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CHEMICAL ANALYSIS OF LOCALLY MANUFACTURED MEAT PRODUCTS

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SUMMARY

A total of one hundred and twenty random samples of sausage, minced meat, beefburger, basterma, luncheon and frarkfurter (20 samples each) were collected from different shops in Cairo and Giza Governorates and subjected to chemical analysis. The obtained results revealed that one sample each of sausage, basterma and luncheon contained nitrite more than the permissible limits. Chemical analysis of moisture, fat and sodium chloride percentages as well as correlation coeffecient and significant differences between the chemical constituents of the afore mentioned products were discussed.

INTRODUCTION

Meat products such as sausage, minced meat, beefburger, basterma, luncheon, and frankfurter are excelent food articles that contain a wide variety of easily digested nutrients, besides their high caloric value, they also supply the consumer with animal protein which is of high biological value. Moreover, they are excellent source of minerals specially phosphorus, iron and sodium.

The use of common salt in the preparation of foods is a part of a tradition going back several thousands of years, at first it was, no doubt added for flavour reasons but later its preservative effect was also recognized (Walter Vosgen, 1992). Such salts should be approximately 3 mg/kg. of meat (Shouaer and Shapris, 1952) as the nitrite salts may react with naturally tissue amines to produce N-Nitrosamines which act as a carcinogenic predisposing factor (Magee and Barnes, 1967).

The paste was used in coating basterma beside its germicidal effect. Moreover, it adds a flavour to the product and protect it from contamination (Jones, 1952). Nitrite also delays oxidative fat spoilage, while the minimum nitrite concentration needed for this purpose is not yet established as this effect is mainly seen in complex building with pro-oxidative substances in the product like iron ions.

Products made exclusively with common salt usually suffer quickly flavour breakdown, especially in finally comminuted products into which a lot of air and thus oxygen has been mixed during manufacture. On the other hand, products containing nitrite can be stored longer before undergoing any obvious breakdown in flavour (Wolf-Dietrich Mullr, 1991).

Olivant (1957) mentioned that pH6.0 or lower of raw sausage indicates fermentation while higher pH value than this limit indicates putrefaction.

The present work was conducted to determine the chemical composition and their correlations between six different types of locally manufactured meat products.

MATERIAL AND METHODS

A total of one hundred and twenty random meat product samples of sausage, luncheon, beefburger, minced meat, basterma and frankfurter (20 samples each) were collected from different shops in Cairo and Giza Governorates in sterile plastic bags and transferred directly to the laboratory and subjected to the following chemical analysis.

1- Determination of Moisture percentage according to the technique recommended by Pearson (1962).

2- Determination of fat percentage using the method recommended by Varley (1981).

3- Determination of sodium chloride percentage was carried out using the method recommended by Pearson (1962).

4- Determination of nitrite residual level using Visocolor (Test Kit for nitrite determination). Macherey - Nagel - Duren.

5- Determination of rancidity using Kreis test quantitatively according to the method recommended by Amer et al., (1975).

6- Determination of pH value according to Dodge and Stadelman (1960).

The results obtained were statistically analysed by using "t" test and correlation coefficient according to Snedecor (1969).

RESULTS AND DISCUSSION

From the results achieved in table (1). It can be concluded that the mean±SE of moisture, fat, sodium chloride and nitrite contents were 53.8±2.2%, 18.7±0.68%, 2.09±0.095% and 112.8±10.5 ppm of the examined sausage samples respectively. In meat products. the relations between moisture on one hand and fat and sodium chloride on the other hand were inverse. These inverse correlations were more prominant between moisture and fat (r= -0.377) in minced meat as well as between moisture and sodium chloride (r=-.43) in sausage and (r=-.518) in luncheon (Fig. 1). These findings agree with that reported by Sawyer (1975) who found that the mean value of moisture and fat percentages of examined sausage samples were 53% and 17% respectively. In this respect, El-Zalaki (1965) concluded that moisture%, fat% and sodium chloride% ranged from 29.61 -66.52, 8.15-40.24% and 1.29-3.13%. These findings are consistant with that reported in the present investigation, while Sadek (1963) found that moisture and fat percentages were 49.11 and 31.43 respectively. Palumbo et al., (1979) recorded that fat% was 18.8%. This result agree with that reported in the present investigation, while lower limit was recorded for moisture% (49.1%). On the other hand, Abdel-Aziz (1979) and Acton and Dick (1976) found that the average moisture % was 43.9% and 46.34% respectively. Higher findings were reported by Amer and Khalafala (1991) (245.4 ppm nitrite) and Abdel-Aziz (1979) (38.04% fat).

Concerning examined samples of basterma, the mean+SE of moisture%, fat%, sodium chloride%, and nitrite (ppm) were 50.1±2.1, 4.88±0.31, 9.4±0.49 and 112±9.97 respectively. Youssef et al., (1966) found that the average sodium chloride percentage of examined basterma samples reanged from 7.98 - 9.26%. These limits are in agreement with that reported in the present investigation . Ilwer findings were reported by Kotzekidou (1990) who found that the average sodium chloride was 6%. The author could detect 100 ppm nitrite in the examined samples. Moreover, Youssef et al., (1966) found that moisture% was ranged from (25.13 - 32.13%), while higher findings were recorded for fat% (15.25 - 19.36%). In this respect, higher limits for moisture, fat and sodium chloride percentages were recorded by El-Banna (1974) (56.01, 15.45 and 13.66) respectively. Daoud (1967) found that moisture, fat and sodium chloride percentages were 46.38, 14.38 and 13.39 respectively. Moreover, Amer and Khalafala (1991) and could detect 261.1 ppm nitrite in the examined basterma samples.

Regarding luncheon and frankfurter samples, the mean±SE of the afore mentioned constituents were 46±1%, 48.6±1.4%, 19.4±0.57%, 18.4±0.48%, 2.36±0.17%, 2±0.04%, 137.6±2.4 ppm and 100.5±3.4 ppm reepectively. These results are coincides with that reported by El-Razaz (1976) who found that the average sodium chloride% and nitrite (ppm) of examined luncheon samples were 2.713 and 97.0 respectively. Moreover, Jacobs (1951) found that moisture and fat percentages were 52.9 and 15.9 respectivley. Higher findings were reported by Amer and Khalafala (1991) (234.6 ppm nitrite) in examined luncheon samples. Sawyer (1975) found that examined frankfurter samples contained 54% moisture and 14% fat. The most desirable external and intrnal cured color and firmest texture was in frankfurter containing 100

Table (1):Incidence and correlation of chemical analysis of different meat products.
Product Moisture% Fat% Nacl% nitrite (ppm) Rancidity pH .

Product	Moisture	Fat %	Nac 1%	Nitrite (ppM)	Rancidity	PH
Sausage						
Min	40	15	1.5	88	0.069	5.6
Max	60	22	2.6	200*	0.082	6.1
Mean±S.E	53.8±2.2	18.7±0.68	2.09±0.095	112.8±10.5	0.076±0.002	5.86±0.045
r		0.168	-0.430			
Basterma						
Min	42	3	6	100	0.065	0
Max	60	6	13.4	200*	0.075	0
Mean+S.E.	50.1±2.1	4.88±0.307	9.4±0.49	112±9.97	0.071±0.001	0
r		0.402	0.211			
Luncheon						
Min	40	14.5	1.8	80	0.068	5.6
Max	50	21	3	333*	0.081	5.9
Mean+S.E.	46.0±1.0**	19.4±0.57	2.36±0.17**	137.6±2.4	0.074±0.001	5.7±0.036
r		0.151	-.518			
Frankfurter						
Min	44	17	1.8	80	0.068	5.4
Max	55	20	2.3	125	0.079	5.9
Mean+S.E.	48.6±1.4	18.4±0.48	2.0±0.04	100.5±3.4	0.073±0.001	5.69±0.06
r		0.044	-0.142			
Minced meat						
Min	60	17	0.7	0	0.069	5.6
Max	70	21	1.3	0	0.08	6.2
Mean+S.E.	65.6±1.2	14.4±0.37	0.96±0.05	0	0.074±0.001	5.91±0.047
r		-0.377	0.044			
Beef burger		14	1.2	0	0.062	5.6
Min	30	20.8	2.3	0	0.083	6.0
Max	61	18.9±0.67	1.82±0.10**	0	0.074±0.002	5.80±0.041
Mean+S.E.	51.5±3.0*	0.095	0.716			
r						

* Siginificant at (p<0.001) * One sample only r= Correlation coefficient

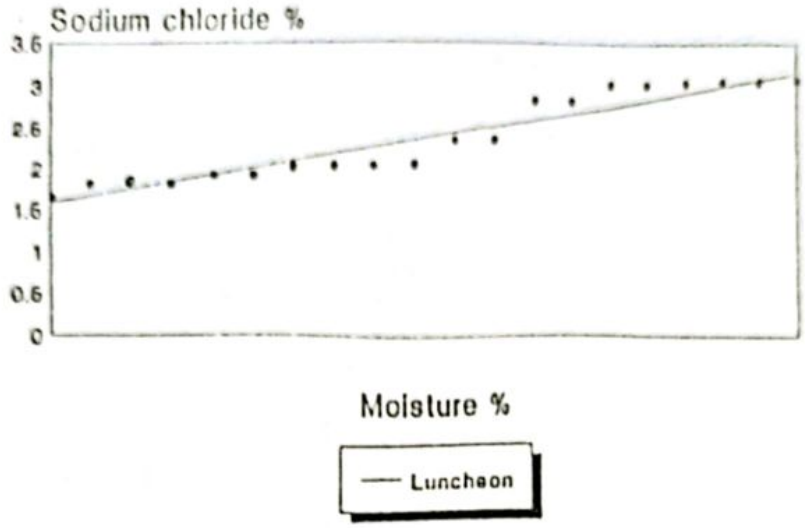

Fig. 1
P <0.001 N = 20 r = -.8184

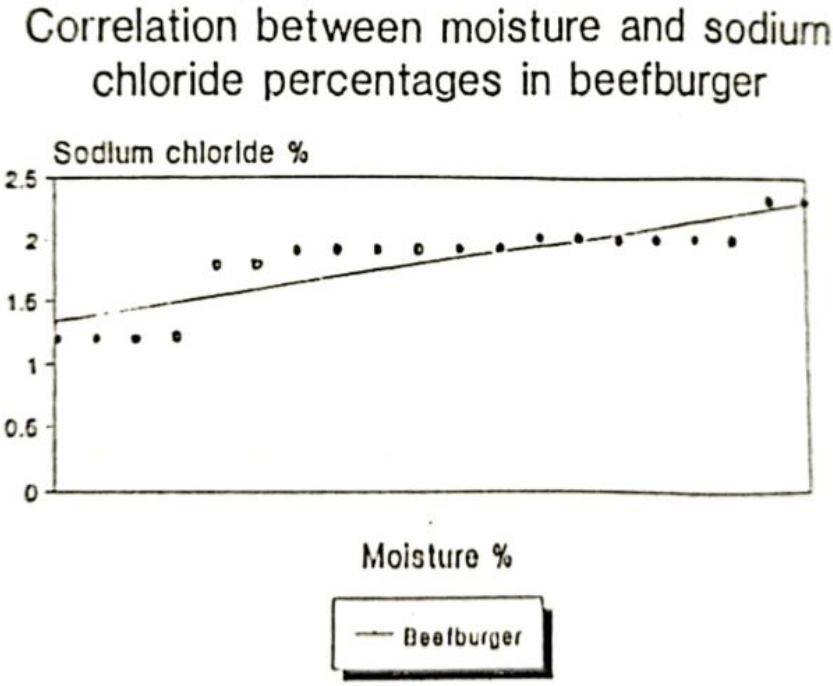

Fig. 2
P <0.001 N = 20 r = .7168

ppm. nitrite. This substantiates the findings reported by Terell et al., (1981).

Table (1) illustrates the mean±SE of moisture, fat and sodium chloride percentages of examined minced meat samples, they were 65.6±1.2, 14.4±0.37 and 0.96±0.05 respectively. Weak and direct correlations were noticed between moisture and fat percentages (r= 0.168, 0.095, 0.402, 0.151 and 0.044) in sausage, beefburger, basterma, luncheon and frankfurter respectively, while such correlations were 0.044, and 0.211 between moisture and sodium chloride in minced meat and basterma respectively. However, the correlation coefficient was stronger in sausage, beefburger and luncheon for sodium chloride than those of other products, while in basterma samples, the corrlation coefficient between moisture and fat percentages was higher than the other products. Elmossalami and Roushdy (1973) found that the minimum, maximum, and mean±SE sodium chloride percentage of examined minced meat samples were 0.13, 0.79 and 0.487±0.016 respectively. They concluded that although there is no state regulations concerning the addition of sodium chloride in the manufacture of minced meat in our country, yet the salt is internationally added to retard and mask undesirable changes in the product. On the other hand, the examined beefburger samples showed that the mean±SE of moisture% was (51.5±3), fat% (18.9±0.67) and sodium chloride% (1.82±0.1). Strong and direct correlation were emphasized for moisture and sodium chloride percentages in beefburger than the other products and it was graphically shown in (Fig. 2) with correlation coefficient (r=0.716) Hefnawy (1980) concluded that the examined samples of beefburger contained14.82% fat. This substatiates the findings in the present investigation, while the same samples contained higher moisture% (63.51) and lower sodium chloride% (0.99). Moreover, Amer and Khalafala (1991) could detect 239.6 ppm nitrite in the examined beefburger samples.

Examined minced meat and beefburger samples were nitrite free. In this respect, Elmossalami and Roushdy (1973) failed to detect nitrite from the examined minced meat samples. This substantiates the findings in the pressent investigation.

Only one sample each of sausage, basterma and luncheon contained nitrite more than the permesible limits. Concerning rancidity, the lower limit was detected in the exmained basterma samples, it was 0.071±0.001, while higher limit was detected in examined sausage samples, it was 0.076±0.002. The mean±SE limits of other products were ranged from 0.073±0.001 to 0.074±0.002.

Concerning the optical density limits for acceptance, it was stated by Amer et al., (1975) that optical density >0.085 indicates signs of fat rancidity and considered unaccepted. Moreover, Oxidation of unsaturated fatty acids leads to the formation of free radicals, peroxides, aldehydes, acids, ketohydroxy and epoxy compounds and the oxidation of fat is due to tissue enzymes or autooxidation. This substantiates the findings reported by Buttkus (1967).

The obtained results showed that the mean±SE of pH value of examined products were ranged from 5.69±0.06 to 5.91±0.047. These findings agree with that reported by Darwish et al., (1986) who found that the mean pH values±SE of the examined minced meat and beefburger samples were 5.88±0.14 and 5.96±0.16 respectively. In this respect, Olivant (1957), Elmossalami and Roushdy (1973) and Palumbo et al., (1979) found that the pH value of examined sausage and minced meat samples were ranged from 5.8 to 6.02. This substantiates the findings in the present investigation.

From the obtained results, it can be concluded therefore that the chemical composition of each type of the studied meat products show a large difference in various samples of each type, this can be easily observed from the standard error of each constituent.

To safeguard consumers from the toxic effect of nitrite salts which may be present in meat products. Food regulations concerning nitrite addition to meat products should be applied.

Moreover, in order to assure safety and quality of the products, strict hygienic measures should be monitored during manufacturing, handling, distribution and storage of meat products.

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