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SOME CHEMICAL AND MYCOLOGICAL EXAMINATIONS OF MEAT AND FISH PRODUCTS

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SUMMARY

A total of 240 samples of fish and meat products were collected from Giza and Cairo supermarkets and examined for mycological profile, moisture and sodium chloride contents. The mean values of mould count, moisture and sodium chloride contents in fish products dried sea cucumber, dried shrimp, smoked fish and canned tuna were $3.1x10^3$, 6.1, 4.8; $2.6x10^3$, 6.6, 3.3; $2.1x10^3$ 54.1, 4.6 and $1.3x10^3$, 67.9, 2.4; while the mean value of mould count, moisture and sodium chloride contents in meat products, luncheon, sausage, basterma and corned beef were $5.5x10^4$, 53.06, 3.36; $1.9x10^3$, 46.7, 2.78; $3.1x10^2$, 55.6, 6.5 and $8.7x10^2$, 57.76, 2.7, respectively. The public health importance of mould was discussed.

INTRODUCTION

Fungi are widely distributed in nature and could grow over a wide range of temperatures. They are considered a major factor in the spoilage of fish and meat products which lead to great economic losses, besides they constitute public health hazard due to production of wide variety of mycotoxins. Therefore, the mycological evaluation of different types of fish and meat have been a concern of many investigators for several years. The growth and temperature relationship of the fungi varies widely. The optimum temperature for growth of most fungi lies between 25 and 30°C. Many species fail to develop above 30°C, but a few have their optimum above this temperature (Hersom and Hulland, 1980).

Aspergillus fumigatus can exist at temperature above 50°C, although spore formation and optimum growth occur at 40°C. The lower limit for growth varies but development of some species such as *Cladosporium herbarum* takes place at about - 6°C. the fungi also show considerable variations in their resistance to heat temperature. Spores are generally slightly more resistant to heat than vegetative cells but are not nearly so resistant as bacterial spores. Some species are destroyed by long exposure to temperatures over 30°C and most species are destroyed by 30 minutes heating at 65°C (Hersom and Hulland, 1980).

The mould can grow in the presence of high concentration of salt or sugar in the food (Refai and Sadek, 1968). The growth of fungi was strongly delayed by addition about 0.05 to 0.1% sorbic acid in the brining process, while the nitrate and nitrite are used in meat and fish curing. Nitrate has little antimicrobial effect and in most applications could be replaced by lower concentrations of nitrite (Skovgaard, 1992).

The objectives in this study are to define the mycological attributes of some meat and fish products with correlation to their moisture and sodium chloride content.

MATERIAL AND METHODS

A total of 240 samples of fish and meat products were collected from Giza and Cairo supermarkets, 30 of each smoked fish, dried shrimp, dried sea cucumber, tuna, basterma, luncheon, oriental sausage, and corned beef.

The samples were transported to the laboratory under aseptic conditions without delay to be subjected to the following examinations:

1- Preparation of samples were done as described in APHA (1992)

2- Determination of salt and moisture contents:

The determination of sodium chloride and moisture contents were carried out according to AOAC (1990).

3- Mycological examination:

a- Enumeration of the total mould count:

Total mould counts were adopted by the technique recommended by Mislivec et al. (1992).

b- The identification of mould genera and species was adopted according to Raper and Fennel (1965) for the members of the *genus Aspergillus*, and Raper and Thom (1949) for penicillium and other genera according to Zyeha et al. (1963) and Al-Doory (1980).

RESULTS

Fish and meat products are widely consumed by Egyptians as some of them are easily prepared and rich in protein content. The products may be contaminated with moulds due to the absence of hygienic measures during processing and storage of the products.

Table (1): Moisture and sodium chloride contents of different products.

Parameter	Moisture content %			Sodium chloride %		
Products	Min.	Max.	Mean ±SE	Min.	Max.	Mean ±SE
Dried sea Cucumber	5.1	7.9	6.1±0.13	3.2	5.5	4.8±0.10
Dried shrimp	5.7	8.2	6.6±0.12	2.5	5.8	3.3±0.08
Smoked fish	50.6	62.6	54.1±0.37	2.8	6.8	4.6±0.15
Canned tuna	66.4	70.1	67.9±0.23	2.3	2.8	2.4±0.02
Luncheon	44.7	60.4	53.06±1.26	1.8	3.8	3.36±0.13
Oriental sausage	41.1	62.5	46.7±0.67	2.0	3.9	2.78±0.10
Basterma	49.2	64.2	55.6±0.88	5.1	8.4	6.5±0.19
Corned beef	54.1	64.9	57.76±0.67	2.2	3.6	2.7±0.07

Table (2): Mould counts in different products

Parameter / Products	Min.	Max.	Mean ±SE
Dried sea Cucumber	$5.5x10^2$	$6.8x10^3$	$3.1x10^3 \pm 4.2x10^2$
Dried shrimp	$5.2 x10^2$	$6.5x10^3$	$2.6x10^3 \pm 3.7x10^2$
Smoked fish	$4.5x10^2$	$4.3x10^3$	$2.1x10^3 \pm 5.1x10^2$
Canned tuna	$<10^2$	$3.8x10^3$	$1.3x10^3 \pm 2.5x10^2$
Luncheon	$<10^2$	$6x10^3$	$1.8x10^3 \pm 3.1x10^2$
Oriental sausage	$<10^2$	$11x10^4$	$1.9x10^3 \pm 6x10^2$
Basterma	$<10^2$	$9x10^3$	$3.1x10^2 \pm 1.2x10^2$
Corned beef	$<10^2$	$3.8x10^3$	$8.7x10^2 \pm 2.1x10^2$

Table (3): Type and number of isolates of examined fish and meat products

Isolates	Number of isolates							
	Dried sea cucumber	Dried shrimp	Smoked fish	Canned tuna	Basterma	Oriental sausage	Luncheon	Corned beef
Aspergillus flavus	6	5	7	4	5	5	4	2
A. ochracus	12	1	3	2	3	1	2	1
A. fumigatus	2	2	4	2	3	1	1	0
A. niger	8	7	9	6	5	6	3	1
Penicillum spp.	12	10	15	9	8	10	11	4
Mucour spp.	6	5	7	5	3	2	4	1
Fusarium spp.	10	9	12	8	0	0	1	0

Table (4): Correlation coefficient between products and both of moisture and sodium chloride contents

Product	Moisture	NaCl
Dried sea Cucumber	0.95	-0.94
Dried shrimp	0.49	-0.69
Smoked fish	0.79	-0.44
Canned tuna	0.67	-0.44
Luncheon	0.53	0.87
Oriental sausage	0.87	0.88
Basterma	0.93	0.86
Corned beef	0.92	-0.63

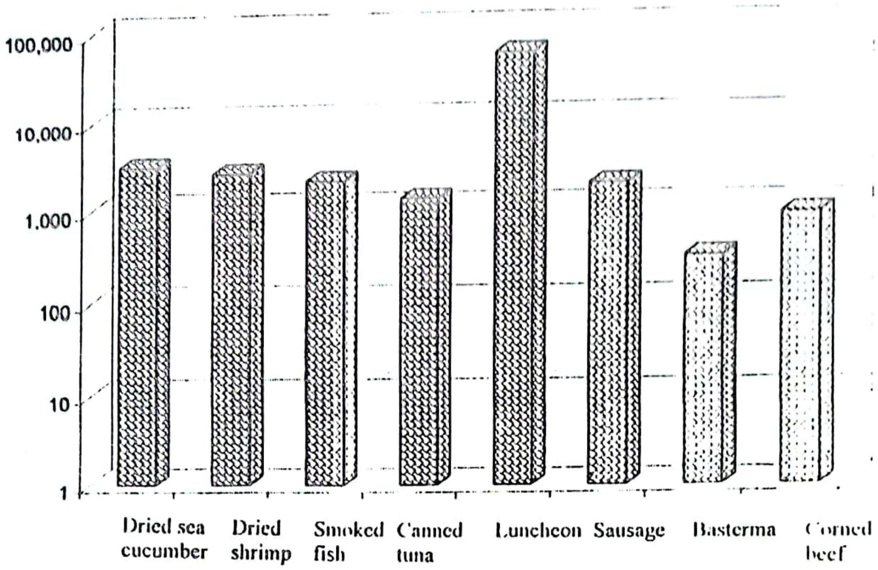

Fig. (1): Mean of mould count of the examined samples.

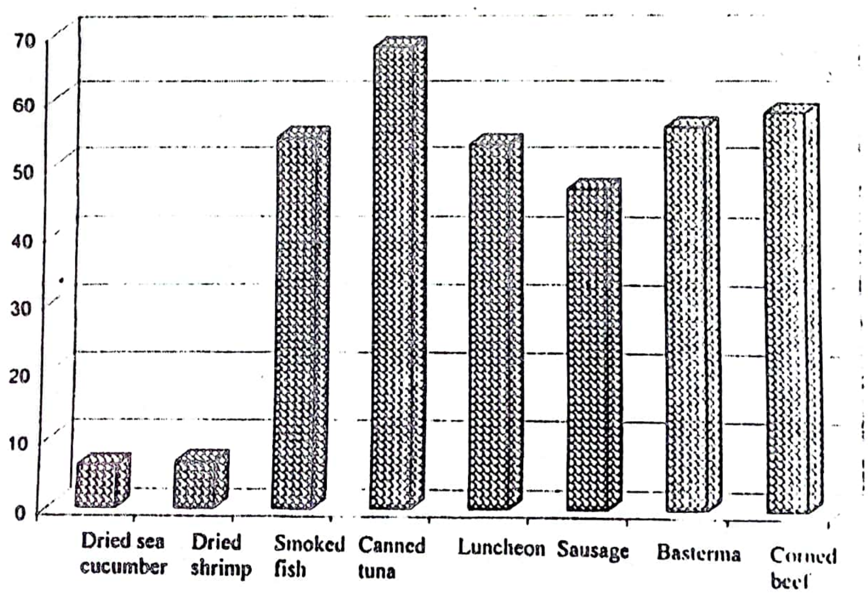

Fig. (2): Mean moisture percent of the examined samples

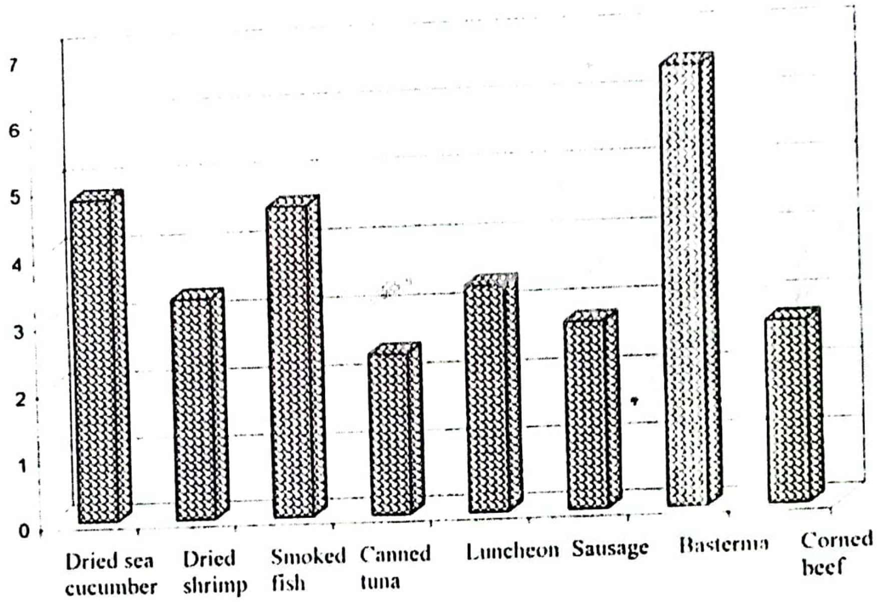

Fig. (3): Mean sodium chloride percent of the examined samples.

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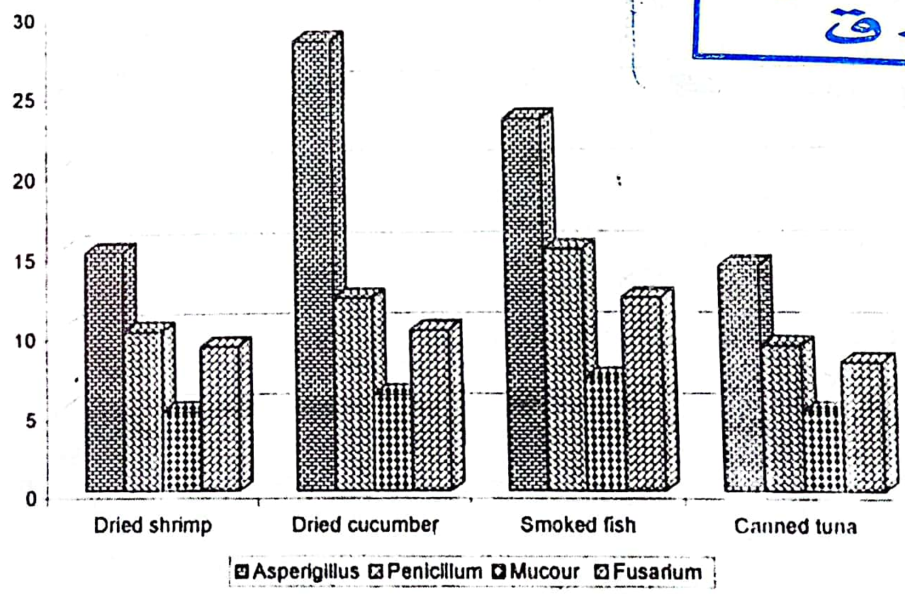

Fig. (4): Type and percent of mould isolates of examined fish products.

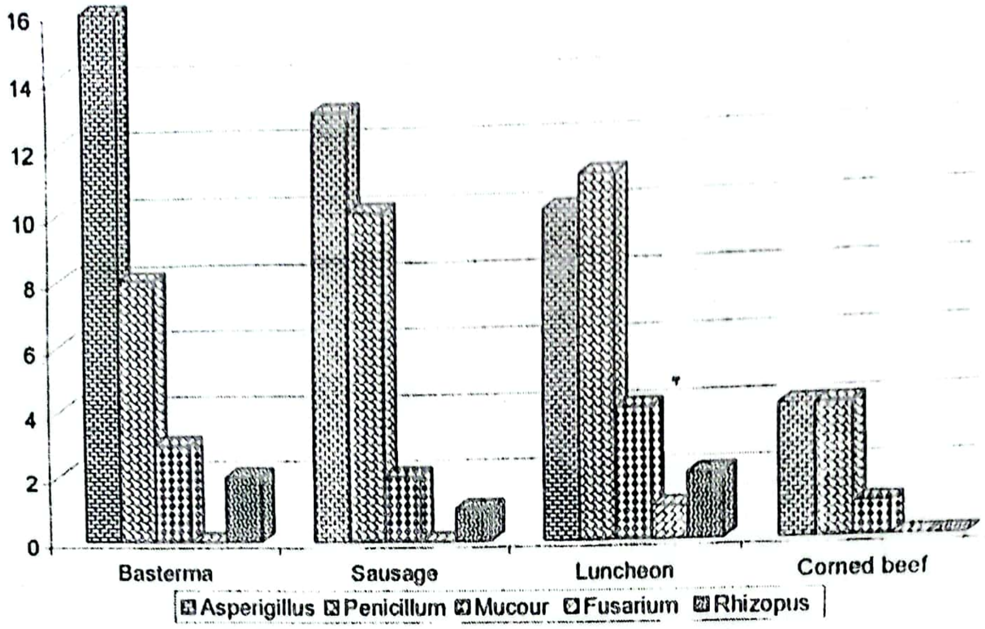

Fig. (5): Type and percent of mould isolates of examined meat products.

DISCUSSION

The variation in quantitative estimation of mould count were attributed to the degree of hygienic measures conducted during preparation of the products and the quality of used additives Hersom and Hulland, 1980).

The recorded results in table (1) revealed that the mean value of moisture percent of dried sea cucumber, dried shrimp, smoked fish, canned tuna, luncheon, oriental sausage, basterma and corned beef were 6.1, 6.6, 54.1, 67.9, 53.06, 46.7, 55.6 and 57.76 while sodium chloride percent of the same products were 4.8, 3.3, 4.6, 2.4, 3.36, 2.78, 6.5 and 2.7, respectively.

Table (2) represented the mean values of total mould count of dried sea cucumber, dried shrimp, smoked fish, canned tuna, luncheon, oriental sausage, basterma and corned beef were $3.1x10^3$, $2.6x10^3$, $2.1x10^3$, $1.3x10^3$, $1.8x10^3$, $1.9x10^3$, $3.1x10^2$, $8.7x10^2$, respectively.

The results of smoked fish are approximately similar to the results obtained by Lu et al. (1988) and lower than that obtained by Edris (1996).

The results obtained for luncheon are nearly similar to that recorded by Abdel-Rahman et al. (1984) and slightly higher than that obtained by El-Gazzar (1995), Aiedia (1995) and Nouman et al. (2001).

The results of oriental sausage are agreed with the obtained by Aiedia (1995) and Nouman et al. (2001).

The results of basterma are approximately similar to the results obtained by Aiedia (1995) and Nouman et al. (2001).

The higher incidence of moulds in luncheon samples were attributed to the use of different untreated food additives and spices which may be the main source of mould contamination in meat products (Hadlok, 1970 and Abdel-Rahman, 1985). The lower incidence of moulds in basterma and sausage were attributed to the lower water activity (aw) in these products and presence of garlic.

The results recorded in Table (3) declared that the mould genera could be identified in the examined fish products. The most predominant species were Asprigillus and Pencillium. The results of mould identification in Table (3) agreed with the results obtained by Edris (1996), Lu et al. (1988), Shank et al. (1972), Bacon (1973), Ito and Abu (1985) ; Jansyn and Lahai (1992) and Wheeler and Hocking (1993).

Table (3) represented that 5 mould genera could be identified in the examined meat product samples, the most predominant mould genera in meat products were Asprigillus and Pencillium. The results obtained in Table (3) agreed with the results obtained by Fiedler (1973), Hadlok (1970), and Abdel-Rahman et al. (1984)

Table (4) illustrated the correlation coefficient between mould count and both of moisture and sodium chloride contents in fish and meat products. There is direct proportion between mould count and moisture content in smoked fish, dried sea cucumber and canned tuna, while it is low in dried shrimp.

There is inverse proportion between mould count and sodium chloride content in dried sea cucumber and dried shrimp.

However, there is direct proportion between mould count and moisture in sausage, basterma and corned beef. While there is direct proportion between mould count and sodium chloride content in sausage, basterma and luncheon. There is inverse proportion between mould count and sodium chloride content in corned beef.

Moreover, there are significant difference in mould count between basterma and corned beef.

Some strains of moulds could produce harmful toxins which cause fish and meat unpalatable taste, unfit for human consumption and increased economic losses. Human diseases have also been shown to be due to the ingestion of fungal metabolites, there is some evidence that aflatoxins are involved to some degree in primary liver cancer in humans (Sen and Lahiry, 1964; Wogan, 1973 and Line et al. 1994). The consumption of mycotoxin contaminated foods have been associated with several cases of human poisoning (Krogh, 1992) and it may have a role in etiology of esophageal cancer (Yoshizawa et al. 1994).

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