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Studies on effect of gamma irradiation on biochemical characteristics of peanut kernels (*Arachis hypogaea* L.)

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Abstract
The object of this study was to assess the effect of gamma irradiation dose level on biochemical characteristics of peanut kernels during storage. The healthy and mature kernels of peanut variety GG-20 and TG-37A were conditioned at three initial moisture contents (6.0%, 8.5% and 11.0%), w.b. and packed in Poly Propylene (PP) bags of 50µ thickness and sealed and these samples were irradiated with the different gamma irradiation dose (0 kGy, 2.5 kGy, 5.0 kGy, 7.5 kGy and 10.0 kGy) and stored at ambient temperature for three months. Biochemical composition including moisture content, protein content, oil content, carbohydrate content, fibre and ash content and peroxide value were determined for irradiated and non-irradiated peanut kernels. The results revealed that the gamma irradiation did not affect biochemical composition peanut kernels adversely just after irradiation and during storage of three month, however, the peroxide value of both peanut varieties kernels negatively correlate with gamma irradiation dose and initial moisture content. The steady rise in peroxide value was noted in all the irradiated peanut samples during storage.

Keywords: Peanut, gamma irradiation, moisture content, peanut quality, storability

1. Introduction
Groundnut or peanut, botanically known as *Arachis hypogaea* L. is one of the most important oilseed crops, globally as well as in our country which belonging to a family of Leguminosae (Hymowitz, 1990) [15]. India is the second largest producer of peanut after China. The Indonesia, Vietnam Social Republic, Malaysia, Philippines and Thailand are the major export destinations of Indian peanut. Gujarat is the leading state in production of peanut as it shares about 50% of India's total peanut production (Anon., 2019).

Peanut (*Arachis hypogaea* L.) is one of the leading oil seed crops that produces edible oil and plant protein, as well as vitamins and minerals such as calcium, magnesium, potassium, iron and zinc. In most of the developing countries, peanut kernels are stored as dry seeds and form an enormous serve of food. However, vast quantities of seeds are lost annually as a result of microbial growth and insects attacks. The hot and humid climate of India is quite favourable for the growth of numerous insects and microorganisms that destroy stored crops and causes spoilage of food (Gowda and Ramakrishna, 1997) [13].

Gamma irradiation is a physical technique of food preservation that seems to have a potential to protect such commodity from insects infestation and microbial contamination during storage and therefore it has been proposed as a good alternative to methyl bromide and other fumigants for pest control (Loaharanu and Thomas, 2001) [17]. However, development of this technique involves consideration that gamma may change the biochemical properties of stored kernels. The absolute relationship of irradiation application dose and possible changes must be known in order to comprehensively assess the acceptability of irradiated peanut kernels. Considering the above facts in mind, a systematic scientific study was undertaken.

2. Materials and Methods
2.1 Irradiation of peanut kernels
The healthy and mature kernels of peanut variety GG-20 (Gujarat Groundnut-20) and TG-37A (Trombay Groundnut-37A) were procured in bulk from peanut processing industry and conditioned at three initial moisture content level (6.0, 8.5 and 11.0% w.b.) as suggested by Obi *et al.* (2014) [21] and packed in virgin Poly Propylene (PP) bags of 50µ thickness followed

by sealing with hand sealing machine. These samples were irradiated at gamma radiation plant (Processing for Agro, Food and Medicine), radiation processing facility of M/s Gujarat Agro Industries Corporation limited (GAICL), at village Bavla, Ahmedabad (a Government Enterprise) and stored at ambient temperature for three months. The samples were analyzed at every 1 month interval for biochemical quality attributes.

2.2 Determination of Biochemical Characteristics of Peanut Kernels

Biochemical characteristics of peanut kernels irradiated and non-irradiated peanut kernels samples of both the varieties were evaluated at one month interval during storage for its biochemical characteristics in term of moisture content, w.b (Hot air oven method), protein content (Lowry *et al.*, 1951), oil content (Soxhlet extraction method), carbohydrate content (Phenol sulphuric acid method), Fiber content (Ranganna, 1986), Ash content (%) and peroxide value as per standard methods and procedures recommended by AOAC (2006) [5].

2.3 Statistical Analysis

The analysis of variance (ANOVA) of mean values generated from the analysis of each of quality attributes obtained from three replications (n=3) during the experimentation were subjected to statistical analysis using factorial completely randomized design (F-CRD) and Microsoft Excel as per the procedure suggested by Panse and Sukhatme (1985) [23]. Treatments having 0.0 kGy gamma irradiation dose (no irradiation) served as control for each variety and moisture content level.

3. Results and Discussions

3.1 Effect of Gamma Irradiation on Moisture content of Peanut Kernels

The influence of gamma irradiation on moisture content of peanut variety GG-20 and TG-37A kernels with respect to different initial moisture contents during entire three month storage are noted in Table 1. On initial day of irradiation, it was recorded, as gamma irradiation dose was increased, the moisture content of both peanut varieties kernels slightly decreased. Further slightly decrease in moisture content was noted in the all the treatments with passage of time of storage. Gamma irradiation is referred to as a "cold process". Although all of the radiation energy is converted to heat during treatment, the process typically increases the product temperature by about 1 ºC (Benebion, 2001) [8]. Naik *et al.* (2013) [20] stated that food irradiation is a cold process it does not cause any significant rise in temperature. However, temperature of the product being irradiated is influenced during the radiation. Due to this phenomenon the initial moisture content may decreased in minute percentage during different irradiation doses. Similar results were also reported by Ahmed *et al.* (1997) [2] and Bamidele and Akanbi (2013) [7] as decreasing moisture content in irradiated grains.

3.2 Effect of Gamma Irradiation on Protein content of Peanut Kernels

The effect of gamma irradiation dose on protein content of both peanut kernels at different initial moisture content during three month storage reported in Table 2. Immediately after irradiation, it was noted, as gamma irradiation dose was increased from 0.0 to 10.0 kGy, the protein content of both peanut kernels non-significantly reduced for the kernels having initial moisture content of 6, 8.5 and 11% (w.b.), respectively. From the observations it was clear that gradually decrease in protein content was noted in all the treatments during three month of storage. The maximum retention of protein content after three month storage was found in the treatment F1D2M1 and F2D1M1 (25.22%) in GG-20 and TG-37A kernels peanut kernels respectively. These findings were in accordance with that reported by Sanchez-Bel *et al.* (2008) [25] the protein and crude fiber content of almonds did not change significantly after radiation to 0, 3, 7 and 10 kGy. Seda *et al.* (2001) [27] for groundnut, Josephson *et al.* (1978) [16] for cereal and legumes and Reddy *et al.* (1979) [24] for common bean also reported that gamma radiation had non-significant effect on proximate composition.

3.3 Effect of Gamma Irradiation on Oil content of Peanut Kernels

The results pertaining to effect of gamma irradiation dose on oil content of both peanut varieties at different initial moisture content during whole storage period reported in Table 3. It was observed that gamma irradiation dose (D) did not affect oil content at different initial moisture content of both varieties peanut kernels adversely and found non-significant ($P \geq 0.05$) just after irradiation and during storage. The minute change was seen in oil content of all the samples during storage. These results are also in accordance with finding of Bishnoi and Chandra (2014) [9], Fapohunda *et al.* (2012) [10] and Al-Bachir (2016a, 2016b) [3-4] for peanut and sesame. Reduction in oil content may be due to the cleavages in some triglycerides molecules resulting in decreased of oil extractability.

3.4 Effect of Gamma Irradiation on Carbohydrate content of Peanut Kernels

The carbohydrate content of both peanut varieties irradiated with different doses level and different initial moisture content and stored for three month period are reported in Table 4. During initial day of storage it was noticed that as gamma irradiation dose increased, the carbohydrate content of both peanut kernels significantly decline for the kernels having initial moisture content of 6, 8.5 and 11% (w.b.), respectively. The negligible change was observed in carbohydrate content of all the samples during storage. The maximum retention of carbohydrate content was found in the treatment F1D2M1 (14.61%) and F2D2M1 (14.69%) in GG-20 and TG-37A peanut kernels respectively after three month of storage. These results are in agreement with previous findings of Ahmed Hmed (2006) [1] for groundnut's flour and oil. Sumedha (2014) [29] also found same results for two variety of groundnut cv. Sodari and Madani.

3.5 Effect of Gamma Irradiation on Fiber content of Peanut Kernels

It was found that the fiber content of both peanut cultivar GG-20 and TG-37A was non-significantly change with respect to gamma irradiation dose and initial moisture content during entire storage (Table 5). There was no consistent pattern of change noticed in both peanut varieties. Similar results reported by Azim *et al.* (2009) [6] for peanut, Ogbadu (1979) [22] for soya-gari diet. Josephson *et al.* (1978) [16] also stated that fiber of legumes and cereals were found to be relatively stable to irradiation up to 10 kGy.

3.6 Effect of Gamma Irradiation on Ash content of Peanut Kernels

The results regarding the effect of gamma irradiation dose on ash content of both peanut varieties at different initial moisture content during entire storage period noted in Table 6. There was of no steady pattern of ash content change was found in both peanut varieties. It was observed that the ash content of both peanut variety GG-20 and TG-37A was non-significantly change with gamma irradiation dose and initial moisture content during whole storage.

3.7 Effect of Gamma Irradiation on Peroxide value of Peanut Kernels

The outcomes relating to impact of gamma irradiation on peroxide value estimation of both peanut varieties at different initial moisture content during entire stockpiling period detailed in Table 7. It was clearly observed from data that gamma irradiation dose (D) at different initial moisture content significantly (P<0.05) did adversarial effect on peroxide value of peanut kernels just after irradiation and during storage. However the rise in amount of peroxide value are quite lower than acceptable value for (10 mEq./kg) for edible oils (FSSAI, 2016) which indicates lower degree of primary oxidation of the oils and their oxidative rancidity. From the observations it was clear that steadily rise in peroxide value was noted in the all the treatments after three month of storage. The minimum upswing of peroxide value was found in the treatment F1D1M1 (1.32 mEq./kg) and F2D1M1 (1.24 mEq./kg) in GG-20 and TG-37A peanut kernels respectively.

The significant increase in peroxide value indicates oxidation in kernels, increased as gamma radiation doses and different initial moisture content with storage time. Increase of peroxide value may be due to the fact that auto oxidation of oil is accelerated by free radicals produced during irradiation to form hydroperoxides which break down into various decomposition products (Hoyland and Taylor, 1991) [14]. This result was also mentioned in various studies that gamma rays interact with fat molecules to cause oxidation, decarboxilation, dehydration and polymerization reactions leading to lipid oxidation (WHO, (1994) [30], Giroux and Lacroix (1998) [12], Stewart (2001)) [28]. Contradicting results have been reported by Mostafa (1987) [18] who found that gamma irradiation decreased the peroxide value of groundnut oil. On the other hand Santos-norris (2001) [26] reported that there was no difference in peroxide value of almond oil due to gamma irradiation. Mozingo *et al.*, (2004) [19] reported that peroxide value of peanut increased during storage time.

Table 1: Effect of gamma irradiation on moisture content, w.b (%) of peanut kernels conditioned at different moisture contents during storage.

Effect	GG-20				TG-37A			
	Storage period (month)				Storage period (month)			
	0 month (Initial value)	1st month	2nd month	3rd month	0 month (Initial value)	1st month	2nd month	3rd month
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Gamma radiation doses (D)								
D1 (0 kGy)	8.53	8.33	8.28	8.23	8.56	8.44	8.34	8.28
D2 (2.5 kGy)	8.44	8.26	8.21	8.16	8.48	8.41	8.25	8.20
D3 (5.0 kGy)	8.36	8.18	8.13	8.08	8.41	8.35	8.18	8.13
D4 (7.5 kGy)	8.10	7.93	7.88	7.83	8.17	8.14	7.95	7.90
D5 (10 kGy)	7.94	7.85	7.72	7.68	8.01	7.88	7.79	7.74
S.Em±	0.04	0.04	0.04	0.04	0.06	0.04	0.08	0.09
CD at 5%	0.11	0.12	0.10	0.12	0.16	0.10	0.24	0.26
Moisture Content (M)								
M1 (6.0%, w.b)	5.87	5.77	5.71	5.67	5.90	5.83	5.74	5.71
M1 (8.5%, w.b)	8.26	8.08	8.03	7.98	8.33	8.26	8.11	8.05
M1 (11.0%, w.b)	10.70	10.47	10.40	10.34	10.75	10.64	10.46	10.39
S.Em±	0.03	0.03	0.05	0.05	0.04	0.03	0.06	0.07
CD at 5%	0.08	0.10	0.13	0.15	0.12	0.08	0.19	0.20
Interaction (D x M)								
S.Em±	0.07	0.07	0.08	0.09	0.10	0.06	0.14	0.16
CD at 5%	NS	NS	NS	NS	NS	NS	NS	NS
C.V.%	1.37	1.58	1.69	1.94	1.98	1.28	3.09	3.39

Table 2: Effect of gamma irradiation on protein content (%) of peanut kernels conditioned to different initial moisture contents during storage.

Effect	GG-20				TG-37A			
	Storage period (month)				Storage period (month)			
	0 month (Initial value)	1st month	2nd month	3rd month	0 month (Initial value)	1st month	2nd month	3rd month
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Gamma radiation doses (D)								
D1 (0 kGy)	23.45	23.48	23.31	23.41	24.58	24.53	24.44	23.41
D2 (2.5 kGy)	23.45	23.44	23.30	23.42	24.59	24.53	24.43	23.42
D3 (5.0 kGy)	23.52	23.46	23.37	23.43	24.75	24.67	24.57	23.43
D4 (7.5 kGy)	23.68	23.61	23.51	23.57	24.21	24.15	24.05	23.57
D5 (10 kGy)	22.80	22.73	22.64	22.69	23.97	23.91	23.81	22.69
S.Em±	0.29	0.34	0.42	0.53	0.29	0.31	0.40	0.53
CD at 5%	NS	NS	NS	NS	NS	NS	NS	NS
Moisture Content (M)								
M1 (6.0%, w.b)	23.91	23.88	23.75	23.83	24.83	24.77	24.67	24.73
M1 (8.5%, w.b)	23.55	23.52	23.40	23.49	24.58	24.51	24.42	24.47
M1 (11.0%, w.b)	22.67	22.63	22.53	22.59	23.85	23.79	23.70	23.75

S.Em±	0.22	0.26	0.33	0.41	0.22	0.24	0.31	0.41
CD at 5%	0.64	0.76	0.94	NS	0.65	0.68	NS	NS
Interaction (D x M)								
S.Em±	0.49	0.59	0.73	0.91	0.50	0.53	0.69	0.91
CD at 5%	NS	NS	NS	NS	NS	NS	NS	NS
C.V.%	3.66	4.37	5.43	6.79	3.56	3.77	4.93	6.50

Table 3: Effect of gamma irradiation on oil content (%) of peanut kernels conditioned at different initial moisture contents during storage.

Effect	**GG-20**				**TG-37A**			
	Storage period (month)				**Storage period (month)**			
	0 month (Initial value)	**1st month**	**2nd month**	**3rd month**	**0 month (Initial value)**	**1st month**	**2nd month**	**3rd month**
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Gamma radiation doses (D)								
D1 (0 kGy)	47.16	47.21	46.62	46.95	44.57	44.45	44.04	44.22
D2 (2.5 kGy)	47.53	47.48	46.93	47.26	44.56	44.45	44.03	44.24
D3 (5.0 kGy)	46.97	47.05	46.38	46.57	44.59	44.46	44.04	44.23
D4 (7.5 kGy)	45.81	45.79	45.14	45.34	43.90	43.78	43.37	43.56
D5 (10 kGy)	45.79	46.24	45.15	45.32	43.75	43.63	43.23	43.41
S.Em±	0.49	0.44	0.54	0.79	0.31	0.37	0.47	0.77
CD at 5%	NS	NS	NS	NS	NS	NS	NS	NS
Moisture Content (M)								
M1 (6.0%, w.b)	46.83	46.75	46.12	46.38	45.30	45.18	44.76	44.95
M1 (8.5%, w.b)	46.47	46.67	45.91	46.16	43.79	43.67	43.26	43.46
M1 (11.0%, w.b)	46.66	46.84	46.10	46.33	43.72	43.61	43.20	43.39
S.Em±	0.38	0.34	0.42	0.61	0.24	0.28	0.37	0.60
CD at 5%	NS	NS	NS	NS	0.70	0.82	1.06	NS
Interaction (D x M)								
S.Em±	0.85	0.75	0.93	1.37	0.54	0.63	0.82	1.34
CD at 5%	NS	NS	NS	NS	NS	NS	NS	NS
C.V.%	3.17	2.80	3.50	5.15	2.11	2.49	3.26	5.28

Table 4: Effect of gamma irradiation on carbohydrate content (%) of peanut kernels conditioned at different initial moisture content during storage.

Effect	**GG-20**				**TG-37A**			
	Storage period (month)				**Storage period (month)**			
	0 month (Initial value)	**1st month**	**2nd month**	**3rd month**	**0 month (Initial value)**	**1st month**	**2nd month**	**3rd month**
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Gamma radiation doses (D)								
D1 (0 kGy)	13.34	13.35	13.25	13.31	13.89	13.85	13.80	13.82
D2 (2.5 kGy)	13.34	13.33	13.25	13.31	13.89	13.85	13.79	13.84
D3 (5.0 kGy)	13.31	13.27	13.22	13.25	13.84	13.80	13.74	13.77
D4 (7.5 kGy)	13.05	13.01	12.96	12.99	13.56	13.52	13.47	13.50
D5 (10 kGy)	12.92	12.88	12.83	12.86	13.42	13.39	13.33	13.36
S.Em±	0.11	0.11	0.17	0.24	0.11	0.11	0.17	0.27
CD at 5%	0.31	0.31	NS	NS	0.33	0.32	NS	NS
Moisture Content (M)								
M1 (6.0%, w.b)	14.45	14.43	14.36	14.41	14.60	14.56	14.50	14.53
M1 (8.5%, w.b)	13.04	13.02	12.95	13.00	13.95	13.92	13.86	13.89
M1 (11.0%, w.b)	12.07	12.05	11.99	12.03	12.60	12.57	12.52	12.55
S.Em±	0.08	0.08	0.13	0.19	0.09	0.09	0.13	0.21
CD at 5%	0.24	0.24	0.38	0.54	0.25	0.25	0.39	0.61
Interaction (D x M)								
S.Em±	0.19	0.19	0.29	0.42	0.20	0.19	0.30	0.48
CD at 5%	NS	NS	NS	NS	NS	NS	NS	NS
C.V.%	2.47	2.44	3.88	5.55	2.48	2.44	3.81	6.03

Table 5: Effect of gamma irradiation on fiber content (%) of peanut kernels conditioned at different initial moisture content during storage.

Effect	**GG-20**				**TG-37A**			
	Storage period (month)				**Storage period (month)**			
	0 month (Initial value)	**1st month**	**2nd month**	**3rd month**	**0 month (Initial value)**	**1st month**	**2nd month**	**3rd month**
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Gamma radiation doses (D)								
D1 (0 kGy)	5.32	5.38	5.30	5.33	5.70	5.71	5.68	5.69
D2 (2.5 kGy)	5.38	5.38	5.35	5.37	5.72	5.70	5.61	5.70
D3 (5.0 kGy)	5.34	5.36	5.34	5.35	5.74	5.73	5.67	5.68
D4 (7.5 kGy)	5.31	5.30	5.28	5.29	5.68	5.61	5.54	5.56
D5 (10 kGy)	5.26	5.24	5.22	5.23	5.66	5.60	5.49	5.50

S.Em±	0.04	0.05	0.07	0.10	0.05	0.05	0.08	0.12
CD at 5%	NS	NS	NS	NS	NS	NS	NS	NS
Moisture Content (M)								
M1 (6.0%, w.b)	5.40	5.39	5.36	5.38	5.77	5.74	5.69	5.71
M1 (8.5%, w.b)	5.36	5.35	5.32	5.34	5.69	5.67	5.65	5.66
M1 (11.0%, w.b)	5.27	5.26	5.24	5.25	5.65	5.60	5.49	5.51
S.Em±	0.03	0.04	0.05	0.08	0.04	0.04	0.06	0.09
CD at 5%	NS	NS	NS	NS	NS	NS	NS	NS
Interaction (D x M)								
S.Em±	0.08	0.08	0.12	0.17	0.09	0.09	0.13	0.20
CD at 5%	NS	NS	NS	NS	NS	NS	NS	NS
C.V.%	2.53	2.66	3.93	5.65	2.73	2.80	4.08	6.17

Table 6: Effect of gamma irradiation on ash content (%) of peanut kernels conditioned at different initial moisture content during storage.

Effect	**GG-20**				**TG-37A**			
	Storage period (month)				**Storage period (month)**			
	0 month (Initial value)	**1st month**	**2nd month**	**3rd month**	**0 month (Initial value)**	**1st month**	**2nd month**	**3rd month**
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Gamma radiation doses (D)								
D1 (0 kGy)	2.18	2.18	2.16	2.18	2.77	2.76	2.75	2.75
D2 (2.5 kGy)	2.18	2.19	2.16	2.18	2.77	2.76	2.75	2.75
D3 (5.0 kGy)	2.17	2.16	2.15	2.16	2.78	2.77	2.76	2.77
D4 (7.5 kGy)	2.12	2.12	2.11	2.11	2.74	2.73	2.72	2.72
D5 (10 kGy)	2.13	2.13	2.09	2.09	2.71	2.70	2.69	2.70
S.Em±	0.02	0.01	0.03	0.04	0.02	0.02	0.04	0.05
CD at 5%	NS	0.03	NS	NS	NS	NS	NS	NS
Moisture Content (M)								
M1 (6.0%, w.b)	2.18	2.17	2.16	2.17	2.86	2.85	2.84	2.85
M1 (8.5%, w.b)	2.15	2.15	2.12	2.13	2.73	2.73	2.71	2.72
M1 (11.0%, w.b)	2.14	2.15	2.12	2.13	2.67	2.66	2.65	2.65
S.Em±	0.01	0.01	0.02	0.03	0.02	0.02	0.03	0.04
CD at 5%	NS	NS	NS	NS	NS	NS	NS	NS
Interaction (D x M)								
S.Em±	0.03	0.02	0.05	0.07	0.04	0.04	0.06	0.09
CD at 5%	NS	NS	NS	NS	NS	NS	NS	NS
C.V.%	2.41	1.43	3.71	5.55	2.29	2.55	4.04	5.80

Table 7: Effect of gamma irradiation on peroxide value (mEq./kg) of peanut kernels conditioned at different initial moisture content during storage.

Effect	**GG-20**				**TG-37A**			
	Storage period (month)				**Storage period (month)**			
	0 month (Initial value)	**1st month**	**2nd month**	**3rd month**	**0 month (Initial value)**	**1st month**	**2nd month**	**3rd month**
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Gamma radiation doses (D)								
D1 (0 kGy)	1.10	1.26	1.46	1.56	1.00	1.15	1.34	1.42
D2 (2.5 kGy)	1.26	1.44	1.68	1.79	1.15	1.31	1.53	1.63
D3 (5.0 kGy)	2.39	2.72	3.18	3.39	2.18	2.49	2.90	3.09
D4 (7.5 kGy)	2.95	3.37	3.93	4.19	2.70	3.08	3.59	3.83
D5 (10 kGy)	3.49	3.99	4.65	4.96	3.19	3.64	4.24	4.52
S.Em±	0.03	0.03	0.07	0.04	0.07	0.08	0.08	0.10
CD at 5%	0.09	0.10	0.20	0.12	0.20	0.23	0.24	0.29
Moisture Content (M)								
M1 (6.0%, w.b)	1.89	2.16	2.51	2.68	1.78	2.03	2.37	2.52
M1 (8.5%, w.b)	2.19	2.50	2.91	3.10	2.04	2.33	2.71	2.89
M1 (11.0%, w.b)	2.64	3.02	3.52	3.75	2.31	2.64	3.08	3.28
S.Em±	0.02	0.03	0.05	0.03	0.05	0.06	0.06	0.08
CD at 5%	0.07	0.08	0.15	0.09	0.16	0.18	0.19	0.22
Interaction (D x M)								
S.Em±	0.05	0.06	0.12	0.07	0.12	0.14	0.14	0.17
CD at 5%	0.15	0.17	0.34	0.21	NS	NS	NS	NS
C.V.%	4.02	4.04	6.83	3.99	10.37	10.41	9.19	10.39

4. Conclusions

The present investigation inferred that gamma irradiation did not harmfully affect biochemical characteristic of peanut kernels; however, gamma irradiation undesirably increase the peroxide value of GG-20 and TG-37A peanut kernels

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