Hygienic Studies on Chicken Edible Offal’s

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Abstract

A total of 90 random samples of chicken edible Offal’s, 30 each of liver, gizzard, and heart, were subjected to organoleptic, chemical and bacteriological evaluation. In concern to organoleptic inspection, all samples were accepted. The mean pH values for liver, gizzard and heart samples were 6.46, 6.34 and 6.48 respectively. The protein content was found to be high level in liver with a mean value of 15.84% followed by gizzard (13.68%) then heart (10.02%). Meanwhile fat was found to be high content in liver with a mean value of 4.40% followed by heart (2.5%) then gizzard (2.27%). Salmonella organisms were isolated from 7 (7.77%) and Escherichia coli was isolated from 11 (12.2%) out of 90 examined samples. The highest frequency of E. coli was recorded in liver samples (16.67%) then heart (13.33%) followed by gizzard (6.67%).

Introduction

Poultry meat is an economical meat, quickly and easily to prepare and serve. It has a number of desirable nutritional and organoleptic properties. It contains several important classes of nutrients, low in calories, source of both saturated and unsaturated fatty acids, its fat contains essential fatty acid and its protein is good source of essential amino acids.

The chicken edible Offal’s can be considered as nutritionally rich meal as they contain sufficient amount of high quality of proteins, minerals & vitamins moreover they are easily digested.

Each 100 g. of chicken liver has nearly 17 g of high-quality protein, which means it contains each of the essential amino acids. It has 117 calories and less than 1 g carbohydrates, also Chicken liver provides 9 mg iron per 100 g, or 50 percent of the daily value for iron. Many Americans, especially children, adolescents and women of child-bearing age, are at risk for inadequate iron intake according to the 2010 Dietary Guidelines from the U.S. Department of Health and Human Services, also a 100 g serving of chicken liver provides 55 mcg selenium, 588 mcg folate, 1.8 mg riboflavin and 11,078 IU, of vitamin A. This is more than 100 percent of the daily value for each of these essential vitamins and minerals. Liver is also high in phosphorus, zinc, vitamin C, niacin, pantothenic acid and vitamin B-6. (Stein, 2011)

The prevalence of salmonellae on retail poultry carcasses remains a significant public health concern. Salmonellae are responsible for the majority of acute cases of human gastroenteritis (Mulder, 1995). Numerous strains of the salmonella's genus cause gastrointestinal illness worldwide, causing substantial morbidity, hospitalization and economic burden. The most common route of transmission of salmonellae is the fecal-oral route, where humans are infected from ingestion of the bacteria from contaminated food or water, or following direct or indirect contact with the feces of an infected human or animal. Common animal sources of salmonellosis include poultry and other birds.

E. coli was the principle organism isolated from de-feathering machines and carcasses and its Offal’s at a commercial poultry processing plant. As edible Offal’s are commonly consumed by the majority of population, the present study was designed for evaluation the
sanitary status of fresh chicken edible offal’s (liver, gizzard and heart) as following:

I. Organoleptic examination of chicken edible offal’s

II. Chemical examination:
   Determination of pH.
   Determination of protein
   Determination of fat.

III. Bacteriological examination:
   1- Isolation and identification of Salmonella
   2- Isolation and identification of E. coli.
   3- Serological examination of Salmonella and E. coli.

2. Materials and methods

2.1. Sampling
A total of 90 fresh chicken edible offal’s 30 of each liver, gizzard and heart were randomly collected from poultry shops and farms in Sharkia Government, Egypt.

2.2. Organoleptic examination
Organoleptic examination was evaluated for the odor, taste, consistency and color for each sample including boiling and roasting test according to the method recommended by Libby (1975) and MacNeil and Mast (1982).

2.3. Chemical analysis:
2.3.1 Measurement of pH:
The method stated by ISO (1974) was applied as follows; 5 g of sample were, homogenized with an equal mass of distilled water in a mixer. And the pH value was measured by using pH meter

2.3.2. Determination of Protein:
The Kjeldahl method stated by AOAC (1990)

2.3.4. Determination of Fat
The Soxhlet technique recommended by AOAC (1990)

2.4. Bacteriological examination
2.4.1. Isolation and identification of Salmonella
2.4.1.1. Isolation
5 gm from each sample were individually stomached in 45 ml of (0.1% sterile buffered peptone water) and incubated at 37°C for 24 hours (Edel&Kamplemacher, 1974). One ml from the incubated tissue homogenate was pipette into a sterile test tube containing 10 ml. Rappaport Vassiliadis broth (Vassiliadis, 1983). The tubes were incubated at 43°C for 18 hours. Loopeful from the content of the tubes were streaked on Xylose Lysine Desoxycholate (XLD) agar. Culture Plates were then incubated at 370 C for 24 hours. Suspected Colonies were picked up and isolated in pure cultures on nutrient slope agar and kept for further identification.

2.4.1.2. Identification of Salmonellae:
The identification was carried out according to Edwards and Ewing (1972), Cruickshank et al. (1982), Krieg and Holt, (1984) and Koneman et al. (1994).

Serological Identification:
Isolates proved biochemically and subjected to serological identification according to Kauffman white scheme (Kauffman, 1974).

2.4.2. Isolation and identification of E. coli:
One ml from the incubated tissue homogenate was pipette into a sterile test tube containing 10 ml MacConkey broth. Selective plating media (ICMSF, 1978): A Loopeful from each positive tube (acid and gas) which firstly incubated at 37 ± 0.5 °C for 24 hrs was streaked into Eosin Methylene Blue (EMB) Agar. The inoculated plates were incubated at 37 °C for 48 hrs. Typical colonies of E. coli appear greenish, metallic and with dark purple centre. Suspected colonies were purified and sub-cultured onto nutrient agar slopes and incubated at 37 °C for 24 hrs. The purified colonies on nutrient agar were subjected to further investigation.


2.4.2.2. Serological identification of E. coli
The isolates were serologically identified according to Kok et al. (1996) by using rapid diagnostic E.coli antisera sets (DIFCO Laboratories, Detroit Michigan 48232-7058, USA) for diagnosis of the Enteropathogenic types.

3. Result and discussion:
3.1. Organoleptic examination: The fitness of any article of food should be based on combined information obtained from
organoleptic evaluation which include (smell, appearance and texture), chemical and bacteriological examinations.

Color was an extremely important sensory characteristic of chicken meat and edible offal’s; it directly influenced the perception of both the flavor and quality of the product.

The results given in table (1) revealed that the acceptable color in examined liver, gizzard and heart were 87%, 93% and 90% respectively. The predominant color was the brownish color in examined organs as normal while yellowish one consider as abnormal.

The acceptable odour was recorded in 87%, 93% and 90% of examined liver, gizzard and heart samples respectively. The lively fresh characteristic odor of organs considered as normal.

The normal consistency of liver was firm while abnormal was friable. The data declared that 87% of examined liver had normal consistency while 93% of examined gizzard had normal consistency and 90% of examined heart was normal.

The mean abnormalities in heart were fibrinous precarditis with percentage of 10% the unpalatable taste of examined liver was 13%, gizzard 7% and heart 10%.

Nearly similar results were obtained by Hafez (1984)EL-Husany (1999), Abd El-Aziz et al. (2002), Gergis (2004), El-Ghamry (2008) , Gad (2009) and El-Malt (2012) while lower results obtained by Abd El-Latif (1988) but the higher results were obtained by Morshdy and Hafez (1986) . The abnormal odor may be due to rancidity, microbial activity or general microbial contamination (Lineweaver, 1994). The normal odor and taste of chicken Offal’s may be influenced by extrinsic factors as kind of food and drugs given to poultry before slaughtering (Mousa, 2001).

3.2. Chemical examination

Edible offal’s involved in this investigation are considered as an excellent source of the nutrients which are important in human being consumption such as protein which is of high biological value and contains high percentage of the essential amino acids, and also these organs contains more saturated fatty acids than most vegetables oils. Certain organs contain lipids which have a higher percentage of unsaturated fatty acids and may be considered excellent sources of polyunsaturated fatty acids.

**Fig. (1) Means of pH, protein and fat in examined chicken edible offal’s:**

The pH is considered as one of the most important factors reflecting product quality depending on pre slaughter treatment, degree of contamination and storage conditions.

The results in table fig. (1) revealed that the pH of examined liver gizzard and heart ranged from 6.3 to 6.6, 6.2 to 6.5 and 6.4 to 6.6 with a mean value of 6.46, 6.34 and 6.48 respectively. Nearly similar results obtained by El-Sayed. (2007).

The protein percentage in examined Offal’s were ranged from 12.5 to 20.3, 10.5 to 15.7 and 9.6 to 10.4 with a mean value of 15.84 , 13.68 and 10.02 in liver, gizzard and heart respectively nearly results obtained by Stein, (2011) during examination of chicken liver.

The fat% was found to be high in liver with a mean value ( 4.40%) followed by heart (2.5%) then gizzard (2.27%), the result of examined heart lower than that obtained by Farahat, (1998) and Fornias, (1996). This may be due to the difference in the fat distribution in the tissue of mammals and birds. There is shortage
in the available data about the chemical composition of edible Offal’s of chicken.

3.3. Isolation of Salmonella

Contamination of edible offal’s were found to be related to all area of production, handling, processing and environmental pollution, so the present study was conducted to evaluate the sanitary condition of fresh edible Offal’s

Salmonella infection in poultry is the most important source of salmonella infection in man. Also salmonella is an important zoonotic pathogen and its prevalence in the animals acts as a continuous threat to man. (El-Newishy and Sylvia , 2010).

Salmonella organisms were isolated from 7 (7.7%) out of 90 examined samples. The highest frequency of salmonella among the examined organs was recorded in liver samples (10%) followed by gizzard and heart with percentage of (6.67%) as shown in table (2). Lower results were obtained by Abd El-Ghany, (2003) found 5 (4.17%) out of 120 examined samples. Different results were obtained by Elmossalami, 2002 who revealed that none of chicken samples contain salmonellae.

The data presented in table (3) showed that the frequency of salmonella strains isolated from examined liver samples were $S. typhimurium$ (3.33%), S. Kentucky (3.33%) and S. chester (3.33%) , which represents total percent as 10% . While salmonella strain isolated from gizzard samples was S. enteritidis (6.67%), meanwhile salmonella strains isolated from heart samples were $S. typhimurium$ (3.33%) and S. muenster (3.33%), which represents total percent as (6.67%). Similar serotypes were obtained by El-Ghamry (2008) as she isolated S. enteritidis, S. typhimurium and S. Kentucky. Also Elias , (1995) found that the identified salmonella serotypes were S. muenster (2.1%) and S. enteritidis (1%) , also Farag , (1995) isolated S. typhimurium and S. enteritidis while Kenawy , (2006) isolated S. Kentucky (10%). Also, Abbass et al. (1999) isolated $S. typhimurium$ from the liver and heart and Mahmoud and Seham Hamouda (2006) found that the isolated Salmonella were $S. typhimurium$ , $S. enteritidis$ and $S. Kentucky$.

FSIS (2008) reported that consumption of food contaminated with Salmonella can cause salmonellosis, one of the most common bacterial food-borne illnesses. Salmonella infections can be life-threatening, especially to those with weak immune systems, such as infants, the elderly and persons with infection or undergoing chemotherapy. The most common manifestations of salmonellosis are diarrhea, abdominal cramps, and fever within eight to 72 hours. Additional symptoms may be chills, headache, nausea and vomiting that can last up to seven days.

3.4. Isolation of E. coli

Escherichia coli play an important ecological role within resistance bacterial populations and can be used as a bio indicator of antimicrobial resistance (Jiang et al 2011).

The results shown in table (4) showed that $E. coli$ organism was isolated from 11 (12.2%) out of 90 examined samples. The highest frequency of $E. coli$ was recorded in liver samples (16.67%) then heart (13.33%) followed by gizzard (6.67%). Higher results were obtained by Panov (1985), Morshdy and Hafez (1986), Abd EL-Ghany (2003), El-Ghamry (2008) and Ruzauskas et al., (2010) as they found $E. coli$ in their examined samples with percentage of 85% , 68% ,45%, 21.67%, 28.3% and 41.7% respectively.

The results in table (5) revealed that the frequency of $E. coli$ strains isolated from examined liver samples were $O_{125}:K_{70}$ (10%) , $O_{119}:K_{69}$ (3.3%) , $O_{113}:K_{58}$ (3.3%) while $E. coli$ strains isolated from gizzard were $O_{55}:K_{59}$ (3.3%) and $O_{256}:K_{60}$ (3.3%), meanwhile in heart the isolated strains were $O_{55}:K_{59}$ (3.3%), $O_{256}:K_{60}$ (3.3%) , $O_{119}:K_{69}$ (3.3%) and $O_{124}:K_{72}$ (3.3%).Similar isolates were obtained by El-Ghamry (2008) as she found $O_{119}$ and $O_{111}$ but

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in different percentage 41.17% and 11.76% respectively. Also Abd EL-Ghany (2003) found O111, O119 and O125 with percentage 15.39%, 19.23% and 15.23% respectively. Meanwhile different isolates were obtained by Farag (1995) as he found O18 and O167.

E. coli is the most common microorganisms implicated in infants and children diarrhea cases (Taha, 2002)

References


Table (1): Organoleptic evaluation of examined chicken edible Offal’s (N=30).

<table>
<thead>
<tr>
<th>edible offal’s</th>
<th>Color</th>
<th>Odor</th>
<th>Consistency</th>
<th>Taste</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal</td>
<td>Abnormal</td>
<td>Normal</td>
<td>Abnormal</td>
</tr>
<tr>
<td>Liver</td>
<td>No. %</td>
<td>No. %</td>
<td>No. %</td>
<td>No. %</td>
</tr>
<tr>
<td>Gizzard</td>
<td>No. %</td>
<td>No. %</td>
<td>No. %</td>
<td>No. %</td>
</tr>
<tr>
<td>Heart</td>
<td>No. %</td>
<td>No. %</td>
<td>No. %</td>
<td>No. %</td>
</tr>
</tbody>
</table>

Table (2): Incidence of suspected Salmonella in examined chicken edible Offal’s (n=30 for each samples)

<table>
<thead>
<tr>
<th>Microorganism</th>
<th>Liver</th>
<th>Gizzard</th>
<th>Heart</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. %</td>
<td>No. %</td>
<td>No. %</td>
<td>No. %</td>
<td>No. %</td>
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</tbody>
</table>

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Table (3): Serological identification of Salmonella in chicken edible offal’s strains

<table>
<thead>
<tr>
<th></th>
<th>Liver</th>
<th>Gizzard</th>
<th>Heart</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
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<tr>
<td>Salmonella typhimurium</td>
<td>1</td>
<td>3.33%</td>
<td>1</td>
<td>3.33%</td>
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<tr>
<td>Salmonella enteritidis</td>
<td>2</td>
<td>6.67%</td>
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<td>Salmonella kentucky</td>
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<tr>
<td>Salmonella muenster</td>
<td>1</td>
<td>3.33%</td>
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<td></td>
</tr>
<tr>
<td>Salmonella chester</td>
<td>1</td>
<td>3.33%</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>3</td>
<td>10.00%</td>
<td>2</td>
<td>6.67%</td>
</tr>
</tbody>
</table>

Table (4): Incidence of suspected E. coli in examined chicken edible offal’s (n=30 for each samples)

<table>
<thead>
<tr>
<th>Microorganism</th>
<th>Liver</th>
<th>Gizzard</th>
<th>Heart</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.coli</td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>E.coli</td>
<td>19</td>
<td>63.33%</td>
<td>15</td>
<td>50.00%</td>
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<tr>
<td></td>
<td>62</td>
<td>68.88%</td>
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Table (5): Serological identification of E. coli in examined chicken edible offal’s. (n=30 for each samples)

<table>
<thead>
<tr>
<th>Chicken Offal’s E. coli</th>
<th>Liver</th>
<th>Gizzard</th>
<th>Heart</th>
<th>Total</th>
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</thead>
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<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>0125:k70 (B15)</td>
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<td>10.00%</td>
<td></td>
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<td>055:k59 (B5)</td>
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<td>3.33%</td>
<td>1</td>
<td>3.33%</td>
</tr>
<tr>
<td>026:K60(B6)</td>
<td>1</td>
<td>3.33%</td>
<td>1</td>
<td>3.33%</td>
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<tr>
<td>0119:K69(B19)</td>
<td>1</td>
<td>3.33%</td>
<td></td>
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<tr>
<td>0111:K58(B9)</td>
<td>1</td>
<td>3.33%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0124:K72(B17)</td>
<td>1</td>
<td>3.33%</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>5</td>
<td>16.67%</td>
<td>2</td>
<td>6.67%</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>12.22%</td>
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