Chemicals and Biological Study on Tortilla Chips

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ABSTRACT

The present study was designed to determine the chemical and biological effects for flavors added to tortilla chips (cheese onion, tandoori chicken, sweet pepper, and chili and lemon) compared with unflavored tortilla chips (homemade) as control. Rats used in the biological study, were fed for 60 days on the tortilla chips with the different flavors and the control. The effect of these flavors on the liver and Kidney function were recorded. Blood samples were collected by withdrawing in zero time 60 day from vein plexus eye and the serum was obtained. ALT, AST, alkaline phosphatase, albumin, total protein, creatinine and uric acid were determined.

The chemical composition of tortilla chips flavored with (Cheese onion, sweet chili pepper, chili and lemon or Tandoori Chicken compared with unflavored tortilla chips. The data revealed that the crude protein ranged between 6.25-6.97%, total lipid 22.30-25.49%, total carbohydrates 59.57-61.17%, crude fiber 12.81-17.44%, Moisture 1.20-1.79%, Starch 50.25-57.04% and total ash 1.05-2.94% for the above mentioned flavored chips, respectively. Levels of marker enzyme alanine transaminase (ALT) aspartate transaminase (AST), alkaline phosphatase (ALP) were increased on the other hand serum total protein and serum albumin were decreased. The results obtained showed that the flavored tortilla chips had badly affected the examined blood serum compared with the unflavored tortilla chips (homemade).

Keywords: tortilla chips**,** flavors, Cheese onion, sweet chili pepper, chili and lemon, Tandoori Chicken

Introduction

Corn is considered as one of the principle crops in Egypt and its production is increasing steadily; however, the majority of the crop is directed for animal and poultry feeding, in spite of the shortage in the cereal-based foodstuffs. Therefore, it would be beneficial to introduce new manufactured corn products to the Egyptian food market such as tortillas.

Corn tortillas are a fundamental food for Mesoamerican countries, being highly consumed in Central America and in countries where tortilla chips, taco shells and snacks are demanded as well. In Mexico, there is currently a consumption of 800 million tortillas per day **(Ayala- Rodríguez et al., 2009**).

Tortilla chips (Doritos) it is chips triangular manufactured from yellow corn or corn flour .Doritos (*little bits of gold* in Spanish) is a hugely popular 2+ billion dollar worldwide brand. Launched in 1966, it was an immediate hit with the consumers in the United States. Doritos continues to be the most popular snack food yet. This industry inside Egypt June 2006 by Chipsy for food industries.

Tortilla is a once important protein source for the Mexican population, its providing 90% from total protein intake and 70% of the calories (**Pérez et al., 2002 and Rosado et al., 2005**)

The tortilla chips have the second product of consumption of salty snacks, behind only potato products. In 2010, the market of tortilla chips represented the first product in terms of sales volume in the area of sweet and savory snacks in the United States, with a value of US$ 6295 million **(Market Indicator Report, 2011).**

The present study was conducted to evaluation four different flavors namely (cheese onion, tandoori chicken, sweet pepper, and chili and lemon). Chemical composition, such as moisture, protein, carbohydrates, lipids and ash of potato chips. Effect of feeding these flavors and tortilla chips on Liver and kidney function.

Materials and Methods

Materials

Manufactured product: bias chips samples were obtained from Company for food industries, 6 October, Giza, Egypt.

End products (sweet chili, chees onion, lemon & chili, tandoori chicken) was purchased from local market nosebag weight 48 g.

Methods:

Chemical analysis:

Moisture, Ash, Crude Fiber, Starch, total carbohydrate and total lipid were determined according to the Official method of **(A.O.A.C., 2005)** the crude protein was determined by using micro-Kjeldahl method; its content was calculated by multiplying the nitrogen content by conversion factor 5.83 **A.O.A.C (2005)**

Biological evaluation:

Experimental Design:-

This study aimed to compare the effect of feeding experimental rats different types of experimental flavors (sweet chili pepper, cheese onion, lemon and chili, tandoori chicken) food diets. After feeding on basal diet for one week, seventy rats were divided randomly into 14 groups (5 rats each) as follows:-

Group (1): Rats fed on basal normal diet.

Group (2): Rats fed on a control tortilla chips food product without any addition of flavors.

Group (3): Rats fed on tortilla chips food product with sweet chili pepper additive in limit.

Group (4): Rats fed on tortilla chips food product with sweet chili pepper additive out of limit.

Group (5): Rats fed on tortilla chips food product with cheese onion additive in limit.

Group (6): Rats fed on tortilla chips food product with cheese onion additive out of limit.

Group (7): Rats fed on tortilla chips food product with tandoori chicken additive in limit.

Group (8): Rats fed on tortilla chips food product with tandoori chicken additive out of limit .

Group (9): Rats fed on tortilla chips food product with chili and lemon additive in limit.

Group (10): Rats fed on tortilla chips food product with chili and lemon additive out of limit.

Group (11): Rats fed on tortilla chips food product with sweet chili pepper additive in limit plus basal normal diet.

Group (12): Rats fed on tortilla chips food product with cheese onion additive in limit plus basal normal diet.

Group (13): Rats fed on tortilla chips food product with tandoori chicken additive in limit plus basal normal diet.

Group (14): Rats fed on tortilla chips food product with chili and lemon additive in limit plus basal normal diet.

During the experimental "period (60 days), each groups of rats was kept, separately in well- aerated cages. The diet consumed and body weights were recorded every week.

Biochemical determination in blood.

Blood samples were collected at end of experiment obtained from the retro-orbital plexus veins from individual rats by means of fine capillary heparinized tubes, and were allowed to clot. Serum was separated by centrifugation at 3000 rpm for 15 min. and was used to investigate the biochemical parameters including function tests of liver and kidney tests and serum lipid profile. Determinations were done on activities of liver enzymes of alanine transaminase (ALT) aspartate transaminase (AST), alkaline phosphatase *(*ALP*)*, creatinine, urea, uric acid as well as serum total protein and serum albumin (**Reitman and Frankel, 1957, Tietz., 1983, Doumas. (1975),** and **Doumas et al., 1971)**. Globulin was calculated by subtracting the albumin from serum total protein. Kidney function parameters of urea, uric acid and creatinine were determined (**Tabacco et al., 1979).**

Results and Discussion

4.1. Chemical composition of different flavored Tortilla chips and control tortilla bias chips.

Data in **Table (1)** shows the chemical composition of tortilla chips flavored with (cheese onion, sweet chili pepper, chili and lemon and tandoori chicken compared with unflavored tortilla chips and illustrated in Fig (1). The data revealed that the crude protein ranged between 6.25-6.97%, total lipid 22.30-25.49%, total carbohydrates 59.57-61.17%, crude fiber 12.81-17.44%, moisture 1.20-1.79%, starch 50.25–57.04% and total ash 1.05-2.94% for the above mentioned flavored chips, respectively. The same table showed a variation between flavored chips concerning all chemical composition and this means that the flavors had no effect on the chemical composition.

Table 1. Chemical composition of different flavored Tortilla chips and control tortilla bias chips.

Groups	Components (%)						
	Moisture	Fat	Protein	Fiber	Ash	Starch	Carbohydrates
control tortilla bias chips	1.20^{aB}	22.30^{dA}	6.95^{aB}	12.81^{cA}	1.05^{cA}	57.04^{aA}	59.57^{aB}
Tortilla Cheese onion	1.23^{aA}	24.92^{bA}	6.71^{aB}	17.44^{aB}	2.44^{aA}	50.25^{bB}	60.12^{aB}
Tortilla Sweet Chili pepper	1.79^{aA}	24.92^{bA}	6.97^{aB}	15.05^{bB}	2.94^{aB}	50.83^{bB}	60.06^{aB}
Tortilla Tandoori Chicken	1.70^{aA}	24.42^{cA}	6.40^{bB}	16.18^{ab}B	2.88^{aB}	50.70^{bB}	59.79^{aB}
Tortilla Chili & lemon	1.77^{aB}	25.49^{aA}	6.25^{bB}	16.76^{abB}	1.85^{bA}	50.23^{bB}	61.17^{aB}

Superscripts to be compared statistically within the same column. Values with different letter superscripts are significantly different (P<0.05).

A & B: Superscripts to be compared statistically within the same row. Values with different letter superscripts are significantly different (P<0.05).

Biological evaluation:

- Effect of different diet on the liver function of albino rats:

Serum enzymes including ALT, AST and ALP are used in evaluating hepatic function and diseases. An increase in these enzymes activities reflects liver damage, either chronic or acute. Acute inflammatory hepatic cellular disorders resulted in elevated liver enzymes levels.

4.3.1.1. Effect of different diet on AST activity:

AST seemed to be more sensitive than ALT caused dramatic increase during eating diet treatment period compared with normal rats (negative control group).

Data presented in **Table (2)** and illustrated in Fig (14) show that rats treated with chili and lemon in limit plus basal diet, tandoori chicken in limit and cheese onion out of limit for eight successive weeks caused significant increase in serum AST activity concentration (176.67±0.67), (167.67±0.88) and (166.33±0.88) respectively as compared with normal rats (59±1.20). While these rats when fed on chili and lemon in limit, cheese onion in limit plus basal diet and tandoori chicken in limit plus basal diet showed that significant decrease in activity of AST (75.00±1.15), (80.67±1.20) and (81.33±0.88) respectively as compared with normal rats (59±1.20).

Table 2. Effect of different diet on AST activity (mean±SE) U/L

Group	Period (days)		Mean
	Zero	After 60	
Control negative	58.20±0.06^{aA}	59.00±0.04^{fA}	58.60±0.07a
Control tortilla bias chips	58.22±0.10^{aB}	92.67±0.15^{cdefA}	75.45±0.14a
Sweet chili pepper in limit	58.35±0.05^{aB}	142.33±0.12^{abcA}	100.34±0.10a
Sweet chili pepper out of limit	58.30±0.09^{aB}	137.67±0.18^{abcdA}	97.99±0.14a
Cheese onion in limit	58.60±0.07^{aB}	97.67±0.14^{bcdefA}	78.14±0.13a
Cheese onion out of limit	58.55±0.12^{aB}	166.33±0.15^{aA}	112.44±0.11a
Tandoori chicken in limit	58.33±0.18^{aB}	167.67±0.12^{aA}	113.00±0.13a
Tandoori chicken out of limit	58.37±0.16^{aB}	157.33±0.14^{abA}	107.85±0.11a
Chili and lemon in limit	58.44±0.09^{aA}	75.00±0.06^{efA}	66.72±0.07^{a}
Chili and lemon out of limit	58.60±0.16^{aB}	114.33±0.11^{abcdA}	86.47±0.08^{a}
Sweet chili pepper in limit plus diet	58.700.08±^{aB}	143.00±0.12^{abcA}	100.85±0.06^{a}
Cheese onion in limit plus basal diet.	58.50±0.06^{aA}	80.67±0.05^{defA}	69.59±0.12^{a}
Tandoori chicken in limit plus basal diet.	58.63±0.07^{aB}	81.33±0.09^{defA}	69.98±0.18^{a}
Chili and lemon in limit plus basal diet.	58.90±0.03^{aB}	176.67±0.08^{aA}	117.79±0.11^{a}
Mean	58.47786^{B}	120.8336^{A}	

a, b & c: Superscripts to be compared statistically within the same column. Values with different letter superscripts are significantly different (P<0.05).

A, B & C: Superscripts to be compared statistically within the same row. Values with different letter superscripts are significantly different (P<0.05).

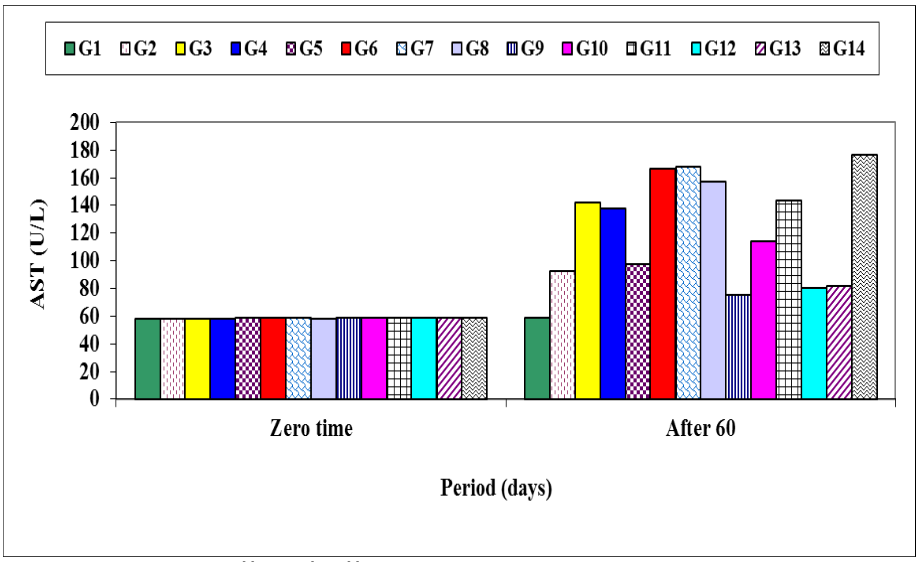

Fig (2): Effect of different diet on AST activity (mean±SE) U/L

4.3.1.2. Effect of different diet on ALT activity

Data presented in **Table (3)** and illustrated in Fig (15) show that rats treated with sweet chili pepper in limit, cheese onion in limit and chili and lemon in limit for eight successive weeks caused significant increase in serum ALT activity concentration (123.00±1.15), (103.67±0.88) and (103.00±1.15), respectively as compared with normal rats (41.33±0.88) while these rats when fed on cheese onion in limit plus basal diet and tandoori chicken in limit plus basal diet showed that significant decrease in activity of ALT (32.33±1.20) and (41.67±1.45), respectively as compared with normal rats (41.33±0.88) ALT is a cytosolic enzyme of hepatocyte and when there is increment in its activity reflect an increase in plasma membrane permeability which in turn is associated with cell damage.

Table 3. Effect of different diet on ALT activity (mean±SE) U/L

Group	Period (days)		Mean
	Zero	After 60	
Control negative	41.25 ± 0.03^{aA}	41.33 ± 0.06^{fgA}	41.29 ± 0.07^{a}
Control tortilla bias chips	41.91 ± 0.05^{aA}	51.67 ± 0.08^{dfgA}	46.79 ± 0.09^{a}
Sweet chili pepper in limit	42.15 ± 0.08^{aB}	123.00 ± 0.06^{aA}	82.58 ± 0.12^{a}
Sweet chili pepper out of limit	43.12 ± 0.07^{aB}	96.67 ± 0.10^{abcA}	69.90 ± 0.13^{a}
Cheese onion in limit	42.61 ± 0.06^{aB}	103.67 ± 0.09^{abA}	73.14 ± 0.11^{a}
Cheese onion out of limit	41.85 ± 0.04^{aB}	85.00 ± 0.06^{abcdeA}	63.43 ± 0.06^{a}
Tandoori chicken in limit	43.51 ± 0.03^{aB}	71.67 ± 0.11^{bcdefgA}	57.59 ± 0.14^{a}
Tandoori chicken out of limit	42.31 ± 0.09^{aB}	88.33 ± 0.05^{abcdeA}	65.32 ± 0.12^{a}
Chili and lemon in limit	41.77 ± 0.11^{aB}	103.00 ± 0.08^{abA}	72.39 ± 0.10^{a}
Chili and lemon out of limit	41.65 ± 0.05^{aB}	92.00 ± 0.11^{abcdA}	66.83 ± 0.12^{a}
Sweet chili pepper in limit plus diet	42.56 ± 0.08^{aA}	49.67 ± 0.06^{ef}	46.12 ± 0.09^{a}
Cheese onion in limit plus basal diet.	41.10 ± 0.02^{aA}	32.33 ± 0.05^{gA}	36.72 ± 0.08^{a}
Tandoori chicken in limit plus basal diet.	41.14 ± 0.07^{aA}	41.67 ± 0.09^{fgA}	41.41 ± 0.13^{a}
Chili and lemon in limit plus basal diet.	42.60 ± 0.07^{aA}	55.33 ± 0.08^{cdefgA}	48.97 ± 0.12^{a}
Mean	58.75^{B}	75.69^{A}	

a, b & c: Superscripts to be compared statistically within the same column. Values with different letter superscripts are significantly different (P<0.05).

A, B & C: Superscripts to be compared statistically within the same row. Values with different letter superscripts are significantly different (P<0.05).

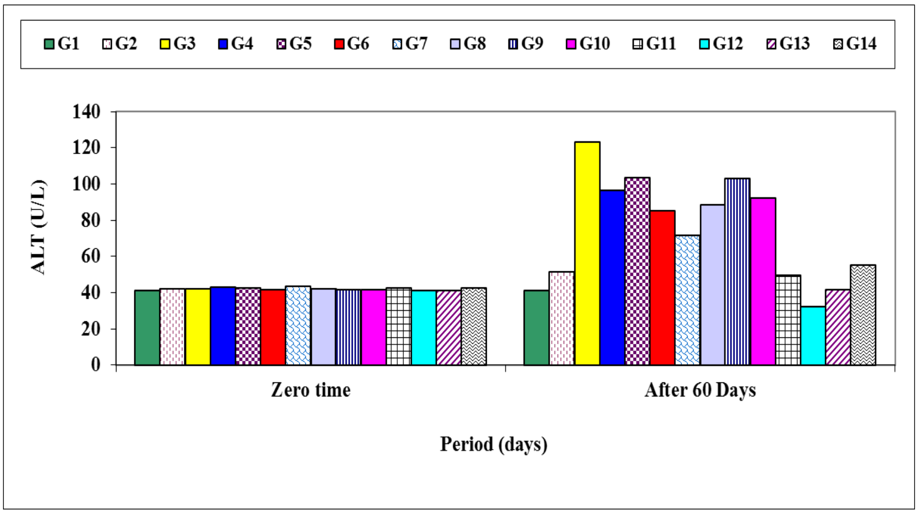

Fig (3): Effect of different diet on ALT activity (mean±SE) U/L

4.3.1.3. Effect of different diet on ALP activity

Data presented in **Table (4)** and illustrated in Fig (16) show that rats treated with cheese onion in limit and cheese onion out of limit for eight successive weeks caused significant increase in serum ALP concentration (286.33±0.33) and (272.67±0.88) respectively as compared with normal rats (100.67±0.88) while these rats when fed on tandoori chicken in limit plus basal diet, cheese onion in limit plus basal diet and chili and lemon in limit showed that significant decrease in activity of ALP (153.00±0.58), (170.67±0.88) and (175.00±1.53), respectively as compared with normal rats (100.67±0.88). SGPT or ALT (alanine transaminase) is a cytosol enzymes mainly located in hepatocytes. The level of ALT increase as a result of releasing this cellular enzyme in to plasma. AST or SGOT (aspartate transaminase) is mitochondria enzymes present in paraenchymacals released from various organs heart, liver, skeletal muscle and kidney. ALP is excreted normally via bile by the liver .The liver injury due to toxin can result in defective execration of bile by hepatocytes which are reflected as increased ALP level in serum **(Rajesh *et al.*, 2004 and Girish *et al.*, 2009).**

Table 4. Effect of different diet on ALPK activity of albino rats (mean±SE) U/L

Group	Period (days)		Mean
	Zero	After 60	
Control negative	100.50±0.03^{aA}	100.67±0.05^{eA}	100.59±0.05^{b}
Control tortilla bias chips	101.50±0.05^{aB}	197.00±0.07^{cdA}	149.25±0.08^{ab}
Sweet chili pepper in limit	103.50±0.08^{aB}	232.67±0.06^{abcA}	168.09±^{ab}
Sweet chili pepper out of limit	102.44±0.09^{aB}	212.33±0.07^{bcdA}	157.39±0.09^{ab}
Cheese onion in limit	103.63±0.06^{aB}	286.33±0.04^{aA}	194.98±0.10^{a}
Cheese onion out of limit	104.52±0.03^{aB}	272.67±0.09^{abA}	188.60±0.05^{a}
Tandoori chicken in limit	106.40±0.07^{aB}	213.33±0.08^{bcdA}	159.87±0.11^{ab}
Tandoori chicken out of limit	103.22±0.04^{aB}	184.00±0.07^{cdA}	143.61±0.05^{ab}
Chili and lemon in limit	104.50±0.08^{aB}	175.00±0.09^{cdA}	139.75±0.10^{ab}
Chili and lemon out of limit	103.22±0.09^{aB}	222.00±0.05^{abcdA}	162.61±0.08^{ab}
Sweet chili pepper in limit plus diet	105.20±0.06^{aB}	181.67±0.08^{cdA}	143.44±0.09^{ab}
Cheese onion in limit plus basal diet.	104.33±0.05^{aB}	170.67±0.09^{cdA}	137.50±0.06^{ab}
Tandoori chicken in limit plus basal diet.	102.56±0.04^{aB}	153.00±0.06^{deA}	127.78±0.07^{ab}
Chili and lemon in limit plus basal diet.	107.55±0.07^{aB}	230.67±0.09^{abcA}	169.11±0.06^{ab}
Mean	103.7346^{B}	202.2864^{A}	

a, b & c: Superscripts to be compared statistically within the same column. Values with different letter superscripts are significantly different ($P<0.05$).

A, B & C: Superscripts to be compared statistically within the same row. Values with different letter superscripts are significantly different ($P<0.05$).

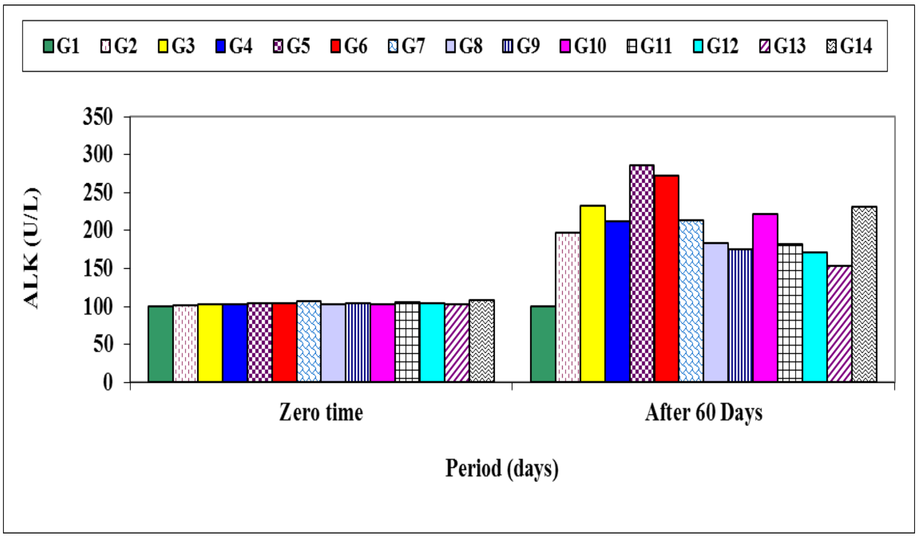

Fig. (4): Effect of different diet on ALPK activity (mean±SE) U/L

4.3.3. Effect of different treatment on albino rats kidney function:

4.3.3.1. Serum creatinine level:

Data presented in **Table (6)** and illustrated in Fig (6) show that rats treated with cheese onion out of limit, sweet chili pepper in limit, cheese onion in limit, chili and lemon out of limit, tandoori chicken in limit plus basal diet and chili and lemon in limit plus basal diet for eight successive weeks caused significant increase in serum creatinine mg/dL concentration (0.67±0.03), (0.63±0.09), (0.60±0.06), (0.60±0.06), (0.60±0.06) and (0.60±0.06), respectively as compared with normal rats (0.47±0.07). While these rats when treated by sweet chili pepper out of limit and sweet chili pepper in limit plus diet showed that significant decrease in serum creatinine (0.40±0.06) and (0.47±0.09), respectively as compared with normal rats (0.47±0.07).

Table 6. Effect of different treatment on serum creatinine level of albino rats (mean±SE) mg/dl

Group	Period (days)		Mean
	Zero	After 60	
Control negative	$0.43±0.03^{cdB}$	$0.47±0.07^{cA}$	$0.45±0.03^{def}$
Control tortilla bias chips	$0.50±0.06^{bB}$	$0.53±0.09^{cA}$	$0.52±0.05^{abc}$
Sweet chili pepper in limit	$0.40±0.06^{dB}$	$0.63±0.09^{abA}$	$0.52±0.07^{abc}$
Sweet chili pepper out of limit	$0.40±0.06^{dA}$	$0.40±0.06^{dA}$	$0.40±0.04^{f}$
Cheese onion in limit	$0.47±0.03^{bcB}$	$0.60±0.06^{bA}$	$0.53±0.06^{abc}$
Cheese onion out of limit	$0.47±0.03^{bcB}$	$0.67±0.03^{aA}$	$0.57±0.05^{a}$
Tandoori chicken in limit	$0.40±0.06^{dB}$	$0.50±0.06^{cA}$	$0.45±0.04^{def}$
Tandoori chicken out of limit	$0.60±0.06^{aA}$	$0.50±0.06^{cB}$	$0.55±0.04^{ab}$
Chili and lemon in limit	$0.40±0.06^{dB}$	$0.53±0.09^{cA}$	$0.47±0.06^{cde}$
Chili and lemon out of limit	$0.50±0.06^{bB}$	$0.60±0.06^{bA}$	$0.55±0.04^{ab}$
Sweet chili pepper in limit plus diet	$0.40±0.06^{dB}$	$0.47±0.09^{cA}$	$0.43±0.05^{ef}$
Cheese onion in limit plus basal diet.	$0.50±0.06^{bA}$	$0.50±0.06^{cA}$	$0.50±0.04^{bcd}$
Tandoori chicken in limit plus basal diet.	$0.40±0.06^{dB}$	$0.60±0.06^{bA}$	$0.50±0.06^{bcd}$
Chili and lemon in limit plus basal diet.	$0.50±0.06^{bB}$	$0.60±0.06^{bA}$	$0.55±0.04^{ab}$
Mean	$0.46±0.02^{B}$	$0.54±0.02^{A}$	

A, b & c: Superscripts to be compared statistically within the same column. Values with different letter superscripts are significantly different (P<0.05).

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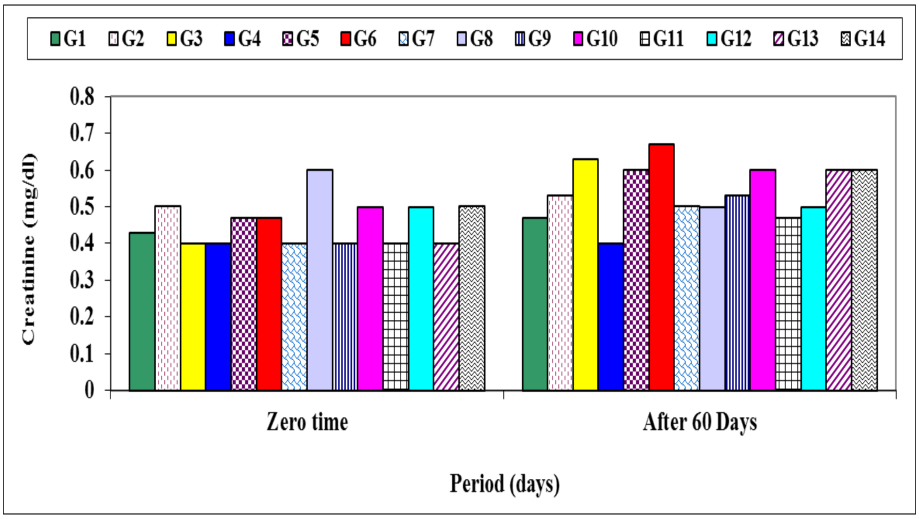

Fig. (6): Effect of different treatment on serum creatinine level of albino rats (mean±SE) mg/dl.

4.3.3.2. Effect of different treatment on serum urea level of albino rats (mean±SE) mg/dl.

Urea is the major end-product of nitrogen catabolism in human synthesized in the liver released into the blood and cleared (excreted) by kidney. change of plasma urea level are due to alteration of renal function (kidney diseases) **(Baron 1987).**

Data presented in **Table (7)** and illustrated in Fig. (7) show that rats treated with cheese onion out of limit, control tortilla bias chips and tandoori chicken in limit plus basal diet for eight successive weeks caused significant increase in serum urea mg/dL concentration (26.67±0.88), (26.00±0.58) and (26.00±0.58), respectively as compared with normal rats (22.55±0.58). While these rats when treated by tandoori chicken out of limit, tandoori chicken in limit and chili and lemon out of limit diet showed that significant decrease in serum urea concentration mg/dL (23.33±0.88), (23.67±0.88) and (23.67±0.33), respectively, as compared with normal rats (22.55±0.58).

Table 7. Effect of Ddifferent treatment on serum urea level of albino rats (mean±SE) mg/dl. (mean±SE) mg/dl.

Group	Period (days)		Mean
	Zero	After 60	
Control negative	22.67±0.33^{gB}	22.55±0.58^{cA}	22.61±0.42^{bc}
Control tortilla bias chips	26.00±0.58^{aA}	26.00±0.58^{abA}	25.43±0.37^{a}
Sweet chili pepper in limit	23.00±0.58^{gB}	26.00±1.00^{abA}	25.18±0.85^{ab}
Sweet chili pepper out of limit	23.00±0.58^{dA}	25.33±0.88^{dA}	24.17±0.48^{c}
Cheese onion in limit	23.00±0.58^{gB}	25.67±0.88^{bA}	25.16±0.76^{ab}
Cheese onion out of limit	23.00±0.58^{gB}	26.67±0.88^{aA}	25.39±0.95^{a}
Tandoori chicken in limit	24.67±0.88^{cdeA}	23.67±0.88^{cdB}	24.17±0.60^{c}
Tandoori chicken out of limit	25.67±1.86^{abA}	23.33±0.88^{dB}	23.97±1.06^{c}
Chili and lemon in limit	24.33±0.33^{deA}	24.33±1.20^{cA}	24.33±0.56^{bc}
Chili and lemon out of limit	24.00±1.53^{efA}	23.67±0.33^{cdA}	24.14±0.70^{c}
Sweet chili pepper in limit plus diet	24.00±0.58^{efB}	25.33±0.88^{bA}	25.10±0.56^{ab}
Cheese onion in limit plus basal diet.	25.00±0.58^{bcdA}	25.33±0.33^{bA}	25.10±0.31^{ab}
Tandoori chicken in limit plus basal diet.	23.33±0.88^{fgB}	26.00±0.58^{bA}	25.16±0.76^{ab}
Chili and lemon in limit plus basal diet.	25.33±0.33^{bcA}	25.67±1.86^{bA}	25.10±0.85^{ab}
Mean	24.54±0.25^{B}	24.93±0.27^{A}	

A, b: & c Superscripts to be compared statistically within the same column. Values with different letter superscripts are significantly different (P<0.05).

A, B & C: Superscripts to be compared statistically within the same row. Values with different letter superscripts are significantly different (P<0.05).

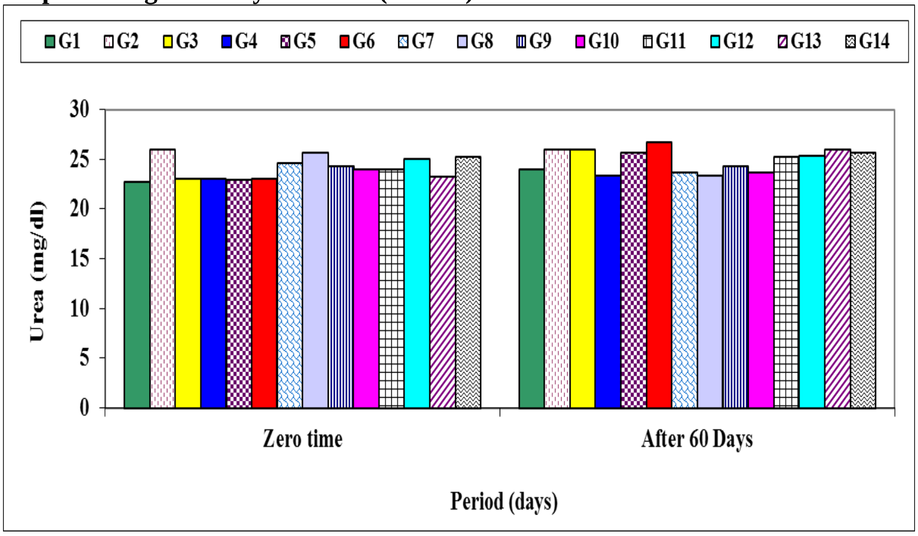

Fig. (7): Effect of different treatment on serum urea level of albino rats (mean±SE) mg/dl.

4.3.3.3. Effect of different treatment on serum uric acid level of albino rats (mean±SE) mg/dl.

Data presented in **Table (8)** and illustrated in Fig. (8) show that rats treated with chili and lemon in limit for eight successive weeks caused significant increase in serum uric acid mg/dL concentration (5.10±0.06) as compared with normal rats (3.83±0.12). While these rats when treated by tandoori chicken in limit plus basal diet, cheese onion in limit plus basal diet and chili and lemon out of limit diet showed that significant decrease in serum uric acid concentration mg/dL (2.80±0.06), (2.83±0.09) and (2.90±0.06) respectively as compared with normal rats (3.83±0.12).

Table 8. Effect of different treatment on serum uric acid level of albino rats (mean±SE) mg/dl.

Group	Period (days)		Mean
	Zero	After 60	
Control negative	3.17 ± 0.33^{iB}	3.83 ± 0.12^{cdA}	3.50 ± 0.22^{cd}
Control tortilla bias chips	3.54 ± 0.06^{cdeB}	4.03 ± 0.12^{bA}	3.78 ± 0.24^{b}
Sweet chili pepper in limit	3.61 ± 0.12^{cB}	3.90 ± 0.21^{cA}	3.75 ± 0.31^{b}
Sweet chili pepper out of limit	3.19 ± 0.06^{iB}	3.90 ± 0.12^{cA}	3.54 ± 0.19^{cd}
Cheese onion in limit	3.57 ± 0.09^{cdA}	3.57 ± 0.09^{eA}	3.57 ± 0.23^{c}
Cheese onion out of limit	3.23 ± 0.09^{hiB}	3.43 ± 0.12^{fA}	3.33 ± 0.17^{ef}
Tandoori chicken in limit	3.33 ± 0.03^{ghB}	3.53 ± 0.09^{efA}	3.43 ± 0.06^{de}
Tandoori chicken out of limit	3.44 ± 0.06^{efgA}	3.20 ± 0.06^{gB}	3.32 ± 0.06^{ef}
Chili and lemon in limit	3.37 ± 0.09^{gB}	5.10 ± 0.06^{aA}	4.23 ± 0.39^{a}
Chili and lemon out of limit	3.97 ± 0.09^{aA}	2.90 ± 0.06^{hB}	3.43 ± 0.05^{de}
Sweet chili pepper in limit plus diet	3.41 ± 0.06^{fgA}	3.13 ± 0.12^{gB}	3.27 ± 0.06^{f}
Cheese onion in limit plus basal diet.	3.83 ± 0.09^{bA}	2.83 ± 0.09^{hA}	3.33 ± 0.06^{ef}
Tandoori chicken in limit plus basal diet.	3.82 ± 0.06^{bA}	2.80 ± 0.06^{hA}	3.31 ± 0.04^{f}
Chili and lemon in limit plus basal diet.	3.49 ± 0.06^{defB}	3.73 ± 0.09^{dA}	3.61 ± 0.09^{c}
Mean	3.49 ± 0.07^{B}	3.56 ± 0.09^{A}	

A, b & c: Superscripts to be compared statistically within the same column. Values with different letter superscripts are significantly different ($P<0.05$).

A, B & C: Superscripts to be compared statistically within the same row. Values with different letter superscripts are significantly different ($P<0.05$).

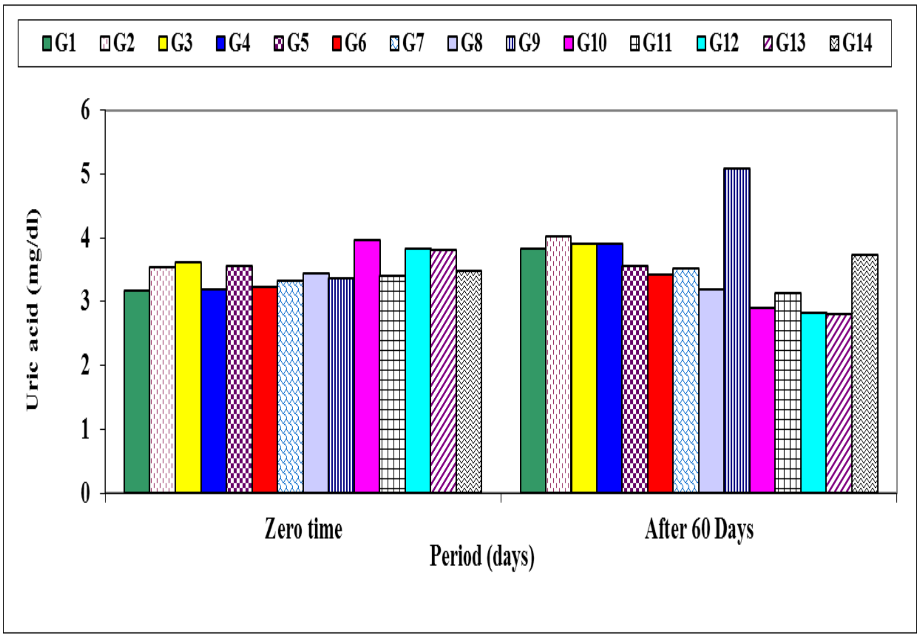

Fig. (8): Effect of different treatment on serum uric acid level of albino rats (mean±SE) mg/dl.

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دراسة كيماوية وبيولوجيه على رقائق التورتيلا

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***قسم الكيمياء الحيوية الزراعية – كلية الزراعة – جامعة بنها**

****قسم الصناعات الغذائية– كلية الزراعة – جامعة بنها**

الهدف من هذه الدراسة هو تعريف و تحديد مكونات رقائق التورتيلا وكذالك تأثير تغذية التورتيلا ومكسبات الرائحة فى المنتج النهائى وايضا بدون مكسب طعم على فئران التجارب من حيث تاثيرها على الزيادة فى وزن الجسم والأستجابة الغذائية وتقديركلا من وظائف الكبد والكلى. تم تقدير مكونات المنتج النهائي التورتيلا للنكهات الاربعة (الجبنة المتبلة, والدجاج التندورى, والفلفل الحلو, والشطه والليمون) وكان أعلى مستوى لمحتوى الرطوبة في منتج الفلفل الحلو وكانت نسبة الرطوبة ١,٧٩%، يليه منتج الشطة والليمون ، بينما كان أقل محتوى فى الرطوبة المنتج بدون اى اضافات وكانت ١,٢٠%.

- تتراوح نسبة البروتين الخام ما بين ٦,٢٥٪ الي٦,٩٧ ٪ وكانت اعلى نسبة فى منتج الفلفل الحلو واقل نسبة فى منتج الشطة والليمون. وسجل المنتج الجبنة المتبلة أعلى نسبة الزيت (٢٤,٩٢٪) في حين ,وجدت أقل كمية فى المنتج المنتج بدون اضافات مكسب طعم ورائحة (٢٢,٣٠٪).
- وتتراوح نسبة الرماد ما بين (١,٠٥٪ الي ٢,٩٤٪) وكانت اعلى نسبة فى منتج الفلفل الحلو واقل نتيجة فى المنتج بدون اى اضافات مكسبات طعم ورائحة.
- تتراوح نسبة الالياف مابين (١٢,٨١% الى ١٧,٤٤%) وكانت اقل نسبة فى المنتج بدون اى أضافات واعلى نسبة فى منتج الجبنة المتبلة ،بالأضافة الى ذلك كانت أعلى كمية لمحتوى الكربوهيدرات (٦١,١٧%) فى المنتج الشطة والليمون في حين ,وجدت أقل كمية(٥٩,٥٧ %) كانت فى المنتج بدون أى أضافات.