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Maleic Hydrazide (MH) induced variations for economic traits in *Trigonella foenum-graecum* L.

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ABSTRACT

Seeds of Methi (*Trigonella foenum graceum* L.) were treated with six different concentrations (0.01, 0.02, 0.03, 0.04, 0.05, 0.06) of maleic hydrazide (MH) to induced variability in seven economic traits viz. plant height, No of nodes/plant, Internodal length/plant, No of Branches/plant, No. of pods/plants, No of seeds/plant and pods length per plant. The direction of shift in mean values for plant height indicated that positive micromutations out weighted the negative ones in lower doses while vice versa in higher doses. Coefficient of variation indicated no linear relationship with the doses of mutagen.

Keywords: MH, Economic traits, Mutagenesis

INTRODUCTION

Trigonella (Family Leguminosae) is cosmopolitan in distribution and is a well known economic herb which produces small and yellowish brown seeds. The seeds are used as condiment, young plants serve as vegetable for human consumption.

Mutation plays a great role in the evolution of plants and formation of new species. The role of mutation in evolution was emphasized by Baur (1924). Mutation breeding attracted considerable attention during 1950s and 1960s and several countries took up research project in Mutation breeding.

Maleic hydrazide (1,2-dihydro-3, 6 pyridazinedione) has been introduced into agriculture as a major commercial herbicide and a depressent of plant growth. MH has been known as an effective chromosome breaking agents in higher plants.

Artificial induction of mutation provides a tool to break through the limitations of variability in plants and to introduce specific improvement in crop varieties without disturbing their better attributes (Khan, 1984). The main advancement of mutational approach is that the desired traits can be obtained in commercial cultivars with high yield.

MATERIALS AND METHODS

Uniform, healthy seeds of Methi (*Trigonella foenum graecum* L.) were presoaked in distilled water for 12 hours and were then subjected to six different concentrations (from 0.01% to 0.06%) of Maleic Hydrazide solution, prepared in phosphate buffer of pH-7. One set of seeds was kept untreated to act as control. After completion of treatment period for 24 hours, seeds were thoroughly washed in running tap water to reduce the residual effects of mutagen sticking to the seed coat.

Three replications of 50-seeds each were sown for every treatment in pots to raise the M_1 generation. Data collected for above mentioned parameters was analysed statistically to find out the Mean, Standard Error (S.E.), Standard Deviation (S.D.), Coefficient of Variability (CV).

RESULTS AND DISCUSSION:

Data on the effects of various treatments of MH on mean values, shift in mean, standard deviation and coefficient of variability for different economic traits in M_1 generation was presented in Table –1. The mean values of plant height increased due to mutagenic treatment of lower doses and then decreased as concentration increases and both increase and decrease in other traits (Table-1).

The shift in mean values was recorded both negative and positive direction. The shift in mean values in positive direction indicates that the positive micromutation has out weighted the negative ones. The mean values were recorded in positive direction in lower doses of plant height, No of Branches/plant, No of nodes/plant, No of pods/ plant while as for internodal length/plant and No of seeds/plant, pods length/plant, the shift in mean values were recorded in negative directions in

Table -1: Estimate of mean values, shift in Mean, S.D. and coefficient of variation (CV) for different economic traits in M_1 generation of *Trigonella foenum graecum* L.

Treatment (%)	Mean±S.E.	Shift in Mean	S.D.	C.V.
		Plant height (cm)		
Control	40.1±1.16	–	3.69	9.20
0.01	46.1±3.15	+6	0.96	21.16
0.02	45.5±2.18	+5.4	6.91	15.18
0.03	44.7±2.85	+4.6	9.01	20.15
0.04	43.4±3.39	+3.3	10.70	22.50
0.05	36.7±2.57	–3.4	8.18	22.20
0.06	35.5±2.16	–4.6	6.83	19.23
		No. of Branches/ plant		
Control	2.5±0.39	–	1.25	50.00
0.01	2.8±0.38	+0.3	1.22	43.50
0.02	2.6±0.36	+0.1	1.14	12.20
0.03	1.8±0.23	–0.7	0.74	41.10
0.04	4.9±0.69	+2.4	2.21	45.10
0.05	1.3±0.20	–1.2	0.64	49.20
0.06	2.9±0.43	+0.4	1.37	47.20
		No. of Nodes/plant		
Control	12.4±0.97	–	3.07	24.75
0.01	13.9±0.55	+1.5	1.75	12.58
0.02	14.3±0.63	+1.9	2.00	13.98
0.03	13.3±0.90	+0.9	2.86	21.50
0.04	14.6±0.32	+2.2	1.10	7.50
0.05	13.3±0.83	+0.9	2.65	19.90
0.06	14.6±0.73	+2.2	2.33	15.90

Table -1 continues

	Internodal length/plant			
Control	3.39±0.29	–	0.91	27.62
0.01	3.67±0.12	+0.28	0.39	11.08
0.02	2.98±0.09	–0.41	0.30	10.03
0.03	3.17±0.12	–0.5	0.40	12.04
0.04	3.56±0.12	+0.17	0.38	10.84
0.05	3.20±0.23	–0.19	0.74	23.12
0.06	3.14±0.18	–0.25	0.58	18.70
	No. of Pods/plant			
Control	5.87±1.01	–	3.21	55.34
0.01	5.60±1.07	–0.27	3.38	67.80
0.02	7.00±0.74	1.13	2.30	32.80
0.03	4.50±0.60	–1.37	1.91	42.40
0.04	8.40±1.87	+2.53	5.91	70.35
0.05	4.40±2.53	–1.47	8.00	41.80
0.06	7.50±1.25	+1.63	3.93	53.06
	No of seeds/plant			
Control	13.5±1.35	–	4.27	31.62
0.01	11.6±1.17	–1.9	3.71	31.90
0.02	11.7±1.10	–1.8	3.61	30.85
0.03	12.3±1.19	–1.2	3.77	30.60
0.04	14.4±1.40	+0.9	4.43	30.76
0.05	13.9±1.36	+0.4	4.12	29.64
0.06	12.6±1.30	–0.9	4.11	32.60
	Length of Pods/plant			
Control	11.2±0.34	–	1.07	9.55
0.01	9.30±0.58	–1.9	1.83	19.30
0.02	9.41±0.62	–1.79	1.96	20.82
0.03	9.28±0.56	–1.92	1.82	19.78
0.04	9.10±0.54	–2.1	1.73	19.00
0.05	9.00±0.53	–2.2	1.69	18.70
0.06	8.80±0.56	–2.4	1.77	20.11

almost all the concentrations of the mutagens. The mutagen treatments were effective for changing coefficient of variation for treated population.

The low concentration of MH causes low toxicity and probably act as growth regulators and hence height was increased over control. Similar results are observed in case of lower concentrations of EDTA in Maize (Kiril, 1980). Sparrow et al. (1961), mentioned that although reduced stem elongation is usually described to reduce auxin and nutritional level, the mechanism of assimilation may also be important factor.

The increase in mean values could be due to the occurrence of polygenic mutations with cumulative effect (Singh et al., 2000a). While the decrease in mean values for various quantitative traits is in agreement with the hypothesis that, due to mutagenic treatment, mean is shifted to a direction opposite to selection (Bhatia and Swaminathan, 1962). The shift in mean values in positive direction indicates that more positive mutations have occurred for these traits whereas, a decline in the mean of treated populations is a pointer of more frequent induction of negative micromutations than the positive ones.

The change of mean values after mutagenic treatments has been reported earlier by Anis et al. (1999) in sunflower, Khan, et al., (2005) in *Vicia faba* L. In the present investigation, the coefficient of variability increased over the control in some doses for almost all the characters in M_1 generation. So various economic traits responded differently to the mutagenic treatments and No linear relationship was observed between the mutagen concentrations and variability induced. These results are in agreement with the earlier report of Singh et al. (2000b) who observed no linear relationship between the mutagen doses and the induced variability in urdbean. The maximum variability was recorded for plant height and no of seeds/pod.

According to Singh et al. (2000b) induction of greater variability in polygenic traits might be due to increased mutations and recombinations so the induction of variability can be effectively use to induced desired changes in genotype of *Trigonella foenum graecum* L. to obtain better variety.

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