



REGULAR ARTICLE

MUTAGENIC EFFECT OF EMS AND DES ON TENAI (*SETARIA ITALICA*) IN M₁ GENERATION

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ABSTRACT

Mutation breeding gives better results for crop improvement through genetic manipulations when compared to other conventional breeding techniques. The present work focused in order to find out the effect of chemical mutagens; EMS and DES on *Setaria italica* in M₁ generation. The seeds of Tenai, variety Co(Te)₇ treated with different concentration of EMS and DES. The LD₅₀ was observed at 30 mmol in EMS and 40 mmol in DES. Selection studies were conducted to improve the yield and to generate genetic variability in different quantitative traits such as days to first bloom, plant height, number of leaves, number of nodes, length and breadth of ear head, 1000 seed weight and yield per plant. The results revealed that, all the parameters were decreased with increasing concentration in both EMS and DES, while days to first bloom was increasing with increasing concentration. According to the result all the parameters studied shows a negative direction towards crop improvement in M₁ generation because of the stress caused by mutagenic treatment.

Keywords: *Setaria italica*, LD₅₀, EMS, DES

INTRODUCTION

Setaria italica is a member of Paniceideace and is the very close relative of several major feed, fuel, bio energy grass. It is an annual grass grown for human food. It is the second most widely grown planted sp. of millet. It was a staple food crop until it was replaced by wet rice sweet potato [1]. Conventional breeding is now being replaced by mutation breeding in plant breeding technique. The earliest evidence for fox tail millet in South East Asia comes from various site in central Thailand. M₁ seedling growth is widely used as an (index) in determining the biological effect of various chemical mutagens. The principal mechanism in producing genetic variability differ in different chemical. The parameters of M₁ generation focuses upon the effectiveness and efficiency of the mutagens in representing the plant with more genetic damage with maximum mutations which is to be inherited to the next generation. Identifying, analyzing and selecting the essential mutations in a predictable manner is the main feature for using the plant for the exploitation in crop improvement and breeding programmes with the diverse spectrum of genetic variability [2] The present investigation in the variety Co (Te)₇ in foxtail millet (Tenai) with chemical induced mutagenesis enables to create variety of gene frequency in the plant beeding techniques. Co (Te)₇ special feature suitable for rainfed condition, high protein and calcium suitable for low rainfall and low fertile soil. Highest yield obtained 449 kg/ha.

DES and EMS are those alkylating agent that have been shown to induce mutation and producing other genetic alternation in a diversity of organism. The mutation is

expected to induce recombinogenic effect in M₁ generation.

MATERIALS AND METHODS

Mutagenic treatment

Seeds of Tenai Co(Te)₇ variety from Tamilnadu Agricultural University, Coimbatore were used in the present study. For ethyl methane sulphonate (EMS) and DES treatment hundred healthy seeds were presoaked in distilled water for 6 h and were treated with different concentration (10, 20, 30, 40 and 50 mmol) freshly prepared aqueous solution of ethyl methane sulphonate for 6 h and of another set 100 seeds were soaked in DES solution in different concentration of 10, 20, 30, 40 and 50 mmol S₁) and same set of 100 seeds were soaked in distilled water and used as control.

Raising M₁ generation

To raise M₁ generation the seeds were treated with different doses/concentration of EMS/DES and were sown along with control at the botanical garden, Annamalai University in a complete randomized block design (CRBD). The seeds were harvested separated from healthy individuals of M₁ plants, the spacing was maintained at 30 cm (plant to plant in a row) and 60 cm (between rows) in the field. The data on germination percentage and seedling characters were observed on 5th and 15th day, respectively. Data of yield and yield attributes were collected and all the data statistically analysed for each character separately. The mean data of each genotype for different characters were used for statistical analysis. The data were analysed by using NPROC software.

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Table 1: Mutagenic effect of EMS and DES on days to first bloom, plant height, No. of leaves per plant 1000 grains weight/plant and Yield/plant

Parameter Treatment	Concentration	Days to first bloom	Plant height (cm)	No. of leaves per plant	1000 grains weight/plant (g)	Yield/plant (g)
Control	-	42±0.21	96.7±0.27	20±0.07	31.13±0.10	3.10±0.11
EMS	10 mmol	45±0.36	89±0.13	18±0.90	29.12±0.47	2.97±0.29
	20 mmol	47±0.24	85±0.17	15±0.71	28.75±0.21	2.54±0.32
	30 mmol	49±0.19	74±0.37	12±0.10	28.29±0.92	2.01±0.17
	40 mmol	50±0.64	69±0.41	10±0.61	26.53±0.19	1.98±0.21
	50 mmol	51±0.15	65±0.50	8±0.46	25.04±0.27	1.68±0.47
DES	10 mmol	46±0.71	86±0.11	16±0.62	28.95±0.18	2.86±0.39
	20 mmol	48±0.29	80±0.25	14±0.57	28.21±0.82	2.27±0.24
	30 mmol	49±0.31	70±0.37	11±0.19	27.52±0.74	1.94±0.15
	40 mmol	50±0.10	63±0.45	9±0.23	26.09±0.61	1.67±0.19
	50 mmol	52±0.38	58±0.57	7±0.42	25.48±0.19	1.48±0.27

RESULTS

The present investigation is an attempt to develop diverse genetic difference and variation for crop improvement by induced mutation through 2 different chemicals EMS and DES in Co(Te)₇ variety of fox tail millet (Tenai). The effect of mutagens on the commercial valued quantitative character like days to first bloom, plant height, number of leaves, number of nodes, length of 1000 grains weight, yield per plant, were recorded, the days to first bloom showed different effect with different concentration. The first blooming was seen at 42nd days on control plant where as the days for flowering increased as the concentration increased. The plant height in control (EMS and DES 96.7 Cm, 86 Cm respectively, found to be decreased in increasing concentration, the number of leaves per plant is 20 cm the growth decreased in other concentrations. Thousand grain weight is 3.100 gram in control the weight of grain decreased with increased concentration. Yield per plant in the control is 31.13 gram which decreases with increasing concentrations The data recorded on yield per plant showed that the mean shifted was in a negative direction in treated population. (table 1) In general the less and minimum of EMS/DES showed a considerable decrease in mean yield/plant over control.

DISCUSSION

In the present investigation the data on five quantitative traits namely days of first bloom, plant height, number of leaves per plant, 1000 grain gram weight and yield/plant were analysed to evaluate extent of induced variability in M₁ generation of fox tail millet. The expected variation in M₁ generation of the treated population was constantly higher than the control population in all these characters in both negative/positive directions. In M₁ generation all the quantitative characters were decreased with increasing dose concentration of chemical mutagen EMS/DES except day to first blooming. The maximum reduction of quantitative characters was noted in 40 mmol EMS and 50 mmol of DES. The very low morphological variation may be due to physiological and some other genomic damage and dilated chromosome damage and failure in segregation, paring of chromosome. The reduction in the quantitative character in M₁ generation were reported by [3] for the delayed germination, EMS reduction germination reported. The expected variation of the treated population [4] in black gram. Days for fruit bloom was increased in increasing concentration was EMS/DES

observed by [5] and found linear relationship between concentration and reduction survival of yield growth of Soybean. The mutagenic effect was found decrease in quantitative characters in soybean [6-7] length of earhead, grain weight, yield per plant were decreased as compared to the non-treatment control. The same result has been reported by [8] in gamma rays treated Sorghum bicolor.

M₁ generation morphological and yield character were decreased increasing dose/concentration of gamma rays and EMS by [9,10] The mean yield per plant in M₁ generation has shown shift towards negative direction which is an agreement with finding of earlier works [11-14].

CONCLUSION

This study revealed difference between chemical mutagen treatment M₁ generation was decreased in increasing concentration of treatment. Mean performance of different quantitative traits were better in control when compared with treated plants, induced mutagenesis in the best method to enlarge genetic variability within short time.

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