untreated seeds took 8 days for germination, while those irradiated with various dose of gamma-rays took only 7 days. The other chemicals except EMS in different concentrations also significantly reduced the time taken for germination as compared to that in control. On the other hand, 1000 ppm of EMS delayed germination by 4 days. Similarly various treatments with gamma-rays, EMS and streptomycin, significantly reduced germination percentage. Maximum reduction was caused by 1000 ppm EMS (Table 1).

Data in Table 1 shows that there was a significant reduction in the length of seedling by various treatments. The maximum reduction was recorded in 2000 ppm strepstomycin (3.8 cm) as compared to that of control (8.8 cm). However, gamma-rays caused miminum reduction in seedling length.

Table 1 also shows that seed treatment with ethidium bromide and to some extent with acriflaving significantly enhanced the size of cotyledonary leaves of the seedlings. The cotyledons of the seedling in 1000 ppm ethidium bromide were the largest (2.96 cm^2) as compared to that in control (1.98 cm^2). However, with the increase in the concentration of ethidium bromide, the size of cotyledon was reduced but it was not less then that of control. On the other hand, with the increase in the concentration of acriflavin the size of cotyledons also significantly increased as the cotyledons were 2.30 cm^2 in size in 2000 ppm actifiavin treatment. On the other hand, streptomycin treatment caused a significant reduction in the size of cotyledons and smallest cotyledon (0.86 cm^2) were observed in treatment with 2000 ppm streptomycin.

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Table 1: Effect of various chemicals on seed germination, seedling and total biomass in *B. juncea* var. Pusa bold.

Treatments	Dose (kR)/ Conc. (ppm)	Time for germination (days) SD	Germination (%) SD	Seedling length (cm) SD	Size of (cm^2) SD	Total biomass (mg) SD
Control	-	8	98	8.8	1.98	178
Gamm-rays	40	7**	97*	8.5	1.50*	170
	60	7** (0)	97* (0.57)	6.4 (1.27)	1.42* (0.12)	120 (26.45)
	80	7**	97**	6.2	1.66*	160
EMS	500	7	91*	6.4**	1.42*	165
	750	8 (2.64)	88* (3.00)	6.2** (0.11)	1.40* (0.31)	135 (32.53)
	1000	12	85*	6.2**	0.86*	100
Streptomycin	1000	6**	92*	5.0**	1.26**	120*
	1500	6** (0)	95* (2.51)	4.2** (0.61)	1.10** (0.20)	105* (20.20)
	2000	6**	90*	3.8**	0.86**	80*
Acriflavin	1000	6*	97	4.6*	1.66	170
	1500	6* (0.57)	97 (0.57)	6.8* (1.27)	1.98 (0.49)	150 (13.22)
	2000	7*	98	6.8*	2.30	175
Ethidium bromide	1000	6**	98	5.2**	2.96	170
	1500	6** (0)	98 (0.57)	5.0** (0.52)	2.56 (0.49)	160 (18.02)
	2000	6**	97	4.2**	1.98	135

* Significantly different from control at 5% level.
** Significantly different from control at 1% level.

It is clear from the data in Table 1 that all the treatments caused a significant reduction in total biomass. The maximum reduction in total biomass was recorded in the treatment with streptomycin and highest concentration of this chemical caused highest reduction (80 mg) as compared to other treatment and control (178 mg).

According to Patel and Shah (1974) gamma-ray induced inhibition of seedling growth may be due to destruction or damage to apical meristem. Singh and Sharma (1988) have observed that the germination percentage decreased after EMS treatment in *Lathyrus* species. Chandra and Tarar (1987) have observed a reduction in seed germination by EMS treatment in *Gloriosa superba.* Tarar and Dhynsagar (1983) and Kumari *et al.* (1987) have also recorded similar results in *Phaseolus* species and *Turnera* respectively by EMS treatment. According to these workers, the reduction in germination may be due to the damage of cell constituents at molecular level. Streptomycin sensitivity at plant level was evaluated for inhibition of the germination rate in seedling bioassay by Kinoshita and Mikami (1990). According to them, streptomycin resistance was assocciated both at cellular and seedling stage. The results of the present authors also indicate that *Brassica juncea* var. Pusa bold is streptomycin resistant at plant level as compared to other chemicals used.

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