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BIOCHEMICAL GENETIC ANALYSIS ASSISTED DISCRIMINATION FOR HIGH YIELDING WHEAT GENOTYPES *(TRITICUM DURUM, DESF)* TREATED BY GAMMA IRRADIATION.

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ABSTRACT

This investigation was carried out to determine the effect of three doses of gamma rays (150, 250 and 350 Gy), on the performance of yield, and yield components traits and protein electrophoretic patterns in the first mutagenic generation (M_1) of the four durum wheat genotypes, included two local genotypes and two introduced lines. The results showed significant response for seeds germination, seedling height, plant height, No. of tillers/plant, No. of spikes/plant, weight of 100 grains, grains yield/plant and Grains yield (ton/fed). The lowest dose of Gamma Rays 150 Gy seemed to have a stimulated effect on these traits. On the other hand, the highest doses caused significant reduction for all studied traits as compared to the control. The effect of interactions between genotypes and gamma doses were significant for all studied traits. The four genotypes were divided into radio-sensitive and radio-resistant. The MSWD-9 line was more resistant to gamma irradiation than the other three genotypes. The electrophoretic patterns revealed that the presence of wide genetic variations between the three gamma doses and control.

Keywords: Durum wheat, gamma radiation, germination, agronomic analysis and electrophoretic analysis.

INTRODUCTION

The production of wheat (*Triticum durum*, Desf.) in Egypt is not enough for human consumption. Meanwhile, the cultivated area is limited and wheat occupying small area due to of the competition between it and the other winter crops. In Egypt, economicists,

agriculturists and successive governments planning agencies aim to develop the new reclaimed lands. Plant breeders had the essential role in this problem upon breeding selection and introduced new genotypes more stable, to local climate and conditions.

Gamma rays belong to ionizing radiation and are the most energetic form of such electromagnetic radiation, having the energy level from around 10 kilo electron volts (keV) to several hundred keV. Therefore, they are more effected than other types of radiation such as alpha and beta rays (Kova´cs & Keresztes, 2002).

Kassem and Nasr (1995) found that exposing wheat grains to gamma rays (15 k-rad) caused significantly increased in growth characters and yield. Rashed *et al*. (2000) noted that gamma irradiation with doses of 100-200 Gy of maize grains showed significant effects on agronomic traits. Moreover, number, intensity and/or density of SDS-electrophoretic bands for protein level were generally varied with different gamma rays doses. Rashed *et al* .(1997) analyzed the protein electrophoresis pattern (SDS-PAGE) of high and low yielding soybean plants treated with 15 k-rad gamma rays. They found that low and high yielding treated plants were characterized by the appearance and disappearance of some minor bands. Tayel *et al*. (1996) found that gamma rays were enhanced maize genome by activating some genes which were expressed by the appearance of some new minor bands in protein electrophoretic patterns.

The present study was aims to investigate the influence of gamma rays doses on the seedling growth, yield components and protein electropheretic patterns of four wheat *(T.durum, Desf.)* genotypes.

MATERIALS AND METHODS

Plant materials:

Seeds of four durum wheat genotypes included two local genotypes (Benysweif-2 and Sohag-2),as well as two introduced lines, NRCWD-21 and MSWD-9. The plant materials subjected to three doses of gamma rays (150, 250 and 350 Gy). Irradiation was carried out at National Center for Radiation Research and Technology, Cairo, Egypt.

1- Agronomic traits analysis:

Field experiment was carried out at the Agricultural Experimental Station, National Research Centre at Nubaria during winter season of 2008/2009.

The normal agronomic practices of growing wheat were carried out tell hardest. The effect of gamma irradiation on yield, yield components (agronomic traits) and protein electrophoretic patterns in the first mutagenic generation (M_1) were studied for the four wheat genotypes. The grains of the wheat genotypes exposed to different levels of gamma irradiation treatments and the control were planted in a randomized complete block design with three replications. The percentage of seed germination was determined after 10 days from sowing. Meanwhile, the height of seedling was calculated after 21 days from sowing. At the harvest, the following plant characteristics were recorded i.e., plant height (cm), number of tillers/plant, number of spikes/plant, weight of 100 grains (g) ,grains yield/plant (g) and grains yield/fedden (ton).

2- Electrophoretic analysis of proteins (SDS-PAGE):

Sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE) for soluble proteins, extracted from grains, was used to study the effect of gamma rays on gene expression. Protein electrophoresis was performed according to Stegmann (1979) and Stegemann *et al*. (1980).

The gel was scanned using Gel Doc 2000 Bio-Rad system and analyzed with the quantity one software package supplied by the manufacturer. The densitometry scanning of each band was based on its three dimension characters. Each band is recognized by its length, width and intensity. Accordingly, relative amount of band quantity could be measured and scored.

3- Statistical analysis:

Analysis of variance and L.S.D. values were estimated according to Wynne *et al*. (1970).

RESULTS AND DISCUSSION

1- Influence of gamma rays on seed germination:

Table (1) and Fig. (1) showed the percentage of seed germination of the four tested genotypes of wheat treated with

different doses of gamma rays. The data revealed that, highly significant differences between the four tested wheat genotypes exposed to different doses of gamma rays. MSWD-9 line gave the largest response to gamma rays while Sohag-2 scored the lowest value.

Table (1): Seed germination (%) at the 10th day of sowing irradiated seeds of four durum wheat genotypes, with different doses of gamma rays.

Wheat genotypes	Gamma doses (Gy)				Genotype means
	0	150	250	350	
Benysweif-2	93.6	94.5	80.5	72.6	85.3
Sohag-2	92.5	93.8	76.4	68.3	82.8
NRCWD-21	94.3	95.3	86.7	74.8	87.8
MSWD-9	95.1	96.3	86.7	74.8	88.2
Treatment means	93.9	94.9	82.6	72.6	-

L.S.D.	5%	1%
Genotypes (G)	1.971	2.576
Gamma doses (γ)	1.764	2.326
G x γ	3.819	4.985

The data also indicated an increases in the percentages of seed germination at 150 Gy, but it was not reach the level of significance as compared to the control. On the contrary there were highly significant decreases in seed germination at 250 Gy .

Maximum decrease in seed germination percentage in all studied wheat genotypes as compared to the control was observed with 350 GY.

As illustrated in Table 1, irradiated wheat seeds kept their germination capacity as compared to the control. Similar results were obtained by Azer (2001), who reported that the percentage of seed germination was decreased significantly by increasing the radiation dose from 50 to 700 Gy.

These results were in accordance with the findings of Kiong *et al*., (2008) who reported that survival of plants to maturity depends on the nature and extent of chromosomal damage. Increasing frequency of chromosomal damage with increasing radiation dose may be

responsible for less germinability and reduction in plant growth and survival.

Changes in the germination percentage were found to attribute to gamma rays treatments. The stimulating causes of gamma ray on germination may be certified to the activation of RNA or protein synthesis, which occurred during the early stage of germination after seeds irradiated (Abdel-Hady *et al*., 2008).Melki & Marouani (2009) pointed that whereby there was no significant difference in germination and survival percentage of irradiated and non-irradiated seedlings of hard wheat.

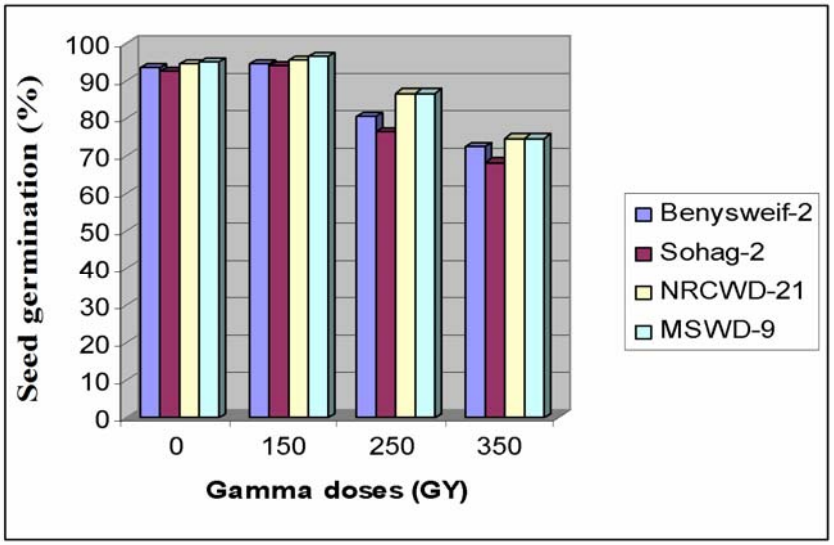

Figure (1): Seed germination (%) at the 10th day of sowing irradiated seeds of four wheat genotypes, with different doses of gamma rays.

2- Influence of gamma rays on seedling height.

Data presented in Table (2) showed the interaction between genotypes and gamma rays doses. Irradiation dose of 150 Gy of gamma rays treatment increased in seedling height by 10.53%, 9.02%, 14, 29% and 16.56%as compared to unirradiated seeds for the wheat genotypes, Benysweif-2, Sohag-2, NRCWD-21 and MSWD-9, respectively.

Table (2): Effect of various doses of gamma rays on seedling height at 21st day from sowing for four wheat genotypes.

Wheat genotypes	Gamma doses (Gy)				Genotype means
	0	150	250	350	
Benysweif-2	13.3	14.7	11.6	7.1	11.7
Sohag-2	12.2	13.3	9.7	6.5	10.4
NRCWD-21	14.o	16.0	12.o	9.6	12.9
MSWD-9	15.7	18.3	13.2	11.2	14.6
Treatment means	13.8	15.6	11.6	8.6	-

L.S.D.	5%	1%
Genotypes (G)	0.971	1.306
Gamma doses ()	0.874	1.165
G x γ	1.898	2.596

At treatment with 250 Gy, all tested genotypes showed highly significant decrease of seedling height. On the other hand, the dose 350 Gy caused highly significant reduction in seedling height for both Benysweif-2 and and Sohag-2 by 46.62%, 46.72%, respectively as compared to the control. Data also cleared that the decrease of seedling height was proportional to the increase of the irradiation dose levels. Similar results were obtained by El-Shouny *et al*. (2001) in triticale and Azer (2001) in wheat.

In contrast, high-dose irradiation that caused growth inhibition has been ascribed to the cell cycle arrest at G2/M phase during somatic cell division and/or various damages in the entire genome (Preussa & Britta, 2003).

Wi *et al*., (2007) reported that there is a hypothesis that low dose irradiation will induce the growth stimulation by changing the hormonal signaling network in plant cells or by increasing the anti oxidative capacity of the cells to easily overcome daily stress factors such as fluctuations of light intensity and temperature in the growth condition (Wi *et al.,* 2007). Borzouel *et al.,* (2010) showed that MGT (Mean Germination Time), root and shoot length, and seedling dry weight were decreased with increasing radiation doses while final germination percentage was not significantly affected by radiation doses.

3- Effect of gamma rays on agronomic characters:

The effect of three doses of gamma irradiation (150, 250 and 350 Gy) on the performance of yield and yield components characters in the first mutagenic generation (M_1) were studied on the four genotypes of wheat (Benysweif-2, Sohag-2, NRCWD-21 and MSWD-9) Table (3) and Figure (2).

As shown from Table (3), notable significant differences have been detected among the four studied genotypes for all studied traits. The mean values of plant height were 92.1, 89.9, 96.7 and 99.9 cm for Benysweif-2, Sohag-2, NRCWD-21 and MSWD-9, respectively. The mean values for No. of tillers per plant were 6.7, 6.1, 7.4 and 8.5, and for No. of spikes per plant were 6.3, 5.8, 6.9 and 7.5 for the four genotypes, respectively. The mean values for weight of 100- grains were 4.1, 3.7, 4.6 and 5.4 g, and for grain yield per plant were 10.1, 11.0, 11.6 and 12.5g for the four genotypes, respectively.

Data presented in Table(3) revealed that a significant differences in grain yield (ton/Fed) among the wheat genotypes under study.Mean values of grains yield ranged from 2.2 tons/fed to 2.8 tons/fed with a general mean value 2.5 tons/fed.

With respect to the effect of different doses of gamma rays on the studied characters, plant height No, of tillers/plant No. of spikes/plant, weight of 100 grains, grain yield/plant and grain yield (ton/fed) low dose of 150 Gy seemed to have a stimulating effect on these traits giving values of 104.4 cm. 8.8, 8.2, 5.3 g 5.3g ,13.1g and 2.9 tons as compared to the control values of 98.9 cm. 7.6, 6.7, 4.6g ,11.4 g and 2.8 tons respectively. On the other hand, the two high doses of 250 and 350 Gy caused significant reduction as compared to the control for all studied traits.

From these results, it could be concluded that low dose of gamma rays (150 Gy) induced stimulating effect on these characters, while the high doses, i.e. 250 and 350 Gy have an inhibitory effect on these traits.

The irradiation of seeds with high doses of gamma rays disturbs the synthesis of protein, hormone balance, leaf gas-exchange, and water exchange and enzyme activity. Similar results were reported by Kassem and Nasr (1995), who reported that the gamma rays dose of 15 Kr

increased plant height of wheat. El-Shouny *et al*. (2001) revealed that significant and wide difference was noticed between the control and the mutagenic treatments of triticale in which low doses of gamma rays seemed to have a stimulating effect on plant height at 10 Kr, while the highest doses of 30 and 40 Kr caused significant reduction in some traits. Azer (2001) indicated that high doses of gamma rays up to 700 Gy decreased wheat yield. Similar results were reported by Amin (2003) who found that irradiation of wheat grains with low doses of gamma rays (2-4 k-rad) increased in some vegetative growth characters.

The interactions between genotypes X gamma doses were significant for all studied traits. The tallest plants and the highest plants in number of tillers, spike and yield per plant were obtained at 150 Gy dose in the four genotypes, while the shortest and lowest plants in the above mentioned traits were obtained at 250 and 350 Gy doses in the four genotypes.

The four genotypes were divided into radio-sensitive as (Benysweif-2 /Sohag-2) genotypes and radio-resistant as (NRCWD-21/MSWD-9), MSWD-9 line was more resistant than the other three genotypes Koing *et al*., (2008) indicated that survival of plants to maturity depends on the nature and extent of chromosomal damage. Increasing frequency of chromosomal damage with increasing radiation dose may be responsible for less germ inability and reduction in plant growth and survival. These effects include changes in the plant cellular structure and metabolism e.g., dilation of thylakoid membranes, alteration in photosynthesis, modulation of the anti-oxidative system, and accumulation of phenolic compounds (Kova´cs & Keresztes 2002; Kim *et al.,* 2004; Wi *et al*., 2007; Ashraf, 2009).

Table (3): Effect of gamma irradiation of five agronomic characters in four wheat genotypes, at harvest.

Wheat genotypes	Gamma doses (Gy)				Genotype means
	0	150	250	350	
Plant height (cm)					
Benysweif-2	95.1	102.6	88.2	82.2	92.1
Sohag-2	93.1	100.4	85.5	80.9	89.9
NRCWD-21	101.3	106.1	91.6	87.5	96.7
MSWD-9	105.6	108.7	96.1	89.4	99.9
Treatment means	98.9	104.4	90.4	85.9	-
Number of tillers per plant					
Benysweif-2	7.2	8.2	6.1	5.4	6.7
Sohag-2	6.3	7.3	5.7	5.0	5.9
NRCWD-21	7.9	9.0	6.9	5.8	7.3
MSWD-9	9.0	10.6	8.1	6.1	8.1
Treatment means	7.6	8.8	6.7	5.5	-
Number of spikes per plant					
Benysweif-2	6.3	7.7	5.9	5.4	6.3
Sohag-2	6.0	7.1	5.1	5.0	5.8
NRCWD-21	6.8	8.6	6.2	5.8	6.9
MSWD-9	7.5	9.4	7.1	6.0	7.5
Treatment means	6.7	8.2	6.1	5.6	-
Weight of 100 grains (g)					
Benysweif-2	4.4	4.9	3.9	3.3	4.1
Sohag-2	3.7	4.4	3.5	3.0	3.7
NRCWD-21	4.8	5.4	4.2	3.8	4.6
MSWD-9	5.5	6.3	5.0	4.7	5.4
Treatment means	4.6	5.3	4.2	3.7	-
Grains yield per plant (g)					
Benysweif-2	11.3	12.6	10.2	9.8	10.1
Sohag-2	10.2	11.7	9.5	9.1	11.0
NRCWD-21	11.8	13.0	11.0	10.7	11.6
MSWD-9	12.4	15.1	11.6	11.0	12.5
Treatment means	11.4	13.1	10.6	10.2	-
Grains yield per feddan (ton)					
Benysweif-2	2.6	2.8	2.3	1.9	2.4
Sohag-2	2.4	2.6	2.1	1.7	2.2
NRCWD-21	2.8	3.0	2.4	2.0	2.6
MSWD-9	3.2	3.2	2.5	2.1	2.8
Treatment means	2.8	2.9	2.3	1.9	-

	L.S.D.	Plant height	No. tillers	No. spikes	W. 100 grains	Grains yield (g)	Grains yield (ton)
Genotype (G)	5%	1.236	0.916	0.939	0.466	0.521	0.325
	1%	1.653	1.225	1.257	0.624	0.697	0.576
Gamma (γ) doses	5%	1.105	0.819	0.840	0.417	0.466	0.374
	1%	1.479	1.096	1.124	0.558	0.623	0.519
GXγ	5%	2.471	1.831	1.878	0.933	1.042	1.021
	1%	3.307	2.450	2.513	1.248	1.394	1.274

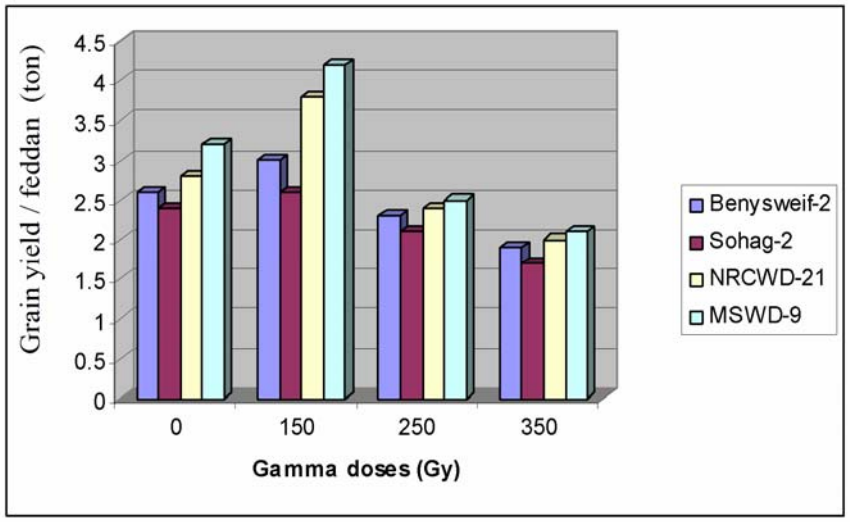

Figure (2): Effect of gamma irradiation on the Grain yield/plant in the four wheat genotypes, at harvest.

4. Effect of gamma irradiation on protein electrophoresis:

The electrophoretic patterns (SDS-PAGE) of water soluble proteins were developed for the identification of the effect of the three gamma doses on the four wheat genotypes as showed in Fig. (3). Forty bands were detected from the densitometric analysis with different molecular weights (MW) and relative mobilities (Rm) as presented in Table (4).

Benysweif-2 group, the control and the three gamma doses, characterized by five common bands no. 1,11,23,26 and 40, respectively. These bands were considered as marker bands for Benysweif-2 gorup. The control genotype exhibited four unique bands no. 5, 18, 25 and 32. The three gamma doses of Benysweif-2 group were discriminated from the control by three common bands no. 6, 19 and 27. The 150 Gy dose distinguished with one unique band no. 33. The 250 Gy dose exhibited one unique band no. 15. The 350 Gy dose showed two unique bands no. 16 and 17.

Sohag-2 group distinguished with six common bands no. 8,19,21,22,23 and 27. Four common bands no. 5,33,36 and 39

characterized the three gamma doses of Sohag-2 group from the control.

The control genotype distinguished with four unique bands no. 6,34,37 and 40. The 250 Gy dose exhibited two unique bands no. 3 and 28. The 350 Gy dose characterized by two unique bands no. 150 and 30.

NRCWD-21 group showed three common bands no. 21, 23 and 26. Four common bands no. 6, 16, 28 and 38 characterized the three gamma doses of NRCWD-21 group from the control. The control genotype exhibited four unique bands no. 7,17,36 and 39. The 350 Gy dose showed seven unique bands no. 3, 5, 11, 13, 18, 20 and 25.

MSWD-9group exhibited seven common bands no. 13, 18, 20, 21, 23, 28 and 29. The three gamma doses of MSWD-9 gorup were discriminated from the control by two common bands no. 4 and 24. One unique band no. 3 characterized the control genotype. The 150 Gy dose exhibited two unique bands no. 11 and 32. The 250 Gy dose discriminated from the control by one unique band no. 16 no. 2, 6, 31 and 37. These results are in agreement with those obtained by Tayel *et al*. (1996) who reported that gamma rays at 100 Gy enhanced the maize genome to activate some genes as realized by the appearance of new minor bands in protein patterns. Rashed *et al*.(1997) found that gamma rays are useful in characterization of soybean plants, treated with 150 Gy, by the appearance and disappearance of some minor bands. Rashed *et al.* (2000) demonstrated the importance of SDS-PAGE technique in the development of characteristic bands for the detection of gamma irradiation effect on gene expression in M_1 maize plants.

Abdel-Hady and Ahmed (2004) reported that the electrophoretic patterns indicated that the presence of wide genetic variations between the three gamma doses and the control.

In general, electrophoretic patterns (SDS-PAGE) for water soluble proteins indicated the presence of wide genetic variations between the genotypes treated with the three gamma doses and the control.

Table (4): Densitometeric analysis of seeds water soluble protein (SDS-PAGE) representing band number, molecular weight and relative amount of each band for the tested four wheat genotypes.

Band No.	Rm	M.W. K.Da.	Benysweif-2 group				Sohag-2 group				NRCWD-21 group				MSWD-9 group			
			0	150 Gy	250 Gy	350 Gy	0	150 Gy	250 Gy	350 Gy	0	150 Gy	250 Gy	350 Gy	0	150 Gy	250 Gy	350 Gy
1	0.087	374.914	1.377	1.147	1.239	1.150	1.597	1.171	-	-	-	-	-	1.025	1.253	1.230	0.871	-
2	0.095	351.539	-	-	-	-	-	-	1.127	1.084	1.216	0.952	1.064	-	-	-	-	1.291
3	0.122	278.656	2.048	-	2.002	-	-	-	2.652	-	-	-	-	2.350	2.063	-	-	-
4	0.129	260.790	-	2.059	-	1.909	2.459	2.448	-	2.140	2.773	2.152	1.080	-	-	2.522	2.387	2.602
5	0.156	207.998	1.543	-	-	-	-	1.152	1.235	1.502	-	-	-	0.959	0.994	2.410	2.530	-
6	0.164	192.360	-	1.192	1.336	2.000	1.626	-	-	-	-	1.887	1.563	1.239	-	-	-	1.668
7	0.174	176.466	1.576	1.881	1.651	-	-	-	-	-	1.564	-	-	-	1.413	-	1.529	-
8	0.187	161.443	1.105	-	-	2.462	1.656	1.522	1.886	1.903	-	3.511	2.218	-	-	2.224	-	2.595
9	0.194	150.034	-	-	1.657	2.390	2.749	-	-	1.270	2.020	-	-	2.778	1.804	-	2.090	2.839
10	0.204	144.345	-	-	-	-	-	1.698	2.091	-	2.608	2.229	1.496	-	-	-	-	-
11	0.243	123.978	1.461	1.192	1.384	1.660	1.880	0.927	-	-	-	-	-	1.608	-	1.918	-	-
12	0.259	116.369	-	-	-	-	-	-	2.271	1.850	1.858	1.530	2.588	-	1.664	-	7.104	1.560
13	0.325	94.429	2.604	0.917	1.013	-	-	-	-	-	-	-	-	2.242	1.658	2.064	2.573	2.134
14	0.334	92.100	0.851	1.518	-	1.651	1.243	1.447	1.155	-	-	-	-	-	-	-	-	-
15	0.339	90.902	-	-	1.578	-	-	-	-	1.428	2.119	1.439	-	-	2.132	1.323	-	1.455
16	0.347	89.400	-	-	-	1.978	-	-	-	-	-	1.347	1.569	1.655	-	-	1.021	-
17	0.354	87.078	-	-	-	0.896	1.505	-	1.162	0.816	1.233	-	-	-	-	-	-	-
18	0.468	67.036	0.699	-	-	-	-	-	-	-	-	-	-	0.963	1.593	0.777	0.989	1.375
19	0.482	64.314	-	1.393	1.147	1.172	1.186	1.281	1.248	1.441	1.672	1.485	1.411	-	-	-	-	-
20	0.528	57.313	0.834	1.028	0.790	-	-	-	-	-	-	-	-	0.838	0.906	1.101	0.605	0.827
21	0.502	55.151	0.884	1.069	-	0.780	0.890	0.934	1.383	1.143	1.354	0.889	1.150	1.160	0.964	0.674	1.074	0.513
22	0.556	53.002	-	-	1.272	0.873	0.968	0.966	1.042	1.063	0.629	0.750	1.060	-	-	-	-	-
23	0.623	45.077	1.516	1.168	1.159	1.593	1.037	1.494	1.462	1.061	1.457	1.694	1.480	1.343	0.982	0.944	1.052	0.775
24	0.669	39.330	-	-	-	-	-	-	-	-	-	-	-	-	-	1.250	1.204	1.583
25	0.676	38.423	1.303	-	-	-	-	-	-	-	-	-	-	1.609	1.245	-	-	1.828
26	0.692	36.854	1.633	1.661	1.591	1.622	2.119	1.366	-	1.722	1.567	6.126	1.669	1.448	1.377	1.379	1.285	-
27	0.711	35.053	-	1.229	1.243	1.549	2.311	1.267	5.689	1.574	2.090	2.559	1.441	-	-	-	-	-
28	0.752	32.163	-	-	-	-	-	-	2.418	-	-	1.904	2.381	1.900	1.754	1.579	1.780	1.850
29	0.776	30.311	1.578	1.160	-	-	-	-	-	-	-	-	-	-	1.661	2.750	1.658	1.984
30	0.781	30.017	-	-	-	-	-	-	-	1.709	2.739	-	-	2.049	-	-	-	-
31	0.786	29.67	-	-	1.505	1.488	1.894	1.334	4.820	-	-	-	-	-	-	-	-	1.971
32	0.795	29.074	1.321	-	-	-	-	-	-	-	-	2.630	1.916	-	-	1.585	-	-
33	0.805	28.475	-	2.133	-	-	-	2.752	6.27	3.56	2.618	-	-	2.552	2.035	-	1.503	-
34	0.818	27.686	-	-	1.305	2.723	1.959	-	-	-	-	-	-	-	-	-	-	-
35	0.824	27.515	0.827	1.247	-	-	-	-	-	-	-	1.600	1.901	-	-	-	-	-
36	0.836	26.598	-	-	1.657	2.153	-	2.689	1.479	2.072	1.905	-	-	-	-	-	-	-
37	0.855	25.496	-	-	-	-	1.865	-	-	-	-	-	-	-	-	-	-	1.664
38	0.885	23.873	-	-	--	-	-	-	-	-	-	2.209	1.796	1.210	1.339	1.089	0.644	-
39	0.911	22.581	-	-	-	-	-	2.538	2.470	1.773	2.915	-	-	-	-	-	-	-
40	0.928	21.784	1.622	2.248	1.458	2.541	1.042	-	-	-	-	-	-	-	-	-	-	-

Rm = Relative mobility and M.W. = Molecular weight.

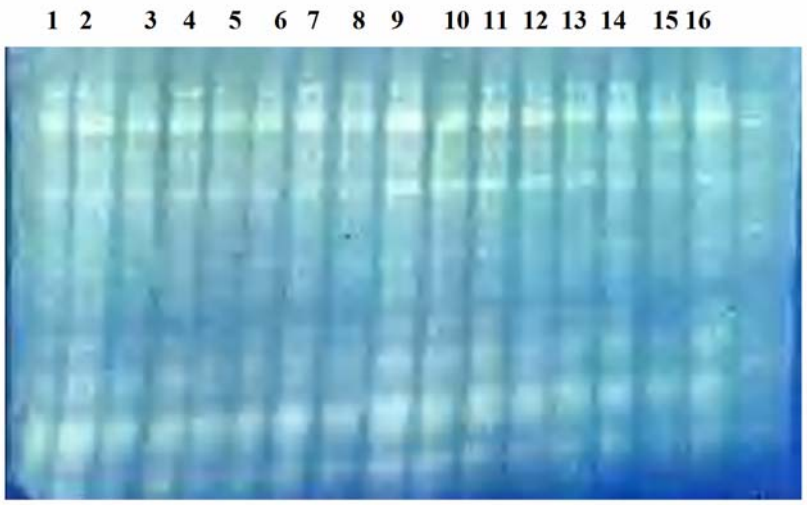

Fig. 3: SDS-PAGE profiles of four tested genotypes irradiated with 0, 150, 350 Gy of gamma rays arranged from lift to right: Benysweif-2(1-4), Sohag-2(5-8), NRCWD-21(9-13) and MSWD-9(13-16)

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التحاليل الوراثية البيوكيماوية المساعدة لتمييز تراكيب وراثية عالية المحصول من القمح المعامل بأشعة جاما

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تم دراسة تأثير أشعة جاما بجرعات 150، 250، 350 جراي علي المحصول وبعض الصفات الحقلية وتم عمل التفريد الكهربي لبروتينات حبوب القمح لأربعة تراكيب وراثية من القمح وهم صنفان محليان (بني سويف – 2 وسوهاج - 2) وسلالتان من القمح (NRCWD 21 – ، 9 - MSWD) في الجيل الأول الإشعاعي. وأظهرت النتائج تأثير معنوي علي نسبة إنبات الحبوب وطول البادرات بعد 21 يوم من الزراعة وطول النبات وعدد الأشطاء وعدد السنابل لكل نبات ووزن 100 حبة ومحصول الحبوب لكل نبات لأصناف القمح تحت الدراسة. وقد أدت الجرعة 150 جراي الي زيادة معنوية في الصفات الحقلية المدروسة لأصناف القمح تحت الدراسة بينما أوضحت الدراسة إنخفاض معنوي لتلك الصفات بزيادة الجرعات الإشعاعية الي 250، 350 جراي وذلك مقارنة بالكنترول.

أوضحت التحاليل الوراثية البيوكيماوية وجود مدي واسع من الإختلافات الوراثية بين الأصناف المعاملة بالجرعات الإشعاعية والكنترول من حيث تباين عدد وتركيز وكثافة الحزم البروتينية في التفريد الكهربي SDS-PAGE تحت تأثير الجرعات المختلفة من أشعة جاما.

بينت الدراسة وجود إختلافات بين أصناف القمح في مدي حساسيتها لأشعة جاما حيث كانت سلالة MSWD - 9 أكثر تحملاً بالمقارنة بالأصناف الثلاثة الأخري.