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Studies on Microbial, Physical and Chemical Quality of Fresh Yemeni Rabbit Meats During Storage in Taiz City

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ABSTRACT

The aim of this study is to evaluate the quality and the degree of contamination of local fresh Yemeni rabbit meats collected from Taiz markets in the Republic of Yemen, the changes of samples examined during storage at zero time and every day. The results illustrate an increase in microbial contamination and a decrease in physical and chemical characteristics, until signs of spoilage appeared after four days of storage . On other hand, the population of Aerobic, Anaerobic, Spore-formers bacteria, Yeast and Moulds, Enterobacteriaceae, Coli form groups, Salmonella spp , Staphylococcus spp, Streptococcus spp, Clostridium spp, Bacillus spp, Enterococcus spp and Proteolysis bacteria increased by the following percentages: 66.10%, 47.92%, 40.10%, 29.43%, 46.50%, 27.69%, 35.00%, 38.48%, 43.77%, 25.77%, 28.42%, 43.61% and 48.76%, respectively. The nutrition chemical characteristics i.e. [Moisture, Protein and Fat content] decreased as shown in these percentages: 0.81%, 0.35% and 0.65%, respectively. And the Carbohydrate content increased by 21.33%. The chemical indicators of spoilage i.e. [Total volatile nitrogen, Tri methyl amine, Ammonia nitrogen, Thiobarabituric acid, Total Energy and Water holding capacity] increased as shown in these percentages: 174.40%, 163.09%, 155.05%, 50.00%, 1.71% and 12.24%, respectively. The pH value and Bound water decreased by 1.315% and 3.126%, respectively, compared with the control samples. In addition, isolation and classification Eight species of Bacillus species, which were identified in previous samples were isolated and classified. They were Bacillus subtilus, B. pumilu, B. cireulans, B. megaterium, B. lentus, B. sphaerieus, B. macerans, B. cereus, shown in these percentages: 10.52%, 15.78%, 05.26%, 15.78%, 5.30%, 21.05%, 10.52% and 15.78%, respectively.

Key words : Microbial ,Physical, Chemical, Storage, Rabbit, Meat.

INTRODUCTION

From the earliest civilization, all societies have had two means for ensuring adequate supplies of safe and nutritious food to meet the needs of their people (**Kaferstein and Moy 1999**) . The quality of rabbit meat is the reflection of microbiological, physical and chemical characteristics before and during storage (**Abd El-Latife, 1998**). Protein plays an important role in the life of man and nation. Meat of cows, rabbit and fish is an important source of protein in human nutrition. Meat from fresh chicken, fish and rabbit is the most common source of high protein food **(Gamal El-Deen, 2007)**. In Yemen most of people suffer from lack of meat, hence the local consumption decreased daily (day by day). Some villages in the Republic of Yemen have no electricity and they sell meat in the open air in retail stores. So the meat loses a great deal of its nutritious value. Storage of food (specially fresh food like meats) at high temperature also has been reported to cause a loss of nutritional value **(Youssef, *et al.*, 2007)**. The chemical composition of the food and the metabolic activities of the organisms growing in the food determine the compounds which can be used as indicators **(Sayed, 2002)**, because of the extreme tendency of some products to perish; and occasionally decomposed foods get into market channels. Therefore, the objective of our present investigation is to evaluate quality parameters of high nutrition and anther chemical composition in Yemeni rabbit meats, and to determine different total bacterial counts of tested samples. The aims of this study can be stated as follows**:-**

1-To find out the degree of bacterial contamination, evaluate the effect of storage at room-temperature on the different microbiological, physical and chemical quality of local fresh rabbit meats.

2- To find out the chemical nutritional characteristics of the samples under investigation.

3- To isolate and identify *Bacillus* species of all tested samples as a selection of rabbit meats contamination.

MATERIALS AND METHODS

1- Preparation and storage of samples:

Local fresh rabbit meats samples were collected and purchased from different local retail stores in Taiz city (Republic of Yemen). After the whole rabbit meat flesh was obtained the skin surface slime, dirt, head, legs, viscera and skeleton were immediately removed. Any residual blood was also removed. After that the meat was sent to the laboratory in Ice-box and was cut into small retail severance meat (each severance meat contain 50 grams). It was immediately stored at room-temperature (28 ^{o}C). The bacteriological, physical and chemical changes of retail severance meat carried out at zero time (as control samples) were examined, within 2 hours and day by day (every day) and during storage at room-temperature for four days, until signs of spoilage appeared by the border line of rabbit meats. Acceptability for total microbial count was found to be ($\geq 10^7$) cell/g and appearance of putrid smell was as reported by Microbiological Criteria for Arabia and Egyptian Standard Food (**El-Shamery, 2001 and Gamal El-Deen, 2007)** .

2-Chemical and physical analysis:

Moisture content (M.O), Total nitrogen (P.R), Crude Fat, and Ash content were determined according to the method described by **A.O.A.C, (2002)**. The total carbohydrate (C.B) was

calculated by the differences according to **(Egan *et al.*, 1981)**. The total volatile bases nitrogen (T.V.N), Tri-methyl amine nitrogen (T.M.A), and Ammonia nitrogen (A.N) were determined according to the method mentioned by **A.M.C, (1979)** (Mg per/ 100gm sample on dry weight basis). Thiobarbituric-acid (T.B.A) was determined as indicated according to the method of **(Siu and Draper, 1978)** mg monoaldehyde per 100 gram sample on weight basis. The pH value was measured using the method described by **Krilova** and **Liskovskain, (1961).** Energy value was calculated using the equation given by **Winton** and **Winton, (1958).** Water holding capacity (W.H.C), and Water bound (B.W) were measured by following the filter press method of **(Gram and Hamm, 1957)** as described by **Soloviev, (1966).**

3-Microbiological examination :

Twenty five grams of random samples of the rabbit meats were blended with 225 ml of 0.1% peptone water in a sterile blender jar for 1-2 minutes and decimal dilutions prepared for testing. Numbers of viable organisms were determined by the plate count method. One ml of each dilution was inoculated with appropriate media for the particular group of organisms to be tested as Colony forming unit per gram (c.f.u/g). The total aerobic bacterial count (A.B) was determined according to **(A.P.H.A, 1992)** using Plate count agar medium incubated at 37 ^{o}C for 3-5 days;Anaerobic bacterial count (A.N.B) was determined according to **(A.P.H.A, 1992)** using cooked meat agar medium with Anaerobic Jars (Gas pak system by B. BL cockysville marland 21030 USA). Yeasts and Moulds (Y.M) were counted on Malt extract agar medium **(Oxoid, 1985)** incubated at 25-30 ^{O}C for 3-5 days as described by **Pitt and Hocking, 1985**. Spore-former bacteria count (S.P.O) were determined according to method described by **Chalmers, 1955.** The suitable dilution was subjected to 80 ^{O}C at 20 m for 48-72 hrs. Proteolysis bacteria count (P.R.O) inoculation were made TGY to which 10 % (10 ml / 100 ml medium) of Sterile skim med milk has been added just before pouring plates were incubated for 2-3 days at 30 ^{O}C **(A.P.H.A, 1992)** . Total *Streptococcus* spp bacterial count (S.T.R) was determined by using Dried brain heart infusion agar and MaCconky agar media **(Oxoid, 1985)** the inoculum was spread on the surface of plate, after incubation at 37^{o}C for 24-48 hrs as mentioned by **Mossel and Tamminge, 1980.** Enterobacteriaceae count (E.N.T) was determined on Violet red blue dextrose agar medium after incubation at 37 ^{O}C for 20-24 hrs as described by **Robert *et al*., 1995**. *Bacillus* spp count (B.A.C) was counted by using Mannitol egg yolk-poly myxin (MYP) agar and incubation for 16- 24 hrs at 37 ^{O}C as described by **Roberts *et al* ., 1995**. *Salmonell*a spp count (S.A.L) was carried out using the most probable number technique (M.P.N) according to **(ISO, 1982) .** After enrichment at 37 ^{o}C for 24 hrs in Selenite broth, the cultures were streaked on Brilliant green agar and incubated at 37 ^{o}C for 24 hrs; then colonies were biochemicaly examined in Triple Sugar Iron agar (TSI) and Lysine de carbonate broth. *Staphylococcus* spp count (S.T.P) was enumerated on Baird–parker medium using surface plating technique as recommended by **I.A.E.A, 1990,** and incubated at 37 ^{O}C for 24 hr. *Enterococci* spp count (E.N.S) was enumerated on Konamycin aesulin azide agar medium **(Mossel and Tamminge, 1980)**. Positive colonies were confirmed by microscopic examination for the presence of short chain streptococci. Coli-form group count (C.O.L) was counted used the (M.P.N) method as reported by **I.A.E.A, 1990** by inoculating MacConkey agar medium incubated at 44 ^{O}C for 24-48 hrs. *Clostridum* spp count (C.L.O) was counted using the Cooked meat agar

medium incubated at 37 ^{O}C for 24 hrs, in anaerobic system using gas generation kit as mentioned by **Craven *et al*., 1979 and Oxoid, 1985 .**

4-Isolation and identification of Bacillus species :

Isolation and identification of *Bacillus* species were determined from the total count plates (APT) agar **(A.P.H.A, 1992)** colonies in opposite sectors were picked and transferred to agar slants of the same medium. After purification, bacterial grouping according to morphological characteristics and Gram stain was carried out. Gram- positive bacterai groups were identified to generic and species level with the aid of **[Bergey's Manual for Systematic Bacteriology, 1986; Kotzekidou, 1996 and Bergey's Manual of Determinative Bacteriology, 1999].** The method of identification adopted for this purpose Genus *Bacillus* with standard tests and classification schemes described by **Smith *et al*., 1952** in conjunction with **[Holt *et al*., 1986]** and examination were carried out according to **[Holt *et al* ., 1986].**

RESULTS AND DISCUSSION

A- Chemical and physical analysis of local fresh rabbit meat during storage at room temperature

Table (1) below shows the effect of storage at room-temperature on Moisture (M.O), Protein (P.R), Fat, Ash, Total carbohydrates contents (C.B) and chemical indicator for spoilage i.e. pH value, Total volatile bases nitrogen (T.V.N),Tri methyl amine (T.M.A), Ammonia nitrogen (A.N), Thiobarbituric acid (T.B.A), Total calories [Energy-value (E.N)] and Water-holding-capacity capacity (W.H.C). It determination as abound water (B.W) of local fresh rabbit meat for four days of storage at this stage of storage the control samples were completely rejected by the border line of rabbit meat acceptability for total microbial count in (table, 2) was found to be [$\geq 10^7$] cell /g and appearance of putrid smell as reported by microbiological and chemical criteria for Arabia and Egyptian Standard Food and by **Shady, 1999 ; Abd-El-Daim, 2004 and Youssef, *et al*.,2007**. From the data in table (1) it can be noticed that the moisture (M.O), Protein (P.R), Fat, Ash, Carbohydrate (C.B) contents, Total calories [Energy value (E.N)], pH value, Water holding capacity (W.H.C), Bound water (B.W), Total volatile nitrogen (T.V.N),Tri methyl amine (T.M.A), Ammonia nitrogen (A.N) and Thiobarbituric acid value (T.B.A) on control samples at 0.0 time of storage have these percentages: 72.00%, 71.251%, 22.857%, 3.928%, 1.964%, 142.284%, 6.08 pH value, 1.96%, 92.379%, 62.399%, 7.412%, 24.932% and 0.014% mg per/ 100g respectively. These results were in agreement with the chemical criteria for Arabia and Egyptian Standard Food and within the range of values of fresh rabbit meat as reported by **El-Mongy *et al* ., 2001 and Gamal El-Deen, 2007.** Regarding the room temperature storage of the Moisture (M.O), Protein (P.R), Fat contents, Bound-water (B.W) and pH value changes slightly decreased with an increase in the storage time on the first day of storage; 72.00%, 71.250%, 22.857%, 92.377% and 6.08 pH value of rabbit meat respectively and slightly decreased through storage to reached at the end of storage to 71.41%, 70.999%, 22.70%, 89.491% and 6.0 pH value after four days of storage for rabbit meat samples respectively. These results were in agreement with the findings of **[Bader, 2004].** In other words, the decrease can be shown in these percentages 0.81% for the Moisture, 0.352% for the Protein, 0.65% for the Fat, 3.126% for the Bound water and 1.315% for the pH value of the above mentioned sample compared with the control sample

respectively. This decrease in moisture content of the above sample may be due to evaporation of water during storage. This is in line with **Affi and El-Nashaby, 2001 ; Sayed, 2002 and El-Shamery, 2007**. The decrease of protein content in the same samples may be due to the loss of nitrogen as volatile bases and nitrogenous substances. Moreover, the decrease of protein might be attributed to decomposition of meat by higher load of micro-organisms which formed volatile nitrogenous substances and soluble substances by the effect of Proteins that scalped from the tissues during storage **[Min *et al*., 1998 ; El-Shamery, 2001 and Nam and Ahn, 2003].** Also, the decrease in Fat content of the above samples may be due to oxidation and hydrolysis by activity of microorganism, leading to the conversion of part of lipids into aldehydes, ketenes and other non fatty substances. **[Anon, 2000; Jenniber *et al*., 2002 and Lee *et al*., 2004]**. Meanwhile, the decrease in Bound water (B.W) of the above samples was attributed to protein denaturalization **[El-Shourbagy *et al* ., 2003 and Youssef *et al*., 2007]**. Moreover, the decrease of pH value in the above meats could be due to the formation of lactic acid and break down of glycogen. **[Gray *et al*., 1996 ; Bassiouny *et al*., 2002 and Aycicek *et al*., 2004].** In addition, it is clear from table (1) that the Total calorie [Energy value (E.N)], Carbohydrate (C.B), Water holding capacity (W.H.C), Total volatile nitrogen (T.V.N),Tri methyl amine (T.M.A), Ammonia nitrogen content (A.N) and Thiobarbituric-acid value (T.B.A) changes increased during storage at room temperature with the increase of storage time. The changes in the beginning [on the first day of storage] were 142.29%, 1.965%, 1.96%, 62.50%, 7.50%, 25.0% and 0.014% mg/100g samples of rabbit meat respectively, and increased through storage to reach at the end of storage to 144.727%, 2.384%, 2.20%, 171.20 %, 19.500%, 63.600% and 0.021% mg/100g samples after four days of storage for rabbit meat respectively. Such results were in agreement with **Yilmaz *et al*., 2002 and El-Shamery, 2007** . In other words, the increase can be shown in these percentages : 1.71% for Total calories [Energy value(E.N)], 21.33% for Carbohydrate content, 12.24% for Water holding capacity, 174.40% for Total volatile nitrogen, 163.09% for Tri-methyl amine, 155.05% for Ammonia nitrogen content and 50.00% for Thiobarbituric acid of the previous samples, compared with the control samples. This increase of Energy may be due to an increase in Carbohydrate content and evaporation of water from the meat. **(Xiong, 1997; El-Feky, 2002 and Redmond *et al*., 2004)**. Also that increase in Carbohydrate during storage at room temperature may be due to the natural feeding which resulted to an increase of glycogen in muscle;s or it may be due to evaporation of water from the outer surface of meat. These results agree with **(Zayas, 1997 ; Ali, 2004 and Gamal El-Deen, 2007).** Moreover, the results of the increase in the Total volatile nitrogen (T.V.N) as an index of the degree putrefaction, decomposition and the degree of proteolysis break down as well as protein autolysis hand autolysis and breakable decomposition resulted in the high level of Total volatile nitrogen (T.V.N) These results were in line with **El-Shamery, 2001 and Aycicek *et al*., 2004.** Meanwhile, increasing of Tri methyl amine (T.M.A) in the above samples could be due to the breakdown of amino acids, phospholipids as lecithin and (T.M.A). These results agree with **Affi and El-Nashaby, 2001 and El-Shamery, 2007 .** The increase in Ammonia nitrogen (A.N) may be due to break down of proteins through proteolysis and decomposition by higher rate of microorganism as reported by **Shady, 1999 ; El-Shamery, 2001; Lee *et al*., 2004 and Gamal El-Deen , 2007**.

Table (1): Effect of storage at room-temperature on chemical composition and physical properties of local fresh rabbit meats

Compound		M.O %	P.R%	FAT %	ASH %	C.B %	E.N%	pH	W.H.C Cm^2 %	B.W%	T.V.N %	T.M.A %	A.N%	T.B.A %
Samples	Storage in days	W.W	D.W	D.W	D.W	D.W	W.W	Value	W.W	W.W	W.W	W.W	W.W	W.W
Control	0.0	72.00	71.251	22.85	3.928	1.964	142.284	6.08	1.96	92.379	62.399	7.412	24.932	0.014
Rabbit meat	1	72.00	71.250	22.85	3.928	1.965	142.290	6.08	1.96	92.377	62.500	7.5000	25.000	0.014
	2	71.85	71.100	22.73	3.907	2.263	142.905	6.05	2.01	90.285	87.033	12.433	34.813	0.016
	3	71.61	71.000	22.71	3.909	2.381	143.948	6.06	2.12	89.794	123.22	17.259	54.313	0.019
	4	71.41	70.999	22.70	3.917	2.384	144.727	6.00	2.20	89.491	171.20	19.500	63.600	0.021

W.W = Wet Weight basis %
D.W = Dry Weight basis%
M.O = Moisture Content %
P.R = Protein conten %
C.B = **Carbohydrate content %**
E.N = Energy value % cal /100g
W.H.C = Water holding capacity (cm^2)
B.W = Bound water %
T.V.N = Total volatile nitrogen content mg/100g
T.M.A = Trim ethyl amine content mg/100g
A.N = Ammonia nitrogen content mg/100g
T.B.A = Thiobarbituric acid value mg/100g

B- Microbiological quality of local fresh rabbit meat during storage at room temperature

The quality of fresh rabbit meat largely depends on its microbial contamination during sliding, hanging, handling, marketing and on storage temperature as reported **(Affi and El-Nashaby, 2001 and Gamal El-Deen, 2007)**. The results in table (2) showed the effect of storage at room temperature on total differential counts of aerobic (A.B), Anaerobic (A.N.B), Spore formers bacteria (S.P.O),Yeast and Moulds (Y.M), Enterobacteriaceace (E.N.T), Coli form groups (C.O.L), *Salmonella* spp (S.A.L), *Staphylococcus spp* (S.T.P), *Streptococcus* spp (S.T.R), *Clostridium* spp (C.L.O), *Bacillus* spp (B.A.C), *Enterococcus* spp (E.N.S) and Proteolytic bacteria (P.R.O) as (colony forming unit per gram c.f.u/g) of fresh rabbit meat. The data in table [2] show that the initial organism counts of control samples [at zero time of storage] were $1.1x10^2$, $4.4x10^1$, $2.5x10^1$, $1.3x10^1$, $1.4x10^1$, 3.0, 2.5, $1.3x10^1$, $2.8x10^1$, 5.3, $1.1x10^1$, 3.4 and $1.2x10^1$ c.f.u/g for rabbit meat samples of above microbes respectively. This value is within the range of values of fresh rabbit meat as reported by Microbiological Criteria for Arabia and Egyptian Standard Food and by **Lee *et al*., 2004 and El-Shamery, 2007**. The same data in [table 2] also indicate that the differential microbial counts increased gradually during storage with the increase of storage time on the first day of storage: $1.3x10^4$, $1.1x10^2$, $4.5x10^1$, $3.5x10^1$, $2.9x10^1$, 3.5, 2.6, $1.8x10^1$, $5.4x10^1$, 6.1, $2.2x10^1$, 5.7 and $2.5x10^1$ c.f.u/g and reached to $9.5x10^7$, $1.2x10^4$, $9.9x10^2$, $9.9x10^1$, $1.0x10^3$, 4.5, 4.0, $2.7x10^2$, $2.2x10^3$, 9.4, $7.1x10^1$, 8.9 and $1.1x10^3$ c.f.u/g after four days of storage on rabbit meat samples of above microbes respectively. However, the samples were rejected after four days of storage and at this

stage, all the other counts of microbial examination were closed. This rejection of samples depended upon the total aerobic bacteria counts reached [$\geq 10^7$] cells /g and appearance of putrid smell also by the border line of fresh rabbit meat. This is acceptable as reported by Microbiological Criteria for Arabia and Egyptian Standard Food and by **Gillespie *et al*., 2000; Jackson *et al*., 2001; Eleftheriadou *et al*., 2002; Ali, 2004 and El-Shamery, 2007**. In other words, the increase can be shown in these percentages: 66.10%, 47.92%, 40.10%, 29.43%, 46.50%, 27.69%, 35.00%, 38.48%, 43.77%, 25.77%, 28.42%, 43.61% and 48.76% of Aerobic (A.B), Anaerobic (A.N.B), Spore formers bacteria (S.P.O),Yeast and Moulds (Y.M), Enterobacteriaceae (E.N.T),Coli fom-groups bacteria (C.O.L), *Salmonella* spp (S.A.L), *Staphylococcu*s spp (S.T.P), *Streptococcus* spp (S.T.R), *Clostridium* spp (C.L.O), *Bacillus* spp (B.A.C), *Enterococcus* spp (E.N.S) and Proteolytic bacteria (P.R.O) respectively. This increase in the total bacterial counts during storage at room temperature was expected as the fresh rabbit meat is considered to be the most perishable food that is highly susceptible to microbial invasion and to direct and indirect effects of higher temperature of storage on microorganism, **(Davis *et al*., 1996 ; Bennett, 2001 ; Fang *et al*., 2003 ; Aycicek *et al*., 2004 ; Lee *et al*., 2004 and Gamal El-Deen, 2007)**. In addition, from table (2) the Total aerobic bacterial counts (A.B) were higher than anther bacterial counts on control samples. Also the *Salmonella* spp (S.A.L), Coli form groups (C.O.L), *Clostridium* spp (C.L.O) and *Enterococcus* spp (E.N.S) counts were lower levels of counts compared with other counts on the control samples or all the anther samples during storage extended. The Total aerobic bacterial counts (A.B) and the Proteolytic bacteria counts (P.R.O) counts were higher than anther bacterial counts during storage compared with other counts on all the samples, these results agree with**[Satin, 2002; Gamal El-Deen, 2007 and El-Shamery, 2007].**

C-Isolation and identification of Bacillus species from local fresh rabbit meat.

Table (3), indicated that nineteen bacterial isolates which are divided into Eight groups; all of these groups are subjected to extensive toxicity studies and classified into different eight species. These groups are: Group one was *Bacillus subtilus* , two species (10.526%) of total isolated. Group two was *Bacillus pumilus* their number of isolate were three species by percentage (15.789%). Group three was *Bacillus cireulans* by percentage (5.263%) of total isolated. Group four was three species of *Bacillus megaterium* by (15.789%). Group five obtained one species of *Bacillus lentus* , (5.263%) of totale isolated. Group six was four species of *Bacillus phaerieus* , by percentage (21.052%) of total isolated. Group seven was two species of *Bacillus macerans* obtained by percentage (10.526%) of total isolated. Group eight was three species of *Bacillus cereus* and isolated by (15.789%) of total isolated.

Table (2): Effect of storage at room- temperature on microbiological properties of local fresh rabbit meats

Microbes		**A .B**	**A.N.B**	**S.P.O**	**Y.M**	**E.N.T**	**C.O.L**	**S.A.L**	**S.T.P**	**S.T.R**	**C.L.O**	**B.A.C**	**E.N.S**	**P.R.O**
Samples	**Storage in days**	Count/g	Count/g	Count/g	Count/g	Count/g	Conu/g	Coun/g	Count/g	Count/g	Coun/g	Count/g	Coun/g	Count/g
Control	**0.0**	**$1.1x10^2$**	**$4.4x10^1$**	**$2.5x10^1$**	**$1.3x10^1$**	**$1.4 x10^1$**	**3.0**	**2.5**	**$1.3x10^1$**	**$2.8x10^1$**	**5.3**	**$1.1x10^1$**	**3.4**	**$1.2x10^1$**
Rabbit meat	**1**	$1.3x10^4$	$1.1x10^2$	$4.5x10^1$	$3.5x10^1$	$2.9x10^1$	3.5	2.6	$1.8x10^1$	$5.4x10^1$	6.1	$2.2x10^1$	5.7	$2.5x10^1$
	2	$2.6x10^5$	$5.1x10^2$	$7.3x10^1$	$6.6x10^1$	$9.8x10^1$	4.1	3.2	$2.9x10^1$	$9.2x10^1$	7.2	$3.6x10^1$	8.8	$8.2x10^1$
	3	$1.5x10^6$	$1.5x10^3$	$9.0x10^1$	$9.8x10^1$	$1.5x10^2$	4.2	3.9	$6.6x10^1$	$1.1x10^2$	8.8	$5.5x10^1$	8.9	$2.4x10^2$
	4	$9.5x10^7$	$1.2x10^4$	$9.9x10^2$	$9.9x10^1$	$1.0x10^3$	4.5	4.0	$2.7x10^2$	$2.2x10^3$	9.4	$7.1x10^1$	8.9	$1.1x10^3$

A.B = Aerobic Bacteria
A.N.B = Anaerobic Bacteria
S.P.O = Spore former Bacteria
Y.M = Yeast and Moulds
E.N.T = Enterobacteriaceace Bacteria
C.O.L = Coli form group Bacteria
S.A.L = *Salmonella* spp Bacteria
S.T.P = *Staphylococcus* spp Bacteria
S.T.R = *Streptococcu*s spp Bacteria
C.L.O = *Clostridium* spp Bacteria
B.A.C = ***Bacillus* spp Bacteria**
E.N.S = *Enterococcus* spp Bacteria
P.R.O = Proteolytic Bacteria

Table (3): Numbers of groups , groups of identification , numbers of isolates , percent distribution , physiological and biochemical characteristics of the Bacillus species isolated from rabbit meat samples.

Number of groups	*Bacillus.* spp identification	No .of isolates	Percent distribution of (total isolates)	physiological and biochemical characteristics																	
				Roade -shape	Gram stain	Endospore formation	Anaerobic growth	V.P.test	Acid from D-glucose	Acid from L-arabinose	Acid from D-xylose	Acid from D-mannitol	Hydrolysis of casein	Hydrolysis of gelatin	Hydrolysis of starch	Utilization of citrate	Reduction of nitrate to nitrite	Formation of indole	Reduction of lecithinase	Growth at PH 6.8 (NB)	owth at PH 5.7(pH)
G1	Bacillus subtilus	2	10.526	+	+	+	–	+	+	+	+	+	+	+	+	+	+	–	–	+	+
G2	B. pumilus	3	15.789	+	+	+	–	+	+	+	+	+	+	+	–	+	–	–	–	+	+
G3	B. cireulans	1	5.263	+	+	+	–	–	+	–	–	–	+	+	–	+	–	–	–	+	–
G4	B. megaterium`	3	15.789	+	+	+	–	–	+	–	–	–	+	+	–	+	–	–	–	+	–
G5	B. lentus	1	5.263	+	+	+	–	–	+	+	+	+	–	+	–	–	+	–	–	+	–
G6	B. sphaerieus	4	21.052	+	+	+	–	–	–	–	–	–	+	–	–	–	–	–	–	+	–
G7	B. macerans	2	10.526	+	+	+	+	–	+	+	+	+	–	+	+	–	+	–	–	+	+
G8	B. cereus	3	15.789	+	+	+	+	+	+	–	–	–	+	+	+	+	+	–	+	+	+
Total .No of *Bacillus* spp		**19**	**100%**																		

(+) = Presente **(.)** = Absent **(*B.*)**= *Bacillus*

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دراسات عن ا لجودة الميكروبيولوجية والطبيعية والكيمائية للحوم الارانب اليمنيه الطازجه خلال التخزين فى مدينة تعز

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ملخص

تهد ف هذه الدراسة لمعرفة الجودة ومدى التلوث الميكروبى والطبيعى والكيمائى للحوم الارانب اليمنية الطازجة والتي جمعت عيناتها من السوق المحلى لمدينة تعز(الجمهورية اليمنية) ثم اجريت لها الاختبارات عند نقطة الصفر وكل يوم خلال فترة التخزين ، وقد دلت النتائج على تدهور الجودة الكيمائية و الطبيعية والميكروبية للحوم الارانب المخزنة في الجو العادي مقارنة بعينا ت الكنترول مما اد ى الى فسادها بعد اربعة ايام وكانت النتائج كالاتي:-

(1)- نقصان المركبات الكيمائية الغذائية بالنسب الاتية : 0.352% للبروتين و 0.65% للدهون و 0.81% للماء مع زيادة المركبات الكربوهيدراتية بنسبة 21.33% مع ثبا ت الرماد.

(2)- زيادة المركبات الطبيعية ا لدالة على الفساد بالنسب الاتية : 1.71% لقيم الطاقة و12.24 % لقيم السعة المائية و 174.48% لقيم الفولتايل نتروجين الكلى و 163.09% لقيم التراى ميثايل امين و 155.05% لقيم الامونيا نتروجين و 50.00% لقيم الثايوبارابيوتريك اسيد مع نقصان لقيم الحموضة بنسبة 1.315% ولقيم ارتباط الماء بنسبة 3.126% مقارنة بالكنترول.

(3)- زيادة الحمولة الميكروبيولوجية بالنسب الاتية: 66.10% للأعداد البكتيريا الكلية الهوائية الكلية و47.92% للأعداد البكتيريا اللاهوائية و 40.10 % للأعداد المتجرثمة و29.43% للفطريات والخمائر و 46.50 % لعائلة البكتيريا المعويه الداخليه و 27.69% لمجموعة القولون و 35.00% لاجناس السالمونيلا و 38.48% لاجنا س الاستافيلوكوكس و 43.77% لاجناس الستربتوكوكاس و25.77% لاجنا س الكلوستريد يم و 28.42% لاجنا س البا سلس و 43.61% لاجناس الاننتروكوكاس و 48.76% للبكتريات المحللة للبروتين .

(4)- تم عزل وتصنيف ثمانية ميكروبات صنفت تبعا لاجنا س باسلس من كافة العينات ا لمختبرة وهم كالاتي : *Bacillus subtilus, B. pumilus, B. cireulans, B. megaterium, B. lentus, B. sphaerieus, B. macerans and B. cereus.*

وكانت نسب تواجدهم مقارنة بعدد عزلاتهم من العينات حسب الترتيب السابق كالاتى :

10.52%, 15.78%, 05.26%, 15.78%, 05.26%, 21.05%, 10.52% and 15.78%.