

PROXIMAL CHEMICAL QUALITY OF FROZEN AND FRIED CHICKEN NUGGETS AND STRIPS

H. A. Abd El-Rahman, Soad A. Soliman; Mona M. Abd EL-Wahab and Amany M. Ahmed

ABSTRACT

A total of fifty random samples of frozen Chicken Nuggets and Strips (25 packages of each) were collected from different supermarket at Ismaillia governorate for studying their proximal chemical composition. The mean values of moisture %, fat %, protein %, ash %, carbohydrate%, T.B.A mg MA/kg and meat % of frozen chicken nuggets were 55.12 %, 16.09 %, 12.03% , 1.6 % , 12.58 %, 0.88 mg MA/kg and 47.1 % respectively, while for frozen chicken stripes were 59.23 %, 1.28 %, 17.1%, 1.9%, 10.4 %, 0.8 mg MA/kg and 71.4 % respectively. The proximal chemical composition of fried chicken nuggets after deep pan oil frying (core temperature reached 75 °C) for moisture%, fat%, protein%, ash%, carbohydrate%, and calories were 48.61%, 21.2% , 13.9% , 2.5% , 14.83% and 305.72 respectively, while for fried chicken strips were 45.46%, 18.81%, 18.93%, 2.2%, 15.6% and 304.41 respectively.

INTRODUCTION

Proximate chemical composition of frozen and fried chicken nuggets and strips are the most significant factors for consumer acceptability. *Brook (1991)* claimed that fried foods contain significant amount of fats, reaching in some cases 1/3 of the total food products weight, which pose human health hazard. *Ang and Huang (1993)* stated that the thiobarbituric acid values ranged from 2.59 to 3.47 mg MA/kg for chicken patties.

Saguy and Pintus (1995) established that oil absorption occurs as moisture is removed from the food during frying and the amount of oil uptake has been shown to be directly proportional to the amount of moisture loss. He also added that the deep fat frying can affect oil absorption of battered food through several chemical and physical changes e.g. starch gelatinization, protein denaturation, and water vaporization and crust formation. *Moreira et al., (1999)* stated that frying is one of oldest process used in preparation

of foods, in many countries fried food is preferable because it retain flavor and juiciness and crispy. *Mukprasirt et al., (2001)* found that the fat contents ranged between 9.20 to 10.53 % and moisture content ranged between 56.85 to 58.82 %. The mean thiobarbituric acid values was 1.4 mg MA/kg samples at 0 day of storage *Modi et al., (2004)* evaluate the quality of chicken nuggets and the proximate composition of nuggets prepared from fresh meat was 48.7 ± 1.74 moisture %, 11.6 ± 0.32 fat %, 31.0 ± 0.95 protein % and 2.3 ± 0.08 ash %. They also mentioned that the thiobarbituric acid values increased gradually during frozen storage. *O'Sullivan et al., (2004)* reported that cooking loss decreased when salt was added to the chicken nuggets formulations, and all nuggets containing salt and polyphosphate had lower cooking loss percentage than those manufactured without salt and polyphosphate. *Egyptian Standards Specification(3493 - 2005)* stated that the chemical standards for frozen chicken nuggets were as follows: the moisture % not more than 65%, fat not more than 15%, protein not less than 12%, carbohydrates not more than 12% , thiobarbituric acid value not more 0.9 mg MA/kg and

meat percent not less than 60%. *Innawong et al., (2006)* found that the increase in frying oil temperature significantly increased the moisture loss in both crust and core ($P < 0.05$). The crust moisture contents of products fried at 175°C and 190°C were 27.24 % and 23.41% respectively. However nuggets fried at 175°C and 190°C had similar core moisture content 61.8 %, an increase in oil temperature during frying elevated the rate of dehydration of products and subsequently increased the removal of moisture, fat % increased from 23.32 % at 175°C to 25.13 % at 190°C. *El-Tahan et al., (2006)* stated that the results of examined chicken meat products purchased from local markets in Cairo city were the protein percentage ranged from 15.2 % to 15.6 % in burger, 13.3 % to 13.4 % in nuggets, 13.45 % to 16.3 % in kofta, 11.3 % to 14% in luncheon and 13.5% to 14.96 % in sausage. The fat percentage ranged from 13.61 % to 15.37 % in burger, 5.83 % to 8.02 % in nuggets, 15.2 % to 18.04 % in kofta, 4.33 % to 5.42% in luncheon and 7.18% to 9.81 % in sausage. Moisture % ranged from 58.6% to 61.3% in nuggets and the Thiobarbituric acid values ranged from 0.17 to 2.69

mg/100g in nuggets. *Kazemi et al., (2006)* stated that the moisture and fat contents are two important parameters in quality evaluation of fried chicken nuggets that the Migration of water from the food leaves pores through which the oil is absorbed by capillarity as a replacement process. As frying time increase the amount of moisture loss and fat uptake increase in fried food. *Ali and Rasool (2007)* examined the chemical and sensory characteristics of frozen chicken patties fried in three different vegetables oils (sunflower, soybean and canola), He found that the moisture%, crude protein % and crude fat % in all treatment of frying significantly affected except in ash%. The moisture % ranged from 36.82 to 40.44, crude protein % ranged from 32.78 to 34.57, the fat % ranged from 10.06 to 12.28 and ash% 2.3. *Hidalgo et al., (2008)* examined chicken nuggets fried in fresh sunflower oil at 160°C for 3 minutes, he found that the core moisture content of nuggets decreased from 72.9 % to 67.4 % and the oil content increased quickly during the first minute of frying and reached 24.0 % at the third minutes. *Qoboory (2008)* mentioned that the moisture content in fresh chicken breast meat was 73.85 %

while in breaded semi fried chicken breast was 65.34 %. The moisture content decreased in both frozen fresh and semi fried breast meat samples during freezing to 67.20 and 59 .81% respectively. Protein content in fresh chicken breast meat was 18.28 % while in breaded semi fried chicken breast was 22.43 %. The protein content decreased in both frozen fresh and semi fried breast meat samples during freezing to 16.26 and 20.53% respectively. The fat content increase with storage from 6.03 to 10.43% in fresh sample and 9.91to13.81% in breaded semi fried chicken breast samples. thiobarbituric acid values was 0.12mg MA/kg in semi fried chicken breasts at 0 time storage at -10 °c and increased to 0.353 after 12 weeks of storage.

Jackson et al., (2009) found the moisture content was 65% in case of frying and baking, protein content 22 to 25 %, fat content 5.2 to 2.8 % respectively. *Lukman et al., (2009)* found that the moisture, protein, fat, ash and carbohydrate content in nuggets were 34.71 to 56.51%, 12.52 to 16.62%, 18.14 to 25.00%, 1.20 to1.58% and 7.52 to 26.49% respectively. *Al-Dughaym and Altabari (2010)* stated that the nuggets moisture contents ranged from 61.65 to 69.99 %, protein contents ranged

from 12.58 to 14.62 %, fat contents ranged from 6.4 to 6.6 and 2.4 % ash. Thiobarbituric acid values were ranged from 0.53 to 2.09 mg MA/kg chicken nuggets. *Michael et al., (2007)* mentioned that during deep frying, moisture content is an important factor in determining oil uptake; Moisture loss creates cavities or pores as well as passageways in the food. These cavities are known as capillary pores and through them the oil penetrates during frying. So foods with high moisture content normally resulted in high oil uptake during frying process

MATERIALS & METHODS

A total of fifty random samples of frozen chicken nuggets and strips (25 packages of each) were examined raw and cooked by Frying in vegetable oil for 6 minutes until obtaining accepted dark golden yellow color at which the core temperature reach 75°C. For determination of moisture%, fat%, protein%, ash%, carbohydrate %, were carried out according to the technique recommended by (*AOAC, 2000*) ,

Thiobarbituric acid value (*Vyncke, 1970*), and the meat % by calculation.

RESULTS & DISCUSSION

The results given in table (1& 2) revealed that the mean values of moisture %, fat %, protein % , ash % ,carbohydrate%, T.B.A mg MA/kg and meat % of frozen chicken nuggets were 55.12%, 16.09%, 12.03%, 1.6%, 12.58%, 0.88 mg MA/kg and 47.1% respectively, while for frozen chicken stripes were 59.23 % , 1.28%, 17.1%, 1.9%, 10.4%, 0.8 mg MA/kg and 71.4 % respectively. The conformity of obtained chemical results as given in tables (3 & 4) of the examined frozen Chicken Nuggets samples (n =25) to the Egyptian Standards revealed that the not conformed samples were; 22(88%) ,11(44%), 9(36%), 8(32%), 3(12%) and 15(60%) for moisture, fat, protein, carbohydrate, T.B.A and meat% respectively; while for frozen chicken Strips were ; 3(12%), 0(00%), 7(28%), 5%(20%), 0(00%) and 8(32%) . From the results obtained its revealed that the frozen chicken nuggets and strips were adulterated by improper additives to the produced nuggets and strips due to large number of samples that not conformed to the Egyptian standards. Also the high percentages of not conformed samples of meat % reflect the amount and types of additives rather than the poultry meat.

The proximal chemical composition of fried chicken nuggets and strips after deep pan oil frying were for moisture, fat, protein, ash, carbohydrate, and calories were 48.61%, 21.2%, 13.9%, 2.5%, 14.83% and 305.72 respectively, while for fried chicken strips were 45.46%, 18.81%, 18.93%, 2.2%, 15.6 % and 304.41 respectively. The loss and gain values of chemical components of the frozen samples after frying at 75°C core temperature for six minutes as given in tables (5 & 6) show that the increase in fat %, protein %, ash %, carbohydrate % and calories in fried chicken nuggets and strips with the following difference percentages 31.75%, 15.50%, 56.25%, and 17.88% ; 66.75%, 10.70%, 15.78% and 48.71% respectively; and the loss of moisture percent by 11.8% and 23.24 % in chicken nuggets and strips respectively. these results were agree with those reported by *Michael et al., (2007)*, *Lukman et al., (2009)*, *Al-Dughaym and Altabari (2010)* on the other hand the calories values increased from 243.25 kcal to 305.72 kcal with increase difference calories value of 25.68% in frozen chicken nuggets and in fried chicken from 211.88 kcal to 307.41 kcal with increase kcal percent of 43.67.

CONCLUSION

From the above results we can concluded that the chicken nuggets and strips have a wide varieties of chemical composition, and therefore a lot of examined samples not conformed to the Egyptian standards. The frying process increases fat%, protein % and carbohydrate% and decrease in moisture %. The increased fat uptake and the calories values by the nuggets and strips due to frying process will pose the consumer health; this point must be taken in consideration during formulation of the nuggets with correct frying time and temperature with the moisture content of nuggets and strips. The quality of these products significantly can affect by processing, raw material and ingredient factors either from nutritional value or overall acceptability by consumers. Therefore strict supervision and periodically inspection of the meat processing factories and products should be carried out to assessment the con-formity of the product to the Egyptian standards.

Table (1): Chemical indices of frozen chicken nuggets

	Min	Max.	Mean	S.E
Moisture %	47.98	64.22	55.12	0.7
Fat %	12	19.54	16.09	0.4
Protein %	7.54	16.9	12.03	0.5
Ash %	0.5	2.5	1.6	0.1
Carbohydrate %	9.5	15.4	12.58	0.7
T.B.A	0.8	1.2	0.88	0.04
Meat %	38.8	68.5	47.1	0.8

Table (2): Chemical indices of frozen chicken Strips

	Min.	Max.	Mean	S.E
Moisture %	52.67	69.99	59.23	0.8
Fat %	8.9	13.96	11.28	0.2
Protein %	7.87	24.5	17.1	0.9
Ash %	1.2	2.9	1.9	0.1
Carbohydrate %	8.1	14.43	10.49	0.7
T.B.A	0.7	0.9	0.8	0.03
Meat %	42.6	84.5	71.4	0.5

Table (3): Conformity of chemical a result of examined frozen Chicken Nuggets samples with the Egyptian Standardization (2005)

	E.S.	Agree	Not agree		
		No.	%	No.	%
Moisture %	65	3	12	22	88
Fat %	15	14	56	11	44
protein %	12	16	64	9	36
Carbohydrate %	12	17	68	8	32
T.B.A %	0.9	22	88	3	12
Meat %	60	10	40	15	60

Table (4): Conformity of Chemical a result of examined frozen Chicken Strips with the Egyptian Standardization (ES: 2005 – 3493).

	E.S.	Agree	Not agree		
		No	%	No.	%
Moisture %	65	22	88	3	12
Fat %	15	25	100	0	0
protein %	12	18	72	7	28
Carbohydrate %	12	20	80	5	20
T.B.A.%	0.9	25	100	0	00
Meat %	60	17	16	8	32

Table (5): The mean values of chemical analysis of frozen and fried Chicken Nuggets.

Nuggets Type	Moisture %	Fat %	Protein %	Ash %	Carb. %	Calorie/ 100gm
Frozen	55.12	16.09	12.03	1.6	12.58	243.25
Fried*	48.61	21.2	13.9	2.5	14.83	305.72
Difference%	-11.8	+31.75	+15.50	+56.25	+17.88	+25.68

Table (6): Statistical analytical results of the mean values of Chemical Analysis of frozen and fried chicken Strips.

Strips type	Moisture %	Fat %	Protein %	Ash %	Carb. %	Calorie/ 100gm
Frozen	59.23	11.28	17.1	1.9	10.49	211.88
Fried*	45.46	18.81	18.93	2.2	15.6	304.41
Difference%	-23.24	+66.75	+10.70	+15.78	+48.71	+43.67

Frying completed when the core temperature reached 75°C for six min.

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الملخص العربي

دراسات على صلاحية بانية و ناجتس الدجاج المجمد

أ.د. حسنى عبد اللطيف عبد الرحمن ، د. منى محمد عبد الوهاب ، د. سعاد أحمد سليمان،
امانى مأمون أحمد

يعتبر ناجتس وبانية الدجاج من الاغذية المفضلة لدى جمهور المستهلكين لطعمها المستساغ و لقيمتها الغذائية العالية لما تحتويه من نسب عالية من البروتين و الاملاح المعدنية. ومع زيادة الاقبال عليها وتقديمها فى كل محلات الوجبات السريعة والمنازل ، كان من الواجب ان تجرى الدراسات والابحاث العلمية على تقييم جودتها ومطابقتها للمواصفة القياسية المصرية لمنتجات الدجاج المعاملة حراريا. تم جمع 50 عينة من ناجتس وبانية الدجاج المجمد (25 من كل نوع) واجريت هذه الدراسة على مرحلتين أولا الفحص المسحي الكيمائى لتحديد نسب المكونات الغذائية الرئيسية وكانت متوسط النسبة المئوية للرطوبة، والدهون، و البروتين، و الرماد، و الكربوهيدرات ، والثيوباربيتوريك اسيد كمالوندلدهايد/كجم ، ونسبة اللحم الصافى فى ناجتس و بانية الدجاج المجمد كالاتى 59.23 ± 0.7 ؛ 0.1 ± 1.6 ، 0.9 ± 17.1 ؛ 0.5 ± 12.03 ، 0.2 ± 11.28 ؛ 0.4 ± 16.09 ، 0.8 ± 1.9 ؛ 0.03 ± 0.87 ؛ 0.04 ± 0.88 ، 0.7 ± 10.49 ؛ 0.7 ± 12.58 ، 0.1 ± 1.9 ؛ 0.8 ± 47.1 ؛ 0.5 ± 71.4 على التوالي . أما الفحص التجريبي بالطهى فى زيت نباتى عميق كان متوسط النسبة المئوية للرطوبة، والدهون، و البروتين،والرماد، و الكربوهيدرات ، ونسبة اللحم فى ناجتس و بانية الدجاج المطهى كالاتى 45.46 ± 1.2 ؛ 1.1 ± 48.61 ؛ 2.2 ± 0.06 ؛ 2.5 ± 18.93 ؛ 0.7 ± 13.9 ، 0.7 ± 18.81 ؛ 0.4 ± 21.2 ؛ 0.09 ± 14.83 ؛ 0.5 ± 15.6 ، 0.9 ± 54.6 ؛ 1.1 ± 77.4 على التوالي . وذلك لتحديد تاثر المكونات الغذائية الرئيسية للمنتج بعملية الطهى .