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دراسات عن الحالة الصحية للأسماك المملحة بأسواق محافظة الشرقية

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أخذت خمسون من كل من أسماك البوري و كلب السمك بطريقة عشوائية من المعروض للبيع
بأسواق الشرقية وتم فحصها ظاهريا والحكم على ٩٠٪ منها لصلاحيتها الآمى . كما
تم اختبارها كيميائيا وكتوبولوجيا . وكانت نسبة الرطوبة مرتفعة فى سمك البورى عنها
فى كلب السمك فى حين كانت نسبة كلوريد الصوديوم مرتفعة فى الثانى عن الأول .
وهذا فلإن الرطوبة وكلوريد الصوديوم تتناسبان عكسيا فى لحوم هذه الاسماك .

نتائج الفحص البكتيولوجي :-

كانت متوسط العدد الكلى للميكروبات فى لحم سمك البورى ولحم كلب السمك أعلى فى
درجة ٢٥م عنها فى درجة ٣٥م . وكان متوسط العدد الكلى للميكروب العنقورى
والميكروبات السبحية المعديّة أعلى فى لحم السمك عنها فى البورى . كما أمكن
عزل ميكروبات الكوليفورم وتصنيفها بنسب متفاوتة .

وقد ثبت تعرض تلك الاسماك للتلوث بالميكروبات المرضية والمسببه للفساد .

STUDIES ON PHYSICAL, CHEMICAL AND BACTERIOLOGICAL STATUS OF SALTED FISHES
IN SHARKIA PROVINCE
(With 4 Tables)

By

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SUMMARY

One hundred salted fishes (50 each of *Mugil cephalus* and *Hydrocynus forskallii* were subjected to physical, chemical and bacteriological examination.

Physical examination: revealed that 10% of samples of *M. Cephalus* and 16% of *H. forskallii* were unfit for human consumption.

The average sod.chloride and moisture contents were inversely proportional in muscles of both species examined.

The average percentage of sod. chloride in the water phase was higher in the muscles of *H. forskallii* than in *M. cephalus*.

The average total colony count in muscles are higher at 25°C than at 35°C and so muscle counts than that of brine.

The average count of *Stephylococcus aureus*, *Streptococcus faecalis* and *Streptococcus faecium* were higher in *H.forskallii* than in *M.cephalus* in muscles than in brine.

Coliform could be isolated from examined samples at varying percentages.

INTRODUCTION

Methods of preservation have been developed to control fish bacterial spoilage. Sod. chloride is the most widely chemical preservative used in Egypt where salted fish are usually consumed within a year from processing.

It is well known that sod. chloride has an osmotic effect on bacteria involved in spoilage, and the concentration of the salt and its rate of penetration influence bacterial action.

This method of storage may be also influenced by the degree of moisture. However, using salt as a mean of preservation does not prevent contamination of fishes with food poisoning bacteria. The aim of this investigation is to study the physical and chemical properties of two principal commercially important species of salted fishes; *Mugil cephalus* and *Hydrocyon forskallii*. The study includes also bacteriological examination for the estimation of the total colony count and other microorganisms namely staphylococci, enterococci and coliforms.

MATERIAL AND METHODS

Random samples of salted fishes, 50 each of *Mugil cephalus* (*M.cephalus*) and *Hydrocyon forskallii* (*H. forskallii*) together with their respective brine solutions were collected from different shops at Sharkia province. The samples were subjected to physical, chemical and bacteriological examinations, with a minimum of delay.

Physical examination included the determination of freshness, firmness, colour, odour of the flesh together with the inspection of the viscera and abdominal wall. For Chemical examination, moisture and sod. chloride content were determined. Methods for both physical and chemical examinations were adopted according to A.O.A.C. (1965).

Bacteriological Examination:

The total colony count in the fish muscle and the brine was estimated according to the methods described by a TATCHER and CLARK (1975).

For the total count of staphylococci, a differential media for isolation and enumeration were used as described by a TATCHER and CLARK (1975). The total staph. count/g muscle or/ml brine was calculated.

For the enterococci count the differential agar (E.S.D.) developed by EFTHYMIU et al. (1974) proved to be advantageous.

MacConkey's broth and MacConkey's agar were used for the determination of MPN of coliforms (TATCHER & CLARK,

1975).

The frequency distribution of examined samples, based on their chemical examination and the total colony count are presented respectively in tables 1&2. Table 3 summarized the results of Staphylococcus, Enterococci and MPN in the samples.

DISCUSSION

The muscles of most of collected samples of both species were light, red in colour, salty and have a moderate or hard texture. Whereas in 10% of *M. cephalus* and 16% of *H. forskallii* were soft, unpalatable, greyish in colour indicating signs of muscle putrefaction and judged as unfit for human consumption.

It was found also that the moisture content in *M. cephalus* (59.5%) was slightly higher than in *H. forskallii* (54.6%). The sod. chloride percentage in the muscles of the examined fishes recorded a mean value of 14.39% in *M. cephalus* which is lower than in *H. forskallii* (16.13%).

The results of moisture and sod. chloride% seemed to be inversely proportional in the muscles of these two species. Results also indicated that the percentage of sod. chloride in the water phase was higher in *H. forskallii* than in *M. cephalus*. It is therefore possible to assume that the keeping quality of the examined fishes is high. Moreover the sod. chloride percentage was found to be generally higher in the brine than in the endogenous muscle of fishes in both species (Table 1). Nearly similar results were reported by SHAHIN (1965) and AHMED (1976).

Bacteriological Examination:

Average total colony count (Table 2) at 35°C in the muscle of *M. cephalus* was 41.81×10^6 /gm muscle, while in *H. forskallii* the number reached 56.06×10^6 /g muscle. Higher counts were recorded at 25°C in both species and their respective values were 42×10^6 /g and 65.22×10^6 /g muscle. Lower counts were observed in the brine of both fishes at both degrees of incubation (Table 2).

The achieved results pointed out that total colony count in the muscles of examined samples is higher in muscles than that of the brine and is directly proportional to it. This may be attributed to the high percentage of sod. chloride in the brine which has a bacteriostatic effect which is substantiated by DUSSAULT (1958). Moreover the contamination of materials as well as unhygienic handling, processing, distribution and high storage temperature accelerate the existing bacterial growth.

Total Staphylococci And Enterococci Counts:

Staph. aureus was isolated in 92% of *M. cephalus* muscles and in 76% of its own brine. The staph. count averaged 10.58×10^6 /g and 7.39×10^3 /ml in muscle and brine respectively. The respective values for *H. forskallii* isolation were 88% and 78%. The average count was nearly similar to that obtained from *M. cephalus*.

Staphylococcus isolation results in this investigation agree findings of SEDIK (1971). In this respect although *Staph. aureus* is seldom recovered from freshly caught fish, survey showed that after handling and processing 10-30% of fishes contain coagulase positive staph. (FAWSON, 1970).

The sources of contamination in the view of TATCHER and CLARK (1975) may be from skin, mouth or nose of workers handling the food. Moreover some strains of staphylococci can give rise to enterotoxins which does not alter the appearance of food. The danger lies also in that staphylococcus food poisoning could ensue in temperate countries where food hygiene is still unsatisfactory.

Enterococci Count:

Streptococcus faecalis and *Strept. faecium* count (TABLE 3) averaged in this investigation 11.25×10^3 /g muscle and 10.17×10^3 /g. of *M. cephalus* while in *H. forskallii* the counts were 11.91×10^3 /g respectively. Lower count were observed in the brine of both species.

The presence of enterococci in salted fishes, besides being implicated in cases of food poisoning, indicates faecal contamination. BARNES and INGRAM (1956) mentioned that *Strept. faecium* may predominate in several domestic animal's faeces, while *Strept. faecalis* is normally found in the microflora of faeces of man.

Most Probable Number Of Coliforms:

The probable number of coliforms/g fish muscle averaged, in the examined samples, 30.97×10^2 in *M. cephalus* and 25.71×10^2 in *H. forskallii* (Table,3). In the brine the average counts were 22×10^2 and 17.58×10^2 ml brine

STATUS OF SALTED FISHES

respectively. Similar findings were reported by DUSSAULT (1958), SEDIK (1971), and AHMED (1976).

The presence of coliforms indicates contamination of raw fish through polluted water or contamination from workers and dirty instruments.

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TABLE (1)

Frequency distribution of examined samples based on their chemical examination.

fish spp.	Muscle			Brine			C%		
	Interval	Frequency		Interval	Frequency		Interval	Frequency	
	No. of sample	%		No. of sample	%		No. of sample	%	
Mugil cephalus	Sod. cl:			Sod. cl:					
	11-14	15	30	17-22	10	20			
	14-17	29	28	22-27	37	74			
	17-20	6	12	27-34	3	6			
	Total	50	100	Total	50	100			
Hydrocynus forskallii	Moisture:						14-18	15	30
	50-58	19	38				18-22	24	48
	58-66	23	26				22-26	11	22
	66-72	8	16				26-30	0	0
	Total	50	100				Total	50	100
Hydrocynus forskallii	Sod. cl:			Sod. cl:					
	11-14	3	6	17-22	30	60			
	14-17	30	60	22-27	19	38			
	17-20	17	34	27-34	1	2			
	Total	50	100	Total	50	100			
Hydrocynus forskallii	Moisture:						14-18	2	4
	50-58	43	86				18-22	19	38
	58-66	7	14				22-26	27	54
	66-72	0	0				26-30	2	4
	Total	50	100				Total	50	100

TABLE (2)

Summarized results of total colony count in examined samples.

fish spp.	Incubation temperature	Total colony count					
		Muscle/gm			Brine/ml		
		Minimum	Maximum	average	Minimum	Maximum	average
Mugil cephalus	35 ± 1°C	5 × 10 ⁶	91 × 10 ⁶	41.81 × 10 ⁶	2 × 10 ⁶	70 × 10 ⁶	27.72 × 10 ⁶
	25°C	8 × 10 ⁶	106 × 10 ⁶	42 × 10 ⁶	4 × 10 ⁶	91 × 10 ⁶	37 × 10 ⁶
Hydrocynus forskallii	35 ± 1°C	19 × 10 ⁶	76 × 10 ⁶	56.06 × 10 ⁶	22 × 10 ⁶	65 × 10 ⁶	47.02 × 10 ⁶
	25°C	43 × 10 ⁶	82 × 10 ⁶	65.22 × 10 ⁶	34 × 10 ⁶	68 × 10 ⁶	54.6 × 10 ⁶

STATUS OF SALTED FISHES

TABLE (3)

Summarized results of Staphylococci, Enterococci and MPN count in examined samples

fish species	Bacteria	Total colony count		
		Brine/ml		
		Minimum	Maximum	Average
Mugil cephalus	Staphylococci	2×10^3	18×10^3	7.39×10^3
	S. faecalis	2×10^3	51×10^3	9.53×10^3
	S. intermediae	-----	-----	-----
	S. faecium	2×10^3	22×10^3	9.25×10^3
	MPN	6×10^2	100×10^2	22×10^2
Hydrocynus forskalii	Staphylococci	2×10^3	18×10^3	7.28×10^3
	S. faecalis	3×10^3	20×10^3	8.31×10^3
	S. faecalis	-----	-----	-----
	S. faecium	4×10^3	19×10^3	5.12×10^3
	MPN	7×10^2	45×10^2	17.58×10^2

TABLE (4)

Summarized results of staphylococci, Enterococci and MPN count in examined samples

fish species	Bacteria	Total colony count		
		Muscle/gm.		
		Minimum	Maximum	Average
Mugil cephalus	Staphylococci	2×10^3	44×10^3	10.58×10^3
	S. faecalis	3×10^3	40×10^3	11.85×10^3
	S. intermediae	-----	-----	-----
	S. faecium	3×10^3	46×10^3	10.17×10^3
	MPN	4×10^2	110×10^2	30.97×10^2
Hydrocynus forskalii	Staphylococci	2×10^3	22×10^3	11.47×10^3
	S. faecalis	5×10^3	22×10^3	11.91×10^3
	S. intermediae	-----	-----	-----
	S. faecium	3×10^3	22×10^3	9.51×10^3
	MPN	7×10^2	110×10^2	25.71×10^2

