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PROMISING MUTANT LINES UNDER SALINE AND NORMAL SOIL CONDITIONS IN FABA BEAN (*Vicia faba* L.)

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ABSTRACT

This investigation was carried out at El-Gemmeiza, Agricultural Research Station, ARC, Egypt during 1999/2000, 2000/2001 and 2001/2002 winter seasons to induce salt tolerance mutants in Faba bean (Vicia faba L.). Two mutagens [gamma ray and sodium azide (NaN_3) were used in this study. The gamma ray doses were 30, 60, 90 and 120 Gy, while the concentrations of sodium azide were 0.001 M and 0.003 M at pH 3. Four faba bean varieties, i.e. Giza 2, improved Giza 3, Giza 714 and Giza 716 were used in this study. The mutants exhibit any apparent morphological characters change of plant height, seed yield, yield attribute characters and seed shape were screened to isolate 180 mutants at M_2 generation. These mutants affect, plant height (dwarf and semi-dwarf), flowering date (early flowering), seed shape (small seeds and large seeds), pod shape (long pod), seed yield (high seed yield, high number of seeds), 100-seed weight (heavy seeds), branching capacity (high no. of branches), height of first pod on the stem (low height of first pod) and fire of tip leaf. In the M_3 generation the selected mutants from M_2 generation were sown under normal and saline conditions and 100 mutant lines were stable at M_3 generation only. The more stable (no segregation) of early flowering (E.F), dwarf (D), semi-dwarf (S.D) and low height of first pod (L.F.P) at M_3 generation suggested that the controlling of these mutants may be due to recessive genes with one or two pair of genes only, as well as little of environmental effects might caused the change of these mutants. Five promising mutant lines under salinity conditions were recorded as follows : H.N.S-6 mutant line from Giza 2 variety, Long P-7, Long P-5 and D-S from Improved Giza 3 variety and S.S-17 from Giza 716 variety. These promising mutants could be considered as very important for breeding to salt tolerance and development of salt tolerant new variety especially mutants that derived from Improved Giza 3 variety. In contrast, dwarf and semi-dwarf mutants appeared as important mutants under normal condition, S.D-1 from Giza 2, D-3 from Improved Giza 3 and S.D-7 from Giza 714. A peliotropic effect of dwarf gene were recorded in these mutant lines, this gene's not only affect of plant height, but also affect seed yield components especially seed and pod shape. Moreover four elite, promising mutant lines had higher seed yield and its

related traits under both saline and normal conditions, i.e., L.S-1 from Giza 2, L.F.P-6 and S.S-15 from Giza 714 and Long P-7 from Giza 3. The last mutant line (Long P-7) could be considered as a very important genotype compared with all mutants and mother varieties under study, especially under saline condition therefore, this mutant could be directly used in comparative experiments for releasing of it as a new variety which possess high yielding under salinity and normal soil conditions.

Key words: ***Faba bean, Saline condition, Gamma rays, Morphological traits, Salt tolerance***

INTRODUCTION

Faba bean (*Vicia faba* L.) is the first pulse crop grown in Egypt. It is used in daily diets, especially, for lower income peoples. This is due to the high nutritive value of seeds which contain about 30% protein (Atia *et al* 1995). Therefore, the investigators in Egypt and in many other developing countries have tried to improve yield and seed quality of this important crop (Kumari 1996, Rabie *et al* 1996 and Omar *et al* 1999).

Mutation breeding using physical and chemical mutagens is considered to be one of the useful tools for plant improvement. Therefore it is very important for induce of new genetic resources (Kharkwal 2000, Hassan *et al* 2001, Mihov *et al* 2001 and Wani *et al* 2001).

Induced mutation to be a useful tool for increasing of genetic variability in many plant species, especially the self-fertilized plants (Fahmy *et al* 1997, Geetha and Vaidyanathan 1998, Hajduch *et al* 1999). Leguminous plants were the target of great deal of investigation concerning induced variability using either irradiation or chemical mutagens (El-Sagi 1993, Fahmy *et al* 1997, Hajduch *et al* 1999, Omar *et al* 1999).

Salinity has been recognized as a major agricultural problem in arid and semi-arid regions (Pessarakil 1991).

Salt tolerance of plants is of great economic and scientific importance. The economic impetus for research and development derives from the fact that salt effected soils occupy about 10% of the world's arable land (Tanji 1990).

Rush and Epstein (1976) have argued at crop production could be greatly enhanced by selecting strains resistant to salinity. Difference in salt tolerance among species has been significantly limits productivity (Delgado *et al* 1994). In general, legumes are either sensitive or moderately tolerant to salinity (Mass and Hoffman 1997). Broad bean (*Vicia faba* L.) is moderately tolerant (El-Karauri 1979), or considered moderately sensitive to salinity (Cordocilla 1996).

In Egypt, the faba bean is very important crop because it cultivated in newly recognized lands which suffering of salinity as a main problem. The local varieties are moderately sensitive to moderately tolerant to salinity. The productivity of these varieties is severe decreasing under markedly salinity. Therefore the present study aimed to obtain salt tolerant mutants for using in cross breeding program.

MATERIALS AND METHODS

This investigation was carried out at El-Gemmeiza Agricultural Research Station. ARC, Egypt during the three winter seasons of 1999/2000, 2000/2001 and 2001/2002. Faba bean varieties Giza 2, Improved Giza 3, Giza 714 and Giza 716 were obtained from Legume Crop Research Department, Institute of Field Crops, ARC, Giza, Egypt. A sample of 100 dry will filled seeds from each variety were subjected to the acute well gamma doses 30, 60, 90 and 120 Gy. Irradiation was achieved in season (1999) at the National Center for Research and Radiation Technology, Naser City, Cairo. Atomic Energy Agency, Egypt. 100 dry well filled seeds from each representing variety were soaked in water for four hours prior to soaking in sodium azide concentrations for two hours which was dissolved in phosphate buffer at PH3.

The treated and untreated (control) seeds were sown to obtain M_2 seeds which were planted under normal condition to release the M_2 generation. The M_2 plants were individually screened for any apparent morphological change. The morphological changes observed were those affecting plant height [dwarf (D) and semi-dwarf (S.D) mutants], pod length [long pod (Long P.)], leaf shape [fire tip leaf (F.T.L), flowering time [early flowering (E.F.)] and branching capacity of the plant [high no of branches (H.N.B)]. In addition. 50 plants from each treatment randomly selected for change determines no. of seeds [high no. of seeds (H.N.S)]. seed yield [high seed yield (H.S.Y)]. 100-seed weight [heavy seeds (He.S)] and size [small (S.S) and large seeds (L.S.)]. The classification of different mutants assessed on z-test and consideration of all M_2 plants of each variety as population, and selection of 0.01 from the population of each character. The mutant types were determined on the basis of main changeable character. In the season (2001/2002), the selected mutants from M_2 generation were sown under normal and salinity conditions (Table 1) in three replicates. Each replicate consisted of fifteen seed in one row (3 m. length and 0.6 m. width) at the rate of one seed per hill of spacing of 20 cms.. between plants at normal soil, while at salinity soil each replicate consists of five seeds in one row (one m. length and 0.6 m width) at the rate of one seed per hill a spacing of 20 cms. between plants.

Table 1. Chemical analysis of the normal and salinity soils at M_3 generation.

Soil treatment	EC mmhos /cm	Anionic and cationic composition (meq/100g soil)							
		Anionic				Cations			
		Ca^{+2}	Mg^{+2}	Na^{+}	K^{+}	Cl^{-}	HCO_3^{-}	Co_3^{-}	SO_4^{-}
Normal	2.60	0.55	0.53	0.85	0.03	0.79	0.42	-	0.75
Salinity	5.31	3.80	2.55	1.95	0.01	0.84	0.25	-	7.22

RESULTS AND DISCUSSION

Screening and isolation of mutants with any apparent morphological characters and change in seed yield, yield attribute characters and seed shape started in M_2 generation. A large number of mutants carrying one or more basic changes as compared to the mother variety have been found. The induced morphological changes in the mutants were classified according to the main alteration brought about through a mutational event. Mutants affecting plant height (dwarf and semi-dwarf), Flowering date (early flowering), seed shape (small seeds and large seeds), 100-seed (weight) (heavy seeds), tillering capacity (high no. of tillers), height of first pod on the stem (low height of first pod) and fire of tip leaf were obtained in M_2 generation. Large number of these mutants were recorded in Improved Giza 3, followed by Giza 2. Meanwhile the number of mutants were equal approximately in Giza 714 and Giza 716 and lower than those found in the above mentioned two varieties (Table 2). These results indicates that the different responses of these genotypes (varieties) may be due to the differential sensivity of different genes to the γ-ray and sodium azide as suggested by Yasin 1996, Omar *et al* 1999 and Kharkwal 2000.

In addition, high number of mutations were obtained by 60 gray of ã-ray followed by 0.001 Mole (M) of sodium azide (Table 3). The results obtained by many investigators, (Mohan *et al.*, 1980, Hajduch, 1999 and Mihov *et al* 2001). Many of these mutants bred true through M_2 generation, except some segregants which carrying the main characteristic feature of the mutant had recovered (Table 2). The stability of selected mutants at M_2 generation were studied at M_3 generation. All early flowering (E.F), dwarf (D), semi-dwarf (S.D) and low height of first pod (L.F.P) mutants at M_3

Table 2. Type and number of mutant lines studied in M_2 and maintained in M_3 generation.

Mutant types	Varieties									
	G-2		Improved G-3		G-714		G-716		Total	
	M_2	M_3	M_2	M_3	M_2	M_3	M_2	M_3	M_2	M_3
E.F	-	-	3	3	-	-	-	-	3	3
D	1	1	5	5	4	4	1	1	11	11
S.D	4	3	-	-	3	3	3	3	10	9
H.N.B	6	-	8	2	4	3	4	2	22	7
L.F.P	3	3	2	2	2	2	-	-	7	7
H.N.S	12	6	14	5	8	7	17	3	51	21
H.S.Y	5	3	1	-	1	1	4	2	11	6
He.S	3	1	4	3	1	1	-	-	8	5
Long P.	2	-	9	4	3	-	2	2	16	6
S.S	6	1	7	6	2	2	3	3	18	12
L.S	3	2	7	4	4	1	3	3	17	10
F.T.L	-	-	4	3	2	-	-	-	6	3
Total	45	20	64	37	34	24	37	19	180	100

gave the same feature of it at M_2 generation. These mutants may be recessive mutants and controlled by one or two gene pairs only, as well as low effects of environmental conditions. Therefore, it could be possible to use these stable mutants directly as new varieties or in breeding programs. These results confirmed the results obtained by Filippetti and Marzona 1984, Soliman 1984, Filippetti 1988 and Hajduch *et al* 1999. Many mutants segregated at M_3 generation especially high no. of branches /plant, high no. of seeds/plant and long pod mutants, but some of these mutants were stable and considered as promising mutants lines for high seed yield. The present results appeared in coincidence with the fact that the seed yield and its attributed characters consider as a quantitative traits and subsequently large affected with environmental conditions and controlling with many gene pairs (polygenes). The present results are in agreement with El-Kady 1978, Vandana and Dubey 1992 and Omar and Singh 1997.

Table 3. Number of mutants at M_2 and M_3 generation for different doses of ã-rays and sodium azide.

Treatments	Varieties								Total	
	G-2		Improved G-3		G-714		G-716			
	M_2	M_3	M_2	M_3	M_2	M_3	M_2	M_3	M_2	M_3
γ-30 Gy	10	3	10	10	9	7	6	3	35	23
γ-60 Gy	16	9	12	6	7	6	7	3	42	24
γ-90 Gy	4	2	10	3	2	2	3	1	19	8
γ-120 Gy	3	-	6	4	5	4	2	2	16	10
SA 0.001 M	6	3	14	9	5	3	13	7	3	22
SA 0.003 M	6	3	12	5	6	2	6	3	30	13
Total	45	20	64	37	34	24	37	19	180	100

Fire of tip leaf mutants appeared in Improved Giza 3 and Giza 714 but most of these mutants were found to be stable at M3 generation only in Giza 3. This mutant could be considered as a marker gene for some important traits such as high no of seed, high seed yield and high 100-seed weight. Eighty hundred morphological mutants were isolated on the basis of the performance of plants from sowing to harvesting at M_2 generation. The behavior of these mutants were studied at M_3 generation and showed that 100, mutants were stable and others were unstable under saline and normal soil conditions. These stable mutants occurred under stress selection on the basis of seed yield and yield attributes characters under saline and normal soil conditions. The final mutant promising lines are recorded in (Table 4 and 5). The different responses of mother varieties and mutant lines under salinity were recorded as seed yield and its attribute's characters under normal and saline soil conditions Giza 2 and improved Giza 3 possessed 238.97 and 35.17 seed yield under normal, while 12.64 and 12.13 under salinity condition, respectively. But substantial decrease was reported of Giza 714 and Giza 716, i.e., 31.27 and 35.29 under normal and 4.68 and 6.37 under salinity conditions. Therefore the varieties Giza 2 and improved Giza 3 consider as moderately tolerance and Giza 714 and Giza 716 moderately sensitive to salinity.

The response of final selected mutant lines for salinity was highly different (7.04 to 23.81 for seed yield/plant comparing with the range of mother varieties of final selected mutant lines under salinity, which was 4.68 to 12.64 under salinity soil condition).

These differences were recorded also for yield attributes characters, i.e., 100-seed weight, no of seeds/plant, no. of branches/plant, no. of pods/plant and plant height (Table 4). Wide difference between stable mutant lines is benefit for selection of salt tolerance lines. H.N.S-6 mutant line considers as promising line induced from Giza 2 variety. It has seed yield and other economic characters larger than the mother variety. Elite promising mutant lines were recorded in Improved Giza 3, namely, Long P-7 and Long P-5. These mutants gave twice seed yield more than the control under salinity, as well as for other important characters. D-5 mutant alone from dwarf and semi-dwarf groups possessed higher seed yield than the mother improved G-3 variety. These promising mutants consider a very important for breeding of salt tolerance and development of salt tolerance new variety, especially improved Giza 3 (mother variety) which showed more adaptability than other Egyptian varieties in most different soils and environmental conditions. The stable mutants from Giza 714 gave twice seed yield more than the mother variety, but no increase in seed yield than Giza

Table 4. Means ± S.E for studied characters of promising mutant lines maintained at M_3 generation under salinity condition.

Mutant lines	Plan height cm.	First pod height cm.	No. of branches/plant	No. of pods/plant	No. of seeds/plant	100-seed weight gm	Seed yield/plant gm.
			Giza 2				
Control	50.00 ± 2.89	21.67 ± 6.68	1.67 ± 0.33	7.33 ± 2.19	20.00 ± 7.22	70.01 ± 16.62	12.64 ± 3.75
H.N.S-6	45.00 ± 0.00	15.00 ± 0.00	1.33 ± 0.00	14.67 ± 0.33	31.00 ± 2.31	57.36 ± 9.60	17.53 ± 0.38
H.N.S-10	58.33 ± 3.33	23.33 ± 1.67	2.67 ± 0.33	9.33 ± 1.20	16.33 ± 1.77	63.35 ± 16.22	10.68 ± 2.48
L.S-1	46.67 ± 1.67	16.67 ± 3.33	3.00 ± 0.58	14.33 ± 1.20	31.00 ± 1.20	49.58 ± 14.31	14.64 ± 2.02
			Giza 3				
Control	43.33 ± 6.01	15.00 ± 0.00	1.67 ± 0.33	7.67 ± 2.60	15.00 ± 5.69	78.13 ± 15.99	12.13 ± 5.57
D-5	42.67 ± 1.45	15.00 ± 0.00	2.00 ± 0.58	11.00 ± 1.73	28.00 ± 4.62	54.10 ± 15.06	18.98 ± 0.80
He.S-6	59.67 ± 3.72	23.33 ± 6.02	2.00 ± 0.58	7.33 ± 0.33	14.67 ± 0.33	78.29 ± 7.42	11.46 ± 0.40
F.T.L-1	56.67 ± 1.67	25.00 ± 0.00	2.00 ± 0.00	9.00 ± 1.53	18.33 ± 0.66	77.02 ± 5.67	14.16 ± 1.09
F.T.L-3	53.33 ± 4.26	21.67 ± 3.33	1.67 ± 0.33	10.33 ± 0.88	22.67 ± 6.02	57.65 ± 11.70	13.64 ± 4.20
Long P-5	58.33 ± 4..38	17.33 ± 1.45	2.00 ± 0.58	11.33 ± 0.66	28.67 ± 2.03	76.16 ± 20.70	21.40 ± 2.36
Long P-7	55.00 ± 5.01	23.33 ± 1.67	2.00 ± 0.00	8.67 ± 2.34	24.33 ± 4.06	99.34 ± 7.48	23.81 ± 3.17
S.S-9	48.33 ± 1.67	20.00 ± 0.00	2.33 ± 0.33	9.67 ± 2.60	27.33 ± 5.79	72.08 ± 3.42	19.93 ± 4.71
L.S-7	55.00 ± 2.89	21.67 ± 1.67	2.33 ± 0.33	8.33 ± 1.20	16.33 ± 1.76	81.05 ± 1.62	13.39 ± 1.41
L.S-8	67.33 ± 1.45	26.67 ± 6.02	2.33 ± 0.33	9.67 ± 1.20	20.67 ± 5.93	75.23 ± 19.74	14.80 ± 3.60
E.F-2	45.00 ± 2.89	13.33 ± 1.67	2.00 ± 0.58	5.33 ±0.76	16.33 ± 1.20	89.70 ± 8.49	14.53 ± 0.32

Table 4. Cont.

Mutant lines	Plan height cm.	First pod height cm.	No. of branches/plant	No. of pods/plant	No. of seeds/plant	100-seed weight gm	Seed yield/plant gm.
				Giza 714			
Control	40.00 ± 2.89	20.00 ± 2.89	1.67 ± 0.88	7.67 ± 2.40	08.67 ± 2.67	42.08 ± 8.41	04.68 ± 1.47
S.D-5	45.00 ± 2.89	16.67 ± 1.67	2.00 ± 0.58	4.67 ± 0.88	11.00 ± 2.09	65.37 ± 20.01	07.04 ± 1.76
H.N.B-16	50.00 ± 2.89	16.67 ± 1.67	2.33 ± 0.33	8.33 ± 1.45	18.33 ± 2.34	61.29 ± 5.48	11.10 ± 0.95
L.F.P-6	50.00 ± 0.00	15.00 ± 0.00	2.67 ± 0.33	8.67 ± 0.33	20.00 ± 1.15	95.87 ± 4.93	11.91 ± 0.13
H.S.Y-7	43.33 ± 1.67	16.67 ± 1.67	1.33 ± 0.33	7.00 ± 1.00	15.00 ± 1.53	64.87 ± 20.59	09.38 ± 0.69
S.S-16	48.33 ± 4.41	16.67 ± 1.67	2.33 ± 0.33	5.67 ± 2.03	15.00 ± 4.73	92.67 ± 61.78	11.51 ± 2.38
	53.33 ± 5.33	21.67 ± 1.67	2.00 ± 0.00	7.67 ± 0.88	17.33 ± 1.20	63.36 ± 5.82	10.92 ± 0.52
				Giza 716			
Control	35.00 ± 0.00	15.00 ± 0.00	1.33 ± 0.33	5.67 ± 0.33	13.67 ± 1.20	48.69 ± 22.8	06.37 ± 1.25
S.D-8	48.33 ± 3.33	18.33 ± 3.33	1.67 ± 0.66	5.67 ± 2.34	10.67 ± 3.67	67.87 ± 1.67	08.16 ± 2.82
H.N.B-19	61.67 ± 6.68	20.00 ± 5.01	2.00 ± 1.15	6.67 ± 2.91	17.67 ± 7.46	60.07 ± 11.39	10.86 ± 5.82
H.S.Y-8	48.33 ± 3.33	20.00 ± 5.01	2.00 ± 0.58	6.33 ± 1.45	15.33 ± 4.34	77.65 ± 9.63	11.53 ± 2.54
H.S.Y-8	41.67 ± 4.41	16.67 ± 4.41	1.33 ± 0.33	6.67 ± 2.19	13.67 ± 5.18	73.84 ± 14.09	09.33 ± 2.47
H.S.Y-11	46.67 ± 1.67	20.00 ± 0.00	1.67 ± 0.33	8.67 ± 2.73	21.33 ± 5.90	77.75 ± 8.58	16.17 ± 3.76
L.P-16	51.67 ± 3.33	23.33 ± 3.33	1.33 ± 0.33	7.33 ± 1.20	19.00 ± 2.64	65.17 ± 7.46	12.56 ± 2.46
S.S-17	45.00 ± 2.89	18.33 ± 1.67	3.33 ± 0.33	9.00 ± 0.58	25.67 ± 1.45	67.93 ± 3.96	17.42 ± 1.08
L.S-15	63.33 ± 4.41	28.33 ± 3.33	1.67 ± 0.33	6.67 ± 2.60	16.67 ± 5.46	79.39 ± 2.99	13.15 ± 4.31
$L.S.D_{0.05}$	9.30	6.32	0.79	4.44	11.07	27.16	7.68
$L.S.D_{0.01}$	12.37	8.40	1.06	5.90	14.72	36.12	10.21

Table 5. Means ± S.E for studied characters of promising mutant lines maintained at M_3 generation under normal condition.

Mutant lines	Plan height cm.	First pod height cm.	No. of branches/plant	No. of pods/plant	No. of seeds/plant	100-seed weight gm	Seed yield/plant gm.
				Giza 2			
Control	52.22 ± 1.69	18.89 ± 1.39	4.78 ± 0.28	14.76 ± 1.41	35.78 ± 4.03	81.98 ± 3.17	28.97 ± 3.04
S.D-1	51.67 ± 2.04	15.22 ± 1.60	4.55 ± 0.75	20.00 ± 2.20	46.78 ± 4.46	89.55 ± 9.00	41.57 ± 5.77
S.D-3	52.22 ± 1.88	13.22 ± 1.12	6.00 ± 0.67	17.67 ± 2.05	48.67 ± 5.92	76.39 ± 3.54	37.46 ± 5.06
H.N.S-4	65.00 ± 3.44	13.33 ± 1.67	4.33 ± 0.50	18.33 ± 1.31	49.67 ± 3.21	81.45 ± 2.75	40.48 ± 3.11
H.N.S-8	55.00 ± 2.36	13.33 ± 0.83	6.22 ± 0.72	17.78 ± 2.06	45.22 ± 5.86	89.17 ± 4.60	39.61 ± 4.84
H.N.S-9	53.33 ± 1.86	14.44 ± 2.12	5.00 ± 0.53	18.00 ± 4.17	43.33 ±10.07	85.13 ± 2.99	37.35 ± 9.74
H.N.S-10	57.22 ± 2.78	16.11 ± 1.11	4.78 ± 0.43	16.22 ± 2.07	31.11 ± 3.64	95.39 ± 4.19	28.97 ± 2.94
S.S-4	66.11 ± 3.31	17.44 ± 1.44	6.33 ± 0.50	24.56 ± 2.57	61.89 ± 5.11	73.58 ± 4.00	45.42 ± 4.26
L.S-1	57.78 ± 1.21	13.33 ± 3.00	5.67 ± 0.87	21.44 ± 2.39	45.78 ± 5.66	93.27 ± 4.69	42.00 ± 4.49
L.S-2	60.56 ± 1.00	16.11 ± 2.00	5.00 ± 0.62	07.89 ± 1.87	51.78 ± 5.56	88.23 ± 2.50	45.49 ± 4.71
				Giza 3			
Control	06.11 ± 1.62	22.78 ± 0.88	5.44 ± 0.44	15.00 ± 1.20	38.22 ± 4.11	094.18 ± 3.95	35.17 ± 2.93
D-3	56.67 ± 2.64	15.56 ± 1.30	4.78 ± 0.74	15.00 ± 2.37	39.44 ± 5.57	100.55 ± 6.57	47.15 ± 7.89
F.T.L-1	06.11 ± 2.32	26.67 ± 1.67	5.78 ± 0.57	17.33 ± 1.39	43.67 ± 4.64	099.77 ± 2.41	43.76 ± 4.97
Long P-7	62.78 ± 1.69	18.33 ± 1.18	6.78 ± 0.55	13.44 ± 1.30	36.56 ± 3.72	118.61 ± 6.40	42.14 ± 3.03

Table 5. Cont.

Mutant lines	Plan height cm.	First pod height cm.	No. of branches/plant	No. of pods/plant	No. of seeds/plant	100-seed weight gm	Seed yield/plant gm.
				Giza 714			
Control	60.00 ± 2.76	22.78 ± 1.21	5.44 ± 0.58	12.33 ± 1.61	32.44 ± 3.50	98.86 ± 5.85	31.27 ± 3.08
D-7	47.22 ± 2.37	17.22 ± 1.47	3.44 ± 0.41	17.56 ± 2.99	45.56 ± 5.79	78.23 ± 2.87	35.73 ± 4.79
S.D-7	54.44 ± 2.27	19.44 ± 0.56	4.67 ± 0.41	14.89 ± 1.07	38.67 ± 3.40	92.96 ± 4.13	36.11 ± 3.66
L.F.P-6	55.00 ± 2.36	20.00 ± 1.44	4.11 ± 0.48	17.11 ± 1.68	45.22 ± 4.68	85.13 ± 2.36	38.59 ± 4.35
H.N.S-29	59.44 ± 1.30	19.44 ± 1.00	4.44 ± 0.58	18.11 ± 1.32	47.44 ± 3.91	82.78 ± 4.10	39.37 ± 3.90
H.N.S-32	53.33 ± 2.50	14.44 ± 1.30	5.22 ± 0.68	18.78 ± 1.21	40.33 ± 2.92	89.10 ± 3.08	35.57 ± 2.18
H.S.Y-7	57.22 ± 1.69	17.78 ± 1.47	3.67 ± 0.37	13.00 ± 1.20	40.44 ± 3.21	82.22 ± 2.84	33.33 ± 3.01
S.S-15	64.44 ± 2.56	21.11 ± 2.00	5.44 ± 0.44	20.22 ± 1.98	50.00 ± 4.81	81.71 ± 4.96	41.34 ± 5.19
L.S-12	63.33 ± 2.36	20.00 ± 1.44	4.56 ± 0.38	15.11 ± 1.74	40.78 ± 4.20	103.43 ± 2.7	41.86 ± 4.05
				Giza 716			
Control	64.44 ± 2.27	26.11 ± 1.62	2.89 ± 0.39	03.11 ± 1.06	37.78 ± 2.85	94.14 ± 4.19	35.29 ± 2.53
H.N.S-50	62.22 ± 2.37	21.11 ± 2.17	5.22 ± 0.68	15.44 ± 2.14	41.11 ± 6.27	92.36 ± 2.89	37.49 ± 5.33
L.S-17	56.67 ± 1.18	25.00 ± 1.18	7.00 ± 0.44	16.22 ± 1.43	35.11 ± 3.62	111.13 ± 4.23	38.58 ± 3.71
$L.S.D_{0.05}$	6.29	4.32	2.68	2.32	7.69	11.76	8.03
$L.S.D_{0.01}$	14.71	5.76	3.58	3.09	10.23	15.68	10.63

2 and improved Giza 3 under salinity. These results showed that the mother varieties used for induction of salt tolerance mutants should possess a higher salinity tolerance than other genotypes and confirmed that salt tolerance depends mainly upon polygene inheritance (Mysklyakov, 1987). SS-17 mutants gave 17.42 grams in comparison for Giza 716 mother variety that gave 6.37gm. Also this mutant possessed over attributes than the mother variety.

Contrary Dwarf and semi-dwarf group consider as a main group which possessed promising mutant lines under normal soil condition. S.D-1 from Giza 2 which had higher seed yield (41.57) than mother variety (28.97) and D-3 from improved Giza 3 possessed a higher seed yield than the other promising mutant lines which selected from all treated varieties. S.D-7 mutant line from Giza 714 was promising also. Peliotropic effect of dwarf gene was recorded in these mutants. This gene not only affected plant height, but also affected the seed yield components especially seed and pod shape. This results appeared in agreement with finding of Vik 1964, Soliman *et al* 1993, Kharkwal 2000, Ramesh *et al* 2001, Silva *et al* 2001 and Wani *et al* 2001. Elite promising mutant lines, with high seed yield and related traits under both (saline and normal) conditions, namely L.S-1 from Giza 2. L.S.P-6 and S.S-15 from Giza 714 were recorded. Long P-7 promising mutant line is considered as a very important genotype among all mutants and mother varieties under study, especially under saline condition and normal soil also. This mutant could be directly propagated to produce a new variety.

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سلالات طفرية مبشرة تحت ظروف التربة الملحية والطبيعية فى الفول البلدى

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٣ قسم البقول – محطة بحوث الجميزة – مركز البحوث الزراعية

أجرى هذا البحث بمحطة البحوث الزراعية بالجميزة – أعوام ١٩٩٩/٢٠٠٠ ، ٢٠٠٠/٢٠٠١ ، ٢٠٠١/٢٠٠٢ بهدف استحداث طفرات تتحمل الملوحة فى الفول البلدى استخدم مطفران هما أشعة جاما (٣٠ و ٦٠ و ٩٠ و ١٢٠ جراى) ، صوديوم أزيد NaN_3 (٠,٠٠١ – ٠,٠٠٣ مول عند pH ٣) وذلك على أربعة أصناف من الفول البلدى وهى : جيزة ٢ ، جيزة ٣ محسن ، جيزة ٧١٤ ، جيزة ٧١٦ وكانت النتائج كالتالى :

أ– فى الجيل الثانى الطفرى شوهدت تغيرات واضحة فى الصفات المورفولوجية وصفات المحصول وشكل البذرة وتم انتخاب ١٨٠ طفرة.

ب– لوحظ أن هناك ثبات وراثى فى الجيل الثالث لطفرات التبكير فى التزهير ، والتقزم وشبه التقزم ، وانخفاض ارتفاع أول قرن على الساق ، ومن الأرجح أن هذه الصفات يتحكم فيها زوج واحد أو اثنين من الجينات المنتحية وتتأثر بدرجة قليلة بالظروف البيئية.

وتم الحصول على ٥ سلالات طفرية مبشرة تحت ظروف الزراعة فى التربة الملحية وهى : سلالة H.N.S-6 من الصنف جيزة ٢ ، سلالات Long P-7, Long P-5, D-5 من الصنف جيزة ٣ محسن وسلالة S.S-17 من الصنف جيزة ٧١٦ ، وتعتبر هذه الطفرات مهمة جداً فى مجال التربية لمقاومة الملوحة وخاصة الطفرات المنتخبة من الصنف جيزة ٣ محسن وعلى النقيض من ذلك كانت طفرات التقزم وشبه التقزم هامة جداً تحت ظروف التربة العادية وطفرة S.D-1 من صنف جيزة ٢ ، طفرة D-3 من صنف جيزة ٣ محسن وطفرة S.D-7 من صنف جيزة ٧١٤ ، اتضح وجود تعدد الأثر peliotropic effect لجين التقزم فى هذه السلالات الطفرية حيث لا يؤثر هذا الجين على طول النبات فقط بل تؤثر على مكونات المحصول خاصة شكل البذرة والقرن أكثر من ذلك انتخبت ٤ طفرات مبشرة ممتازة ذات صفات محصول بذور عالى تحت ظروف التربة الملحية وظروف التربة العادية وهى : سلالة L.S-1 من الصنف جيزة ٢ ، سلالتين S.S.-15 ، L.F.P-6 من الصنف جيزة ٧١٤ وسلالة Long P-7 من الصنف جيزة ٣ محسن.

وتعتبر السلالة الأخيرة (Long P-7) أفضل السلالات من حيث التركيب الوراثى مقارنة بالسلالات الأخرى والأصناف تحت الدراسة وخاصة تحت ظروف الملوحة وكذلك الظروف الطبيعية ولذلك يمكن إدخال هذه الطفرة فى تجارب مقارنة المحصول المكبرة لاعتمادها كصنف جديد يتفوق فى المحصول تحت الظروف الملحية والطبيعية.