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Effect of Ionizing Radiations on Germination and Emergence of Cowpea Seeds

Many studies have been undertaken on the application of cobalt-60 gamma ray irradiation for the germination and growth of field crops. The stimulation of plant growth through the application of gamma rays irradiation of seeds has been reported in several crop by Woodstock and Jusfice (1967). Sen and Gosh (1968) working with jute seeds reported that the geminability of the seeds was not affected due to irradiation of gamma rays even upto 140 Kr. However, till now very few studies have been reported on biochemical or physiological changes in cowpea seeds accompanied by irradiation. Thus, it was deemed essential to study the effects of ionizing radiation on germination and other related characters of seed.

Dry seeds of variety, C-152 with low moisture content were irradiated with 10.20.30,40, 50 and 60 Kr gamma rays. Treated and control seeds were sown in the Botany garden fields of Agril. College, Dharwad during kharif season of 1999 and observations were recorded regularly. Germination counts were recorded at an interval of 5 days.Shoot length, root length,emergence count and survival % were recorded. Lethal dose-50 (LD-50) value of gamma rays on survival % root length, shoot length and field emergence were calculated using probit analysis (Finney. 1977).

Differences in germination percentage was striking and very marked. Almost a linear relationship between germination with doses of radiations was noticed.In control and 10 Kr treated lots, 100% and 96%, germination was observed and obtained within second week. Among other treatments very low percentage of germination was observed and they took up to 25 days for completing germination (Table 1).

Table 1. Effect of gamma rays on germination, field establishment, shoot length and root length in cowpea

Sl. No.	Treatments	Germination count		Survival (%)	Field establish	Shoot length	Root length
		7th day	14th day				
1.	Control	97	98(100)	100	98	7.0	8.5
2.	1 OKr	94	96(97)	90	90	5.0	6.1
3.	2OKr	84	91(92)	70	70	4.1	4.5
4.	3OKr	62	86(87)	35	10	3.2	2.6
5.	4OKr	44	76(77)	5	0	2.8	2.2
6.	5OKr	33	54(55)	0	0	2.4	1.9
7.	6OKr	22	37(37)	0	0	2.0	1.0
	LD-50			22.29.	19.93	26.58	19.82

Figures in parenthesis indicate percentages over control

There was a significant reduction in the germination of C-152 genotype with increase in dose of irradiation. The highest germination was observed in control while the least was in 60 Kr treatment . The observations on root length and shoot length were recorded on seventh day after keeping the seeds for germination. The highest shoot length was seen in control and it decreased with increase in the dose of irradiation. The root length was highest in the untreated control. There was a gradual decrease in root length with increase in the dose of irradiation. The highest number of seedling establishment with the increase in the dose of irradiations. the lowest value for field establishment was 30 Kr. The LD-50 for field establishment was 22 Kr in C-152 cowpea variety.

The increased doses of gamma irradiation cause much reduction in the germination of C-152. The effect of highest dose of irradiation i.e. 60 Kr was very striking. It also caused significant reduction in shoot and root length. The effect was much more clear than on germination. Similar effects of mutagen on root and shoot length were observed by several workers in different crops (Sahai and Dalal, 1973; Ramachandram and Goud, 1983a). In the variety Phalguni mortality rate was higher at 10 Kr and the plant survival rate was 87 percent as against 75 in the control (Uprety,1968) but the LD 50 dose was not calculated as per the probit analysis.Gamma rays treatment had very significant effects on the field establishment. There was a drastic reduction in the field establishment of the genotype with the increase in the dose.

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References

WOODSTOCK, L.W. AND JUSTICE,O.C., 1967, Radiation induced changes in respiration of corn, wheat, sorghum and radish seeds during initial stages of germination in relation to subsequent seedling growth. *Radiation Botany*,**7**:129-136.

SEN,S AND GOSH, N., 1968, Delayed germination in gamma rays dry seeds of jute. *Science and Culture*, **34**: 346.

FINNEY, D. J., 1977,*Probit Analysis*. 3rd edition. Cambridge University Press, Cambridge.

RAMACHANDRAM, M.M. AND GOUD, J.V., 1983, Mutagenesis in safflower to differential radio sensitivity. *Genetica Agraria*, **37**: 309-318.

SAHAI, L. J. AND DALAL, K. C., 1973, Gamma ray induced variability in M_1 generation of safflower. *Indian Journal of Genetics*, **34**:1-13.

UTPRETY, D. C., 1968, Effect of Gamma irradiation on growth and development of *Vigna unguiculata* L. (Walp) var. *Phalguni. Indian Journal of Agronomy*, **13**:177-180.