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دراسة من الفطريات والخمائر الموجودة في منتجات اللحوم

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تتميز الفطريات بقدرتها على تحمل الظروف المختلفة من حيث احتياجاتها الغذائية ، وكذلك الظروف البيئية المحيطة بها ، ولهذا تأثير كبير فيما تسببه من مشاكل في منتجات اللحوم سواءً ما تسببه من فساد للمنتج أو تكون نكهات غير مرغوبة أو الأضرار بصحة المستهلك ، ولذا أجريت هذه الدراسة على ٦٠ عينة من منتجات اللحوم عشرون عينة من كل من اللحم المفري واللانشون والبسترمال التي جمعت من أماكن البيع في مدينة أسيوط لعزل وتصنيف ما بها من فطريات وخمائر وكان متوسط العدد الكلي للفطريات ١٠ x ٣١٠ بينما كان متوسط العدد الكلي للخمائر ٤٦ x ٣١٠ ، وقد تم تصنيف الفطريات والخمائر المعزولة من منتجات اللحوم .

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MYCOLOGICAL QUALITY OF MEAT PRODUCTS IN EGYPT
(With 4 Tables)

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SUMMARY

60 samples of meat products 20 each of minced meat, luncheon and basterma were collected from Assiut City market and subjected to mycological examination. The total mould count per gram of examined samples of meat products ranged from 110 to 100×10^3 with a mean value of 10×10^3 , while the total yeast count was 80 to 150×10^3 with a mean value of 46×10^3 .

The isolated mould genera were *Penicillium*, *Aspergillus*, *Mucor*, *Geotrichum*, *Cladosporium* and *Fusarium*, *Penicillium* and *Aspergillus* were the most predominant genera. Moreover, the genera were further identified into *P. verrucosum* var. *cyclopium*, *P. verrucosum* var. *verrucosum*, *P. citrinium*, *P. digitatum*, *P. waksmani*, *P. italicum*, *P. granulatum*, *P. chrysogenum*, *P. brevicompactum*, *P. claviformi* and *P. expansum*, while the genus *Aspergillus* into the spp. *A. niger*, *A. flavus*, *A. fumigatus*, *A. sodywii*, *A. terreus*, *A. candidus*, *A. repens* and *A. amstelodami*. The isolated yeast genera were *Debaryomyces* with the spp. *D. nicotianae*; *D. klockeri*, *D. hansenii*, *D. subglobosus* and *D. vini*; *Torulopsis* with the spp. *T. etchellsii*, *T. glabrata* and *T. candida*; with the spp. *C. deformans*, *C. zeylanoides*, *C. pseudotropicalis*, *C. pilliculosa*, *C. parapsilosus*, *C. tropicalis* and *C. krusei*; *Saccharomyces* with the spp. *S. cerevisiae*, *S. fragilis* and *S. unisporus*; *Trichosporon* with the spp. *T. fermentans* and *Rhodotorula* with the spp. *Rh. aurantiaca* and *Rh. mucilaginosa*.

INTRODUCTION

Mould and yeast are of ubiquitous distribution and regarded more or less a source of contamination of meat and meat products which lead to spoilage and/or of food borne mycotoxicosis. The significance of such contamination in relation to meat and meat products is intensively discussed by various authors; ABDEL-RAHMAN (1981), BOJARSKI (1974), BEUCHAT (1978), BUSBY and WOGAN (1979), EMPY and SCOTT (1939), KROGH and HASSELLAGER (1968), MOSSEL (1977), SCHIRREN (1963) and ROLLE and KOLB (1954). The aim of this work is to throw light on the mycoflora content of meat products of public health importance reflecting the sanitation degree during preparation of the slaughtered carcasses, processing and handling of meat products.

MATERIAL and METHODS

Mycological studies and identification of the isolates were carried out according to; A.O.A.C. (1975), ARX (1967-1972), ARX *et al.* (1977), BARNETT and HUNTER (1972), KULIK (1968), LODDER and KREGER (1952), LODDER (1971) RAPER and THOM (1949) RAPER and FENNELL

(1965), SAMSON *et al.* (1976), SAMSON (1979) and ZYCHA *et al.* (1969).

RESULTS

The results were tabulated in tables 1, 2, 3 and 4.

DISCUSSION

Results given in table (1) revealed that the total mould count/g of examined samples of minced meat, luncheon and basterma lied between 8×10^3 to 100×10^3 , 110 to 63×10^3 and 350 to 43×10^3 with a mean value of 27×10^3 , 92×10^3 and 140×10^3 respectively, while the total yeast count/g lied between 8×10^3 to 150×10^3 ; 80 to 40×10^3 and 15×10^3 to 150×10^3 with a mean value of 98×10^3 ; 97×10^3 and 310×10^3 in minced meat, luncheon and basterma respectively. Six genera each of mould and yeast could be isolated from the examined meat products. The No. frequency percentage of the isolated mould genera given in table (2) revealed that the predominant mould genera were *Penicillium* spp. 78 (64.5%), 166 (76.2%) and 88 (47.8%); *Aspergillus* spp. 15 (12.4%), 42 (19.3%) and 46 (25.0%); *Mucor* spp. 5 (4.1%), 2 (0.9%) and 20 (10.9%) in examined samples of minced meat, luncheon and basterma respectively, *Geotrichum* spp. 14 (11.6%) and 4 (1.8%) from minced meat and luncheon; *Cladosporium* spp. 4 (1.8%), 30 (16.3%) from luncheon and basterma, while the *fusarium* spp. could be isolated only from minced meat 9 (7.4%).

These findings were in agreement with those reported by FRANK (1967), HADLOK (1972), HADLOK and SCHIPPER (1974), HADLOK *et al.* (1975), JAY (1978), LEISTNER *et al.* (1965), LEISTNER and AYRES (1967 b).

The number and frequency percentage of predominant yeast genera as given in table (2) revealed that *Debaryomyces* 82 (37.9%), 60 (54.5%) and 60 (38.7%); *Torulopsis* 30 (13.9%), 20 (18.2%) and 20 (12.9%) *Candida* 22 (0.2%), 10 (9.1%) and 30 (19.4%) in minced meat, luncheon and basterma respectively; while *Sacharomyces* and *Rhodotorula* spp. could be isolated from minced meat and basterma in No. and percentage of 17 (7.8%), 15 (9.6%), 25 (11.6%) and 30 (19.4%) respectively. Moreover, *Trichsporen* spp. with 40 (18.6%) and 20 (18.2%) could be isolated from minced meat and luncheon. These findings were similar to those reported by AYRES (1960), HADLOK (1972-1977), HESSEL-SCHMAL-FUSS (1976), JAY (1978) and LEISTNER and BEM (1970).

The predominant spp. in minced meat were *p.verrucosum* var. *cyclopium* 40 (33.0%) *P.verrucosum* var. *verrucosum* 23 (19.0%) *P.citrinum* 7 (5.8%) *P.digitatum* 4 (3.3%) *P. funiculosum* and *P.waksmanni* with 2 (1.7%); the *Penicillium* spp. which could be isolated and identified from luncheon were *P.verrucosum* var. *cyclopium*, *P.chrysogenum*, and *P.waksmanni* in No. and percentage of 85 (39.0%), 25(11.5%), 20(9.2%), 11(5.0%), 10(4.6%) 9(4.1%) and 6(2.8%) respectively; while in basterma the following *Penicillium* spp. could be isolated; *P.granulatum*, *P.citrinum* *P.brevicomactum*, *P.verucosum* var. *cyclopium*, *P.verrucosum* var. *verrucosum*, *P.italicum* *P.claviformi* and *P.chrysogenum* in No. and percentage 28(31.8%), 16(18.1%), 11(12.6%), 7(7.9%), 7(7.9%), 2(2.3%), 1(1.3%) and 16 (18.1%), respectively.

The No. and frequency percentage of the identified *Aspergillus* spp. which isolated from minced meat were *A.niger*, *A.flavus*, *A.fumigatus* and *A.sodywii* in No. and percentage of 8(6.6%) 3(2.4%), 2(1.7%) and 2(1.7%); from luncheon *A.niger*, *A.flavus* and *A.sodywii* in No. and percentage of 11 (5.0%), 20(9.3%) and 11(5.0%); and from basterma *A. niger*, *A.flavus* *A.terreus*, *A.candidus*, *A.amstelodami* and *A.repens* in No. and percentages of 19 (41.3%), 15(32.6%), 2(4.4%), 3(6.5%), 5(10.8%) and 2(4.4%) respectively. These findings nearly agreed with those reported by BÖSENBERG and EBERHARDT (1969), JAY (1978), LEISTNER *et al.* (1965) and LEISTNER and AYRES (1967 b).

MYCOLOGICAL QUALITY OF MEAT PRODUCTS IN EGYPT

The 6 yeast genera which included 21 species and could be isolated from the examined samples of meat products were; in minced meat *Debaryomyces nicotianae* D.kloeckari, *D.subglobosus*, *D.hansenii* and *D.vini* with the following No. and frequency percentage 50(23.2%), 15(6.9%), 10(4.6%), 5(2.4%) and 2(0.9%) respectively; *Candida* spp. with *C.zeylanoides*, *C.deformans*, *C.pseudotropicalis*, *C.parapsilosis*, and *C.krusei* in 10(4.6%), 5(2.4%), 3(1.4%) and 2(0.9%) respectively. *Saccharomyces* with *S.cervisiae*, *S.faragilis*, and *S.unisporus* in 10(4.6%), 2(0.9%) and 5(2.4%); *Torulopsis* lied with *T.etchellsii* 20(9.3%) and *T.glabrata* 10(4.6%); *Rhodotorula* with the spp. *Rh.aurantiaca* 10(4.6%) and *Rh.mucilaginosa* 15(6.9%); *Trichosporon fermentans* 40(18.5%).

From luncheon the following yeast spp. could be identified *Debaryomyces nicotianae* 30(27.2%), *D.hansenii* 10(9.1%) and *D.subglobosus* 20(18.2%); *Trichosporon fermentans* 20(18.2%); *Torulopsis etchellsii* 5 (4.6%) and *Torulopsis candida* 15(13.6%); *Candida deformans* 10 (9.0%), *C.zeylanoides* 7(6.3%) *C.pilliculosa* 3(2.8%). From basterma the following yeast spp. could be isolated and identified; *D.nicotianae* 40(25.8%), *D.subglobosus* 20(12.9%); *S.cerevisiae* 5(3.2%), *S.unisporus* 10(6.5%); *Torulopsis candida* 20 (12.9%); *Rh.aurantiaca* 30(19.3%), *C.deformans* 10(6.5%), *C.Parapsilosis* 15(9.6%) and *C.tropicalis* 5(3.2%).

These findings are similar to those reported by HADLOK (1972), HESSEL-SCHMALFUSS (1976), JAY (1977) and LEISTNER and BEM (1970).

As result of contamination of meat products with mould and yeast, such products may undergoe spoilage beside they are incriminated in human mycosis (MOSEL 1977 and RIETH 1973). Therefore for the dangerous role of fungi in relation to foodstuff SCHMIDT-LORENZ (1977) considered all mould as potential pathogens. Moreover incidence of mould and yeast in meat products indicate bad hygienic measures in the processing and handling of fresh meat and meat products. Therefore perpetual investigations are continuously undertaken to find new methods and technology on a scientific basis to safe these products from being spoiled on the market. Moreover the sanitary instructions in slaughter houses, transport vehicles and processing plant should be strictly imposed together with educational programs to producers, processors in order to improve the quality of these products.

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H.A. ABDEL-RAHMAN, *et al.*

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MYCOLOGICAL QUALITY OF MEAT PRODUCTS IN EGYPT

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Table (1): Mould and yeast count/g of examined samples of meat products

	Minced meat		Luncheon		Basterma	
	yeast	mould	yeast	mould	yeast	mould
Minimum	8×10^3	8×10^3	80	110	15×10^2	350
Maximum	150×10^3	100×10^3	40×10^3	63×10^3	150×10^3	43×10^3
Mean	98×10^3	27×10^3	97×10^3	92×10^2	310×10^2	14×10^3

Table (2): No. and frequency percentage of isolated mould and yeast genera

Mould and Yeast genera	Minced meat		Luncheon		Basterma	
	No.	%	No.	%	No.	%
Penicillium	78	64.5	166	76.2	88	47.8
Aspergillus	15	12.4	42	19.3	46	25.0
Mucor	5	4.1	2	0.9	20	10.9
Geotrichum	14	11.6	4	1.8	-	-
Cladosporium	-	-	4	1.8	30	16.3
Fusarium	9	7.4	-	-	-	-
Total	121	100	218	100	184	100
Debaryomyces	82	37.9	60	54.5	60	38.7
Torulopsis	30	13.9	20	18.2	20	12.9
Candida	22	10.2	10	9.1	30	19.4
Sacchromyces	17	7.8	-	-	15	9.6
Trichosporon	40	18.6	20	18.2	-	-
Rhodotorula	25	11.6	-	-	30	19.4
Total	216	100	110	100	155	100

Table (3): No. and Frequency percentage of identified *Penicillium* and *Aspergillus* species

Mould spp.	Minced meat		Luncheon		Basterma	
	No.	%	No.	%	No.	%
<u>Penicillius</u>						
<u>P.verrucosum var.</u>						
cyclopium	40	33.0	85	39.0	7	7.9
P.verrucosum var						
verrucosum	23	19.0	-	-	7	7.9
P.digitatum	4	3.3	-	-	-	-
P.citrinum	7	5.8	25	11.5	16	18.1
P.funiculosum	2	1.7	-	-	-	-
P.waksmanni	2	1.7	6	2.8	-	-
P.italicum	-	-	20	9.2	2	2.3
P.granulatum	-	-	-	-	28	31.8
P.chrysogenum	-	-	9	4.1	16	18.1
P.brevicompactum	-	-	-	-	11	12.6
P.claviformi	-	-	-	-	1	1.3
P.corylophilum	-	-	11	5.0	-	-
P.expansum	-	-	10	4.6	-	-
<u>Aspergillus</u>						
A.niger	8	6.6	11	5.0	19	41.3
A.flavus	3	2.4	20	9.3	15	32.6
A.fumigatus	2	1.7	-	-	-	-
A.sodywii	2	1.7	11	5.0	-	-
A.terreus	-	-	-	-	2	4.4
A.amstelodami	-	-	-	-	5	10.8
A.repens	-	-	-	-	2	4.4

MYCOLOGICAL QUALITY OF MEAT PRODUCTS IN EGYPT

Table (4): No. and Frequency percentage of identified yeast species

Yeast spp.	Minced meat		Luncheon		Basterma	
	No.	%	No.	%	No.	%
<u>Debaryomyces</u>						
<i>D.nicotianae</i>	50	23.2	30	27.2	40	25.8
<i>D.kloeckeri</i>	15	6.9	-	-	-	-
<i>D.hansenii</i>	5	2.4	10	9.1	-	-
<i>D.subglobosus</i>	10	4.6	20	18.2	20	12.9
<i>D.vini</i>	2	0.9	-	-	-	-
<u>Candida</u>						
<i>C.deformans</i>	5	2.4	10	9.0	10	6.5
<i>C.zeylanoides</i>	10	4.6	7	6.3	-	-
<i>C.pseudotropicalis</i>	3	1.4	-	-	-	-
<i>C.pilliculosa</i>	-	-	3	2.8	-	-
<i>C.parapsilosis</i>	2	0.9	-	-	15	9.6
<i>C.tropicalis</i>	-	-	-	-	5	3.2
<i>C.krusei</i>	2	0.9	-	-	-	-
<u>Sacchromyces</u>						
<i>S.cervisiae</i>	10	4.6	-	-	5	3.2
<i>S.fragilis</i>	2	0.9	-	-	-	-
<i>S.unisporus</i>	5	2.4	-	-	10	6.5
<u>Torulopsis</u>						
<i>T.etchellsii</i>	20	9.3	5	4.6	-	-
<i>T.glabrata</i>	10	4.6	-	-	-	-
<i>T.candida</i>	-	-	15	13.6	20	12.9
<u>Rhodotorula</u>						
<i>Rh.aurantiaca</i>	10	4.6	-	-	30	19.3
<i>Rh.mucilaginosa</i>	15	6.9	-	-	-	-
<u>Trichosporans</u>						
<i>Tr.fermentans</i>	40	18.5	20	18.2	-	-
<hr/>						
Total	216	100	100	100	155	100

