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The Effect of Gamma-Rays on Cotton Yield, Yield Components and Fiber Quality Characters

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ABSTRACT

The present research was carried out to study the effect of using gamma rays dose 10 and 15Kr on the yield and yield components and quality traits in M_1, M_2 and M_3 generations during 2014, 2015 and 2016 seasons for two cultivars Giza 92 and Giza 94. The results showed that the effects of treatment were significant for all studied traits except Micronaire reading in M_1 and fiber length in M_1 and M_2. Also the results revealed that the interaction between the cultivars and doses were significant for all traits except for boll weight in M_3, lint percentage and fiber length in M_2. The effect of dose 15 Kr had significant effects for seed and lint cotton yield. The variability in M_1 and M_3 were higher than the variability in M_2 due to effectiveness of sever selection in M_1 generation. Positive coefficient skewness were found for seed cotton yield, lint yield, number of bolls and lint percentage indicating that most of plants lie left half of curve. While, most of plants lie in right half of curve for boll weight, Micronaire reading and pressely index in M_1. Moment coefficient of kurtosis were less than 3 for all traits in M_1, M_2, and M_3 it can be concluded that the normally curves of plant distribution were platykurtic so the variabilities were broad.

INTRODUCTION

Egyptian cotton breeding programs might pay more attention to increase genetic variability in the breeding materials. So the inductions of mutation consider the important source of variation in plant breeding programme as well as hybridization and plant introducing. The exposing plant, material to ionizing radiation is important way to mutation induction; Gamma rays are of great importance in this case. Many investigators studied the effect of radiation on genetic variance and heritability. The induced mutations in the plants exposed to nuclear radiation, might play a primitive role with greater economical values. Literature, survey revealed that mutations induced by gamma irradiations in the crops have been developed with improved characters having greater potential of increased yield, in time maturity, high protein proportion and healthy stem Javed *et al.,* (2000). Amer (2004) found that hybridization and mutagen treatments were effective tools for inducing variation of quantitative and qualitative nature. Lowery (2007) reported that many viable application for genetic mutant which include increasing germplasm diversity and improving quality, yield as well as decreased and pest resistance. Orabi (2004) found that significant differences in mean and variance in the treated parents compared with normal parents more than the other populations. significant increases were found in Giza 86 irradiated or unirradiated when used as a female parent in means and variances for number of bolls per plant, seed cotton yield per plant, boll weight, lint yield per plant, seed index and uniformity ratio, while significant decrease was found in Giza 86 irradiated or unirradiated when used as a male parent in means and variances for earliness characters and fiber fineness. Muhammad *et al.* (2015). Varieties significantly affected lint percentage, staple length and fiber fineness. Bt-131 recorded maximum lint percentage (37.7%), lengthy staple (30.9) and highest cotton yield (340.4 kg ha 1) as compared to other varieties. Haidar *et al*., (2016). reported that the mutant lines showed significant variation with comparing control lines. Moreover, lower dose application of mutagenic treatments effectively stimulate the agronomical characters like, early flowering, plant height, number of bolls, yield of seed cotton, ginning % , seed index, harvest index and fiber characters.

The objective of the present study was to evaluate the effects of gamma-rays on yield, yield components and fiber quality of cotton.

MATERIALS AND METHODS

The present investigation was carried out at Sakha Experimental Station, Agricultural Research Center, Kafr El-Sheikh, Egypt, during the three growing seasons from 2014 to 2016. The materials used in this research included two varieties which belong to the species *G. barbadese, L.* These two varieties were the Egyptian varieties Giza 92 is extra-long staple (derived from a cross between G.84 and (G.74 x G.68)) and Giza 94 is a long staple (derived from a cross between 10229 and Giza 86). Dried seeds of each variety were exposed to gamma-rays emitted from Cobalt 60 (Co60) source at the Middle East Regional Radio-Isotopes Center from Arab countries, Dokki, Giza. The doses of irradiation were 10 and 15 Kr.

In 2014 season, irradiated seeds were grown to raise plants of the M1 generation. M1 plants were artificial self-pollinated to produce M2 seeds, selfed bolls of each separate gamma dose in each variety were bulk harvested.

In 2015 season, the M2 selfed seeds from the irradiated doses were sown to obtain M2 plants. M2 plants were artificial self-pollinated to produce M3 seeds, selfed bolls of each separate gamma dose in each variety were bulk harvested.

2016 season the M3 selfed seeds from the irradiated doses were sown to obtain M3 plants M1, M2 and M3 generations were sown in the experimental design was a randomized complete blocks design with four replications. Each replicate consisted of three rows, 4m long; 65 cm apart between rows and 70 cm between hills, plants were thinned at one plant per hill.

Data were recorded on individual plant basis as follows:

1. Boll weight in grams (B.W. g): The average boll weight in grams of 5 bolls picked at random from each plant.

2. Number of open bolls per plant: Obtained by the formula:

$$B\ /\ P = \frac{\text{weight of seed cotton yield per plant}}{\text{boll weight}}$$

3. Seed cotton yield, estimated as the weight of seed cotton yield per plant in gram

4. Lint cotton yield, estimated as the weight of lint cotton yield per plant in gram

5. Lint percentage: Ratio of lint cotton yield to seed cotton yield sample expressed as percentage using the formula:

$$L\% = \frac{\text{weight of lint in sample}}{\text{weight of seed cotton in the same sample}} x100$$

6. Micronaire value (Mic): Fineness was expressed as micronaire instrument reading. The characters were measured with micromat instrument. ASTM D-3818-98
7. Fiber strength (F.S): Measured by HVI in gram / tex units. ASTM D-3818-98
8. Fiber length (upper half mean): measured by HVI in (mm). ASTM D-3818-98

The fiber properties were carried out under the standard conditions of testers (65 ± 2% relative humidity and 70 ± 2F° temperature).In Cotton Tech. Res. Sec., Cotton research institute, Giza.

Statistical procedures:-

The analysis of variance of the three populations (M1, M2 and M3) was statistically analyzed using (factor analysis) analysis of variance. The significance of means was determined using the least significant difference (L.S.D).

Moment coefficient of skewness:

$$M.C.S = \frac{M_3}{\sqrt{(M_2)^3}}$$

Where:

$$M_3 = \frac{\sum (x-\bar{x})^3}{n} \qquad M_2 = \frac{\sum (x-\bar{x})^2}{n}$$

The values of M.C.S take each of positive, negative and zero values.

Moment coefficient of kurtosis:

$$M.C.K = \frac{M_4}{(M_2)^2}$$

Where: $M_2 = \frac{\sum (x-\bar{x})^2}{n}$ $\qquad M_4 = \frac{\sum (x-\bar{x})^4}{n}$

The value of M.C.K take values of <3, >3.or =3

RESULTS AND DISCUSSION

The results in Table (1) showed mean square of main effects which cotton cultivars and treatment, as well as, the interaction between cultivars and treatment. The results showed that the two cultivars were differed in their genetic prospective for cotton yield and quality. Variability exists among tested cultivars showed significant effects for all traits of three generation M1, M2 and M3 except boll weight and lint percentage in M2, while the effects of treatment were significant for all studied traits except micronaire reading and fiber length in M1 and M2. Table (1) also revealed that the interaction between the cultivars and treatments were significant for all traits except for boll weight in M3, lint percentage in M2 and U.H.M in M2.

Table (1): The mean squares of the effect of cultivars and treatments in three generations

Source	d.f	Boll weight			Number of boll / plant			Seed cotton yield			Lint cotton yield		
		M_1	M_2	M_3	M_1	M_2	M_3	M_1	M_2	M_3	M_1	M_2	M_3
Replication	3	0.47	0.83	0.86*	339.54	694.57	316.61	5033.24	12894.00	3051.73	648.41	1658.25	338.73
Cultivars (A)	1	4.05*	0.001	3.48*	25698.7*	28088.23*	14785.3*	429532.5*	302922.4*	282480.9*	73845.4*	50294.1*	55207.38*
Doses (B)	2	3.00*	0.38*	1.80*	6177.23*	1987.41*	4477.77*	57486.88*	14976.05*	41299.15*	9313.90*	2652.04*	7059.85*
AB	2	1.73*	0.86*	0.14	10736.59*	2936.76*	3413.20*	93186.33*	52621.48*	33864.34*	14771.59*	8473.03*	4352.24*
Error	267	0.09	0.10	0.10	133.89	188.87	147.95	1373.48	1892.04	1690.68	251.35	329.76	308.01

* Significantly different at the 0.05 level of probability

Table (1): Cont.

Source	d.f	Lint percentage			Micronaire value			Pressely index			Fiber length		
		M_1	M_2	M_3	M_1	M_2	M_3	M_1	M_2	M_3	M_1	M_2	M_3
Replication	3	6.84	7.22	9.74*	0.02	0.01	0.26*	0.09	0.02	0.31	16.03	8.75	27.12
Cultivars (A)	1	3.42*	0.30	61.42*	4.36*	2.06*	0.51*	10.96*	6.08*	28.79*	334.08*	226.58*	334.86*
Doses (B)	2	15.15*	8.65*	41.98*	0.04	0.66*	4.58*	1.18*	0.42*	1.00*	0.63	0.46	4.43*
AB	2	3.56*	0.44	13.33*	2.60*	4.38*	3.07*	1.65*	0.55*	0.28*	9.98*	0.80	9.91*
Error	267	0.75	0.84	1.04	0.04	0.06	0.06	0.05	0.07	0.09	0.78	0.76	0.91

* Significantly different at the 0.05 level of probability

I- The effects and interaction effect on yield, yield component and fiber quality.

The yield components and quality traits as affected by irradiation doses in M1 generation are presented in Table (2). The data showed that the boll weight was significantly affected by irradiation doses. Mean boll weight values of both cultivars were 3.4g for unirradiated seeds (control), 3.7g for 10Kr irradiation and 3.4g 15Kr irradiation. The interaction between cultivars x doses was insignificant indicating that the two cultivars similarity responded to gamma irradiation doses with respect to boll weight. Similar results of boll weight were reported by El-Marakby et al., (2000). The M2 and M3 generations exhibited same results for boll weight were insignificantly affected by the two doses irradiation in two generations M2 and M3. The two cultivars were responded similarity.

Table (2): Yield components and quality traits of Giza 92 and Giza 94 as affected by gamma radiation doses M_1, M_2 and M_3

Generation	Treat.	Boll weight			Number of boll / plant			Seed cotton yield			Lint cotton yield		
		Giza 92	Giza 94	Mean	Giza 92	Giza 94	Mean	Giza 92	Giza 94	Mean	Giza 92	Giza 94	Mean
M_1	Cont.	3.4	3.4	3.40	45.3	83.8	64.6	152.8	283.5	218.15	62.6	115.6	89.10
	10kr	3.6	3.8	3.70	51.8	55.4	53.6	183.9	205.9	194.90	76.2	85.8	81.00
	15kr	3.2	3.7	3.45	46.8	55.3	51.1	147.07	201.7	174.39	59.8	83.14	71.47
	Mean	3.40	3.63	3.52	47.97	64.83	56.4	161.26	230.37	195.81	66.20	94.85	80.52
LSD 0.05	A	0.59			22.78			72.97			31.21		
	B	0.42			16.11			51.60			22.07		
	A x B	0.59			22.78			72.97			31.21		
M_2	Cont.	3.1	3.3	3.20	58.3	85.8	72.1	182.1	284.1	233.10	74	115.4	94.70
	10kr	3.4	3.3	3.35	60	67.8	63.9	201.9	220.6	211.25	81.8	89.9	85.85
	15kr	3.3	3.2	3.25	58.8	76.6	67.7	191.3	244.6	217.95	76.9	98.3	87.60
	Mean	3.27	3.27	3.27	59.03	76.73	67.9	191.77	249.77	220.77	77.57	101.20	89.38
LSD 0.05	A	0.63			27.06			85.64			35.75		
	B	0.45			19.13			60.56			25.28		
	A x B	0.63			27.06			85.64			35.75		
M_3	Cont.	3.2	3.3	3.25	61.7	85.8	73.8	193.9	284.1	239.00	78.5	115.4	96.95
	10kr	3.4	3.6	3.50	66.3	69.1	67.7	221.4	244.5	232.95	90.8	103.7	97.25
	15kr	3.2	3.5	3.35	55.8	47.7	51.8	176.9	162.1	169.50	71.6	60.8	66.20
	Mean	3.27	3.47	3.37	61.27	67.53	64.4	197.40	230.23	213.82	80.30	93.30	86.80
LSD 0.05	A	0.63			23.95			80.96			34.55		
	B	0.45			16.93			57.24			24.43		
	A x B	0.63			23.95			80.96			34.55		

Table (2): Cont.

Generation	Treat.	Lint percentage			Micronaire value			Pressely index			Fiber length		
		Giza 92	Giza 94	Mean	Giza 92	Giza 94	Mean	Giza 92	Giza 94	Mean	Giza 92	Giza 94	Mean
M_1	Cont.	40.9	40.8	**40.85**	3.9	3.9	**3.90**	10.6	10.4	**10.50**	35.5	34	**34.75**
	10kr	41.4	41.6	**41.50**	4.1	4.1	**4.10**	10.9	10.3	**10.60**	36	33.4	**34.70**
	15kr	40.6	41.18	**40.89**	4.2	4	**4.10**	10.5	10.3	**10.40**	35.5	33.7	**34.60**
	Mean	40.97	41.19	**41.08**	4.07	4.00	**4.03**	10.67	10.33	**10.50**	35.67	33.70	**34.68**
LSD 0.05	**A**		**1.70**			**0.39**			**0.44**			**1.74**	
	B		**1.20**			**0.27**			**0.31**			**1.23**	
	A x B		**1.70**			**0.39**			**0.44**			**1.74**	
M_2	Cont.	40.6	40.6	**40.60**	4.2	3.9	**4.05**	10.7	10.3	**10.50**	36	34.3	**35.15**
	10kr	40.5	40.7	**40.60**	4	4.4	**4.20**	10.7	10.5	**10.60**	35.8	34.2	**35.00**
	15kr	40.16	40.1	**40.13**	4	4.4	**4.20**	10.6	10.5	**10.55**	35.8	34.4	**35.10**
	Mean	40.4	40.5	**40.44**	4.1	4.2	**4.15**	10.7	10.4	**10.55**	35.9	34.3	**35.08**
LSD 0.05	**A**		**1.81**			**0.48**			**0.51**			**1.71**	
	B		**1.28**			**0.34**			**0.36**			**1.21**	
	A x B		**1.81**			**0.48**			**0.51**			**1.71**	
M_3	Cont.	40.5	40.6	**40.55**	4	3.9	**3.95**	10.8	10.3	**10.55**	35.6	34.3	**34.95**
	10kr	41	42.4	**41.70**	4	4.4	**4.20**	10.8	10.2	**10.50**	35.6	33.6	**34.60**
	15kr	40.4	38.4	**39.40**	4.4	3.9	**4.15**	10.6	10	**10.30**	35.9	33.7	**34.80**
	Mean	40.63	40.47	**40.55**	4.13	4.07	**4.10**	10.73	10.17	**10.45**	35.70	33.87	**34.78**
LSD 0.05	**A**		**2.01**			**0.49**			**0.59**			**1.88**	
	B		**1.42**			**0.35**			**0.42**			**1.33**	
	A x B		**2.01**			**0.49**			**0.59**			**1.88**	

With regarding number of bolls per plant, the data in Table (2) revealed that mean of number bolls per plant with insignificant deference between the two cultivars which amount 47.97 and 64.83 for two respective cultivars. Mean number of bolls per plant of both cultivars were giving a value 53.6 for 10Kr and 51.1 for 15 Kr dose for two cultivars with insignificant between doses or with comparing with control. With regard the interaction between cultivars x doses, the data in Table (2) showed that Giza 92 insignificant differences between two doses and untreated for while Giza 94 showed significant decrease for boll number in two doses comparing untreated. Higher reduction of number of bolls per plant was recorded at Giza 92 for two doses. While, the cultivar Giza 94 exhibited stimulation effect comparing with untreated. Same trend of these results was showed by El-Marakby et al., (2000).

With regarding number of boll per plant to M2 and M3, the results revealed that, the same trend of results M1 so, the cultivar Giza 94 was higher values were85.8, 67.8, 76.6 for two doses in M2 while, the values were 58.3, 60.and 58.8 for two doses in M2 of Giza 92 .The M3 of Giza 92 exhibited values 61.7, 66.3, 55.8 for three doses respectively while the values of the M3 of Giza 94 were 85.8, 69.1 and 47.7 for three doses, respectively. The interaction between cultivars x doses were significance reduction in M3 for Giza 94 and insignificant effect in M2 and Giza 92 in M3 for number of boll per plant.

With respect SCY/plant and LCY/plant, the data in Table (2) revealed that, the mean of seed cotton yield per plant was 166.24g and 217.17 g for two respect cultivars, while the mean of lint yield per plant were 66.53 and 87.4 for two respect cultivars. These differences were significant at 5% Muhammad et al. (2015)..

With regard to the means of doses, only the 15 Kr gave high reduction for seed and lint cotton yield per plant with values 162.1 and 60.8 respectively these values were significant at 5%. While, the dose of irradiation 10 Kr had insignificant effect for seed and lint cotton yield. For interaction between cultivars x doses, the data in Table (2) showed that the cultivar Giza 94 was affected by two does of irradiation by significant values while the cultivars Giza 92 was not affected by the two doses for seed and lint cotton yield. With respect M2 and M3, the data showed that the cultivars Giza 94 was matched with Giza 92 with insignificant values for seed and lint cotton yield. Haidar et al., (2016).

For effects of doses, the data showed that the dose 15 Kr had significant effects for seed and lint cotton yield in M2 and M3, while the dose of 10 Kr had insignificant effects. With regard the interaction between cultivars x doses in M2 and M3, only the effect of dose 15 Kr on cultivar Giza 94 had significant reduction values for seed and lint cotton yield, while the dose 10Kr had insignificant reduction in Giza 94. For Giza 92 exhibited, higher values by insignificant value comparing with Giza 92 untreated in M2 and M3 for use the 10Kr. Same trend of these results were obtained by El-Marakby et al.,(2000) and Amer et al.,(2016).

With respect lint percentage, the data in Table (2) showed that the effect of cultivars was stimulation and the difference between the two cultivars was in significant. The data also showed that effective doses of irradiation were 41.5 and 40.89 for 10 Kr and 15Kr, respectively these effects were insignificant as comparing with control. For the interaction between cultivars x doses the effects of interaction between cultivars and doses exhibited insignificant differences as comparing with control. The effects of M2 and M3 exhibited same trend hence these doses had insignificant differences except for dose 15Kr effect in Giza 94. These result agreed partially with those were obtained by Haidar et al., (2016).

For micronaire value in M1 generation, the data indicated that the effect of two cultivars exhibited insignificant difference as well as the effect of doses of irradiation was insignificant. The data of M2 suggested that the effects of cultivars and effect of doses were insignificant; while the effect of the interaction exhibited that the two doses had significant effect in cultivar Giza 94. The interaction of two doses had insignificant effect for Giza 92. The data in Table (2) indicated that effects of cultivars and doses was insignificant in M3, while the effects of interaction between cultivars x doses were insignificant in M3 except for the dose 10 Kr on Giza 94 had significant effect, these results were harmony with Haidar et al., (2016) and Awaad et al., (1995)

With regard the fiber strength in M1, M2 and M3 generations, the data in Table (2) illustrated that the effects of cultivars had insignificant effects in three generations, while the effect of doses had negative significant effect of dose 15 Kr in three generations. The effects of the interaction between cultivars and doses were insignificant for three generations. These result agreed partially with those obtained by Haidar et al., (2016), Raafat (1995) and Mahdey (1996).

With respective the fiber length (U.H.M) the data in Table (2) indicated that the effects of cultivars were insignificant in M1, as well as the effect of cultivars in M2 and M3 were insignificant. The data in Table (2) showed that the effects of irradiation doses were insignificant in M1, M2 and M3 generations. Also, the data showed insignificant effects for interaction between the irradiation doses and the cultivars in three generations. These result disagreed with those obtained by Allam (2007) and agreed with those obtained by Orabi (2004)

II-The moment coefficient of skewness and kurtosis

The moment coefficient of kurtosis and skewness are shown in Table (3). With regarding boll weight, the data showed higher increasing of phenotypic variability in M1 and M3 due to the effect of irradiation, while in M2 phenotypic and genotypic variability were decrease it may be to due to effectiveness of sever selection in M1 generation.

The data in Table (3) indicated that the moment coefficient of skewness for boll weight were relatively negative of low values for two doses in the two cultivars indicating that the most individual plants lie in the right half of the normal curve so, in this case the plant breeder can take high selection intensity for these trait, while for the control the value was positive indicating the most of values sit at left half of curve this was harmony of the moment coefficient of kurtosis, it were less than 3 indicating that the individual plants shaped as platy shape, these results were harmony with increasing of the phenotypic variability , these results were in agreement with those obtained by Allam(2007) , Orabi (2004 and 2009).

With respect the number of bolls per plant, the data in Table (3) showed that higher increasing of phenotypic variability in the three generations indicating the treatments of gamma rays increased the variability in three generations. The data in Table (3) show the moment coefficient of skewness for all guarded plants was positive indicating that most of individual plants sit in the left half of curve so; this case the plant breeder can take high selection intensity.

Table 3. The moment coefficients of skewness, kurtosis, phenotypic and genotypic variability for Giza 92 and Giza 94

Gen	Parameters	Characters	Boll weight		Number of boll / plant		Seed cotton yield		Lint cotton yield	
		Treat.	Giza 92	Giza 94	Giza 92	Giza 94	Giza 92	Giza 94	Giza 92	Giza 94
M_1	Variance	Cont.	0.059	0.014	55.46	70.6	625.0	791.5	114.5	128.9
		10kr	0.174	0.083	158.56	238.1	1587.3	2412.9	286.6	446.4
		15kr	0.191	0.065	158.56	236.92	1231.7	2921.4	211.7	500.2
	Skewness	Cont.	0.768	-0.696	0.579	-0.082	0.329	-0.164	0.435	-0.138
		10kr	-0.37	-0.496	0.674	1.038	0.224	0.729	0.252	0.806
		15kr	-0.225	-0.029	0.674	1.05	0.234	1.051	0.245	0.998
	Kurtosis	Cont.	0.479	-0.109	-0.281	-0.774	-0.384	-0.445	-0.242	-0.683
		10kr	1.517	-0.597	0.636	1.479	-0.325	0.466	-0.192	0.777
		15kr	1.117	-0.195	0.636	0.983	-0.279	2.008	-0.156	1.804
M_2	Variance	Cont.	0.045	0.023	55.461	46.1	675.01	561.1	126.2	107.9
		10kr	0.174	0.083	193.0	243.3	1982.9	2646.4	330.9	457.0
		15kr	0.219	0.071	158.6	371.7	1526.3	3287.8	255.5	561.6
	Skewness	Cont.	0.684	-0.278	0.579	-0.232	0.436	0.004	0.44	0.045
		10kr	-0.37	-0.38	0.48	0.382	-0.072	0.599	-0.054	0.703
		15kr	-0.3	0.615	0.674	-0.031	0.321	-0.267	0.294	-0.188
	Kurtosis	Cont.	0.511	-0.795	-0.281	-0.828	-0.631	0.187	-0.567	0.026
		10kr	1.517	2.132	0.308	-0.309	-0.747	0.423	-0.687	0.589
		15kr	0.384	0.774	0.636	0.205	-0.11	-0.044	0.077	-0.088
M_3	Variance	Cont.	0.041	0.023	47.62	46.1	511.761	561.1	87.604	107.9
		10kr	0.197	0.158	133.67	288.6	1506.07	2598.5	262.07	474.5
		15kr	0.088	0.104	105.40	264.5	1133.97	3326.0	194.68	615.3
	Skewness	Cont.	0.244	-0.278	0.146	-0.232	-0.317	0.004	-0.137	0.045
		10kr	-0.449	-0.252	0.587	0.324	0.407	0.18	0.375	0.264
		15kr	-0.168	0.398	0.322	-0.288	0.17	-0.261	0.179	-0.232
	Kurtosis	Cont.	-0.11	-0.795	1.086	-0.828	0.804	0.187	0.602	0.026
		10kr	0.734	-0.776	0.154	-0.117	-0.462	0.801	-0.369	0.893
		15kr	1.052	-0.004	-0.105	-0.65	-0.583	-0.764	-0.496	-0.739

Table 3. Cont.

	Parameters		Lint percentage		Micronaire value		Pressely index		Fiber length	
		Treat.	Giza 92	Giza 94	Giza 92	Giza 94	Giza 92	Giza 94	Giza 92	Giza 94
M_1	Variance	Cont.	0.902	0.542	0.024	0.053	0.035	0.03	1.272	0.683
		10kr	1.044	0.745	0.073	0.028	0.066	0.027	0.631	0.461
		15kr	0.997	0.835	0.047	0.033	0.087	0.03	1.611	0.523
	Skewness	Cont.	-0.383	0.001	0.056	0.008	-0.383	-0.587	0.198	0.024
		10kr	-0.565	0.769	-0.304	-1.281	-0.816	-0.094	-0.202	0.376
		15kr	-0.394	1.959	-0.676	-0.119	-0.323	-0.19	0.34	-0.699
	Kurtosis	Cont.	-0.54	0.041	-0.527	-0.977	-0.267	-0.555	-1.126	-0.66
		10kr	-0.316	1.316	-1.044	2.169	0.176	-0.592	0.087	-0.877
		15kr	-0.746	7.869	-0.591	0.028	-0.348	-0.502	-1.172	0.015
M_2	Variance	Cont.	0.902	0.524	0.024	0.052	0.035	0.044	0.798	0.702
		10kr	1.044	0.807	0.073	0.056	0.066	0.077	0.631	0.309
		15kr	1.258	1.075	0.076	0.068	0.105	0.056	1.586	0.268
	Skewness	Cont.	-0.383	-0.152	0.056	-0.203	-0.383	-0.375	0.075	0.183
		10kr	-0.565	-0.256	-0.304	-1.487	-0.816	0.337	-0.202	-1.101
		15kr	-0.056	0.179	-0.226	-1.417	0.196	0.124	0.087	-1.465
	Kurtosis	Cont.	-0.54	-0.766	-0.527	-1.376	-0.267	-1.152	-1.124	1.041
		10kr	-0.316	-0.542	-1.044	1.904	0.176	-0.199	0.087	0.879
		15kr	-1.01	0.077	-1.184	1.009	-1.133	0.049	-1.265	2.714
M_3	Variance	Cont.	0.734	0.524	0.018	0.052	0.058	0.044	1.203	0.702
		10kr	0.998	2.097	0.022	0.124	0.06	0.178	1.243	1.283
		15kr	0.802	1.832	0.024	0.148	0.065	0.155	0.463	1.161
	Skewness	Cont.	-0.288	-0.152	0.1	-0.203	0.429	-0.375	0.173	0.183
		10kr	-0.524	0.924	0.214	-0.405	0.3	0.232	0.102	0.133
		15kr	-0.287	-0.205	-0.584	-0.808	-0.532	-0.022	-0.185	0.881
	Kurtosis	Cont.	-0.869	-0.766	-0.671	-1.376	-0.529	-1.152	-1.258	1.041
		10kr	-0.193	5.032	0.411	0.14	-0.356	-0.81	-1.261	-1.239
		15kr	-0.627	0.495	-0.648	1.503	-0.338	-0.696	-0.791	-0.009

For kurtosis, the moment of coefficient was less than 3 indicating that curve of number of bolls per plant were platykurtic which indicating that the individual plants were not concentrated around mean , our results in agreement partially with those obtained by Orabi (2004).

With regarding seed and lint cotton yield per plant, the results in Table (3) illustrated that of phenotypic variability for three generations were increased indicating that the treatments of irradiation increased the variability of S.C.Y and L.C.Y per plant, these results were in agreement with those obtained by Orabi (2004) and Allam (2007).

Table (3) showed the moment coefficient of skewness of S.C.Y and L.C.Y per plant, three generations were positive indicated that the individual plants sit in the left half of the curve , in this case the plant breeder can take high selection for improvement of these traits. Also, the Table (3) showed that moment coefficient kurtosis of S.C.Y and L.C.Y per plant, were less than 3 indicating that their curves were platykurtic indicating that the individual plants are unconcentrated around mean, same results were obtained by Orabi (2004 and 2009).

For lint percentage, the data in Table (3) indicated that the phenotypic variability were high values in three generations. Table (3) showed that the moment coefficient of skewness were negative in three generations , which indicated that the most of individual plants sit in the right half of curve, so in this case the plant breeder can take low selection intensity. Moment coefficient of kurtosis were less than 3 except for Giza 94 was more than 3, which denote that the curve was platykurtic, in this case of platykurtic the individual plants are unconcentrated around mean, except for 15 Kr in Giza 94 the most plants concentrated around mean, so the plant breeders might decrease the selection intensity except the case Giza 94 in 15 Kr dose. This finding was harmony with those was obtained by Orabi (2009)

The moment coefficient of kurtosis were insignificant, so the plant breeder can not depend on kurtosis for the intensity selection results were obtained by Orabi (2004) and were agreement partially with Sayed *et al.,* (1998).

With respective micronaire reading, the data in Table (3) showed high values for phenotypic. Concerning the moment coefficient of skewness and kurtosis are presented in Table (3), the data suggested that moment coefficient of skewness were negative and significant in M_1 in the case Giza 92 in 15 Kr treatment and negative insignificant in the case Giza 92 in 10 Kr treatment and M_2 and M_3 indicating that the most of plants sit in right half of curve. The negative coefficient of skewness in fiber fineness was found by Orabi (2004).

For kurtosis were less than 3 which denote curve were platykurtic, this result was harmony with that obtained by Orabi (2004).

Concerning pressely index, the data in Table (3) showed that phenotypic variability were high values indicating the treatment increased the variability, these results are in agreement with Raafat (1995) and Mahdy (1996) who found that lower dose 10Kr of gamma gave better effect comparing with high the dose 20Kr.

Table (3) show the most of moment coefficient of skewness were negative indicating that most of individual plants tended to sit in right half of curve. Positive cases of Giza 94 of M_2 for 10 and 15 Kr and M_3 in case 10Kr as well as M_2 in Giza 92 15 Kr and M_3 in case of control and 10Kr. So, the positive cases indicated that the most of plant sit in left half of curve with respect to kurtosis, the data in Table (3) showed that moment coefficient of kurtosis were less than 3 indicating that curves were platykurtic which indicating that the individual means are not concentrated around the mean so the breeder might decrease the selection intensity these results were agreement with those obtained by Orabi (2004).

Concerning fiber length, Table (3) showed that the phenotypic variability in three generation were high values some results were obtained by Abd-El-Aziz (1988) who found that fiber length was significantly decreased with gamma irradiation treatment. Table (3) showed that moment coefficient skewness the most of case were positive indicating that the most of individual plants sit in left half of curve. The case which exhibited negative were in Giza 94, control, 10Kr in M_1 and control in M_2, these case the most plants sit in right half of curve. Regarding the moment coefficient of kurtosis were less than 3 for fiber length these results denote that the curve was platykurtic this agreed with the results obtained by Orabi (2009).

CONCLUION

With regarding the previous results it may conclude that the gamma ray effect of the wide variability, so the breeder can be select the excellent strains

REFERENCES

Abd-El-Aziz, M.A. (1988). Effect of gamma irradiation and some growth regulators on morphological and technological characters of the Egyptian cotton cultivar c.v. Giza 75. Ph.D. Thesis, Cairo Univ., Cairo, Egypt.

Allam, M.A.M. (2007). Induced variability for yield and its components and fiber quality characters by irradiation in a long staple cotton variety. Egypt. J. of Appl. Sci., 22 (6B) 500-515.

Amer, E. A. (2004). Induced variation in quantitative characters of cotton plant by using hybridization and mutagenes. . Ph.D. Thesis, Fac. of Agric., Cairo Univ., Egypt.

Amer, E.A; H.A. El-Hoseiny; M.H. Orabi and H.E. Hamed (2016). Inducing genetic variability in Egyptian cotton. Egypt. J. OF Appl. Sci.,31(11):290-305.

ASTM, (1998). (Designation D.4605 – 98 and 3818-98) Vol. 07. No 1 Easton, MD, USA.

Awaad, M.M.; M.T. Abdel-Fattah and M. Kassem, (1995). Effect of gamma irradiation on yield components and technological characters of two Egyptian long staple cotton varieties. Egyptian J. of Appl. Sci., Zagazig Univ., 10 (6): 679-695.

El-Marakby, A.M.; A.M. Esmail; A.M. Tolba and E.M. Rabie (2000). Effect of gamma-rays on Giza 75 and Giza 85 cotton varieties. Egyptian J. of Pl. Breed., 4: 213-235.

Haidar,S., M. Aslam and M.A. Haq (2016). NIAB-852: Anew high yielding and better quality cotton mutant developed through pollen irradiation technique. Pak. J. Bot., 48(6): 2297-2305.

Javed, M.A., A. Khatri, I.A. Khan, M. Ahmad, M.A. Siddiqui, and A.G. Arain. (2000). Utilization of gamma irradiation for the genetics improvement of oriental mustard (Brassica juncea Coss.). Pak. J. Bot. 32: 77-83.

Lowery, C.C.; Auld, D.L.; Bechere, E.; Wright, R.J.; Abidi, N. and Smith, C.W.(2007). Use of chemical mutagenesis in improving upland cotton. World Cotton Research Conference-4, Lubbock, Texas, USA, 10-14 September 2007.

Mahdey, M.A. (1996). Genetical studies on mutagenic effect on cotton plants. M. Sc. Thesis. Fac. Agric. Al-Azhar Univ., Egypt.

Muhammad,A.; S.M. Wazir; H. Ullah and S. Afridi (2015) Effect of Selected -Irradiated Cotton Varieties on Fiber Quality During M2 Generation under Rainfed Condition American-Eurasian J. Agric. & Environ. Sci., 15 (2): 191-196.

Orabi, M.H. (2004). Induction of variability in some Egyptian cotton populations using gamma rays. M. Sc. Thesis, Fac. Agric. Al-Azhar Univ., Egypt.

Orabi, M.H. (2009). Irradiation of cotton pollen grains as a source for genetic variability.Ph. D. Thesis, Fac. Agric. Al-Azhar Univ., Egypt.

Raafat, M.A. (1995). Effect of seed irradiation on genetic variability and recombination of some economic yield components in Egyptian cotton. Proceedings Beltwide Cotton Conf., San Antonio, TX, USA, January Vol. (I): 494-497.

Sayed, A.I.A.; S.I. El-Morsy; S.K. Abd-El-Aal and M.N. A Abd-El-Aziz (1998). The response of two Egyptian cotton varieties γ-rays and DMS treatments on some technological traits. Annals of Agric. Sci., Moshtohor., Vol. 36 (1): 337 – 351.

تأثير اشعة جاما علي صفات محصول القطن ومكوناته وصفات الجودة

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اجرى هذا البحث بمحطة البحوث الزراعية بسخا لمواسم ٢٠١٤، ٢٠١٥، ٢٠١٦ بهدف تقييم أثر استخدام أشعة جاما علي بذور القطن وذلك علي المتوسطات والتباينات ومقاييس الالتواء والتفرطح العزميين في القطن لصفات المحصول ومكوناته بالإضافة إلي بعض الصفات التكنولوجية لصنفين من أصناف القطن المصري وهما جيزة ٩٢ وجيزة ٩٤ تم معاملتها بأشعة جاما مصدر الكوبالت ٦٠ بجرعات ١٠ ، ١٥ ك راد وذلك بوحدة التشعيع الجامي بالمركز الإقليمي للنظائر المشعة للدول العربية- الدقي- الجيزة، فى موسم ٢٠١٤ تم زراعة النباتات الفردية واجراء عملية التلقيح الذاتى للحصول على بذرة الجيل الطفرى الاول وفى موسم ٢٠١٥ تم زراعة النباتات الفردية واجراء التلقيح الذاتى للحصول على بذرة الجيل الطفرى الثانى وفى موسم ٢٠١٦ تم تقييم كلا من الجيل الاول والجيل الثانى والجيل الثالث للاباء المعاملة والغير معاملة فى تجربة احتوت على ٣ خطوط طول الخط ٧ متر وعرضه ٦٠ سم والمسافة بين الجور ٧٠ سم فى اربع مكررات وتم تسجيل البيانات على النباتات الفردية لصفات (وزن اللوزة وعدد اللوز المتفتح على النبات و محصول القطن الزهر ومحصول القطن الشعر وتصافى الحليج والنعومه مقدرة بقراة الميكرونير والمتانة والطول). وكانت اهم النتائج المتحصل عليها:-1 اظهرت النتائج ان المعاملة باشعة جاما كان لها تأثير معنوى على جميع الصفات فى الاجيال الثلاثة ماعدا صفة الميكرونير فى الجيل الطفرى الاول وصفة الطول فى الجيل الطفرى الاول والثانى . كذلك أظهرت النتائج ان التفاعل بين الاصناف والمعاملات كان معنويا لجميع الصفات فى جميع الاجيال ماعدا وزن اللوزة فى الجيل الطفرى الثالث وتصافى الحليج والطول فى الجيل الطفرى الثانى.-2 اظهرت النتائج ان تأثير الجرعة ١٥ كيلو راد كان له تأثيرا معنويا على محصول القطن الزهر والشعر . ٣- كان التباين في M_1 و M_3 أعلى من التباين في M_2 مما دل على فعالية الانتخاب في الجيل الطفري الاول M_1. ٤- كانت قيم معامل الالتواء العزمي موجبة وذلك في صفات محصول القطن الزهر والشعر ، عدد اللوز /نبات وتصافى الحليج مما يدل على ان معظم النباتات تكمن فى النصف الايسر من المنحنى. في حين أن معظم النباتات تقع في النصف الأيمن من منحنى لصفات وزن اللوزة ، قراءة ميكرونير و البريسلي في M_1. ٥- كانت قيم معامل التفرطح العزمي اقل من ٣ لجميع الصفات في M_1، M_2، و M_3 وبالتالي فان معظم القيم غير متجمعة حول المتوسط العام للعشيرة وبالتالي فان الانتخاب سيكون مجديا في هذه الحالة.