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INDUCTION OF GENETIC VARIABILITY IN PEANUT USING GAMMA RAYS AND SODIUM AZIDE

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ABSTRACT

The aim of this study was to induce genetic variability in peanut cultivars (Giza 5, Giza 6, NC9 and Gregory) using gamma rays and sodium azide mutagens during 2002 and 2003 seasons.

The investigated varieties responded differently to mutagens in both M1 and M2 generations. In most of the studied characters genotypic variances were higher in M2 than M1. This observation might be explained on the light of considering M2 generation as the first segregating generation. The results indicated that sufficient amount of variability was induced due to mutations in M2. This finding was clear for most of yield and yield components among the investigated varieties. The results also proved that gamma rays and sodium azide could be considered as a tools for variation induction with different sensitivity among the present varieties. This variation formed basis for desirable selection to improve the important economic characters of peanut.

In M1 generation Giza 5 had the highest values of most of the genetic parameters for plant height under the effect of gamma rays. While, it gave the same result for no. of branches/plant using sodium azide in M2. Giza 6 responded more than the other cultivars for pods/plant in M1 and most studied yield components in M2 using gamma rays.

Correlation study indicated that pod yield/plant was positively correlated with plant height, pods/plant, seeds/plant, seed yield/plant, 100-seed weight and oil content under the effect of gamma rays. Furthermore, it was positively correlated under the effect of sodium azide with branches/plant, pods/plant, seeds/plant, seed yield/plant and 100-seed weight. Therefore, pods/plant, seeds/plant, seed yield/plant and 100-seed weight could be considered as a selection criteria for yielding ability in peanut breeding program. On the other hand, the regular positive genotypic correlation (0.670 and 0.616) in M1 and M2 generations between pod yield per plant and number of branches/plant dramatically changed to be negative (-0.630 and -0.992) in M1 and M2 populations treated with sodium azide. Hence, selection criteria might be changed depending upon used mutagen.

Key words: *Peanut, Variability, Gamma-rays, Sodium azide, genotypic and phenotypic correlations*

INTRODUCTION

Peanut (*Arachis hypogea* L.) is one of the important oil crops all over the world as well as in Egypt, although, it is grown in Egypt for direct consumption rather than for oil extraction. For the production of year 2004, the total production in Egypt was 191000 metric tons, harvested from 141600 fad. with an average yield 1.36 metric tons/fad. (FAO 2004). The ultimate aim of peanut breeding programs is to develop cultivars that have higher yielding ability and seed oil content. Difficulties of traditional breeding programs in peanut led to induce mutations as an alternative technique. Out of 265 grain legume cultivars developed using induced mutations have been released in 32 countries, 44 peanut cultivars were developed (Bhatia 2001). Since, most of the economic traits are complex in their inheritance and may be associated, the amount of genotypic and phenotypic variances and correlations are important. Ramanathan (1983) reported that EMS-treated groundnut seeds gave higher values than controls for genotypic variance, heritability and genetic advance of pod and seed yields in M3 generation. Ramanathan and Rathinam (1983) also reported that stem height in M3 generation was positively associated with pod yield/plant and pods/plant as a result of irradiating seeds of groundnut with 40 Kr gamma rays and EMS at60 mM and 80 mM, but not in controls. However branches/plant was positively associated with pod yield/plant in controls, but not in the M3 generation. Ramani and Jadon (1991) observed that moderate to high levels of heritability accompanied by high levels of genetic advance for pod weight/plant, pods/plant and seeds/plant due to treatment of seeds of groundnut with gamma radiation and EMS. Nagabhushanam and Prasad (1992) reported that there was simultaneous increase in variance for branches, pods, pod weight and seed weight/plant as a result of seed treatment with sodium azide at 3mM. Vuayakumar *et al* (1993) reported that gamma-irradiated groundnut populations showed significantly higher variability in the M3 generation. Sorour *et al* (1999) reported that gamma-irradiated groundnut populations had the highest coefficient of variability in the majority of pod yield/plant, pods/plant, seed yield/plant and 100-seed weight when 30 Kr dose was applied. They indicated that groundnut improvement through mutation breeding is feasible.

The main objectives of this work were to induce genetic variability using gamma rays and sodium azide mutagens as well as study genotypic and phenotypic correlations among some economic traits in four peanut cultivars, taking differential in sensitivity of cultivars into account.

MATERIALS AND METHODS

This work was conducted during 2002 and 2003 seasons to study the induction of genetic variation in four peanut cultivars using gamma rays and sodium azide. The treated cultivars were Giza 5, Giza 6, NC9 and Gregory. The used doses were 20, 30 and 40 Kr. Seeds were irradiated at Middle East Regional Radiostope Center for the Arab Countries at Dokki, Giza. The used concentrations of sodium azide were 0.001, 0.002 and 0.003 molar. The seed samples were submerged in the solutions for 2 hr and washed after treatment in running tap water for one hour. The treated and untreated seeds were sown to arise M1 generation. The seeds collected from the different plants of each treatment were bulked to give rise to M2 generation. In the second season, the bulked seeds of each M1 treatment and untreated were sown. The complete randomized block design with four replications in both seasons was used. The experimental plot consisted of three rows, 4 meters long and 60 cm apart in the first season while it was 3meters long and 60 cm apart in the second season. Single seeds were planted in both seasons in hills 10 cm apart for Giza 5 and Giza 6 cultivars, and 30 cm apart for NC9 and Gregory cultivars. In the first and second seasons all the cultural practices were performed as recommended.

In both seasons, data of number of primary branches/plant, plant height in cm, number of pods/plant, pod yield/plant, number of seeds/plant, seed yield/plant, 100-seed weight and seed oil content (%) were recorded. All data were subjected to statistical analysis according to Gomez and Gomez 1984. The genotypic and phenotypic variances (Vg and Vp), broad sense heritability (h^2) and genotypic and phenotypic coefficient of variability (G.C.V. % and P.C.V. %) computed according to Singh and Choudhary (1976). Expected genetic advance (in M2 generation) was calculated according to Allard (1964). The genotypic and phenotypic correlation coefficients were estimated according to Miller *et al* (1958).

RESULTS AND DISCUSSION

Genetic behavior and variability of plant characteristics

Branches/plant and plant height

Results given in Table (1) show that the highest values of the parameters were recorded for plant height by Giza 5 under the effect of gamma radiation in M1 generation. However, in M2 generation NC9 under the effect of sodium azide showed the highest values as well as high estimate of heritability. Regarding to branches/plant, data in Table 1 revealed that

Table 1. Effect of Gamma rays and Sodium azide on genetic behavior for both number of primary branches/plant and plant height (cm.) for groundnut varieties at M1and M2 generations.

Variables	Varieties	Mutagens	Vg	Vp	h^2 %	P.C.V	G.C.V	Vg	Vp	h^2 %	P.C.V	G.C.V	Gs
			M1					M2					
Number of primary branches/plant	Giza 5	G. rays	0.35	0.66	52.83	23.21	16.90	0.21	0.40	52.50	11.73	8.50	0.58
		S. azide	0.35	0.87	40.23	23.67	15.02	0.43	0.85	50.59	18.33	13.04	0.82
	Giza 6	G. rays	0.61	0.91	67.03	22.77	18.64	0.35	0.73	47.95	15.73	10.90	0.72
		S. azide	0.96	1.58	60.76	29.86	23.27	0.22	0.50	44.00	13.84	9.18	0.55
	NC9	G. rays	0.34	0.93	36.56	27.87	16.85	0.29	0.44	65.91	14.55	11.81	0.77
		S. azide	0.15	0.45	33.00	19.11	11.03	0.22	0.35	62.86	11.67	9.25	0.65
	Gregory	G. rays	0.38	0.57	66.67	22.01	17.97	0.23	0.40	57.50	12.70	9.63	0.64
		S. azide	0.46	0.88	52.27	24.12	17.44	0.13	0.21	61.90	9.33	7.34	0.50
			M1					M2					
Plant height (cm)	Giza 5	G. rays	96.57	106.40	90.76	25.28	24.10	20.86	40.75	51.19	14.86	10.63	5.75
		S. azide	14.99	24.82	60.39	12.11	9.41	7.20	10.74	67.04	7.55	6.18	3.87
	Giza 6	G. rays	47.92	54.10	88.58	19.47	18.33	37.61	47.18	79.72	16.15	14.42	9.64
		S. azide	27.07	41.89	64.62	16.55	13.31	38.65	42.76	90.39	15.02	14.28	10.40
	NC9	G. rays	21.75	40.33	53.93	13.87	10.18	58.37	72.24	80.80	17.23	15.49	12.09
		S. azide	35.11	49.83	70.46	14.25	11.96	31.82	58.69	54.22	13.69	10.08	7.31
	Gregory	G. rays	11.73	19.47	60.25	10.62	8.25	8.58	14.16	60.59	7.63	5.94	4.01
		S. azide	15.26	28.90	52.80	12.04	8.75	8.16	14.92	54.69	7.50	5.55	3.72

Giza 6 and Giza 5 under the effect of sodium azide had the highest values of the parameters except for heritability values in M1 and M2 generations respectively. In this connection, Nagabhushanam and Prasad (1992) found simultaneous increase in variance for branches/plant after treatment with sodium azide at 3mM.

Yield components

Data presented in Tables (2), (3) and (4) showed that in M1 generation the highest values of phenotypic and genotypic variances as well as high value of the other genetic parameters were scored for seeds/plant and seed yield/plant by Giza 6 under the effect of sodium azide. Moreover, high values of heritability as well as high values of the other genetic parameters were recorded for 100-seed weight by Gregory under the effect of sodium azide and for oil % by NC9 under the effect of gamma radiation. Giza 6 under the effect of gamma radiation gave the highest values of phenotypic and genotypic variances for pods/plant. However, NC9 under the effect of sodium azide had the highest values of genotypic variance and coefficient of phenotypic and genotypic variances for pod yield. Regarding to M2 generation, the data also revealed that Giza 6 under the effect of gamma radiation gave the highest values of the parameters for pod yield/plant and seeds/plant. The highest estimates of parameters were obtained for oil % from NC9 when treated with sodium azide. However, it had the highest estimates of genotypic variance, heritability, coefficient of genotypic variance and genetic advance for 100-seed weight when irradiated.

It is clear from the above-mentioned results that the varieties were differently responded to each mutagen. This may be due to mutation sensitivity of the studied varieties for different traits. In this connection, Ramanathan (1983), Nagabhushanam and Prasad (1992) and Sorour *et al* (1999) in groundnut found increase in variability of yield components in their studies under mutation breeding.

Phenotypic and genotypic correlations

Genotypic and phenotypic correlations were computed in both M1 and M2 generations among certain economic characters of peanut as affected by exposing seeds to gamma rays or sodium azide mutagens (Tables 5 and 6).

Regular genetic positive correlations under the effect of gamma rays were detected between pod yield/plant (gm.) and each of number of pods/plant (0.961 and 0.859), number of seeds/plant (0.995 and 0.974), seed yield per plant (gm.) (0.875 and 0.920) in M1 and M2 generations,

Table 2. Effect of Gamma rays and Sodium azide on genetic behavior for both straw yield/plant (gm.) and number of pods/plant for groundnut varieties at M1and M2 generations.

Variables	Varieties	Mutagens	Vg	Vp	h^2 %	P.C.V	G.C.V	Vg	Vp	h^2 %	P.C.V	G.C.V	Gs
			M1					M2					
Number of pods/plant	Giza 5	G. rays	26.91	46.10	58.37	27.29	20.85	24.44	45.26	54.00	18.73	13.77	6.39
		S. azide	28.95	39.97	72.43	25.41	21.63	33.81	63.33	53.39	21.61	15.79	7.48
	Giza 6	G. rays	58.80	70.61	83.27	41.62	37.98	86.24	108.65	79.37	28.60	25.48	14.56
		S. azide	47.28	61.64	76.70	27.85	24.39	29.63	53.21	55.69	21.39	15.96	7.15
	NC9	G. rays	11.72	19.16	61.17	58.83	46.01	41.51	46.32	89.62	22.34	21.15	10.73
		S. azide	38.53	56.44	68.27	33.30	27.51	19.90	32.00	62.19	17.80	14.04	6.19
	Gregory	G. rays	29.32	40.29	72.77	40.07	34.18	29.43	33.18	88.70	19.36	18.24	8.99
		S. azide	20.12	32.76	61.42	25.67	20.11	10.69	19.24	55.56	14.47	10.79	4.29
			M1					M2					
Pod yield/plant (g)	Giza 5	G. rays	18.58	28.02	66.31	26.27	21.39	49.23	82.87	59.41	22.61	17.42	9.52
		S. azide	38.60	68.51	56.34	27.42	20.58	22.80	45.03	50.63	14.76	10.50	5.98
	Giza 6	G. rays	49.27	67.79	72.68	41.42	35.31	89.50	127.94	69.95	28.19	23.58	13.93
		S. azide	63.95	95.39	67.04	31.06	25.44	21.92	37.43	58.56	14.62	11.19	6.31
	NC9	G. rays	14.73	22.39	65.79	32.34	26.23	15.50	27.52	56.32	17.03	12.78	5.20
		S. azide	73.46	93.60	78.48	42.47	37.62	15.14	26.77	56.56	15.90	11.96	5.15
	Gregory	G. rays	11.54	14.61	78.99	26.56	23.61	32.98	56.39	58.49	18.80	14.38	7.73
		S. azide	59.81	79.29	75.43	38.07	33.06	26.09	49.50	52.70	17.62	12.79	6.53

Table 3. Effect of Gamma rays and Sodium azide on genetic behavior for both pod yield/plant (gm.) and number of seeds/plant for groundnut varieties at M1and M2 generations.

Variables	Varieties	Mutagens	Vg	Vp	h^2 %	P.C.V	G.C.V	Vg	Vp	h^2 %	P.C.V	G.C.V	Gs
			M1					M2					
Number of seeds/plant	Giza 5	G. rays	14.17	18.88	75.05	24.11	20.89	26.25	40.35	65.06	16.80	13.55	7.27
		S. azide	28.06	44.35	63.27	25.33	20.15	37.16	43.95	84.55	17.57	16.15	9.87
	Giza 6	G. rays	35.01	48.12	72.76	40.61	34.64	173.51	184.27	94.16	33.56	32.56	22.50
		S. azide	76.90	91.66	83.90	33.08	30.30	39.57	59.26	66.77	19.64	16.05	9.05
	NC9	G. rays	15.04	28.06	53.60	42.68	31.25	20.58	29.25	70.36	17.40	14.60	6.70
		S. azide	28.18	44.92	62.73	35.75	28.31	10.97	16.00	68.56	11.46	9.49	4.83
	Gregory	G. rays	18.36	21.46	85.55	36.30	33.58	28.39	31.20	90.99	15.92	15.19	8.95
		S. azide	41.51	60.81	68.26	38.11	31.49	18.29	28.86	63.37	14.25	11.34	5.99
			M1					M2					
Seed yield/plant (g)	Giza 5	G. rays	5.56	7.53	73.84	25.41	21.83	33.73	49.72	67.84	28.08	23.13	8.42
		S. azide	13.63	24.37	55.93	28.77	21.51	23.88	38.63	61.82	22.95	18.05	6.76
	Giza 6	G. rays	11.14	17.21	64.73	40.43	32.53	61.74	69.17	89.26	37.45	35.38	13.07
		S. azide	37.72	44.46	84.84	35.54	32.74	55.52	73.75	75.28	29.06	25.22	11.38
	NC9	G. rays	7.24	10.13	71.47	39.10	33.06	7.49	10.96	68.34	17.89	14.79	3.98
		S. azide	11.52	17.61	65.42	38.39	31.05	9.87	14.89	66.29	19.44	15.83	4.50
	Gregory	G. rays	5.08	6.43	79.00	32.64	29.01	8.46	15.45	54.76	17.54	12.98	3.79
		S. azide	26.58	30.34	87.61	41.60	38.94	14.69	21.78	67.45	20.67	16.97	5.54

Table 4. Effect of Gamma rays and Sodium azide on genetic behavior for both seed yield/plant (gm.) and 100-seed weight (gm.) for groundnut varieties at M1and M2 generations.

Variables	Varieties	Mutagens	Vg	Vp	h² %	P.C.V	G.C.V	Vg	Vp	h² %	P.C.V	G.C.V	Gs
			M1					M2					
100-seed weight (g)	Giza 5	G. rays	46.89	52.11	89.98	15.51	14.72	33.60	57.04	58.91	12.53	9.62	7.83
		S. azide	10.04	16.05	62.55	7.23	5.72	19.63	40.57	48.39	9.41	6.55	5.42
	Giza 6	G. rays	12.23	20.59	59.40	9.89	7.62	34.73	44.31	78.38	11.65	10.32	9.18
		S. azide	18.60	24.29	76.57	9.31	8.14	25.09	42.53	58.99	9.27	7.12	6.77
	NC9	G. rays	25.17	31.10	80.93	13.11	11.79	36.84	43.90	83.92	11.69	10.70	9.79
		S. azide	9.44	14.95	63.14	8.94	7.10	15.43	21.86	70.59	8.51	7.15	5.81
	Gregory	G. rays	14.41	24.22	59.50	12.00	9.27	7.20	9.52	75.63	5.15	4.48	4.11
		S. azide	136.63	161.08	84.82	23.24	21.41	6.89	15.19	45.36	6.57	4.42	3.11
			M1					M2					
Seed oil content (%)	Giza 5	G rays	4.95	7.69	64.37	5.78	4.64	2.60	4.66	55.79	4.40	3.29	2.12
		S. azide	9.40	12.14	77.43	7.34	6.46	3.02	3.79	79.68	3.88	3.47	2.73
	Giza 6	G. rays	5.74	8.73	65.75	6.62	5.37	3.17	4.81	65.90	4.34	3.53	2.54
		S. azide	3.91	5.32	73.50	5.07	4.35	2.57	4.05	63.46	4.07	3.24	2.25
	NC9	G. rays	14.02	23.57	59.48	10.61	8.18	2.57	4.13	62.23	4.10	3.23	2.23
		S. azide	5.96	10.19	58.49	7.27	5.56	5.53	6.04	91.56	4.92	4.71	3.96
	Gregory	G. rays	6.83	12.23	55.85	7.99	5.97	1.83	3.22	56.83	3.68	2.78	1.79
		S. azide	4.54	6.82	66.57	5.77	4.71	3.13	4.20	74.52	4.18	3.61	2.69

Table 5. Phenotypic (r.p) correlation coefficient among eight characters in M1 and M2 generations of groundnut varieties treated by gamma rays and sodium azide.

Characters			Plant height	No. of pods/ plant	Po yield / plant	No. of seeds / plant	Seed yield / plant	100-seed weight	Oil %
No. of branches /plant	M1	G.rays	-0.650	-0.226	-0.282	-0.100	-0.178	-0.481	-0.067
		S.azide	0.221	0.247	0.184	0.196	0.217	-0.181	0.162
	M2	G.rays	-0.135	-0.323	-0.213	-0.333	-0.343	0.269	-0.216
		S.azide	0.100	-0.055	0.277	-0.034	0.098	0.121	-0.123
Plant height	M1	G.rays		0.210	0.329	0.078	0.145	0.328	0.026
		S.azide		0.562	-0.400	0.537	0.479	0.276	-0.136
	M2	G.rays		0.273	0.331	0.188	0.310	0.253	-0..251
		S.azide		0.092	0.135	-0.234	-0.688	-0.007	0.533
No. of pods/plant	M1	G.rays			0.524	0.574	0.525	0.324	-0.014
		S.azide			0.814	0.633	0.812	0.426	-0.097
	M2	G.rays			0.430	0.692	0.352	-0.425	0.308
		S.azide			0.267	0.129	0.110	0.203	0.048
Pod yield/plant	M1	G.rays				0.734	0.742	0.516	0.037
		S.azide				0.906	0.844	0.499	-0.077
	M2	G.rays				0.683	0.758	-0.248	0.273
		S.azide				0.480	0.510	0.754	0.022
No. of seeds/plant	M1	G.rays					0.883	0.462	0.121
		S.azide					0.836	0.484	-0.131
	M2	G.rays					0.816	-0.397	0.181
		S.azide					0.646	0.430	-0.141
Seed yield/plant	M1	G.rays						0.534	0.148
		S.azide						0.536	-0.070
	M2	G.rays						-0.172	0.302
		S.azide						0.329	-0.197
100-seed weight	M1	G.rays							0.172
		S.azide							-0.366
	M2	G.rays							0.016
		S.azide							-0.054

Table 6. Genotypic (r.g) correlation coefficient among eight characters in M1 and M2 generations of groundnut varieties treated by gamma rays and sodium azide.

Characters			Plant height	No. of pods/ plant	Po yield / plant	No. of seeds / plant	Seed yield / plant	100-seed weight	Oil %
No. of branches /plant	M1	G.rays	-0.999	-0.466	-0.630	-0.374	-0.604	-0.688	-0.242
		S.azide	0.758	0.657	0.670	0.690	0.488	-0.350	0.627
	M2	G.rays	-0.950	-0.900	-0.992	-0.738	-0.917	0.316	-0.944
		S.azide	-0.082	0.475	0.616	0.166	0.125	0.292	-0.809
Plant height	M1	G.rays		0.341	0.397	0.106	0.364	0.477	0.104
		S.azide		0.944	-0.982	0.954	0.994	0.468	0.121
	M2	G.rays		0.499	0.564	0.237	0.503	0.227	-0.534
		S.azide		0.488	0.037	-0.673	-0.999	-0.664	0.870
No. of pods/plant	M1	G.rays			0.961	0.896	0.922	0.832	-0.674
		S.azide			0.992	0.655	0.979	0.556	-0.284
	M2	G.rays			0.859	0.975	0.658	-0.755	0.515
		S.azide			0.799	-0.002	-0.291	0.319	-0.217
Pod yield/plant	M1	G.rays				0.995	0.875	0.925	0.041
		S.azide				0.983	0.992	0.574	-0.156
	M2	G.rays				0.974	0.920	-0.767	0.573
		S.azide				0.731	0.280	0.859	-0.293
No. of seeds/plant	M1	G.rays					0.986	0.984	0.011
		S.azide					0.974	0.533	-0.263
	M2	G.rays					0.978	-0.964	0.218
		S.azide					0.905	0.979	0.626
Seed yield/plant	M1	G.rays						0.810	0.073
		S.azide						0.722	-0.319
	M2	G.rays						-0.822	0.498
		S.azide						0.631	-0.913
100-seed weight	M1	G.rays							0.264
		S.azide							-0.797
	M2	G.rays							0.311
		S.azide							-0.721

respectively. While, it was significantly negative (-0.767) with 100 seed weight in M2. The point of interest is that the regular positive association between pod yield/plant (gm.) and 100 seed weight was genetically changed to be negative and significant among the segregating generation M2 due to irradiation effect. At the same way, the regular positive genotypic correlation (0.670 and 0.616) in M1 and M2 generations between pod yield per plant and number of branches/plant dramatically changed to be negative (-0.630 and -0.992) in M1 and M2 populations treated with sodium azide. Hence, these results indicated that selection criteria might be changed depending upon used mutagen.

Oil content (%) of populations promoted under the effect of gamma rays in M2 had significant positive correlation coefficients with number of pods/plant (0.515), pod yield /plant (gm.) (0.573) and seed yield /plant (gm.) (0.498). It is worth to mention that the regular negative associations between the principle yield components and oil content were destroyed among the segregating generation M2 due to the irradiation effect in M1 generation. According to such cases, selection criteria might be reconsidered and selection to high yield accompanied with higher oil content seems to be visible. Ramanathan and Rathinam (1983) obtained similar results.

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استحداث التباين الوراثى في الفول السوداني باستخدام أشعة جاما وأزايد الصوديوم

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٢. قسم المحاصيل – كلية الزراعة -جامعة جنوب الوادى – قنا**

أجرى هذا البحث بهدف دراسة إمكانية استحداث التباين الوراثى فى أربعة أصناف من الفول السوداني (جيزة ٥ ، جيزة ٦، NC9 وجريجورى) خلال موسمي ٢٠٠٢، ٢٠٠٣م باستخدام أشعة جاما و أزايد الصوديوم.

وأشارت النتائج إلى تباين الأصناف المدروسة فى استجاباتها للمطفرين فى كلا من الجيل الأول والثاني . كما زادت التباينات الوراثية فى الجيل الثانى عن الجيل الاول لمعظم الصفات المدروسة. ويفسر ذلك باعتبار أن الجيل الثانى هو الجيل الانعزالى الاول. وكان ذلك واضحا مع معظم صفات المحصول ومكوناته للأصناف المدروسة. وتعضد النتائج اعتبار أشعة جاما وازايد الصوديوم كوسائل لاستحداث التباين مع وجود تباين فى حساسية الأصناف المدروسة. وقد شكل هذا التباين أساسا للانتخاب لتحسين الصفات الاقتصادية الهامة فى الفول السودانى.

وقد أعطى الصنف جيزة ٥ أعلى القيم لمعظم مقاييس التباين المدروسة لصفة ارتفاع النبات فى الجيل الأول تحت تأثير أشعة جاما ولصفة عدد الأفرع/نبات تحت تأثير أزايد الصوديوم فى الجيل

الثانى. كما أظهرت الدراسة أن الصنف جيزة ٦ كان أكثر استجابة عن باقي الأصناف لصفة عدد القرون/نبات فى الجيل الأول ولمعظم مكونات المحصول المدروسة فى الجيل الثانى تحت تأثير أشعة جاما .

كما أظهرت دراسة الارتباط وجود ارتباط موجب بين محصول القرون/نبات وصفات ارتفاع النبات، عدد القرون/نبات ،عدد البذور/نبات ،محصول البذور/نبات ووزن ١٠٠ بذرة تحت تأثير أشعة جاما أما تحت تأثير أزايد الصوديوم فأظهرت النتائج ارتباط موجب بين محصول القرون/نبات وصفات عدد الفروع الأولية /نبات ، عدد القرون/نبات ،عدد البذور/نبات ،محصول البذور/نبات ووزن ١٠٠ بذرة. وعليه يمكن اعتبار صفات عدد القرون/نبات،عدد البذور/نبات ،محصول البذور/نبات ووزن ١٠٠ بذرة معايير انتخابية لمحصول القرون في برامج تربية الفول السوداني. ومن ناحية أخرى تغير الارتباط الوراثى الموجب المنتظم بين محصول القرون /نبات (جم) وعدد الفروع/ نبات (٠,٦٧٠، ٠,٦١٦) في الجيلين الأول والثاني ليصبح ارتباط سالب (-٠,٦٣٠ ، -٠,٩٩٢) في الجيلين الأول والثاني كنتيجة للمعاملة بازايد الصوديوم .وعلية فان الصفات التي يمكن استخدامها كمعايير انتخابية تتغير تبعا للمطفر المستخدم.

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