



Effect of gamma irradiation on seed germination, seedling survival and lethal dosage LD₅₀ of *Hibiscus sabdariffa* L.

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Abstract

The present investigation was on Effect of Gamma irradiation on seed germination, seedling survival, lethal dosage LD₅₀ in *Hibiscus sabdariffa* L. The *Hibiscus sabdariffa* L. seeds were treated in a various dose of gamma irradiation 05KR, 10KR, 15KR, 20KR, 25KR, 30KR, 35KR, 40KR, 45KR and 50KR for studying the seed germination, seedling survival and lethal dosage LD₅₀. The seed germination was noted on 15th day and the seedling survival was noted on 30th day. Seed germination will be reduced when the dose of treatment increase. 50 percent of germination is considered as a LD₅₀ value. The LD₅₀ value was 20KR. The maximum value of seed germination was recorded in 05KR and the Minimum value was recorded in 50KR dose of gamma rays treatment.

Keywords: *Hibiscus sabdariffa*, gamma rays, ld₅₀, seed germination, seedling survival

Introduction

Roselle is an annual herbaceous plant belonging to the family Malvaceae and comes under the order Malvales; it is commonly called Roselle. The plant was commonly cultivated in warm countries. The immature are unlobed but are they deeply 3 to 5 lobed at maturity. The leaves are having sour taste. The flowers are yellowish in colour and they have five petals with red colour at the bottom. The plant will grow up to 3.5m tall. Deep penetrating taproot system is present in the plant ^[1]. The stems are red mixed with green. In sudan it is a major crop plant and its occupies the second place in cultivation ^[2]. *Hibiscus sabdariffa* (2n=72) is self-pollinated crop plant. The plant extracts are used as a folk medicine. The Roselle juice extract is used to cure hypertension ^[3]. The fruits are fleshy and dark red in colour. Its plays an important role in food and medicine. Mutation was first introduced by Hugo De Vries in 1901. Mutation is the sudden heritable change in the organism. Mutation breeding is a conventional breeding method for crop improvement. The mutation causes lots of beneficial variation to the plants. Mutation breeding is the best tool for plant breeders in now a day. In the past nine decades through mutation breeding 2252 mutant varieties are officially released in the world ^[4]. Mutation is well known as a variation. On the basis of the cause, mutations are of two types; spontaneous and induced mutation. Spontaneous mutations are naturally occurred in the organism but the induced mutations are artificially caused by the factors. The agents of the induced mutation are called as mutagens. Gamma rays are physical mutagens and it is one of the cheapest and best mutagens. Physical mutagens are the most used techniques in mutation breeding. Through mutation breeding, new varieties of plants with special characters are produced ^[5]. Mutation breeding is relevant with various field like morphology, anatomy and molecular biology ^[6]. Gamma irradiation is produced by the ⁶⁰Co radioisotopes. Gamma rays are the ionizing radiation having a low wave length with a high penetrable power ^[7]. Induced mutation is a simple cheap technology performing in a useful way ^[8].

Gamma rays are most energetic form of electromagnetic radiation. This radiation can damage and modify the plant cells. The use of gamma rays give a lot of positive results like disease free mutants and new varieties of plants like Tomato ^[9] and Mungbean ^[10].

Materials and Methods

The seeds of *Hibiscus sabdariffa* L. is collected from University of Agricultural Science, Hebbal, Bangalore. The matured and healthy seeds are taken for gamma rays treatment and 100 seeds were treated against each concentration. The seeds are irradiated with following concentration 05KR, 10KR, 15KR, 20KR, 25KR, 30KR, 35KR, 40KR, 45KR and 50KR doses of gamma rays ⁶⁰Co source at Indira Gandhi Centre for Atomic Research (IGCAR) Kalpakkam, 100 seeds were kept in petri-dishes for counting the germination percentage and was placed in the blotting paper. The germination percentage will be calculated on the 15th day after directly showed in the field. The seedling survival was determined on 30th day after sowing.

Result and Discussion

Seed Germination

The growth of an organism from a seed is called as a seed germination. The seed germination percentage in control is 95.4 (Table 1). The highest germination percentage was observed as 83 percentage (05KR) and the lowest germination percentage was observed as 13.54 percentage (50KR). A germination percentage was significantly decreased when the concentration dose of gamma rays increased. It was also reported in Little Millet ^[11]. The decrease in seed germination at higher dose of the mutagens attributes to the disturbance level of cells. The statement was already declared by a past worker in Okra ^[12]. The germination percentage decreased means the increase of the concentration/dose of gamma radiation, which was already reported by the previous workers in *Pinus* ^[13]. Lethality Dose (LD₅₀):

The concentration in which the germination of exactly 50 percent of plants is occurred is termed as LD₅₀. The LD₅₀ value identification is depended upon the germination percentage. The LD₅₀ was reported 50.24 in 20KR. The same result was supported by earlier worker in Pigeon Pea [14].

Seedling survival

The seedling survival was calculated in the 30th day. The seedling survival of plant in control was 100%, as shown in Table (1). The maximum seedling survival was 93.81 in 05KR and the minimum was 15.95 in 50KR. The decrease and increase in the survival percent depend on the mutagenic treatment. It was similarly reported in Horse Gram [15] and Soybean [16].

Table 1: Effect of gamma rays on seed germination, seedling survival and LD₅₀ value of *Hibiscus sabdariffa*.

Treatment of dose gamma rays (KR)	Seed germination percentage %	Seedling survival percentage %	Percent over control	Percent of reduction over control
Control	95.4	93.81	100	00.00
05KR	83	89.15	87.00	12.99
10KR	74.66	77.68	78.25	21.74
15KR	62.9	68.36	65.93	34.06
20KR	50.24	51.75	52.66	47.33
25KR	42.89	48.96	44.95	55.04
30KR	38.46	41.60	40.31	59.68
35KR	29.57	33.81	30.99	69.00
40KR	23.66	29.98	24.80	75.19
45KR	18.68	21.41	19.58	80.41
50KR	13.54	15.95	14.19	85.80

Conclusion

In this study, by increasing the dose of gamma irradiation from 05KR to 50KR the seed germination and survivability are reduced. From the result we conclude the LD₅₀ value was reported in the 20KR.

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Conflicts of Interest

None

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