POST-TREATMENTS AND THE EFFICIENCY OF ETHYL-METHANE-SULPHONATE

GEORGE VARUGHESE
Atomic Energy Laboratory, Indian Agricultural Research Institute, New Delhi-12

AN efficient mutagen is one which is capable of inducing maximum mutations with the minimum of lethality. The potency of ethyl-methane-sulphonate (EMS) as one of the most efficient mutagens has been proved in a wide range of organisms. The factors which control the effectiveness and efficiency of chemical mutagens are many[1-4] but are limited in comparison with physical mutagens. The action of post-treatments[4,5] in modifying the efficiency of EMS is of interest to mutation breeders. The results obtained in one of our experiments in wheat, revealing the modification of the EMS action brought about by different post-treatments, are summarised in this communication.

Seeds* of *Triticum æstivum* sub-sp. *vulgare* var. Sonora 64 were subjected† to two doses of EMS, *viz.*, 1/200 and 1/100. Control seeds as well as the treated seeds were then divided into three equal parts. The first lot was put for germination in a germinator at 20° C. while lot Nos. 2 and 3 were given 8 hours post-treatments in buffer (pH 9, borax) and distilled water respectively at 30° C. and were then germinated as the first lot. After seven days all the seedlings were transplanted in the field after recording the shoot and root growth. Survival was recorded at the time of harvest. The M_2 generation was grown on spike progeny basis keeping the identity of each spike.

The results obtained in this experiment are summarised in Table I. It can be seen that the seedling injury is maximum in direct treatments and it is the least in post-water treatments closely followed by post-buffer treatments. This confirms the earlier report.[5] But the results of the M_1 and M_2 mutation frequencies show that with the reduction in seedling injury there is a coincident reduction in mutation frequency too. Since the survival is not much altered by the post-treatments and since the mutation frequency is higher in direct treatments, the efficiency of direct treatments are far higher than the post-treatments, although Msp/I reveals a reverse trend.

These results would imply that many mutations induced by EMS are delayed in origin caused by the mutagen retained in the tissue. The mechanisms governing the delayed origin of mutations in chemical treatments have been discussed by Mathew.[6] When post-treatments are given, both the chemical as well as the harmful hydrolytic products are washed away, which results in a reduced mutation rate and a higher recovery. If this explanation is true, then the same post-treatment should give different results after different durations of EMS treatments. This part of the experiment is at present underway.

I am grateful to Dr. M. S. Swaminathan for his guidance and the CSIR for financial assistance.

TABLE I

Treatment	I	S	% of M_1 plants showing chimeras		M_2 mutation rate as			Msp/I
			Chlorophyll	Ear	Mp	Msp	Msd	
Direct control ..	0·00	100	0·00	0·00	4·17	0·84	0·02	..
Post buffer control ..	0·00	100	0·00	0·00	4·17	0·85	0·02	..
Post water control ..	0·00	100	0·00	0·00	0·00	0·00	0·00	..
Direct EMS 1/200 ..	24·19	94·3	25·00	5·00	65·00	21·00	2·91	0·868
Post-buffer EMS 1/200 ..	8·16	96·5	20·80	4·10	50·00	15·83	3·27	1·939
Post-water EMS 1/200 ..	7·52	95·0	11·10	5·30	31·59	8·42	1·30	1·119
Direct EMS 1/100 ..	70·76	77·1	57·10	14·30	95·24	53·92	11·82	0·762
Post-buffer EMS 1/100 ..	43·48	79·2	57·80	5·30	78·94	35·41	6·15	0·814
Post water EMS 1/100 ..	34·01	78·1	46·60	6·60	66·67	24·00	4·20	0·705

I—Growth reduction of 7-day old seedlings as a % of the control. S—Mature-plant survival as a % of the control. Mp—Mutations/100 M_1 plants—Mutation frequency on a plant basis. Msp—Mutations/100 M_1 spikes—Mutation frequency on a spike basis. Msd—Mutations/100 M_2 seedlings—Mutation frequency on a seedling basis.

* 14 hours pre-soaked seeds were used.

† 8 hours treatment at 30° C; in pH 7 citric acid sodium phosphate buffer.

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