



SHORT COMMUNICATION

EFFICACY EMS AND DES ON MUTAGENESIS AND SEEDLING CHARACTERS OF *ELEUSINE CORACANA* L. GAERTN

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ABSTRACT

This study was performed by exposing the seeds of Finger millet (*Eleusine coracana* L. Gaertn.) Var CO-13 to Ethyl Methane Sulphonate (EMS) and Diethyl sulphate (DES). The observations were made on seed germination and survivability in M_1 generation. The study revealed that germination percentage and survivability were decreased by increasing concentration of the mutagens when compared to the control. The LD_{50} value was found in 30 mmol of EMS and 40 mmol of DES. So it was found that both mutagens at lower treatments have influenced less biological damage and could be suitable for inducing desirable mutations in Finger millet.

Keywords: EMS, DES, LD_{50} value, Finger millet, Seed germination, Survivability

INTRODUCTION

Finger millet (*Eleusine coracana* L. Gaertn.) is an important millet species used as a staple food in many parts of the world. Finger millet is commonly known as 'Ragi' is one of the important food crops and largely grown in Southern States of India [1].

Now a day, out of the many available ways of inducing genetic variability available to the plant breeder, Mutation breeding is of prime importance [2, 3]. In this technique, the chance of changing specific characters is there, and the meantime, the remaining traits will be stay unaltered [4]. Mutation breeding has been used to create genetic variability in quantitative traits of various crop plants within the shortest possible times [5-7]. Diethyl sulphate is reported to be a monofunctional and strong alkylating agent which ethylates DNA [8].

For any mutagenesis, the main step is to fix the dosage and determining the LD_{50} . The mutagen dose administrated should be sufficient to kill about 50 percent of the seed to obtain the maximum number of mutation [9, 10]. Generally, it was observed, higher doses/concentrations of mutagens produce biological damage to germination and failure to survival at maturity. These biological damages are considered as the indication of mutagenic effect [11]. On the light of above facts, the present investigation was carried out to evaluate the effect of chemical mutagens (EMS and DES) on seed germination and survivability of Finger millet. These parameters are helpful in determining the effect of mutagens for further mutation breeding

programme.

MATERIALS AND METHODS

Plant material

Dry and healthy seeds of Finger millet (*Eleusine coracana* L. Gaertn.) Var CO-13, were obtained from Tamilnadu Agricultural Research Institute Villupuram.

Mutagens employed

Chemical mutagens namely, Ethyl methanesulphonate (EMS) (10, 20, 30, 40 and 50 mmol) and Diethyl sulfate (DES) (20, 30, 40, 50 and 60) were used at various concentrations. The treatments were done as explained previously [12].

Raising of M_1 generation

The treated seeds were sown in seed beds and watered at least once a day. After 25-30 d, seedlings (at 4-5 leaf stage) were shifted to main field in randomized block design with three replications. All the mutagenic treatments including the control were raised adopting a space 30x15 cm Botanical Garden, Department of Botany, Annamalai University. All the necessary practices like cultural operations and irrigations were carried out.

Seed germination (%)

In the laboratory, the seeds of each treatment along with control were placed on absorbent cotton-wet Petri dishes. For each treatment three replicates were studied and the number of seeds germinated on the 7th day was counted and the germination percentage was calculated.

Received 28 February 2018; Accepted 20 May 2018

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Plant survival on 30th day

The number of plants survived on 30th day after sowing was counted from each treatment and the survival percentage was calculated.

RESULTS AND DISCUSSION**Seed germination (%)**

The seed germination data on Finger millet (*Eleusine coracana* L. Gaertn.) Var Co 13 are given in table 1 and table 2. The seed germination percentage of various mutagenic treatments under laboratory conditions revealed that, the germination percentage was decreased with increasing concentrations of EMS and DES. The percentage of seed germination was highest in lower concentration of EMS (10 mmol--84.00%) and DES (20Mm 86.32%). Based on the seed germination percentage on the 7th day, the LD₅₀ values were fixed at 30 mmol for EMS and 40 mmol for DES.

Reduction in seed germination may be due to the effect of mutagen on meristematic tissues of the radical/plumule [13]. One of the physiological effects caused by treatment of these mutagens particularly chemical mutagens might be due to the disturbances in the formation of enzymes involved in the germination process [14]. Similar

inhibitory effect on seed germination by the various mutagenic treatments were reported earlier in Onion [15].

Plant survival on 30th day

In general, a gradual reduction in the seedling survival in all mutagenic treatments is shown in Table3. The maximum plant survival was recorded at 10 mmol of (72.10%)in EMS and 20 mmol (73.19%)in DES. If the higher dose was imposed, growth reduction will be the result in plants [9]. The reduction in plant survival due to the mutagenic treatments has also been reported in *Dianthus* [16], Horsegram [17] and Ashwagandha [18], Pearl Millet [19], Sesame [20] and Okra [21].

CONCLUSION

The Finger millet Seed germination and survivability were decreased by increasing concentrations of EMS and DES. It can be concluded that, EMS and DES could be utilized as a potential tool for inducing genetic variability. And among the 30 mmol in EMS and 40 mmol in DES were founded as a threshold dose.

ACKNOWLEDGEMENT

The facilities provided by Department of Botany, Annamalai University are gratefully acknowledged.

Table 1: Determination of LD₅₀ for EMS on finger millet

Mutagens	Treatments Conc. (mM)	Seed Germination Percentage (%)	Percent of reduction over control
Control		96	00.00
EMS	10 mmol	86	10.41
	20 mmol	77	19.79
	30 mmol	51	46.87
	40 mmol	40	58.33
	50 mmol	34	64.58

Table 2: Determination of LD₅₀ for DES on finger millet

Mutagens	Treatments Conc. (mM)	Seed germination percentage (%)	Percent of reduction over control
Control		96	00.00
DES	20 mmol	84	12.5
	30 mmol	73	23.95
	40 mmol	52	45.83
	50 mmol	39	59.37
	60 mmol	30	68.75

Table 3: Effect of mutagens on plant survival (%) in M₁ generation (30th day) finger millet

Mutagens	Treatments Conc. (mM)	Range	mean±SE	Percent over control
Control		83.10-87.15	81.16±3.93	00.00
EMS	10 mmol	72.44-79.18	72.10±3.51	11.16
	20 mmol	64.00-71.51	59.22±2.91	27.03
	30 mmol	49.14-57.13	42.43±2.47	47.72
	40 mmol	31.28-36.11	33.31±1.27	58.95
	50 mmol	19.21-24.85	21.72±0.89	73.23
DES	20 mmol	73.42-89.31	73.19±3.55	09.82
	30 mmol	62.54-74.04	64.18±3.14	20.92
	40 mmol	52.08-61.95	44.55±2.58	45.10
	50 mmol	41.84-32.77	35.33±1.22	56.46
	60 mmol	29.12-31.93	24.16±0.93	70.23

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