RESEARCH ARTICLE

Effect of Gamma Radiation in *Crotaleria juncea* Linn.

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ABSTRACT

*Crotalaria juncea*Linn.belongs to the subfamily papillionaceae/fabaceae of family leguminosae. It is cultivated for local use and export, as a raw material for sacking and cordage and also for fibre and green manure. A review of available literature indicates that a meager cytogenetic work on *Crotalaria juncea*Linn. In connection with mutagenesis, has been carried out. There has been little work with regard to the use of gamma rays been carried out. It was therefore thought worthwhile to undertake a detailed cytogenetic study of this plant involving induced mutation by using physical mutagen i.e. gamma rays.

Keywords: Effect of gamma radiation, *Crotalaria juncea,* Family leguminosae.

INTRODUCTION

Family Leguminosae is the second largest family of dicotyledons with 550 genera and about 13,000 species. Knowledge of Cytogenetical aspects of different plants is essential for the improvement of plants with this aspects in the view one member of subfamily papillionaceae/fabaceae belong to the family Leguminocsae that is *Crotalaria juncea*Linn. is selected for the cytogenetic studies with special references to gamma irradiation. Hutchinson was the first to raise the rank and named it as this family Fabceae (the pea family) and the order which it belongs as Leguminales. The mainly confined to the temperate regions of both the northern and southern hemisphere. This family includes about 375 genera and over 5000 species.

*Crotalaria juncea*Linn.has great potential as an annually removable multipurpose fiber crop. As one of the most widely grown green manure crop and throughout the tropics, sunn hemp is often grown in rotation with several different crop species (Kundu 1964). The stem of Sunn hemp are composed of two fibers, the bast and woody core. The best fibers, which are located in the outer bark, are much longer than the core fiber. But the two fiber widths are very similar.

MATERIAL AND METHODS

Seeds of *Crotalaria juncea*were obtained from the N.B.P.G.R. satellite center Amravati and sown in the Botanical Garden. Seeds of the stabilized plant were used for the present work**(Fig. 3 & 4)**.

Gamma Irradiation Treatment: Dry seeds were irradiated by cobalt 60 source in the gamma cell of USIC, department of chemistry, Nagpur University, Nagpur. They were irradiated with 5, 10, 20, 40, 60, 80, 100 and 120 KR. 100 seeds were sown in the field to study morphological parameters. 100 seeds were kept for germination in petridishes and 50 seeds were sown in slots to study seedling height.

Parameters: The effects of gamma rays were studied with respect to the following parameters in R_1 generation.

Seed Germination: Irradiated seeds were sown in the field. Seeds with plumule just emerging out were counted as germinated. The final percentage was calculated on the basis of the total number of seeds germinated.

Survival of Plants: The number of plants survived at maturity was considered for determining the percentage of survival.

Seedling height:50 seeds were sown in the blotting paper folds (slots) following the method devised by Konzak et al. (1961). After 10 days, seedling from those folds for each treatment was used for measuring the height from the base to the tip of the first leaf. The percentage of reduction in the seedling height is expressed as the injury caused by the mutation.

Plant height: It was measured in the two months old plants before the commencement of tendril, from the soil level to the top of the plant.

Number of branches: It was recorded on the main stem per plant.

Number of leaves: These were determined on the main stem per plant at the time of flowering.

Chlorophyll chimeras: These were observed in the field from the time of germination to the maturity.

Number of pods/plant: It was counted in the 25 randomly selected plants at the time of harvesting on main stem. Mean no. of pods was considered for each dose.

Seeds yields/plant: Weight of the seeds from at least 25 readings were selected from main stem of the plant for calculating the average yield of each dose.

Pollen fertility: For determining the pollen fertility the pollen grains of several anthers were stained with acetocarmine mixed with glycerine. The pollen grains which were fully stained were scored as fertile, while the unstained or partly stained or shrieveled ones were taken as sterile. The pollen fertility was determined by calculating the mean percentage of stained pollen grains in at least 25 plants for each treatment.

RESULT & DISCUSSION

Seed Germination: The data regarding germination is given. In control, germination was 80%. The maximum germination was found on the fourth day after sowing. At the exposure of gamma rays (5, 10 and 20 KR) germination was slightly earlier i.e. one day before the control, but when exposure were high (40, 60, 80, 100 and 120 KR), the germination was delayed, i.e. one day late than in the control. The germination percentage increased at the lower exposure of gamma rays. It was 81%, 85% and 85% in case of 5, 10, and 20 KR respectively. Beyond20 KR, however, it decreased gradually and the minimum of 30% was observed at 120 KR. in graph **Fig 1.**

Survival of Plants: The percentage of survival of plants reaching maturity was found to be 91.87 in control plant. The data regarding the survival percentage is given.

With an increase in the dose of gamma rays, the survival percentage decreased gradually, the minimum percentage (6.66%) was observed at 120 KR. (**Fig. 2**).

Seedling Height: The seedling height in control plants was found to be 9.54 cm. Lower doses of gamma rays (5, 10 & 20 KR) had a stimulatory effect on seedling height, whereas at higher doses (60, 80, 100 & 120 KR) it decreased. The maximum height was seen at 5 KR (11.92 cm) and minimum at 120 KR (6.06).

Plant Height: In control**,** the plants attained a mean height of 159.96 cm stimulation in the height was observed in 5 and 10 KR treatment. The mean height decreased considerably at 20 KR and onwards, the maximum height (180.64 cm) was noted 10 KR and the minimum (80.4 cm) at 120 KR.

Branching and Leaf Arrangements: In control plant, the branching is of racemose type. The plant mostly bears primary and secondary branches. The

arrangement of leaves is alternate. The length of internode varies from 6.5 to 18, 5 c. The basal internodes are more condensed than the terminal ones.

Number of Branches: In control the mean number of branches was 8.4. The number of branches decreases with the increase in dosages of gamma irradiation except in 5 and 10 KR. The maximum number of branches (9.36) was observed at 10 KR, whereas the minimum (3.04) of it was observed at 120 KR.

Branching abnormalities: Mostof theplant raised from seeds irradiated with gamma rays had normal racemose branching and alternate phyllotaxy. However, some abnormal types were also recorded. The change in branching and leaf arrangement in these variants was with respect to only one or two nodes. In some plant the main axis forked at the very first node. There forked branches, however had normal branching with alternate phyllotaxy.

Number of leaves: In control the mean number of leaves were (58.32). The number of leaves increased at 5 and 10 KR treatments. It decreased in other dosages. The maximum (63.48) number was at 10 KR, while the minimum (10.48) was at 120 KR treatments. There was an increase in length of petiole as well as axis of leaflets in some plants at the lower dosages of gamma rays. In some plants micro leaves asymmetrical leaves were observed due to reduction in lateral leaflets.

Chlorophyll Chimeras:A wide spectrum chlorophyll chimeras was obtained as a result of gamma rays. All the dosages of gamma rays were found to be affective in inducing chlorophyll chimeras. They were in the form of albino (white) xanthan (Yellow), chlorina (Yellowish green) and viredish (Light green) **(Fig-5 A-D).** In some cases they were in the form of streaks on the lamina entirely restricted to the margin are apex of the leaflets. In a few other cases, the entire leaf and stem were also affected.

All the dosages of gamma rays were affective in inducing the chlorophyll chimeras and total frequency increased with an increase in the dose of gamma rays. Thus it was maximum chimeras were chlorina>viradis> xanthan > albino.

Number of Pods: In control the mean no. of pods per plant was (46.04). There was a slight increase in the number of pods at 5 KR (63.52) and 10 KR (73.92). Whereas it was decrease in all other dosage. The minimum number of pods was noted at 120 KR (6.04).

Yield Per Plant: In control mean seed yield per plant was found to be (5.65 gm). It increased at 5 KR (8.55 gm) and 10 KR (9.95 gm) whereas it was found to be decreased in all other doses. The decrease in yield was greater at heigher doses. It was found to be minimum (0.70 gm) at 120 KR dose.

Pollen fertility Percentage (%) : Pollen fertility was found to be 92.85 in control. It gradually decreases as the dose increase.

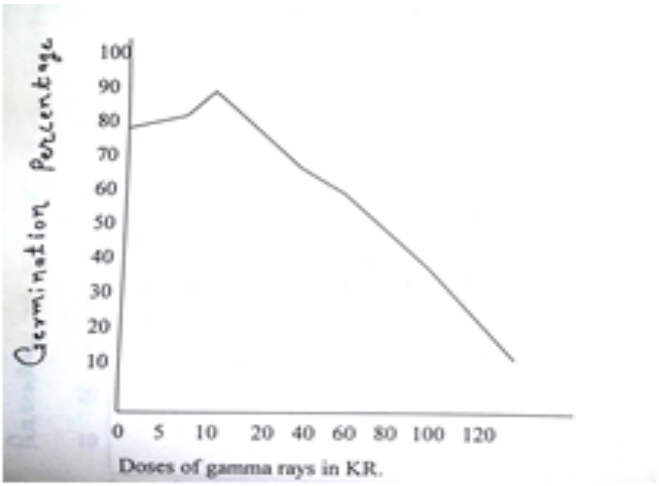

Fig. 1 : Showing effect of gamma rays on germination percentage in R_1 generation

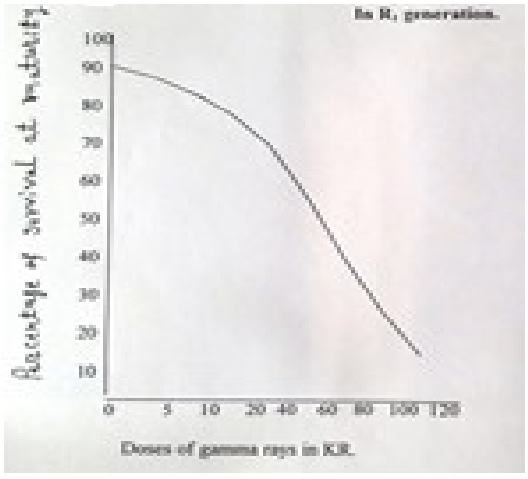

Fig.2: Showing effect of gamma rays on survival of mature plants in R_1 generation

Fig. 3

Fig. 4

Fig. 5 A

Fig . 5 B

Fig. 5 C

Fig. 5 D

Fig. 3 - Plant showing stimulatory effect in height, branches and leaves at 5 and 10 KR doses of gamma irradiation.

Fig. 4 - Plant showing maximum height at 5 and 10 KR doses of gamma Irradiation.
Plant with luxuriant growth at 5 and 10 KR doses of gamma Irradiatioin.

Fig. 5 Chlorophyll chimeras in R1 generation **(5 A)** - Leaf showing Viridis sectors, **(5 B)** - Plant showing xantha leaf, **(5 C)** - Leaf showing chlorina sector, **(5 D)** - Leaf showing albino sector.

DISCUSSION

The effects of mutagens in the immediate germination after treatment are measure and expressed by certain parameters. It is a well-known fact that seed treatments with mutagens cause reduction on germination survival and seeding growth induce chromosomal aberrations during cell division both at mitosis and meiosis, reduction in fertility of the pollen grain and seeds and some morphological changes like chimeras (Kadu, 1981). This parameters are used as a indices for tasting mutagenic sensitivity of plants (Ehrenberg; 1961;Nilan et al, 1968; Khanolkar et al. 1974)

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