The study contains the description of the ostrich fat by estimating the chemical content, which included moisture, protein, fat, ash, cholesterol, minerals and lipid-soluble vitamins, including vitamin (E and A) and the estimation of lipoproteins. Chemical properties were also studied which include peroxide value (PV), free fatty acids (FFA), saponification number (SN), iodine number and Physical properties include viscosity, density and specific gravity, refractive index, melting point and ester value (EV). Fatty acids were identified by using gas chromatography (GC). The results showed the percentage of moisture, protein, fat and ash were 5.56%, 5.16%, 87.88% and 1.03%, respectively. The mineral includes sodium, potassium, calcium, magnesium, phosphorus, iron and selenium reach to 8.5, 2.5, 40.11, 12.96, 78.6, 0.532 and 7.86 ppm respectively, cholesterol content was 50.63 mg / 100 g, vitamins content A and E was recorded 72.13 and 91.30 mg / ml respectively. The fat has good chemical and physical properties, such as viscosity, density and specific gravity, refractive index, melting point, saponification number, iodine number and ester value. While the results of lipoproteins in the ostrich fat HDL was 65 mg / dl, LDL 52 mg / dl and VLDL 35 mg / dl and triglycerides reach to 75 mg / dl. The peroxide number was 0.86 equivalent Meq O₂ / Kg, and the percentage of the free fat acids reach to 0.38%. The fatty acid compassion was analyzed by gas chromatography (GC) and also showed nine saturated and unsaturated fatty acids including oleic acid, palmitic acid, arachidonic acid, erucic acid, heneicosanoic acid, undecanoic acid, lauric acid, caproic acid and myristic acid.

1. Introduction:
Ostrich bird Struthio camelus is the largest bird herbaceous plant in the nature, its native is the deserts of Africa and the Arabian Peninsula. It was follows the Struthionidae family, the Struthioniformes, and the bird species that can run and cannot fly Raitae [1].

The interest of the ostrich has increased in the world. As well as it is a source of meat, there are secondary products include the fat in specific depots in abdomen, on breast, and on back of the ostrich bird, which different in their quantity, composition and characteristics varied depending on the type, composition, diet, age and sex of the animal [2,3].

Ostrich fat is rich in polyunsaturated fatty acids (PUFA) and there are many studies about the effects of these acids which has advantages about their ability to modified phospholipids, modified their biological functions, their role in maintaining tissue and low cellular toxicity of normal cells. Ostrich fat contains omega-9, omega-6, omega-3, essential fatty acids (EFAs) and some vitamins that keep the skin healthy. It has the ability to penetrate the skin completely without blocking pores, this advantage returns to the high levels of oleic acid. The ostrich fat can be used as a conveyor medium...
with various medical or cosmetic manufactures since it easy to absorb in because of ostrich fat rich in EFAs is help cardiovascular, immune and nervous system, it helps to produce the necessary phospholipids to properly form, maintain cell membranes and help develop neurons, brain and nervous systems [2].

The objective of this study was to estimate chemical content, physical and chemical properties, estimate lipoproteins, saturated and unsaturated fatty acid to the ostrich fat to show their nutritional, health and industrial importance.

2. Materials and Methods

Black neck ostrich bird was bought from the farms of the Babel governorate in the Mahaweel district, the study was conducted in the laboratories of the department of food science, college of agriculture, Basrah University. It was slaughtered, feathers removed and fatty tissues were isolated from the rest of the carcass. The lipid tissue was then extracted from the wet tissue by the method of [4] mentioned in [5].

Chemical content of ostrich fat:

Chemical content of ostrich fat included moisture, protein, fat and ash content was studied according to the method described in [6]. Mineral in ostrich fat were estimated by the method of [7]. Cholesterol content according to the method mentioned by [8]. Vitamin A content according to [9], vitamin E according to the method described in [10]. Refractive index was calculated using abbe refractometer, density and specific gravity, saponification number and ester value according to the methods mentioned in [11]. Viscosity and Lipoproteins were estimated according to the method mentioned in [5]. Melting point and iodine number of ostrich fat was estimated by the method reported in [12]. Peroxide value according to the method described in [13]. Acid value was calculated by the ratio of free fatty acids according to the method mentioned in [14].

Lipoproteins of the ostrich fat was evaluated by using Reflatrom device supplied by Una-Health English Company. The fat sample was prepared according to the method that prepared from ABCAM Company. 100 mg of sample that melt in 1 ml of 5% Triton X-100 in water bath for 2-4 min or until the liquid become hazy, the heating is repeated more than once with 50 ml from the sample, then 30 microliter from sample was placed in the device tube, after that the sample reading was entered into the device.

The fatty acid estimated using Gas Chromatography of the Ministry of Science and Technology's Department of Gas Chromatography - the Laboratory of Chromatography Techniques where the FID was used. The type of separation column used was SP-2480 with dimensions of 30 m × 0.25mm × 0.25mm. The temperature of the injection area is 280 ◦C and the temperature of the detector is 330 ◦C at 100 kPa pressure. Then, the sample compared with standard fatty acids separated under the same conditions and depending on Retention time [15].

3. Results and Discussion

3.1. Chemical content of ostrich Fat:

The results in Table (1) showed that the chemical content of ostrich fat, moisture, protein, fat, ash is 5.56%, 5.16%, 87.88% and 1.03% respectively, cholesterol content is 50.63 mg / 100 g. The chemical content of the fat was lower than that described by [16] when they studied the ratio of moisture and fat that reached to 2.60% and 93.10% respectively. These differences in the chemical content of fat may be due to the species and type of nutrition of ostrich birds. The results agreed with [17] who founded that cholesterol content in the fat was 49.5 mg / 100g. The results showed that cholesterol in ostrich fat is lower than other types of fat.

The results in Table (2) showed fat content of some minerals Na, K, Ca, Mg, P, Fe and Se were 8.5, 2.5, 40.11, 12.96, 78.6, 0.532 and 7.86 (ppm) respectively. The results agreed with [18] they found through their studies on ostrich fat that the concentration of the iron component was 0.46 mg / kg [19]. The present study found that the ostrich fat contains a small proportion of sodium compared to other animal fats, which making it ideal to use amount in healthy food products.
Table 1. Chemical content of ostrich fat

| Chemical content          |
|--------------------------|
| Moisture (%) | Protein(%) | Fat(%) | Ash(%) | Cholesterol (mg / 100g) |
|---|---|---|---|---|
| 5.56 | 5.16 | 87.88 | 1.03 | 50.63 |

Table 2. Ostrich fat content of some mineral (ppm)

| Minerals (ppm) |
|----------------|
| Na | K | Ca | Mg | P | Fe | Se |
|---|---|---|---|---|---|---|
| 8.5 | 2.5 | 40.11 | 12.96 | 78.6 | 0.532 | 7.86 |

The results in Fig. 1 illustrated that the content of ostrich fat from fat-soluble vitamins, vitamin Retinol (vitamin A) and α-Tocopherol (vitamin E) were 72.13 and 91.30 mg / ml respectively. Found [19] through their studies that vitamin A content about 0.75 mg / kg while vitamin E content was lower than that recorded from this study that reach to 3.40 mg / kg. The researchers attribute that the content of vitamins dissolved in fat cannot be synthesized in the ostrich fat and acquired by feeding on the plant as it is found in a large number of vegetable oils that feed on them, so that the content of these vitamins depend on the quality of nutrition.
3.2. Chemical indicators and physical properties of ostrich Fat:
The results in Table (3) showed the chemical indicators and the physical properties of ostrich fat, peroxide value was 0.86 meq O2/ kg while free fatty acid was 0.38%. The results were almost agreed with [18] through their studying to the peroxide value in the ostrich fat which reach to 0.72 meq O2/ kg. The results agreed with [3] as they found that the peroxide value to ostrich fat was 0.9 meq O2/ kg, they reported that this ratio is low, and it can have replaced with other fats for the manufacture of baked, such as biscuits. Results converged with [16] in a study of ostrich fat, where it found that the acid number for ostrich fat was 0.803.

The results also showed that viscosity of fat was 14.2155 cP, its density was 0.9196%, specific weight 0.8896, and refractive index was 1.4560, while the melting point was 25 co, the ester value was 202.32, and the saponification number was 203 mg / kg, While the iodine number was 80.

The results showed that there are differences in the physical and the chemical properties of ostrich fat compared with other animal fats. Compared [20] ostrich fat with fat of cow, buffalo, sheep and chicken, they reported that refractive index was 1.4562, 1.4565, 1.4567, 1.4652 and 1.4567 respectively, melting point 25.5, 45.10, 47, 48.30 and 48.20( Co) respectively. The iodine number were 79, 60, 55, 53 and 56 (l/100g oil) respectively and saponification number were 205, 198, 196, 195 and 188 (mg / kg) respectively. The results showed that ostrich fat was the highest in the iodine number, which is very close to what was obtained in this study, which indicates that it contains unsaturated fatty acids with a high percentage compared to other fats, as well as that the number of saponification has higher than other fats and close to what was Obtained and the melting point was the least compared to other fats which is equal to that obtained. The refractive index was close to other fats and this is what our study found.

The researchers mentioned that the relative density and melting point are the basic qualities of fat, which reflects the degree of purity and the high iodine number to contain a high proportion of fatty acids unsaturated. because of the characteristic of the ostrich fat, it is considered suitable and appropriate for use it in food industry, and in manufacture of drugs and cosmetics.
3.3. Lipoproteins in ostrich fat:
The results in Table (4) showed that the content of lipoproteins in the ostrich fat the content of high density lipoprotein (HDL) was found to be 65 mg / dl, while low density lipoprotein (LDL) was 52 mg / dl and very low density lipoprotein (VLDL) was 35 mg / dl, triglyceride was 75 mg / dl. These results were agreed with that proposed by [21] results who found through their studies on estimating the content of lipoproteins in the ostrich fat. The content of high-density lipoprotein was 57 mg / dl and low-density lipoproteins reached to 78 mg / dl and very low-density lipoproteins was 60 mg / dl. This difference in the content of lipoproteins and triglycerides in the ostrich fat due to the species, variety and age of the bird as well as the diet followed in feeding it.

Table 4. Lipoproteins in ostrich fat

| Lipoproteins (mg / dl) | HDL | LDL | VLDL | Triglycerides |
|------------------------|-----|-----|------|---------------|
|                        | 65  | 52  | 35   | 75            |

3.4. Fatty acids in ostrich fat
The results of fatty acids in the ostrich fat with identification by gas chromatography (GC) in Fig. 2 and Table 5 showed 9 peaks of saturated and unsaturated fatty acids, it found that the highest ratios for Oleic acid 31.0415% followed by Palmitic acid 19.2634%, then Arachidonic acid 15.9240% and Erucic acid 6.7563%. The fatty acids Heneicosanoic acid, Undecanoic acid, Lauric acid, Caproic acid and Myristic acid were found 5.7223%, 5.7108%, 5.5365%, 5.2733% and 4.7719% % Respectively, the saturated fatty acids ratios were 46.2782% and 53.7218% for unsaturated fatty acids.
The results agreed with [2] through their studied for fatty acids in the ostrich fat, which appeared that the oleic acid 34.80% and palmitic acid 22.60%. Also the results agreed with that proposed by [22] through their studying on the content of fatty acids in ostrich fat using GC / FID, who found that the Oleic acid 28.31% and the Palmitic acid 27.12%, while the other fatty acids were presented in low rates and its results were converged with [23] the saturated fatty acids ratio was reach to 44.01% and the ratio of unsaturated fatty acids was 55.99%. The fatty acids ratio estimated by GC / FID technique, since the oleic acid ratio was 33.67% and the palmitic acid was 34.18%. Also, the fatty acids ratios appeared in Myristic acid, Stearic acid, Linoleic acid, Linolenic acid and Palmitoleic acid with different ratios. mention [24] in their study about the fatty acid content in the ostrich fat that the total content of polyunsaturated fatty acids was 16.5% of the total fatty acids as well as the presence of fatty acids such as palmitic acid, stearic acid, oleic acid and palmitoleic acid with different ratios. The difference in the types and ratios of fatty acids in ostrich fat estimated in our study may be attributed to the type, sex, age and feeding of the bird.

4. Conclusions
Ostrich fat characterized by its low cholesterol content, as well as it is high content of polyunsaturated fatty acids, which makes it suitable for introducing in the food industry, and in the manufacture of drugs and cosmetics. It also contains good ratios of vitamins and minerals, such as vitamin E and selenium element, which considered as natural antioxidants.
Table 5. Content of fatty acids in ostrich fat

| Saturated fatty acids (SFA)                  | Area %   |
|---------------------------------------------|----------|
| Caproic acid C6:0                           | 5.2733   |
| Undecanoic acid C11:0                       | 5.7108   |
| Laurie acid C12:0                           | 5.5365   |
| Myristic acid C14:0                         | 4.7719   |
| Palmitic acid C16:0                         | 19.2634  |
| Heneicosanoic acid C21:0                    | 5.7223   |
| Total (SFA)                                 | 46.2782  |

| Unsaturated fatty acids (USFA)               |          |
|---------------------------------------------|----------|
| Oleic acid C18:1                            | 31.0415  |
| Erucic acid C22:1                           | 6.7563   |
| Total USFA                                  | 37.7978  |

| Polyunsaturated fatty acids (PUSFA)          |          |
|---------------------------------------------|----------|
| Arachidonic acid C20:4                      | 15.9240  |
| Total PUSFA                                 | 15.9240  |
| Total unsaturated fatty acids               | 53.7218  |
| Total fatty acids                           | % 100    |

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References

[1] Al-Shabib NA and Abu-Tarboush HM 2004 Nutritional value and some functional properties of proteins in ostrich and camel meat. Arab Journal of Food and Nutrition.5(9):6-20.
[2] Gavanji S et al 2013 A Review of application of ostrich oil in pharmacy and diseases treatment. J. Nov. Appl Sci., 2 (11): 650-654.
[3] Basuny A MM et al 2017 Biological Evaluation of Ostrich Oil and Its Using for Production of Biscuit. Egypt J. Chem., 60(6): 1091 – 1099.
[4] Hussein M F et al 1962 Animals fats. Annals. Of Agri. Sci., Fac. Of Agri. Univ. Cairo, 7 (1).
[5] Al-salim AMA 2014 Study of the chemical composition and quality properties of the fresh, frozen and rendered sheep, cows, buffaloes and camel's fat. Ph.D. Thesis. College of Agriculture, University of Basra. P:155.
[6] AOAC Association of Official Analysis Chemists 2007 Official Methods of analysis Association of Official Analysis Chemists (900.02, 927.09, 927.39, 991.20) 18th ed., Rockville, Maryland, USA.
[7] Aidos I 2002 Production of high-quality fish oil from herring byproducts. Ph.D. Thesis, Wageningen Univ., the Netherlands. pp: 203.
[8] Al-Salhie K Ch K 2012 Effect of in ova injection of testosterone and estrogen hormones and vitamin c on some reproductive, physiological, behavioral and productive traits of Japanese quail (Coturnix japonica). Ph.D. Thesis, University of Basrah.

[9] Achikanu C et al 2013 Determination of the vitamin and mineral composition of common leafy vegetables in South Eastern Nigeria. Int. J. Curr. Microbiol. App.Sci., 2(11): 347-353.

[10] Mohamed H et al 2012 Association of oxidative stress components with resistance to flax powdery mildew. Tropical Plant Pathology. 37(6): 386–392.

[11] Pearson D 1970 The chemical analysis of food. Chemical publishing company, INC. New York.

[12] AOAC A ssociation of Official Analysis Chemists 1984 Association of official Analytical chemist's official methods of analysis, Washington, U. S. A.

[13] Egan H et al 1988 Pearson's chemical analysis of food. Logman Scientific and Technical. The Bathpress. Avon. 8 th edition, New York.

[14] Al-Ta i M A and AL-Mossawi U B H 1992 Practical Technology of Meat and Fish. College of Agriculture, Univ. of Basrah Press. P: 142.

[15] Amores G and Virto M 2019 Total and Free Fatty Acids Analysis in Milk and Dairy Fat. Review. m.d.p.i journal Separations. 6 (14):1-22.

[16] Frontczak M et al 2008 Characteristics of fat from African ostrich Struthio camelus . Electronic Journal of Polish Agricultural Universities. 11(4):1-11.

[17] Horbańczuk J O et al 2004 Cholesterol content and fatty acid composition of two fat depots from slaughter ostriches (Struthio camelus) aged 14 months. Animal Science Papers and Reports. 22(2): 247-251.

[18] Ponphaiboon J et al 2018 Physicochemical property, fatty acid composition, and antioxidant activity of ostrich oils using different rendering methods. Food Science and Technology. 93: 45–50.

[19] Dalvi M and Garmakhany A D 2012 Physico-chemical properties and fatty acid composition of ostrich (Struthio camelus) oil. Minerva Biotbc., 24(1): 5-10.

[20] Basuny A M M et al 2011 Utilization of ostrich oil in foods. Int. Res. J. Biochem. Bioinform. 2(8):199-208.

[21] Khaki Z et al 2012 Comparative study of serum lipid profile in chicken, ostrich, cattle, and sheep. Comparative Clinical Pathology. 21(3): 259–263.

[22] Belichovska D et al 2015 Fatty acid composition of Ostrich (Struthio Camelus) abdominal adipose tissue. Mac Vet Rev., 38 (1): 53-59.

[23] Aguirre-García F and Yañez-López L 2018 Technology development to obtain ostrich oil. Chemistry Research Journal. 3(4):80-84.

[24] Majewska D et al 2014). Fatty acid profile of three fat depots from slaughter ostriches (struthio camelus). Vet. Med. Zoot., 68 (90): 43-47.