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Short Communication

MUTAGENEIC EFFECTIVENESS AND EFFICIENCY OF ETHYL METHANE SULPHONATE AND DIETHYL SULPHATE IN FOXTAILMILLET (*Setaria Italica* [L.] P. BEAUV.) *VAR. CO(Te)*$_7$

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ABSTRACT

The present investigation was carried out to determine the Lethality, Injury, Pollen grain sterility, Effectiveness and Efficiency induced by EMS (Ethyl methane sulphonate) in the concentration 20mM,30mM,40mM and DES (Diethyl sulphate) in the concentration 30mM, 40mM, 50mM. The M_2 generation seeds were subjected to observe the mutation frequency which acts as an inducing factor for these variations. The Lethality was found to be increased with increase in the concentration. In EMS the Maximum Effectiveness was observed in the low concentration of 20mM (0.35%) and in DES in the concentration of 30mM (0.24%) and the Efficiency was observed to be maximum in the concentration 20mM (44.76%) EMS and (39.92%) in 30mM of DES. EMS was more effective and efficient in stimulating variability in fox tail millet than DES. Therefore the mutants of *Setaria italica* var. Co (Te) $_7$ with less biological damage and high mutation frequency can be developed at low concentration of EMS and DES can be chosen for plant breeding in Fox tail millet.

Keywords: Setariaitalica, Mutagenic effectiveness, Mutagenic efficiency, seedling injury, pollen sterility, Lethality.

1. INTRODUCTION

Setariaitalica is traditional Chinese crop planted in the North, North west china it is a comprehensive and balanced nutrient millet and its tolerant to arid and barren soil rank it as one of the most popular side crop and plant to secure food supply it has a good impressive ability of stress resistance, stable and high yield even under adverse weather condition. Fox tail millet was domesticated from *Setaria viridis* a major cereal crop. It is dietary staple crop. [1].The origins of food production in North china; Genotypes from domesticated cereals which are indigenous to the semi-arid regions should be improved for high yielding stable varieties [2] .This cereal is mainly cultivated in North Africa [3]. The plant has relatively high tolerant to drought and extreme conditions of weather and external chemicals or nutrients [4]. A Different kind of agricultural revolution was generated in the plantation of foxtail millet. Induced mutagenesis is a significant tool to break the limitations of variability and to create changes in a short period of time [5, 6]. The application of chemical mutagens in mung bean breeding found high variation in yield per plant, nutritional improvement specially protein content [7] were reported. A highly effective mutagen may not necessarily show high efficiency and vice versa, the higher efficiency of mutagen indicates relatively less biological damage (seedling injury, lethality, sterility etc) in relation to induced mutation [8,9] Therefore high frequency of desirable mutation is obtained by selecting effectiveness and efficiency of mutagens. The present investigation is focused on knowledge on effectiveness and efficiency of mutagens EMS and DES to classify the range of concentration in promoting mutation breeding in *Setaria italica* var.Co (Te)$_7$

2. MATERIALS AND METHOD

Var.Co(Te)$_7$ of *Setaria italica* were collected from TNAU Coimbatore and used for the present study. The 20g of seeds were presoaked in the mutagens at room temperature for M1 generation near 4 hours. The seeds of 20,30,40 mM of EMS and 30,40,50mM of DES of M_2 were subjected to Research studies. The M_1 generation treated seeds then removed and washed thoroughly in the tap water; untreated seeds were used for the control and followed the same procedure. M_1 generations were raised by using Chemical treated and untreated seeds in the fashion of RBD (Randomized block diagram) in the botanical garden of Annamalai university field with the appropriate spacing between the rows of the plant. The seeds were harvested from the M_1 generation and proceed to M_2 generation with three replications Chlorophyll mutants, viable morphological mutants were screened and classified according to [10] and [11] Frequency of viable mutations data on Biological

abnormalities such as injury, lethality in M_2 generations, chlorophyll mutation frequency in M_2 were used as unique tool in determining the mutagenic efficiency and effectiveness according to [12] formulas expressed.

3. RESULT AND DISCUSSION

Mutation frequency was calculated, based on the classification the chlorophyll and morphological mutants were sorted out in M_2 seedlings. High mutation frequency was observed in 30mM of EMS (9.27) and 40mM of DES (7.95) [13] in *Setaria italica*. The mutation rate of mutagenic effectiveness is based on amount of concentration of a mutagen hence forth mutagenic efficiency is the mutation rate in relation to biological injury (or) lethality. Lethality and biological injury is based on the survivability of seedlings and is increasing with increasing doses of EMS and DES. Variations obtained in lethality in mutagenic effectiveness and efficiency was due to mutagens, the mutagenesis in 40mM of EMS (59.71) produced was the highest and in DES and 50mM of DES (59.86) Produced highest (Table1). Similar results were earlier reported in Pearl millet [14].

Table 1.Mutagenic effectiveness and efficiency of chlorophyll and viable mutation in *Setaria italic* Var. co(Te)$_7$

Chemicals	Concentration	Total number of plant studied	Mutants	Mutation frequency (%)	Lethality (%)	Injury (%)	Pollen sterility	Effectiveness M/CxT	Efficiency	
									L=MF/L	I=MF/I
	20	770	54	7.01	43.21	15.66	0.08	0.35	0.16	0.44
EMS	30	722	67	9.27	58.26	22.02	0.19	0.30	0.15	0.42
	40	702	41	5.84	59.71	24.36	0.25	0.14	0.09	0.23
DES	30	763	57	7.47	47.54	18.71	0.09	0.24	0.15	0.39
	40	714	60	8.40	56.25	26.12	0.17	0.21	0.14	0.32
	50	676	51	7.54	59.86	29.65	0.24	0.15	0.12	0.25

3.1. Mutagenic Effectiveness

20mM of EMS produced high mutagenic Effectiveness and low mutagenic effectiveness is observed in 40mM of EMS. Thus the effectiveness decreased with increase in concentration of both chemical mutagen similar results were observed in Green gram [15], Chilli [16] chick pea [8] Sorghum bicolor [17].

3.2. Mutagenic efficiency

The mutagenic efficiency varies on different concentration of mutagens EMS and DES. The highest mutagenic efficiency was observed 20mM of EMS and 30Mm of DES [18] reported mutagenic effectiveness and efficiency of gamma and EMS in mung bean, treatment of mutagen suggesting the direct relationship with the dose dependent increase.

3.3. Pollen sterility

Pollen sterility revealed that both the mutagen EMS and DES are effective in inducing pollen sterility in M_2 generation. The rate of pollen sterility increased with increase in concentration of mutagen. The result observed were synchronizing to those earlier result [19] in green gram [20], in mung bean [21], in chick pea [22] .

4. CONCLUSION

The viability of M_2 generation mutant were significantly handled by seedling injury, lethality and pollen sterility increased with increasing concentration of EMS, DES concentration of mutagen established as drive force in representing mutagenic effectiveness and efficiency. The effectiveness and efficiency stimulated the research work in selecting specific mutants likely to cause mutational changes in the selected genotypes. The increased use of mutants in association with gene recombination may act as an essential tool in genetic engineering for the benefit of the plant breeders to overcome the conventional slow progressing techniques and to provide better understanding towards mutational breeding in revolutionizing the field of crop improvement in providing stable genetic traits in the environment. The

maximum frequency of mutation was observed in *Setaria italica* by chemical mutagens were found in 30mM of EMS and 40mM of DES.

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