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EFFECT OF GAMMA RADIATION ON THE CHANGES OF BIOCHEMICAL, MORPHOLOGICIAL AND TECHNOLOGICAL CHARACTERISTICS FOR POTATO TUBERS DURING STORAGE

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ABSTRACT

The investigation aimed to study the influence on gamma irradiation of postharvest potato tubers for extending their shelf-life for more than six months. Two cultivars were used i.e. Diamont and Spunta cvs., in this investigation, using two different doses of gamma irradiation i.e. 50 and 150 Gry, in addition to a control (unirradiated tubers). Thus, 18 treatments were carried out with their replications for measuring physical, physiological and microbiological characters. Percentage of sprouts rot tubers, total count of bacteria, yeast and fungi counts were determined.

Moreover, chemical constituents were determined, including moisture, dry matter percentage, total soluble sugars, ascorbic acid (vitamin C), amino acids and nucleic acids (RNA and DNA) content.

INTRODUCTION

Food treatment with gamma radiation is considered one of the physical means for food preservation to face the problem of preserved human foods, according to FAO (1994). The aim of this investigation was to study the influence of post harvest potato tubers by gamma irradiation for extending the shelf-life of tubers for more than six months.

Radwan et al. (1996) found that irradiation at 6 to 10 k rad decreased water loss in potato tubers. Kolb and Stephan (1997), reported that a dose of 10 k rad proved to be effective for sprout inhibition. In this study potato samples (Diamont and Spunta cvs.) were irradiated with 0, 50 and 150 Gy and stored in normal condition, then data were recorded every two weeks biweekly. Percentage of sprouts, rot tubers and total count of bacteria, yeast and fungi were reported.

Manday and Seetharan (1990) and Beukema and Van der Zaag (1990), found that irradiation dosage within the range of 12-15 K rad for potato tubers resulted in a significant reduction due to sprouting, rotting, moisture loss and microflora growth three tested varieties after a storage period of 9 months. Moreover, chemical constituents were taken including moisture, dry matter percentage, total soluble sugars, ascorbic acid (vitamin C), amino acids and nucleic acids (RNA and DNA) contents. Moreover, tubers (chips) fried were evaluated. All data were subjected to various methods of statistical analysis.

ICGFI (1991), and Kolb and Stephan (1997), showed a correlation between the morphological changes taking place in potato eyes, irradiated with doses ranging from 0.5 to 10 k rad and the distribution of RNA and DNA in the tunica, procambuim, and the opical meristem of the eye. At 8 to 10 k rad the potato eye elongated in length and width, and the shape of the eye was very variable due to the degeneration of the tissue. RNA content in the cytoplasm decreased sharply. It was concluded that the disturbance in the growth process of the potato eyes by irradiation is closely coupled with changes in RNA and DNA content, especially the RNA content.

Wany and Brennan (1995) and Al-Kahtani et al. (1997 and 2000) demonstrated the effect of gamma irradiation on the Ajax and Diamont potato tubers with 0.05 and 0.20 KGy and storage at 80 ± 2% R.H. and 20 - 25°C for 6 months. Irradiation prevented sprouting, high percentage of dry matter, organic acid and other chemical component. Investigated potato tubers showed extended shelf life. Dio-Sady et al. (1996); Mostrocola et al, (1996) and Al-Magrabi (2000), used irradiated potatoes with 5, 10 and 15 k.rad, then stored them under room temperature for 6 months. They also concluded that 10 and 15 k rad were effective to keep potatoes tubers quality and their fried chips,were frying (chips), they were keep with yellow color, while the samples of control were in brown color at the end of storage period.

MATERIAL AND METHODS

Samples:

Two cultivars of Diamont and Spunta were obtained from the Ministry of Agriculture and Water Riyadh, Saudi Arabia to use in this investigation.

Irradiation process:

Potatoes samples (Diamont and Spunta) were irradiated with (0, 50 and 150 Gry) at Gamma cell-220 in King Abdul Aziz City for Science and Technology (KACST).

Methods:

Potato tubers Diamont and Spunta were taken after their harvest, curing with two weeks and cleaned, then divided to three groups. The first group was irradiated with 50 Gry, the second group was irradiated with 150 Gry, while the third was untreated (control). Thus, 18 treatments were carried out with their replications for measuring physical and physiological characters of treated and untreated potato tubers. Moreover, fourth replicate was used for chemical analysis only. All treatments were stored at room temperature.

1 -Physical, Physiological and microbiological characters:

Determination of shelf life was determined using the:

-Percentage of sprouted tubers based on number basis,

-Percentage of rotted tubers based on number basis and the microbiological tests follows:

- Total plate Count (TPC): Total plate count of dried potato samples was carried out according to the A.P.H.A. method (1960)
- Mold and yeast counts: Mold and yeast counts for the dried potato samples were carried out according to (Difco, 1953).

2- Chemical and technological determinations:

- Moisture was determined in tubers according to the method described in A.O.A.C. (1990).
- Dry matter was determined in tubers according to the method described in A. O. A. C. (1975).
- Total soluble sugars (T.S.S.) were determined in tubers according to the method described in A. O. A. C. (1990).
- Ascorbic acid content (vitamin C) of potato samples was determined according to the titration method using: 2,6 Dichloropheol-Indophenol as was reported by Ranganna, (1979).
- Amino acids contents were determined by using HPLC. (Modil 1993 from Shimdzu, JanPan) and using column: NH_2 Amino column (SHIM. PACK) (SHIMADZU) according to the method desribed by Devaries *et al.*(1980).
- Nucleic acids RNA and DNA were determined by taking 2 grams of potato buds from treated and untreated potato samples and were determined according to Ogur and Roson (1971).
- Technological evaluation of frying potato tubers (chips) and their organoleptic test were determined according to Abdel Magied (1991).

RESULTS AND DISCUSSION

It is clear from table (1), that an increase in sprouting percentage as the periods advanced. The sprouts were early in untreated potato (control) at the 12th week in Diamont and spunta cvs. respectively, whereas other treatments (50 and 150 kCy) delayed sprouting to the end of storage period for each cultivars. Sample of 150 Gry of gamma irradiation showed more inhibited sprouts during storage periods whereas, some spruts were shown in potato tubers treated with 50 Gry. This result is in agreement with the findings of Nassef (1989); Tatuler (1993) and Al-Magrabi (2000) who used Alpha and King Edwar potato tubers irradiated with gamma rays of doses 50, 80, 100 and 150 Gry and stored them for six months.

Table (1): Percentage of sprouting in potato tubers of Diamont and Spunta cvs. as affected by gamma radiation during storage.

Variety	Treatment	Period after harvest, in week												L.S.D.
		6	8	10	12	14	16	18	20	22	24	26	28	0.05
Diamont	150 Gry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	50 Gry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.1	4.4	5.2	9.1	0.92
	Control	0.0	0.0	0.0	2.0	15.0	24.1	-	-	-	-	-	-	1.47
Spunta	150 Gry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	50 Gry	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	2.0	3.0	5.0	8.9	1.97
	Control	0.0	0.0	0.0	8.1	12.9	34.2	-	-	-	-	-	-	2.12

* The value is equal the average of three replicates.

From table (2), is indicated that the rotted tubers percentage increased progressively until reached at the end of storage at the 28th week, the untreated potato tubers were rotted through 12th week but gamma irradiation potato tubers with 150 Gry were of low percentage of rotting. This result is in agreement with the finding of Orabi (1985) and Manday and Seetharan (1990), when they irradiated potato tubers with 50, 80, 100 and 150 Gry and stored it for six months.

Table (2): Percentage of rotting in potato tubers of Diamont and Spunta cvs. as affected by gamma radiation during storage.

Variety	Treatment	Period after harvest, in week												L.S.D. 0.05
		6	8	10	12	14	16	18	20	22	24	26	28	
Diamont	150 Gry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.0	15.0	18.0	20.8	25.5	2.13
	50 Gry	0.0	0.0	0.0	0.0	0.0	3.6	7.4	8.8	15.5	17.2	25.6	25.9	2.27
	Control	0.0	0.0	0.0	1.0	7.0	15.3	-	-	-	-	-	-	2.20
Spunta	150 Gry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.9	12.0	13.8	17.9	19.4	2.19
	50 Gry	0.0	0.0	0.0	0.0	0.0	4.6	5.1	7.0	8.5	9.0	17.0	21.5	2.19
	Control	0.0	0.0	0.0	1.8	8.0	20.3	-	-	-	-	-	-	2.15

On the other hand, from the Fig. (1, 2, 3, 4, 5 and 6) we notice that untreated potato tubers had the highest percentage of total count for microflora (bacteria, yeast and fungi) from 6th week till 16th week. Whereas, untreated tubers with 50 and 150 kGy had shown better results than the control of both Diamont and Spunta cvs. This confirm the fact that was occurred simultaneously by Hassan (1995), Thybo, and Christiansen (1996) and Al-Maghrabi (2000), who found that there were decreases in total count for bacteria, yeast and fungi for treated potato tubers irradiated with gamma rays, doses of 50, 100 and 150 Gry, and stored for periods of 6-8-10 months.

On the other side, the results shown in table (3) indicated that there was a reduction of sound tubers percentage during storage periods. This decrease began after the 12th week of storage according to Diamont and Spunta cvs. respectively. The highest percentage was found in treated potato tubers with 150 Gry, whereas the lowest percentage was recorded in the untreated potato, this result is in agreement with the finding of Maghrabi and El-Sayed (1988) and ICGFI (1990), when who treated potato tubers with 200 Gry of gamma rays and stored them at 25 – 30°C and 70 – 80% R.H. to 8-10 months. They found that the irradiated tubers showed better physical properties and good qualities.

Table (3): Percentage of sound potato tubers of Diamont and Spunta cvs. as affected by gamma radiation during storage.

Variety	Treatment	Period after harvest, in week												L.S.D. 0.05
		6	8	10	12	14	16	18	20	22	24	26	28	
Diamont	150 Gry	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.0	85.0	82.0	79.2	74.5	2.83
	50 Gry	100.0	100.0	100.0	100.0	100.0	96.4	92.1	89.2	80.4	78.4	69.2	65.0	3.71
	Control	100.0	100.0	100.0	89.0	78.0	42..6	-	-	-	-	-	-	6.35
Spunta	150 Gry	100.0	100.0	100.0	100.0	100.0	100.0	100.0	44.1	88.0	86.2	82.1	80.6	2.25
	50 Gry	100.0	100.0	100.0	100.0	100.0	95.4	93.0	92.0	89.5	82.0	78.0	70.5	2.86
	Control	100.0	100.0	100.0	90.1	79.1	45.5	-	-	-	-	-	-	7.58

.The value is equal the average of three replicat

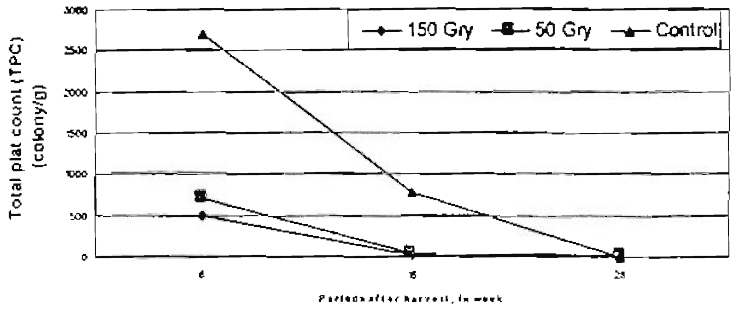

Fig. (1) Effect of storage on the total plat count (TPT) of bacteria (colony/g) for irradiated ad unirradiated tubers of Diamont cv.

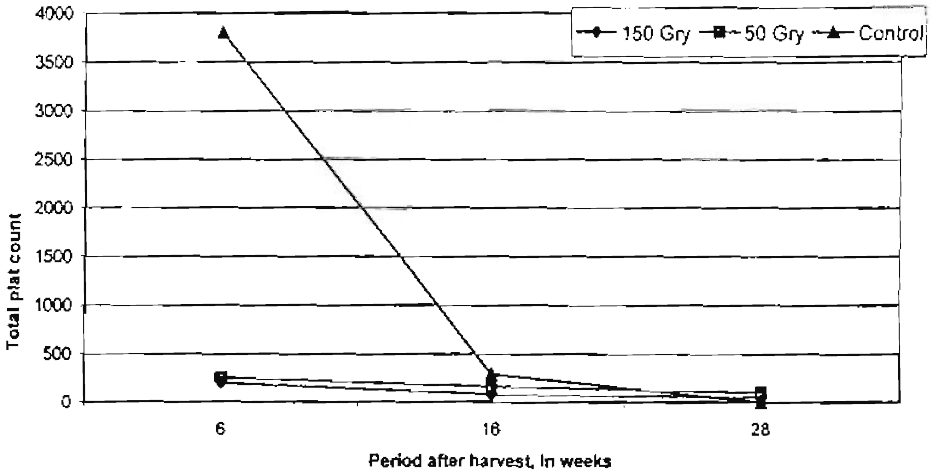

Fig. (2) Effect of storage on the total plat count (TPC) of bacteria (colony/g) for irradiated and unirraddiated tubers of spunta cv.

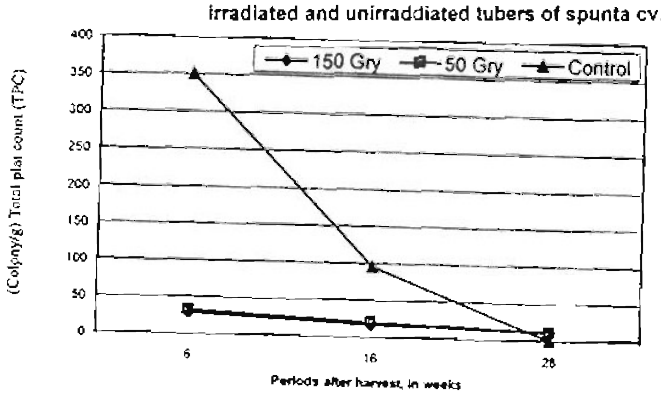

Fig. (3) Effect of storage on the total plat count (TPC) of yeast (colony/g) for irradiated and unirradiated tubers of Diamont cv .

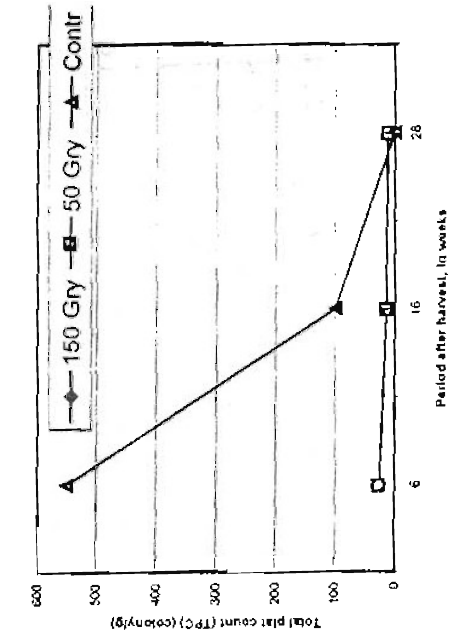

Fig. (4) Effect of storage on the total plat count (TPC) of yeast (colony/g) for irradiated and unirradiated tubers of Spunta cv.

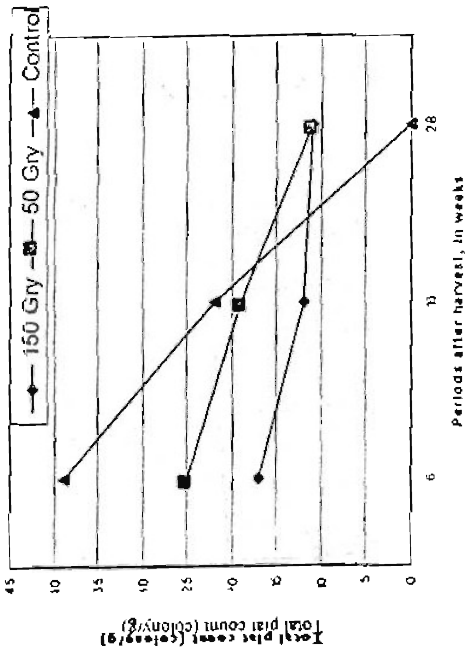

Fig. (5) Effect of storage on the total plat count (TPC) of fungi (colony/g) for irradiated and unirradiated tubers of Diamont cv.

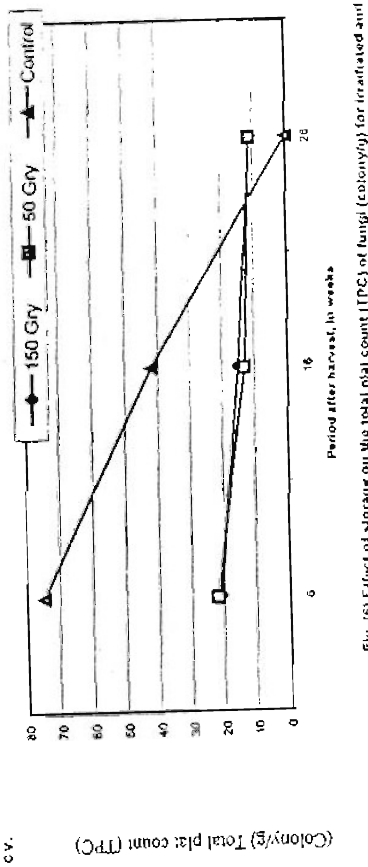

Fig. (6) Effect of storage on the total plat count (TPC) of fungi (colony/g) for irradiated and unirradiated tubers of Spunta cv.

Table (4) shows that the highest loss due to moisture was detected at beginning of storage and decreased during storage. The reduction in percentage loss was observed in Diamont cv. and Spunta cv. potato tubers treated with 50 and 150 Gry, whereas these treatments without radiation showed the highest percentage in both cultivars. This result is in agreement with the finding of Mamoon (1995) and Al-Maghrabi (2000) who treated potato tubers with gamma rays of 50, 80, 100 and 150 Gry and stored them for 6-8 months. They found that the moisture content for irradiated tubers was decreased than that of untreated tubers.

Table (4): Percentage of moisture in potato tubers of Diamont and Spunta cvs. as affected by gamma radiation during storage.

Variety	Treatment	Period after harvest, in week		
		6	16	28
Diamont	150 Gry	18.18	18.14	18.12
	50 Gry	18.21	18.18	18.15
	Control	18.31	18.26	-
Spunta	150 Gry	18.46	18.42	18.39
	50 Gry	18.50	18.44	18.41
	Control	18.58	18.52	-

Moreover, table (5) indicates that dry matter percentage increased during in storage periods. The last periods from the 16th to 28th week were approximately of the highest percentage. The results showed that the dry matter percentage was higher in potato tubers treated with gamma irradiation with 50 and 150 Gry than that untreated ones in each cultivars. This results is in agreement with Asker and Treptow (1993) and Cassens (1994), who treated potato tubers with 50, 75, 100 and 150 Gry of gamma rays and stored them from 6-12 months. They found that the irradiated tubers had higher percentage of dry matter than the untreated tubers.

Table (5): Percentage of dry weight of potato tubers of Diamont and Spunta cvs. as affected by gamma radiation storage.

Variety	Treatment	Period after harvest, in week		
		6	16	28
Diamont	150 Gry	24.3	23.8	23.6
	50 Gry	24.0	23.3	23.2
	Control	24.0	23.4	-
Spunta	150 Gry	24.1	23.4	23.2
	50 Gry	23.9	23.2	23.0
	Control	23.8	22.9	-

It is clear from table (6), that the reduction in total soluble sugars was detected in all treatments except potato tubers treated with 150 Gry. T.S.S. increased until reached to sprouting and the highest increased was recorded at the end of storage. Also, Diamont cv. had higher percentage in T.S.S. than spunta cv. This result is in agreement with the finding of Nassef (1989) and Tatuler (1993) who used Alpha and King Edwar potato tubers and irradiated then with gamma rays with doses (50, 80, 100 and 150 Gry) and stored them for six months.

Table (6): Percentage of total soluble sugars of potato tubers of Diamont and Spunta cvs. as affected by gamma radiation storage.

Variety	Treatment	Period after harvest, in week		
		6	16	28
Diamont	150 Gry	0.661	0.798	0.799
	50 Gry	0.621	0.611	0.611
	Control	0.623	0.422	-
Spunta	150 Gry	0.645	0.778	0.780
	50 Gry	0.632	0.625	0.623
	Control	0.636	0.339	-

On the other hand, from table (7) that the reduction in ascorbic acid (V.C) was detected continuously a long side the self life of potato tubers in all treatments of both cultivars. Generally gamma irradiation treatments cause a pronounced decreases in (V.C). This means that the most effective factor on the (V.C) was the gamma irradiation. Thus the high of dose caused the lowest in (V.C). This result is in agreement with the findings of Nassef (1989), Tatuler (1993) and Kolb and Stephan (1997), who used potato tubers with irradiation with doses 50, 80, 100 and 150 Gry and stored it for a period from 6 to10 months.

Table (7): Percentage of Ascorbic acid (V.C) of potato tubers of Diamont and Spunta cvs. as affected by gamma radiation during storage.

Variety	Treatment	Period after harvest, in week		
		6	16	28
Diamont	150 Gry	0.54	0.39	0.33
	50 Gry	0.39	0.34	0.29
	Control	0.40	0.31	-
Spunta	150 Gry	0.54	0.47	0.42
	50 Gry	0.50	0.44	0.39
	Control	0.52	0.44	-

It is clear from tables (8 and 9) that there were different amino acids before and during sprouting periods in most treatments under study-Diamont and Spunta cvs. behaved the same behavior to this character. Generally, amino acids before and during sprout in Diamont and Spunta cvs. essential amino acids were Valine, Methionine, Isoleucine, Leucine, Tyrosine, Phenylalanin, Histadine, Leucine and Arginine, while non-essential amino acids were Aspartic acid, Threonine, Serine, Glutamic acid, Glycine and Alanine. Irradiation with 150 and 50 Gry showed that total free amino acids increased from the beginning to the end of storage period. But, with unirradiated (control) potato tubers results showed that increasing amount of total free amino acids was only in the beginning but when tubers began to sprout the total amino acids became decrease. This result is in agreement with Nassef (1989), Van Grade and Wood (1994) and FAO (1994).

Table (8): Pecentage of free amino acids of potato tubers (mg/100g dry weight) of Diamont cv. as affected by gamma irradiation during storage period.

Number	Amino acids	150 Gry			50 Gry			Control		
		Storage periods, in week								
		6	16	28	6	16	28	6	16	28
Essential A. A.*										
1	Valine	5.8	2.1	7.1	4.3	5.8	6.1	5.0	4.1	-
2	Methionine	1.8	2.1	2.4	1.2	1.7	2.3	2.1	0.8	-
3	Isoleucine	3.4	4.2	5.7	3.5	5.1	5.2	4.2	3.2	-
4	Leucine	4.8	7.0	7.1	4.8	5.7	9.2	7.0	3.0	-
5	Tyrosine	4.3	5.1	7.2	4.4	5.3	9.3	6.4	3.8	-
6	Phenylalanine	8.3	12.8	12.4	8.2	11.1	11.9	10.2	6.1	-
7	Histadine	3.0	3.4	5.1	2.3	5.3	5.9	4.2	3.3	-
8	Lysine	7.8	8.9	9.1	8.2	8.3	9.1	9.2	7.1	-
9	Arginin	7.8	9.2	12.2	7.8	8.8	9.0	12.0	7.1	-
Total Essential A. A.		47.0	58.9	68.3	44.7	57.1	68.0	60.7	41.5	-
Non-essential A. A.										
1	Aspartic acid	35.7	36.3	39.1	31.5	36.3	38.0	45.1	22.2	-
2	Theronine	3.4	4.2	5.2	3.1	3.6	6.2	6.0	3.1	-
3	Serine	4.4	5.0	6.1	5.3	6.1	6.6	7.1	3.1	-
4	Glutamic acid	17.0	20.7	21.3	17.1	19.7	27.2	33.1	15.3	-
5	Glycine	3.2	4.2	5.1	3.1	3.7	5.1	4.6	4.0	-
6	Alanine	.5	5.0	6.0	3.8	4.6	5.2	4.6	4.2	-
Total of non-essential A. A.		68.2	75.5	85.8	63.9	74.0	88.3	77.6	75.2	-
Total of A. A.		115.2	134.4	151.1	108.6	131.1	126.3	138.3	116.7	-

* A. A. : Amino Acid

Table (9): Pecentage of free Amino acids of potato tubers (mg/100g dry weight) of Spunta cv. as affected by gamma irradiation during storage period.

Number	Amino acids	150 Gry			50 Gry			Control		
		Storage periods, in week								
		6	16	28	6	16	28	6	16	28
Essential A. A.*										
1	Valine	6.5	7.0	7.9	6.0	7.0	7.4	8.1	7.1	-
2	Methionine	1.2	2.0	2.3	1.0	1.5	1.6	2.6	2.0	-
3	Isoleucine	4.0	5.1	7.8	4.2	4.2	6.9	7.3	5.0	-
4	Leucine	7.5	9.0	10.4	7.2	9.5	10.3	9.4	9.0	-
5	Tyrosine	4.3	4.8	12.0	4.3	4.4	15.0	11.0	6.0	-
6	Phenylalanine	8.0	13.8	15.6	8.0	13.1	14.8	15.2	7.0	-
7	Histadine	3.4	3.9	5.0	2.3	2.8	5.0	5.0	3.4	-
8	Lysine	9.5	9.6	11.1	9.0	9.0	10.0	10.4	9.0	-
9	Arginin	6.8	7.1	8.1	5.1	5.9	6.0	8.7	6.0	-
Total Essential A. A.		51.2	62.3	80.2	49.9	57.4	77.0	77.7	54.0	-
Non-essential A. A.										
1	Aspartic acid	41.6	43.0	54.0	31.0	34.6	50.0	44.0	37.0	-
2	Theronine	5.0	6.2	7.0	4.5	5.7	7.0	6.0	5.3	-
3	Serine	6.1	7.2	8.0	5.4	6.1	8.0	8.0	4.0	-
4	Glutamic acid	25.9	26.2	27.0	17.0	20.9	29.0	26.0	24.7	-
5	Glycine	4.4	6.0	6.5	4.1	4.4	6.0	7.0	5.8	-
6	Alanine	5.6	6.0	7.0	5.8	6.3	107.0	95.0	83.2	-
Total of non-essential A. A.		88.6	94.6	109.5	67.8	78.0	107.0	95.0	83.2	-
Total of A. A.		139.8	156.9	189.7	117.7	135.4	184.0	172.7	137.8	-

* A. A. : Amino Acid

Table (10):Technological evaluation of frying potato tubers (chips) for Diamont and Spunta cvs. as affected by gamma radiation during storage.

Varity	Factors Tratments	A			b			c		
		Colour (50)	Flavour (50)	Overall accep-tability	Colour (50)	Flavour (50)	Overall accept-ability	Colour (50)	Flavour (50)	Overall accep-tability
Diamont	150 gry	49.0	50.0	99.0	48.9	49.5	98.4	47.2	46.6	93.7
	50 gry	49.0	50.0	99.0	43.0	45.4	88.4	42.2	43.3	85.5
	Control	50.0	50.0	100.0	32.0	25.6	57.0	-	-	-
spunta	150 gry	47.0	50.0	97.0	45.5	47.0	92.5	45.0	46.2	91.2
	50 gry	46.0	50.0	96.0	45.0	42.0	87.0	44.1	41.1	85.2
	Control	49.0	50.0	99.0	30.0	25.1	55.1	-	-	-

***A: The beginning of storage period.**
***B- The end of control potato tubers**
***C: The end of storage period**
Accepted 69 – 60
Excellent 90 – 100
Very good 89 – 80
Good 79 – 70
No accepted less than 59

On the other side, Fig. (7,8,9 and 10) that the contents of nucleic acids (RNA and DNA) behaved similar in the same trend in the two cultivars (Diamont and Spunta). All potato tubers treated with various radiation doses as well as untreated (control) potato tubers induced a marked increment in nucleic acids contents at all periods of storage except potato tubers treated with 150 Gry which showed a pronounced reduction during these periods. Slight differences were observed during periods of storage in all potato treated or untreated. The untreated potato tubers were of the lower contents because the quantities of nucleic acids increased sharply in the direction of the advanced periods until reached to sprout period at the 12^{th} week in Diamont and Spunta cvs. respectively, except potato tubers treated with 150 Gry which decreased until reached the end of storage period. Then the increase or the decrease were stable to the end of storage periods. Furthermore long period were in untreated potato, whereas the lowest ones in gamma irradiated potato of 150 Gry. This result is in agreement with those of Chachin, *et al.* (1974), Nassef (1989), Van Grade and Wood (1994) and FAO (1994), who irradiated that potato tubers with doses 50, 80, 100 and 150 Gry to gamma rays and stored them for a period 6-8-10 months.

Finally, technological evaluation of frying potato tubers (chips), including the color value changes of fried potato samples from the beginning till the end of 6 months of storage period is shown in table (1o) and Figs. (11 and 12). The treated samples with 150 Gry showed the best color, followed by the samples treated with 50 Gry. Where as, untreated tubers (control) showed yellow color only in the beginning of storage period but they were in brown color at the end of the tubers life. This result is in agreement with Diehl (1990) and Al-Maghrabi (2000).

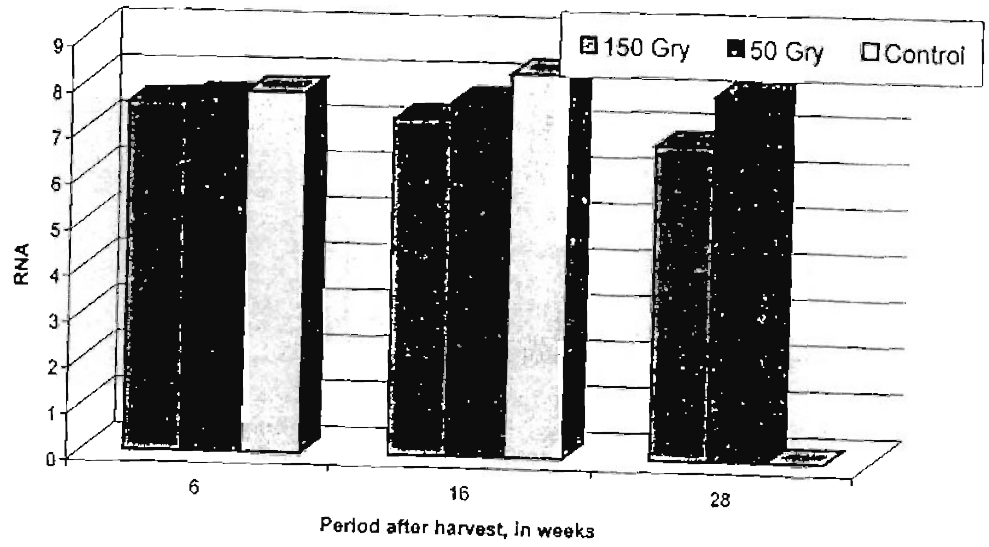

Fig. (7) Effect of storage on RNA% for Irraidated and unirradiated tubers of Diamonts cv.

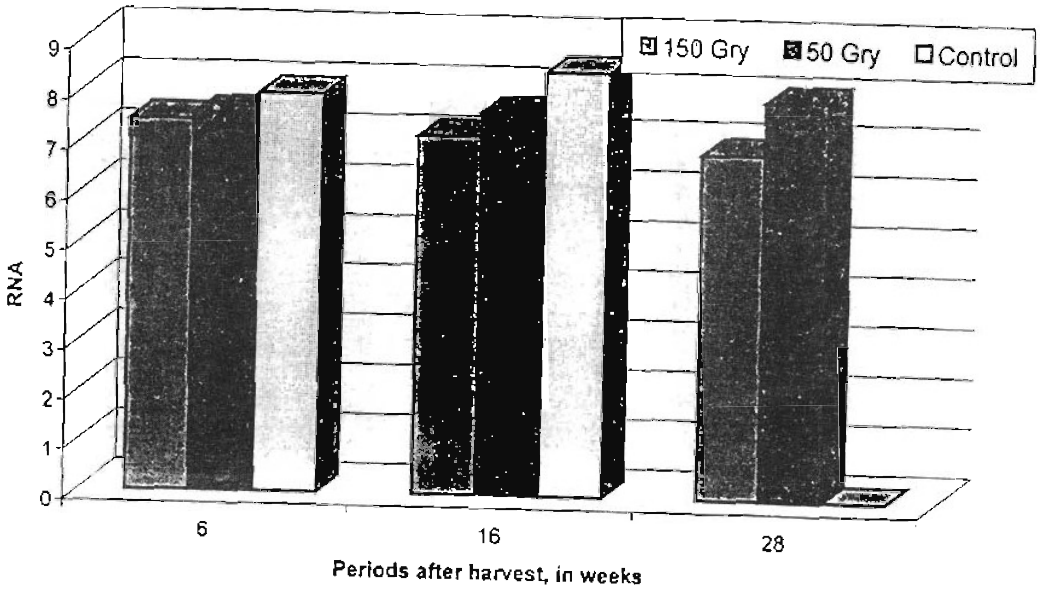

Fig. (8) Effect of storage on RNA% for Irraidated and unirradiated tubers of Spunta cv.

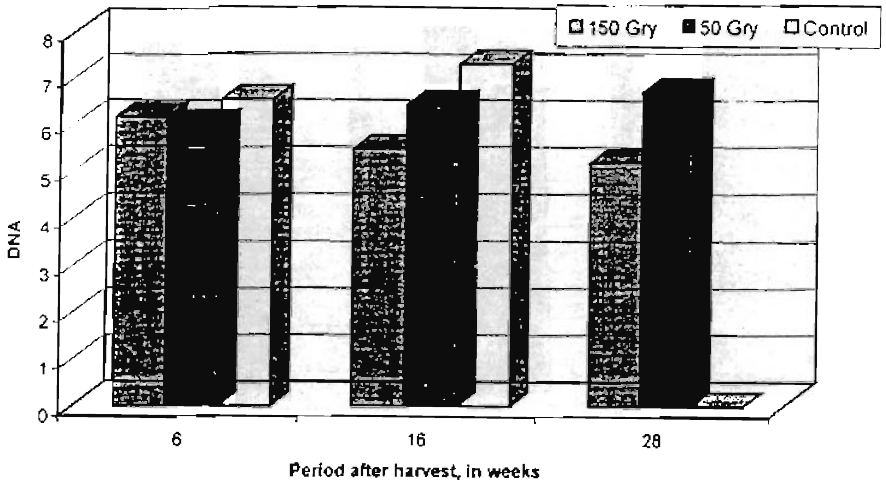

Fig. (9) Effect of storage on DNA % for irradiated an unirradiated potato tubers of Diamont cv.

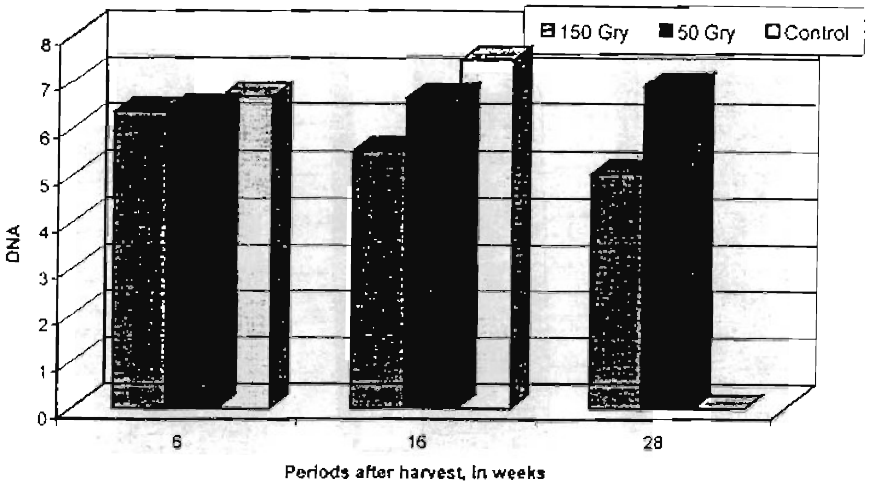

Fig. (10) Effect of storage on DNA % for Irradiated an unirradiated potato tubers of Spunta cv.

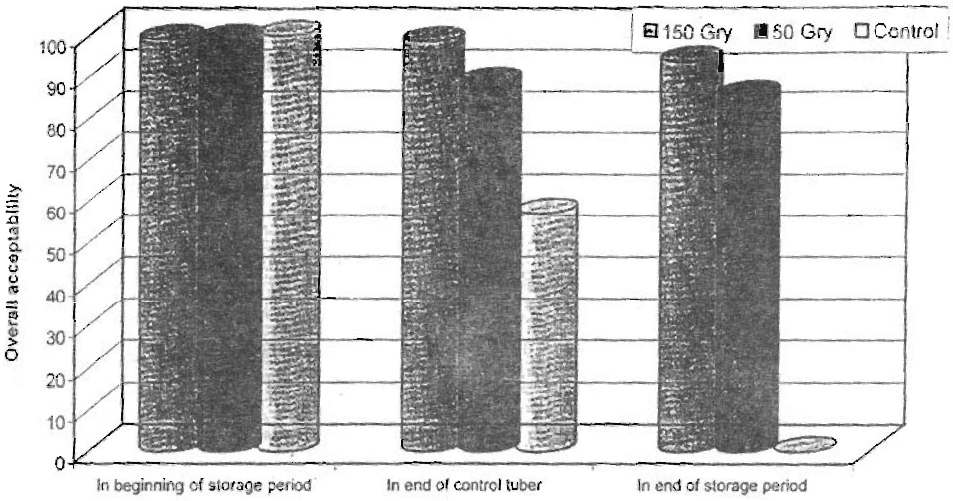

Fig. (11) Techological evaluation of frying potato tubers (chips) for Diamont cv. as affected by gamma radiation during storage.

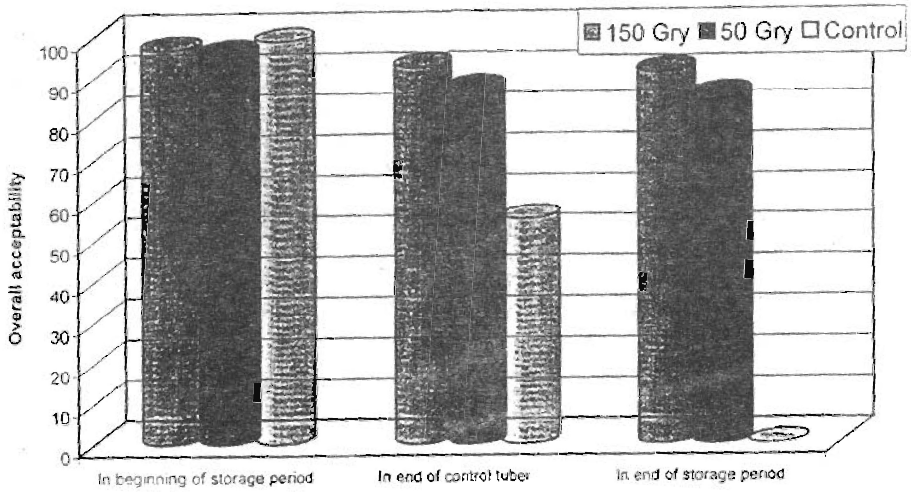

Fig. (12) Technological evaluation of frying potato tubers (chips) for Spunta cv. as affected by gamma radiation storage.

Conclusion and Recommendation

It is clear that treating potato tubers treated with gamma radiation prolonged their shelf life for more than six months with low percentage of total loss and high percentage of sound tubers, where as the untreated potato exhibited short shelf life not more than 16 week in Diamont and Spunta cvs. However, Diamont cv. revealed better physical and physiological properties than Spunta cv. during storage.

Therefore, it was found that using 150 Gry of gamma irradiation from Cobalt 60 could be recommended for preserving the tubers for more than six months with high sound tubers and low total loss percentage.

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تأثير الإشعاع الجامي على التغيرات البيوكيميائية والمورفولوجية والصفات التكنولوجية لدرنات البطاطس أثناء التخزين

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*** المركز القومي لبحوث وتكنولوجيا الإشعاع – هيئة الطاقة الذرية- جمهورية مصر العربية**

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أجريت هذه الدراسة بهدف تقييم القيمة الغذائية لدرنات البطاطس لصنفي دايمونت وسبونتا بعد المعالجة بجرعات من أشعة الجاما (٥٠ – ١٥٠ جراي) وبعد الفرز والتدريج والتقسيم إلى ثلاثة مجاميع (٥٠ جراي – ١٥٠ جراي – صفر (المقارنة) ثم التخزين لمدة ٢٨ أسبوعا. وقد شملت الدراسة تقييم الصفات المورفولوجية (الطبيعية) من حيث الإنبات وكذا مدى الإصابة بالعفن والعد الكلي للحمل الميكروبي للدرنات من البكتيريا ، الخمائر ، الفطريات وكذا تقدير نسبة الدرنات السليمة عند نهاية تخزينها هذا وقد أعطت المعاملة (١٥٠ جراي) أفضل النتائج للصفات السابقة وأعقبها في ذلك المعاملة (٥٠ جراي) حيث بقيت الدرنات بحالة سليمة حتى نهاية الفترة التخزينية ، بينما أظهرت درنات المقارنة عكس ذلك فقد كانت أسرع في الإنبات وذات قابلية كبيرة للإصابة بالبكتيريا والخمائر والفطريات ولم تستمر حتى نهاية الفترة التخزينية.

كما شملت الدراسة تقدير الصفات البيوكيميائية من حيث المحتوى الرطوبي للدرنات والوزن الجاف لها والسكريات الكلية الذائبة (الكربوهيدرات) وحمض الإسكوربيك (V.C) والأحماض الأمينية الكلية الحرة (Total Free Amino Acids) وتقدير الأحماض النووية Nucleic acid, RNA and DNA وقد أعطت أيضا المعاملة (١٥٠ جراي) أحسن للنتائج للتقديرات السابقة وتلاها المعاملة (٥٠ جراي) واستمرت المعاملتان إلى نهاية الفترة التخزينية مع احتفاظهما بالقيمةالغذائية. في حين أظهرت درنات المقارنة نتائج مخالفة تماما للمعاملات الإشعاعية حيث أنها لم تستمر حتى نهاية الفترة التخزينية ولم تحتفظ بقيمتها الغذائية.

وأخيرا تم تقيم تكنولوجي للدرنات المعاملة والغير معاملة بإجراء تجربة تحمير لشرائح البطاطس (Chips) من حيث اللون والطعم لاختبار مدى قابلية المستهلك لها حيث دلت النتائج على أن المعاملة (١٥٠ جراي) كانت أحسن المعاملات حيث حصلت على أعلى تقدير ثم المعاملة (٥٠ جراي) ، بينما أعطت درنات المقارنة (Control) أعلى تقدير في بدء الفترة التخزينية ثم نقصت تدريجيا ولم تستمر في التواجد حتى نهاية الفترة التخزينية لكلا الصنفين.