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Short Communication

Mutagenic effects of ethyl methane sulphonate and sodium azide in potato (*Solanum tuberosum* L.)

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Commercially potato is propagated through tubers. Propagation through seeds is hindered by high degree of hetero-zygosity, self-incompatibility and male sterility leading to failures in fruit and seed set. Such problems pose difficulty in incorporation of useful characters in a new genotype. The present investigation was undertaken to study effect of two chemical mutagens [ethyl methane sulphonate (EMS) and sodium azide (SA)] on two potato genotypes *viz.* MF-II and TPS-67. Mini-tubers (5 to 10 gm weight) were treated with three concentrations of EMS (0.03, 0.05 and 0.07 %) and SA (0.02, 0.04 and 0.06 %) for 4 hours at room temperature (25±2°C). Immediately after treatment these tubers were washed thoroughly under running tap water and soaked in distilled water for one hour. The tubers soaked in distilled water for 4 hours served as controls. For each treatment, a batch of 450 tubers was used. 150 tubers from each treatment were kept in petriplates on moist cotton for recording germination percentage. The remaining lot of 300 tubers from each treatment was sown in nethouse in plastic pots (23 cm size) filled with coco-peat and laid in Completely Randomized Design with three replications. The data were analyzed statistically [1]. Observations were recorded on germination, plant survival upto maturity and abnormality in plants if any. The biggest and smallest tuber from each plant from each treatment was taken and its weight measured. The total number of tubers per plant, per plant yield and tuber size was also recorded. The frequency of plants having increased weight of biggest, smallest tuber, total number of tubers produced per plant, yield per plant and average tuber size was recorded. The tubers from five economically important parameters (weight of biggest, smallest tuber, total number of tubers produced per plant, yield per plant and average tuber size) were harvested separately plant wise and one tuber from each plant was taken and planted to grow M_2 generation.

The mutagenic treatments had significant effect on all the parameters studied in both the genotypes of potato in M_1 generation (Table 1). In controls, germination was found to be 100 % in both genotypes. After EMS treatment, the germination ranged from 57.33 to 47.33 % in genotype MF-II and 52.00 to 46.67 % in TPS-67. After SA treatment, the germination ranged from 54.00 to 44.67 and 52.00 to 42.00 % in MF-II and TPS-67, respectively. In genotype MF-II, plant survival at maturity ranged from 43.67 to 54.33 % after EMS and 41.00 to 52.33 % after SA treatment. The highest and lowest survival was recorded at 0.03 % EMS and 0.06 % SA, respectively. The survival ranged from 41.33 to 49.00 % and 37.67 to 49.00 % after EMS and SA treatment, respectively in genotype TPS-67. The highest survival was seen with 0.03 % EMS and 0.02 % SA, while lowest survival was seen with 0.06 % SA. Maximum abnormal plants were seen at 0.07 % EMS in MF-II and at 0.06 % SA in TPS-67. Minimum abnormal plants in MF-II and TPS-67 were seen at 0.02 % SA and 0.03 % EMS, respectively. The proportion of abnormal plants ranged from 6.33 to 22.00 % after EMS and 5.00 to 21.00 % after SA treatments in MF-II. After EMS treatment, 8.33 to 23.33 % and after SA treatment 10.00 to 25.00 % abnormal plants were seen in genotype TPS-67.

Maximum frequency for increased weight of biggest tuber was observed with EMS treatment of 0.05 % in both genotypes. Minimum frequency was observed with 0.02 % SA in MF-II and with 0.06 % SA in TPS-67. In genotype MF-II, frequency ranged from 1.67 to 12.33 % after EMS and 1.00 to 6.00 % after SA treatment. The frequency ranged from 3.33 to 14.00 % and 1.67 to 6.00 % after EMS and SA treatment respectively in TPS-67. For increased weight of smallest tuber, maximum (11.33 %) and minimum (1.00 %) frequency was observed with 0.05 % EMS and 0.06 % SA, respectively in MF-II. In case of genotype TPS-67, maximum (13.33 %) and minimum (1.00 %) frequency was observed with 0.05 % EMS and 0.02 % SA, respectively. After EMS treatment, the frequency ranged

Table 1. Analysis of variance (MS) for different parameters of potato as effect of mutagenic treatment in M_1 generation

Source	DF	Germination		Plant survival at maturity		Abnormal plants		Weight of biggest tuber		Weight of smallest tuber		Number of tubers per plant		Yield per plant		Tuber size	
		MF-II	TPS-67	MF-II	TPS-67	MF-II	TPS-67	MF-II	TPS-67	MF-II	TPS-67	MF-II	TPS-67	MF-II	TPS-67	MF-H	TPS-67
Treatment	6	58.34*	67.07*	68.67*	59.17*	19.17*	28.27*	8.67*	6.57*	5.87*	8.58*	51.57*	48.18*	8.87*	18.85*	7.81*	17.52*
Error	14	20.17	18.15	28.18	21.19	10.50	9.58	2.10	1.98	1.88	2.12	15.18	14.18	2.81	5.35	2.17	15.11

(*Significant at 5 %)

Table 2. Response of mutants for five economically important parameters in M_2 generation of potato

S. No.	Parameter	M_2 population		Positive response		Percent response	
		MF-II	TPS-67	MF-II	TPS-67	MF-II	TPS-67
1	Weight of biggest tuber	75	95	70	85	93.33	89.47
2	Weight of smallest tuber	84	83	72	78	85.71	93.97
3	Number of tubers per plant	39	62	30	60	76.92	96.77
4	Yield per plant	120	150	78	102	65.00	68.00
5	Tuber size	150	203	85	127	56.67	62.55

from 2.00 to 11.33% in MF-II and 1.33 to 13.33% in TPS-67. The frequency ranged from 1.00 to 7.00 % in MF-II and 1.00 to 6.67% in TPS-67 after SA treatment. The desirable effect of EMS was also reported previously by other workers in potato [2].

In genotype MF-II, maximum (4.67%) and minimum (1.00%) frequency for increased number of tubers per plant was observed with 0.05% EMS and 0.02% SA, respectively. In genotype TPS-67, maximum (9.33%) frequency was observed with 0.05% EMS and minimum frequency (1.33%) was observed with 0.02 and 0.06% SA. The frequency ranged from 1.33 to 4.67% and 1.00 to 2.67% after EMS and SA treatments, respectively in genotype MF-II. After EMS and SA treatment, frequency ranged from 1.67 to 9.33% and 1.33 to 4.67% respectively in TPS-67. The frequency for increased yield per plant ranged from 2.67 to 8.67% in genotype MF-II and 4.37 to 10.67% in TPS-67 after EMS treatment, while from 4.00 to 12.67% in MF-II and 5.55 to 14.57 % in TPS 67 after SA treatment. The maximum frequency was recorded at 0.04% SA (MF-II = 12.67 % and TPS-67 = 14.57%), while minimum at 0.03% EMS (MF-II = 2.67% and TPS-67-4.37%). The frequency for increased tuber size ranged from 2.67 to 14.00% after EMS and 2.67 to 14.67% after SA treatment in genotype MF-II, while from 3.00 to 15.67% after EMS and 4.87 to 16.00% after SA treatment in genotype TPS-67. The maximum frequency was recorded at 0.04% SA in both the genotypes (MF-II = 14.67% and IPS 67 = 16.00%). The minimum frequency was recorded at 0.07% EMS and 0.06% SA in genotype MF-II (2.67%), while at 0.07% EMS in TPS-67 (3.00%).

The data regarding response of mutants in M_2 generation is given in Table 2. In genotype MF-II, more response (93.33%) was seen for increase in weight of biggest tuber than that of smallest tuber (85.71%). The more response (93.97%) for increase in weight of smallest tuber was seen than that of biggest tuber (89.47%) in genotype TPS-67. The genotype TPS-67 recorded more response (96.77%) than MF-II (76.92%) for increased number of tubers per plant. The positive response of 65.00% was observed in genotype MF-II and 68.00% in TPS-67 for increased yield per plant and 56.67% in MF-II and 62.55% in TPS-67 for increased tuber size. There is further need of clonal selection and further generations to isolate non-chimeric and solid mutants. The possibility to obtain desirable mutants through induced mutation is on record in potato [3] and several other crops [4].

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