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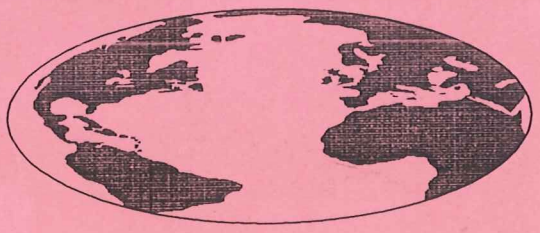

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Microbiological Aspects of Semi-cooked Chicken Meat Products

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A total of one hundred samples of semi-cooked chicken meat products including chicken hot wings and chicken drumstick (50 of each) were collected from different super-markets of different sanitation levels at Kalyobia Governorate and examined for determination of their microbiological aspects. The results revealed that the mean values of the total bacterial count , psychrotrophic count , enterobacteriaceae count and total fungal count were 6.22 x 105, 2.10 x 103 , 5.10 x103and 1.80 x103CFU/ g. of chicken hot wings samples , respectively . Such values for chicken drumsticks samples were 4.16 x 104, 7.50 x 103, 3.90 x 103 and 3.40 x 103 CFU/g., respectively. Staphylococcus aurous, Staphylococcus epidermidis, E.coli, Salmonella enteritidis, Salmonella typhimurium, Pseudomonas Spp. , Aeromonas Spp. , Enterbacter Spp ,Aspergillus flavus , Aspergillus niger , Aspergillus ochracheus, Aspergillus parasiticus , Penicillum citrinum, Penicillum expansum , Cladosporium Spp, Mucor Spp, Rhizopus Spp, Fusarium Spp., Candida albicans, Candida tropicalis, Candida solani, Cryptococcus spp, Rhodotorula Spp and Saccaromyces Spp could be isolated from the examined samples with different percentages.The public health significance of the isolated bacteria and fungi was discussed.

Introduction

Chicken acts as an important source of meat for human consumption .Contamination of poultry meat products with human enteric pathogens, such as Salmonella has been, and continues to be of concern to public health authorities and to the poultry industry. poultry is frequently implicated as a source of bacterial food poisoning ,often in domestic environments or food service establishments ,where cross-contamination of food can occur (Carson et al.,1987 ; Beli, et al., 2001 and Dominguez et al., 2002).Furthermore ,the cost of product recall in food industry due to food borne is very high (Todd,1985).Semi-cooked chicken meat products are chicken meats which were exposed to moderate heat treatment. Consumption of chicken meat products has been increased considerably during the past few decades due to intensive production of chicken, excessive demand of animal protein, growth of fast food services, institution and delicatessen markets (Waldroup, 1993). The microbial profile and safety of semi- cooked chicken meat are major issues of concern for producers, consumers and public health officials' world wide. Therefore the present investigation was planned out to throw light on the microbiological aspects of semi-cooked chicken meat products through performing:

- Total bacterial count.
- Total psychotropic count.

- Total Enterobacteriaceae count.
- Screening of Salmonella, Staphylococcus, E. coli, Pseudomonas, Aeromonas and Enterobacter spp.
- Total fungal count.
- Isolation and identification of existed moulds and yeasts.

Material and Methods

A total of one hundred samples of semi-cooked chicken meat products including chicken hot wings and chicken drumsticks (50 of each) were collected from different super-markets of different sanitation levels at Kalyobia Governorate, and transported as soon as possible to the laboratory.The samples were examined for detection of:

1.Aerobic Plate Count which was carried out according to the method Recommended by ICMSF (1978)

2.Total psychotrophic count which was performed by plating on aerobic plate count agar at 7°C for 10 days (ICMSF 1978).

3.Total Enterobacteriaceae count which was done by plating on violet red bile glucose agar medium at 37° C for 24 hours (Gork, 1976)

4.Screening of Salmonella, which was carried out as follows: The pre- enrichment broth (peptone water 1%) recommended by Edel and Kamplemacher (1973) was inoculated by the original sample and incubated at 37 °C for 24 hours. Enrichment by taking one ml. of pre-enrichment broth was transferred into 9 mls. of Rappaport Vassiliadis broth and incubated at 43 °C for 24 hours (Harrey and Price, 1981). Loopfuls from inoculated tubes were streaked over Xylose Lysine Desoxcholate agar (XLD) medium plates and then incubated at 37°C for 24 hours. Suspected colonies with or without black center were isolated. Biochemical identification was done according to the methods recommended by Edward and Ewing (1972), McFadden (1976) Collins (1984) and Kotula & Davis (1999) ,isolated colonies proved biochemically to be Salmonella microorganism were subjected to serological identification according to Kauffman white Scheme (Kauffman, 1974).

5-Isolation and identification of bacteria was done according to the methods recommended by Kauffman (1974) , Cruickshank et al (1975), McFadden(1976),Banwart(1979),Collins(1984) and Lorca et al.(2000).

6-Total fungal count according to the method recommended by Koburger & Farahat (1975) and APHA (1976) .Identification of isolated moulds according to the methods recommended by Rapper et al. (1965), Rapper and Thom (1968), Larna (1976) Samson et al. (1976), Koneman et al. (1978), Domsch et al. (1980), AL-Doory (1980), Samson et al. (1981) and Rippon (1982).Identification of yeasts was performed according to Lodder and Kreger Van Rij (970) ; Feingold and Martin (1982); Rippon (1982) ; Koneman et al. (1983) and Deak (2001).

Results

Table (1): Aerobic Plate Count/g. of the examined semi-cooked chicken meat products samples.

Semi-cooked chicken meat products	Minimum	Maximum	Mean ± S.E.
Chicken hot wings	4.72 x 103	5.30 x 107	6.22 ± 0.96 x 105
Chicken drumsticks	3.50 x 103	7.12 x 106	4.16 ± 0.81 x 104

Table (2): Total psychrotrophic count/g. of the examined semi-cooked chicken meat products samples.

Semi-cooked chicken meat products	Minimum (x102)	Maximum (x104)	Mean ± S.E. (x103))
Chicken hot wings	4.30	8.10	2.10 ± 0.85
Chicken drumsticks	7.10	3.90	7.50 ± 0.92

Table (3): Total Enterobacteriaceae count /g. of the examined semi-cooked chicken meat products samples.

Semi-cooked chicken meat products	Minimum (x 102)	Maximum (x 104)	Mean ± S.E. (x103)
Chicken hot wings	3.40	7.20	5.10 ± 0.81
Chicken drumsticks	2.50	4.60	3.90 ± 0.69

Table (4): Isolated bacteria from the examined semi-cooked chicken meat products samples.

Semi-cooked chicken meat products / Isolated bacteria	Chicken hot wings		Chicken drumsticks	
	Samples No. + ve	%	Samples No. + ve	%
Staphyllococcus aureus	9	18	3	6
Staphyllococcus epidermidis	2	4	4	8
E. coli	5	10	10	20
Salmonella enteritidis	1	2	7	14
Salmonella typhimurium	3	6	-	-
Psendomoanas spp	4	8	6	12
Aeromonas spp	2	4	3	6
Enterobacter spp	1	2	1	2

Table (5): Total fungal count /g. of the examined semi-cooked chicken meat products samples.

Semi-cooked chicken meat products	Minimum	Maximum	Mean ± S. E. ($x 10^3$)
Chicken hot wings	32	3.90 x 104	1.80 x103 ± 0.30
Chicken drumsticks	41	1.50 x 105	3.40x 103 ± 0.97

Table (6): Isolated moulds from the examined semi-cooked chicken meat products samples.

Semi-cooked chicken meat products / Isolated moulds	Chicken hot wings		Chicken drumsticks	
	Samples No. + ve	%	Samples No. + ve	%
Aspergillus flavus	7	14	3	6
Aspergillus niger	4	8	9	18
Aspergillus ochracheus,	1	2	5	10
Aspergillus parasiticus	3	6	-	-
Penicillum citrinum	8	16	3	6
Penicillum expansum	-	-	5	10
Cladosporium Spp	2	4	1	2
Mucor Spp	5	10	7	14
Rhizopus Spp	-	-	2	4
Fusarium Spp	3	6	1	2

Table (7): Isolated yeast from the examined semi-cooked chicken meat products samples.

Semi-cooked chicken meat products / Isolated yeast	Chicken hot wings		Chicken drumsticks	
	Samples No. + ve	%	Samples No. + ve	%
Candida albicans	3	6	10	20
Candida tropicalis	1	2	6	12
Candida solani	5	10	2	4
Cryptococcus spp	1	2	-	-
Rhodotorula spp	2	4	7	14
Saccaromyces spp	3	6	5	10

Discussion

The results presented in Table (1) revealed that the aerobic plate count/g. of the examined semi-cooked chicken hot wings was ranged from 4.72 x 103 to 5.30 x 107 with a mean value of 6.22 x 105 ± 0.96 x 105 CFU / g., while such count was ranged
from 3.50 x 103 to 7.12 x 106 with a mean value of 4.16 x 104 ± 0.81 x 104 CFU / g. of semi-cooked chicken drumstick samples.

Such results are coincide what has been reported by Patterson (1972) and ICMSF (1980) who stated that the higher aerobic count of chicken meat products may be attributed to the general hygiene in the processing plants , personal hygiene , cleaning efficiency , worker hands and kitchen equipments. The aerobic plate count is considered as an essential index of poultry meat quality as well as its storage life (Tompkin, 1990).

The data recorded in Table (2) revealed that the total psychrotrophic count/g. of the examined semi-cooked chicken hot wings was ranged from 4.30 x 102 to 8.10 x 104 with a mean value of 2.10 x 103 ± 0.85 x 103 CFU / g., while such count was ranged from 7.10 x 102 to 3.90 x 104 with a mean value of 7.50 x 103 ± 0.92 x 103 CFU / g. of semi-cooked chicken drumstick samples.

These results are in agreement with those reported by Mossel et al. (1972) who stated that psychrotrophes can grow most rapidly on meat during cold storage and are considered the major microorganisms responsible for spoilage. Banwart (1979) stated also that the exposure of poultry meat to chilling or holding in cold stores results in growth of psychrotrophic microorganisms which predominate and lead to meat deterioration. Although psychrotrophic bacteria are generally non pathogenic to man they are considered by different investigators the most responsible causative organisms of cold stored food spoilage (Shaw and Latty, 1982).

The results achieved in Table (3) declare that the mean value of the total Enterobacteriacea count of the examined semi-cooked chicken meat products was 5.10x 103 ± 0.81x103 and 3.90 x 103 ± 0.69x103 /g. of chicken hot wings and chicken drumsticks, respectively.

These results are in agreement with those reported by Simmonson (1971) , Patterson(1972) and ICMSF (1978) who stated that the presence of considerable number of enterobacteriaceae indicates inadequate processing and/or post processing recontamination as well as unsanitary handing .In processed food , enterobacteriaceae do indicate inadequate processing or post-processing contamination , most probably workers , dirty instruments, machinery , surfaces or from raw food before processing which might drive their contamination from various sources as human contact , polluted water , soil or manure(Walls and Scott,1997).

The date recorded in Table (4) revealed that Staphylococcus aureus, Staphylococcus epidermidis, E.coli, Salmonella enteritidis, Salmonella typhimurium, Pseudomonas Spp., Aeromonas Spp., Enterbacter Spp, could be isolated from semi-

cooked chicken meat products samples. These results are in agreement with those reported by ICMSF (1980) and Duffy et al. (2000) who stated that presence of Staphylococcus aureus, in heat treated food may be due to its contamination from food handlers, inadequate cleaned equipments or post-processing contamination. There are many stages in poultry processing where cross – contamination may occur during processing (Lillard, 1989; Mead, 1992 and Capita et al., 2002).

Increased consumption of poultry has resulted in an increase of poultry – associated food borne diseases. Particularly salmonellosis (Todd, 1978; Grant and Patterson, 1995; Kotula and Davis, 1999; Bovill et al., 2000, and Rose et al., 2002). Human diarrhea is a major medical problem. It constitutes are of the principal cause of morbidity in infants and children. Salmonella typhimurium was isolated from children suffering form acute gastroenteritis in (De Boer and van der Zee, 1992 and Roy et al., 2002). Foods are usually contaminated after cooking by persons cutting, slicing, chopping or otherwise handling them and then keeping the foods at room temperature
for several hours or storing them in large containers (Arias et al., 2001). Foods associated with staphylococcal poisoning, meat products including poultry and dressing (Bergdoll, 1979; Crane, 1999, Dinges et al., 2000 and Castillejo - Rodriguez et al., 2002).

The data recorded in Table (5) revealed that the mean values of the total fungal count were 1.80x 103 ± 0.30x103 and 3.40 x 103 ± 0.97x103 /g. of chicken hot wings and chicken drumsticks, respectively. These results are in agreement with those reported by Lowry and Gill, (1984) who stated that the mould spores on meat from the air is considered the main source of contamination of the meat with moulds.

The data recorded in tables (6&7) revealed that ,Aspergillus flavus , Aspergillus niger , Aspergillus ochracheus, Aspergillus parasiticus , Penicillum citrinum, Penicillum expansum , Cladosporium Spp,Mucor Spp, Rhizopus Spp, Fusarium Spp.,Candida albicans, Candida tropicalis, Candida solani, Cryptococcus spp, Rhodotorula Spp and Saccaromyces Spp could be isolated and identified from the examined chicken hot wings and chicken drumstick samples.

These results are in agreement with those reported by Aziz and Youssef (1991) who stated that the presence of fungi in meat increase the probability of hazards arising from mould growth on meat . The direct hazard to human health from mycotoxins is achieved due to mycoyoxigenic strains of moulds are still able to secrete mycotoxins in stored meat at suitable instances.

The ability of the yeast species to grow at low temperatures and their proteolytic & lipolytic activities. Yeasts may play a more significant role in the spoilage of poultry meat products (Deak, 2001) .

Total bacterial count of semi-cooked chicken meat products must not be more than 1x104 /g.The semi-cooked chicken meat products must be free from Staphylococcus aureus, their toxins, E.coli, Salmonella Spp, Shigella Spp. and mould

growths (E.O.S., 2000).`Semi-cooked chicken meat products must be prepared, processed, exposed to semi-cooking and stored under good hygienic conditions.

References

Al-Doory, Y. (1980): Laboratory Medical Mycology. Lea and Febiger, Philadelphia

APHA, (1976): Compendium of methods for the microbiological examination of foods. The American Public Health Association, Washington D.C

Arias, M.L.; Monge-Rojas, R.; Chaves, C. and Antillon) (2001) Effect ofstorage temperatures on growth and survival of Escherichia coli O157: H7 inoculated in foods from a neotropical environment. Rev. Biol. Trop; 49(2):517-523.

Aziz, N. and Youssef, A. (1991): Occurrence of aflatoxin producing moulds in fresh and processed meat in Egypt .Food Additives and Contaminants, 8(3):321- 331.

Banwart, G.J. (1979) :Basic Food Microbiology. Publishing Company INC. West Port AVI Connecticut 2nd Ed.

Beli, E.; Duraku, E. and Telo, A. (2001): Salmonella serotypes isolated from chicken meat in Albania. Int . J. Food Microbiol. 71(2-3):263-266 ·

Bergdoll, M. S (1979): Staphylococcal intoxication, in Riemann H, Bryan (eds): Food borne infections and intoxication 2nd Ed. New York. Academic press 59-73.

Bovill,R. Bew. J. Cook, N. D'Agostino M. Wilkinson,N. Baranyi, J. (2000): Predictions of growth for Listeria monocytogenes and Salmonella during fluctuating temperature. Int. J. Food Microbiol .59, (3): 157-165.

Capita, R.; Alonso-Calleja, C.; Garcia-Fernandez MC and Moreno, B. (2002): Characterization of Staphylococcus aureus isolated from poultry meat in Spain. Poultry Sci .; 81(3):414-421.

Carson, M.O.; Lillard, H.S. and Hamdy, M.K.(1987): Transfer of firmly attached Salmonella typhimurium from raw poultry skin to other surfaces .Journal of Food Protection ,50(4):327-329.

Castillejo - Rodriguez. A. M.; Gimeno , R. M. ; Gosano G. Z. ; Alcala , E. B. and Perez M. R. (2002): Assessment of mathematical models for predicting Staphylococcus aureus growth in cooked meat products. Food Prot., 65 (4): 659-665.

Collins, C.H. (1984): Microbiological methods 5th Ed. Microbiology Laboratory Manual, British library. Butter worth in Co.

Crane, J.K. (1999): Preformed bacterial toxins. Clin. Lab. Med. 19: 583-589

Cruickshank,R.; Duguid,J.;Marmion,B.; and Swain,R.(1975): Medical Microbiology.The practice of medical microbiologyVII,12thEd.Churchill living stone ,Edinburgh. Identification of yeasts isolated from poultry meat. . (2001): M –Deal Acta Biol Hung. 52(3):195-200.

De Boer, E. and van der Zee,H.(1992): Salmonella in food of animal origin in the Netherlands .Proceedings of a conference on Salmonella and salmonellosis . Ploufragan , France.15-17 September 1992.Reports commune 265-272.

Dinges, M. M.; Orwin, P. M.; Schlievert, P. M. (2000): Exotoxins of Staphylococcus aureus. Microbiol. Rev. 13: 16-20.

Dominguez, C.; Gomez, I. and Zumalacarregui, J (2002): Prevalence of Salmonella and Campylobacter in retail chicken meat in Spain. Int. J. Food Microbiol. 72(2):165-168.

Domsch, K.H.; Gams, W. and Anderson,T.H.(1980): Compendium of soil fungi.Academic press , London.

Duffy, G, Kilbride, B. Sheridan, J. J Blair , I. S. McDowell, D. A. (2000):A membrane-immunofluorescent- viability staining technique for the detection of Salmonella spp. from fresh and processed meat samples. J. Appl. Microbiol , 89 (4) : 587-594.

Edel, W. and Kamplemacher, E. (1973): Comparative studies on the isolation of sublethally injuried Salmonella in a European laboratories.Bull of the World Health Organization, 438, 167-174.

Edwards, P.R. and Ewing, W.H. (1972): Identification of Enterobacteriaceae.Minneapolis, Burgess, Publ. Comp., Atlanta, U.S.A.

E.O.S.(2000):Poultry meat products .Egyptian Organization for Standardization and Quality Control, Ministry of Industry . Cr 3493-2000.

Feingold, S.M. and Martin, W.J. (1982): Bailey and Scott's Diagnostic Microbiology, 6th Ed. The C.V.Mosby Company, st, Loins Toronto.

Gork, F.P.(1976) : Uber die ursachen von qualitats mangein bei liefge frozen fertiggerichten quffeischbasis in derfluggast. Verpflegung. Doktor Ingeveur Diseration Berlin.

Grant, I.R. and Patterson, M. F. (1995): Combined effect of gamma radiation and heating on the destruction of Listeria monocytogenes and Salmonella typhimurium in cook-chill roast beef and graying. J. Food Microbiol. 27 (3): 117-128

Harrey, R.W. and Price, H. (1981) :Comparison of selenite F-muller Kauffmann tetrathionate and Rapp port's medium for salmonella isolation from chicken giblets after pre-enrichment in buffered peptone water. J.Hyg. Camb. 87: 219-227.

ICMSF (1978): International Commission on Microbiological Specification for Foods, Vol. I Their significance and methods of enumeration 2nd Ed. Univ. of Toronto Press, Toronto and Buffalo, Canada.

ICMSF (1980): International Commission on Microbiological Specification for Food, Microorganisms in food. Vol. 2, Univ. of Toronto Press, Toronto, Canada.

Kauffman, F. (1974): Kauffman white scheme. WHO, BD / 72, L. Rev. I. Acta. Pathol. Microbiol. Sci. 61: 385- 398.

Koburger, J.A. and Farahat, B.Y. (1975): Fungi in foods .A comparison of media to enumerate yeasts and moulds. J. Milk and Food Technol.38:466-468.

Koneman, E. W.; Allen, S. D.; Dowell, Jr., V.R. and Sommer, H. M. (1983): Color Atlas and Textbook of Diagnostic Microbiology, 2nd Ed. J. B. Lippincott Company, New York, Sydney.

Koneman, E. W.; Robertsa, G.D. and Wright, S.E.(1978) : Practical Laboratory Mycology, 2nd Ed. The Williams and Wilkins Company, Baltimore.

Kotula, K. L. and Davis, M. E. (1999): Broiler Skin Sampling for Optimum Recovery of Salmonella spp. Journal of Food Protection. 62 (3): 284-286.

Larna, D.H. (1976): Medically important fungi, a guide to identification Harper and Row publishers. Hagerstown, Maryland, New York San Francisco, London

Lillard, H.S. (1989): The Impact of commercial processing on the bacterial contamination and cross- contamination on broiler carcasses. J. of Food Protect. 53 (3):202 – 204.

Lodder, J. and Kreger – Van Rij, N.J.W. (1970): The Yeasts. Taxonomic Study. North Holland Publishing Company, Amsterdam.

Lorca, T.A.;Pierson, M.D.; Claus, O.D.; Morcy, O.E. and Sumner S.S. (2000): Penetration of surface – inoculated bacteria as a result of hydrodynamic shock wave treatment of beef steaks . J. Food Prot.65 (4):616-620.

Lowry, P.D. and Gill, C.D. (1984): Temperature and water activity minimum for growth of spoilage mould from meat. J. Appl. Bacteriol., 56:193-197.

McFadden, Jean, F. (1976): Biochemical tests for identification of medical bacteria. The Williams &Wilkins Comp., Baltimore, U.S.A.

Mead, G.C. (1992): Food poisoning salmonellas in the poultry industry .The current prospect for controlling Salmonella in the poultry industry .Meat Hyg. 73:6-12.

Mossel, D. A.;Krol,B. and Moerman,P.C. (1972): Bacteriology and quality perspectives of Salmonella redication of frozen meat .Alimenta 11.51

Patterson, J.T. (1972): Microbiological sampling of poultry carcasses. J.Appl. Bacteriol. 35: 569 – 575.

Rapper, K.B.; Fennel, D. I. and Austwick, A.K. (1965): The genus Aspergillus. Williams and Wilkins Company, Baltimore.

Rapper, K. B. and Thom, C. (1968): A manual of Penicillia Hafner pubishing Co. New York.

Rippon, J. W.; (1982): Medical Mycology, 2nd Ed. W. B. Saunders Company, Philadelphia

Rose, B.E.; Hill, W.E.; Umholtz ,R.; Ransom ,G.M. and James ,W.O.(2002): Testing for Salmonella in raw meat and poultry products collected at federally inspected establishments in the United States, through1998. J. Food Prot.; 65(6):937-947.

Roy P, Dhillon AS, Lauerman LH, Schaberg DM, Bandli D, Johnson.S(2002): Results of Salmonella isolation from poultry products, poultry, poultry Environment, and other characteristics . Avian Dis; 46(1):17-24.

Samson, R. A.; Hilkstia, E. S. and Van Oorschot, C. A. N. (1981): Introduction to food fungi Centralbureau voor Schimmelculures. Baarn. The Netherlands.

Samson, R. A., Stolk, A. and Hadlok, R. (1976): Revision on the subsection fasiculata of genus Penicillium and some allied species. Studies in Mycology (11). Centraalbureau voor Schimmelcultures, Baarn. The Netherlands

Shaw, B. G. and Latty, J. B. (1982): A numerical taxonomic study of Pseudomonas strains from spoiled meat. Journal of Applied Bacteriology 52, 219 - 228

Simmonson, B. (1971): Methods for determining the microbial count of ready – to cook poultry. Poult. Sci.J.27, 368-373.

Todd, E. (1978): Food borne diseases in six countries a comparison. J.Food Protect. 41:559-564.

Todd. E. C. D. (1985): Economic loss from food borne disease and non-illness related recalls because of mishandling by food processors. J. Food Prot. 48:621 –633.

Tompkin, R.B. (1990): The use HACCP in the production of meat and poultry products .J. Food Protect. 53(9):795- 803.

Waldroup, A.L. (1993): Summary of worktop control pathogens in poultry processing. Poultry Sci.72 (6):1177-1179.

Walls,I. and Scott,V.N.(1997): Use of predictive microbiology in microbial food safety risk assessment . J. Food Microbiol.20, 36(2-3):97-102.

الملخص العربي

السمات الميكروبيولوجية لمنتجات لحوم الدواجن نصف المطهية

فهيم عزيز الدين محمد شلتوت
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أجريت هذه الدراسة على عدد ١٠٠ عينة منتجات لحوم الدو اجن نصف المطهيه و هي:-
دبوس الدواجن وأجنحة الدواجن الحارة، بواقع ٥٠ عينة من كل نوع، وتم إجراء الفحوصات التالية عليها:-

١- العد البكتيري الكلى وكان متوسط العد البكتيري الكلى ٦,٢٢ × ١٠^{٥} ، ٤,١٦ × ١٠^{٤} لكل جرام دبوس الدواجن، وأجنحة الدواجن الحارة على الترتيب.
٢- العد البكتيري للبكتريا المحبة للبرودة وكان متوسطها ٢,١ × ١٠^{٣} ، ٧,٥ × ١٠^{٣} لكل جرام دبوس الدواجن، وأجنحة الدواجن الحارة على الترتيب.
٣- العد البكتيري للبكتريا المعوية وكان متوسطها ٥,١ × ١٠^{٣} ، ٣,٩ × ١٠^{٣} لكل جرام دبوس الدواجن، وأجنحة الدواجن الحارة على الترتيب.
٤- عزل وتصنيف البكتريا وكانت
***Staphylococcus aureus, Staphylococcus epidermidis, E.coli, Salmonella enteritidis, Salmonella typhimurium*, Pseudomonas Spp., Aeromonas Spp. , Enterbacter Spp.**
و بنسب مختلفة.
٥- العد الكلى للفطريات والخمائر وكان متوسطها ١,٨ × ١٠^{٣} ، ٣,٤ × ١٠^{٣} لكل جرام دبوس الدواجن، وأجنحة الدواجن الحارة على الترتيب.
٦- عزل وتصنيف الفطريات والخمائر وكانت ***Aspergillus flavus* , *Aspergillus niger* , *Aspergillus ochracheus, Aspergillus parasiticus* , *Penicillum citrinum, Penicillum expansum*** , **Cladosporium Spp,Mucor Spp, Rhizopus Spp, Fusarium Spp.,*Candida albicans, Candida tropicalis, Candida solani,* .Cryptococcus spp, Rhodotorula Spp and Saccaromyces Spp**
و بنسب مختلفة.
٧- *تم مناقشة الأهمية الصحية للميكروبات المعزولة وخطورتها على الصحة العامة*