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**SIİRT UNIVERSITY**  
**INSTITUTE OF SCIENCE**

**EFFECTS OF DIFFERENT VEGETABLE OILS AND ANIMAL FAT ON  
PERFORMANCE AND CARCASS TRAITS OF BROILER CHICKS**

**MS THESIS**

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**October-2017**

**SIİRT**

## THESIS ACCEPTANCE AND APPROVAL

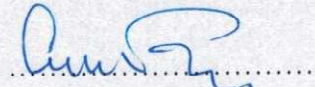
This thesis entitled Effects of Different Vegetable Oils and Animal Fat on Performance and Carcass Traits of broiler chicks presented by Barzan Fadhl FARIQ under supervision of Asst. Prof. Dr. Muhammet Ali KARA and Second-Supervisor: Asst. Prof. Dr. Rozgar Baiz SAEED in the Department of Animal Science has been accepted as a MS thesis according to Guidelines of Graduate Higher Education on 04/10/2017 with unanimity members of jury.

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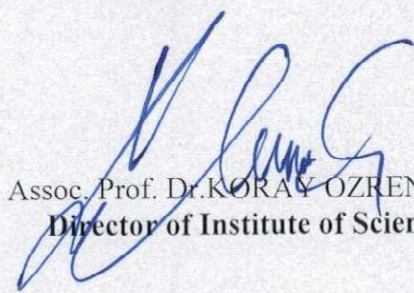
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I would also like to thank my supervisor Asst. Prof. Dr. Mustafa Ali Kara who tirelessly helped me to finish my research. Additionally, I extend my deepest appreciation to my co-supervisor Asst. Prof. Dr. Rozgar Aziz S. who let and without him, I could not have completed this research.



Barzan Fadhl FARIQ

My thanks go to Asst. Prof. Dr. Behzad Hama Salih Mustafa, the head of Animal Products Department in the University of Sulaiman who gave us permission to do our research in a farm in the university.

Last but not the least, I thank all of my teachers who helped me, especially Dr. Zaid Khalaf Khidir, Mr. Heral Abulxal Faraj, Mr. Hama Noraddin Mohammed and Mr. Azad Alkhatir.

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## ACKNOWLEDGEMENT

First of all, I want to thank God for giving me this opportunity and bestowing me with the strength and power to complete my master thesis. I would like to thank my family: my father, my mother, brothers and sisters for always being supportive to me especially my parents who have always supported me to continue my education. I appreciate and value their efforts.

I would also like to thank my supervisor Asst. Prof. Dr. Muhammad Ali Kara who tirelessly helped me to finish my research. Additionally, I extend my deepest appreciation to my co-supervisor Asst. Prof. Dr. Rozhgar Baiz Saeed who helped me a lot and without him, I could not have completed this research.

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## LIST OF ABBREVIATIONS

<b><u>Abbreviation</u></b>	<b><u>Statement</u></b>
<b>LBW</b>	: Live body weight
<b>WG</b>	: Weight gain
<b>FCR</b>	: Feed conversion ratio
<b>PI</b>	: Production Index
<b>ME</b>	: Metabolizable energy
<b>PUFA</b>	: Poly unsaturated fatty Acid
<b>FFA</b>	: Free fatty acid
<b>EFA</b>	: Essential fatty acid
<b>NRC</b>	: Nutritional requirement commercial
<b>Cp</b>	: Crude protein
<b>AFP</b>	: Abdominal fat pad
<b>DP</b>	: Dressing percentage
<b>T</b>	: Treatment
<b>R</b>	: Replication
<b>G</b>	: Gram
<b>M</b>	: Meter
<b>cm</b>	: Centimeter
<b>Kg</b>	: Kilogram
<b>mg</b>	: Mile gram
<b>Kcal</b>	: Kilo calorie

## **ABSTRACT**

### **MS THESIS**

# **EFFECTS OF DIFFERENT VEGETABLE OILS AND ANIMAL FAT ON PERFORMANCE AND CARCASS TRAITS OF BROILER CHICKS**

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**2017, 59 Pages**

This study was carried out at the Poultry Farm of Animal Sciences Department College of Agriculture Sciences, the University of Sulaimani to find out effects of different vegetable oil and animal fat on broiler performance. The aim of this research was to identify the effects of different sources of oils on productive performance of broiler chicks.

The experimental period was from 8th March 2017 to 27th April 2017. An overall of two hundred sixty, one-day-old of Ross 308 broiler chicks were distributed randomly on five treatments (4 replicates each with (13 chicks/ replicate). The treatments include T1: Control (without oil and fat addition); T2: Canola oil (%4); T3: Corn oil (%4); T4: Animal fat (%4); T5: Sunflower oil (%4). During the period of study, three types of diets were applied: Starter diet (from the one to 20day of the study), grower diet (from 21 to 42 days of study) and finisher diet (from 43 to 49 days of the study). Results indicated that supplementation of diets with different types of oil and animal fat significantly ( $p < 0.05$ ) improved live body weight and weight gain and feed conversion ratio and feed intake and production index, at periods (1-49) day. However, the effect of different vegetable oil and animal fat had no significant effect on abdominal fat and dressing percentage at period (1-49) day.

**Keywords:** Vegetable oil, animal fat, productive performance, broiler chicks

## 1. INTRODUCTION

In broiler diets, oils have continuously been utilized as a source of energy. For integrating oils in poultry diets, there is numerous another benefit such as: reducing dustiness and increasing in palatability, digestion, and absorption of lipoproteins. Leeson and Atteh, (1995) reported that oils help in absorption of calcium as well as vitamins E and A.

Additionally, the passage rate of the digestible through the gastrointestinal tract is reduced by the dietary fat. Consequently, it provides superior utilization and absorption of the nutrients (Peebles *et al.*, 2000; Baião and Lara, 2005; Latshaw, 2008). Furlan and Macari, (2002), reported that current fast-growing broiler strains have high energy necessities and because oil has high energy concentration, the addition of oil to the diet nearly obligatory. According to Scaife *et al.*, (1994), the addition of oils to animals feed have a substantial effect on the quantity of abdominal fat and the composition of fatty acid. In fact, as the dietary fatty acids are incorporated into little alteration into the bird's abdominal fat, the composition of fatty acids of oils utilized in poultry feed are reflected in the animal products (Wilson and Bayer 2000). Saleh *et al.*, (2004) indicated that feed cost consists around 70% of the overall expenses of production, and approximately 70% of the feed cost is contributed to the energy alone.

Rose, (2001) declared that poultry consumes the quantity of feed that almost meets their energy necessities. Furthermore, poultry eats a quantity of food that is nearly 10% of their body weight per day. Therefore, it is recommended that so as to reduce feed expenses one have to utilize the most inexpensive form of energy or the energy source that generates the highest rate of growth per unit cost. Fat should be used to balance poultry rations. Regulating dietary energy by supplementing fat is believed to be one of the effective ways to adjust feed intake of broiler chicks (Habib *et al.*, 2011). For escalating the energy density of diets in poultry feeding, the best practical approach is fat and oils supplementation (Peebles *et al.*, 2000). Sanz *et al.*, (2000a), Pesti *et al.*, (2002) stated that various fatty acids and dietary fats could impact fat digestion and absorption in poultry. The following are some concerns that ought to be taken into considerations with fat utilization: Metabolizable energy (ME) content measurement can be difficult; there is the possibility for rancidity, the utilization of higher concentration of fat might reduce the impacts of pelleting, apparatus requirements

comparative to fat supplementation have to be suitable and perhaps poor digestibility of saturated fats via the young bird (Chen and Chiang, 2005). Despite being a good polyunsaturated fatty acid (PUFA) source, soybean oil contains about 50-54% linoleic acid, which is an omega-6 PUFA (Martin et al., 2006). Therefore, the composition of broiler abdominal fat influenced by the kinds of the fat that applied in the feed. Since chicken is highly sensitive to alteration in the composition of dietary fatty acid, abdominal fat is a decent indicator of body fats in chicken (Sanz, *et al.*, 2000b). According to Fayad (1985), the so-called free fatty acids are not linked to another organic component as the glycerol. The free fatty acids contain a small fraction of total lipids in natural foods. The main objective of the present study is to evaluate the different Sources Oils on the performance of broiler chicken from one to 49 days of age in diets that differ in Sources Oils. There is currently much importance in optimizing the amount and type of fat in diets of farm animals, in the cases where better feed conversion rate and faster growth is aimed, fats should be considered as much important as proteins and carbohydrates in animal nutrition.

## **2. LITERATURE REVIEW**

### **2.1. Definition of Fat and Oil**

The Term “ fat” (animal or vegetable) is used as A synonym for lipid in the human food along in the composition for animal nutrition (Baião and Lara, 2005). The concept fat and oil denote to triglycerides of group shapes of fatty acids. The fats and oils are esters glycerol; the first is solid, while the latter are liquid at a normal temperature, and while oils are liquids. Fats and oils consist of chains of molecules which are known as fatty acids that are composed mostly of carbon atoms. Providing about 9 calories per gram of fat. This is more than twice the energy content of sugars and starches (Wilson and March, 2015).

### **2.2. Lipids**

Lipids are generally happening substrates that are unsolvable in water but melt in organic solvents. Alkaline hydrolysis of lipids (known as saponification) gives rise to alcohol and sodium or potassium salts of constituent fatty acids. Based on this lipids can be classified into two main groups, namely, saponifiable and unsaponifiable groups. Lipids in the saponifiable group are simple lipids and compound lipids, whereas lipids in the unsaponifiable group include some compound lipids which are alcohols and not esters (Plummer, 1987). Chemically, however, lipids are divided into three categories namely, simple, compound and derived lipids (Pond et al., 2005).

#### **2.2.1. Simple lipids**

Esters of fatty acids with various alcohols. Simple lipids can be classified into groups. The first group is fat and oils which are esters of fatty acids with glycerol. The latter group is waxes which are esters of fatty acids with high molecular weight monohydric alcohols (Pond et al., 2005).

#### **2.2.2. Compound lipids**

Esters of glycerol which have two fatty acids residue plus another chemical group such as choline (linked complete phosphoric acid) are so-called compound lipids (Pond et al., 2005).

### **2.2.3. Derived lipids**

Derived lipids contain materials from simple or compound lipids by hydrolysis, for example, fatty acids, glycerol, alcohols, fat-soluble vitamins, sterols and terpenoids (Pond *et al.*, 2005).

### **2.3. Fat and Oil in General**

Each year the human population of the earth now consumes nearly 195.6 million tons of fats and oil in 2014 achieved from animal and vegetable sources (FAOSTAT, 2008). These huge natural resources provide raw materials for the production of both edible and non-edible products., (Shipton, 1994). Edible oils are combinations of many different organic molecules called lipids. Lipids are water-insoluble (or sparingly soluble) biological molecules that can be pulled out from plant or animal sources (Shipton, 1994; Dupuy *et al.*, 1996). According to Evrard *et al.*, (2007), Vegetable oil is composed of around 95 to 99 % of triglycerides and, it encompasses of phytosterols, natural pigments, phospholipids and soluble vitamins (A, D, E, and K). Fats and oils are created from esters of triglycerides, as the molecule of glycerol is esterified with the fatty acids. In comparison to carbohydrates, fats possess two and one-quarter times the calories by weight. Fat offers nine calories of energy per gram, while carbohydrates provide only four calories in per gram. While, at room temperature, saturated fats are solids at the same temperature, unsaturated fats are liquid. Several instances of saturated fats that can be utilized in poultry diets are lard, tallow, poultry fat, and choice white grease. Furthermore, corn oil, soy oil, and canola oil are some examples of working unsaturated fats. Poultry fat, animal fat, and yellow grease Care some general sources of supplemental fat in commercially produced poultry feeds. including these fats in poultry, diets are uneconomical because of the high price of vegetable oils makes. Either vegetable oils or animal fats (fat) are utilized as an intense source of calories in a diet. Diets for meat-type birds, for example, will have over 3,000 kcal per kilogram (1,364 kcal per pound). Getting that many calories are not possible without the addition of a fat source. Fats also aid in the absorption of important fat-soluble vitamins, as well as improve the handling qualities, palatability, and pellet quality of a feedstuff. The body can absorb fats without widening any energy. Consequently, for keeping birds from feeling over-heated, calories from carbohydrates with calories from fat is sometimes can be replaced in warm-weather months.



In order to absorb the fat-soluble vitamins A, D, E, and K, fat has to be present in the diet for poultry. Fat is supplied to the feed to decrease grain dust in addition to its role in nutrition. The palatability of feed is developed by fat addition (that is, makes the feed more appetizing).

Fats are contained of smaller compounds called fatty acids. Fatty acids are in charge of cell-membrane integrity and hormone synthesis. Poultry has a definite requirement for one linoleic acid even though there are numerous different fatty acids. Thus, it has to be encompassed in the diet. Linoleic acid is recognized as an essential fatty acid as poultry cannot produce it from other nutrients (for instance, via changing one fatty acid to another). Fats, including those incorporated in feed, have a tendency to go bad, or become rancid. This is a year-round problem, nonetheless, in the summer the risk of feed going rancid is even bigger. Antioxidants are supplied to poultry diets including added fat to prevent feed from going rancid. Kenneth Wilson and Scott Beyer, (2013) stated that ethoxyquin is one of the common antioxidants listed on feed labels.

#### **2.4. Source of Fat**

Fats are used as high-energy sources in broiler foods. The energy-yielding potential of lipids is resolved by the degree of saturation and chain length. The place of the fatty acid in the glycerol molecule and the proportion of free fatty acids influence its energy value. (Wiseman, 2003) expressed that in comparison to unsaturated fatty acids, saturated fatty acids are not much absorbable and have a lesser energy value as unsaturated fatty acids are polar solutes and are so willingly united into micelles and absorbed. The majority of dietary fat sources comprise higher unsaturated fatty acids compared to saturated fatty acids. Grounded on the information of the fatty acid composition, it is possible to run the quantity of energy to be supplied to the animal. The best source of energy for animal farms is vegetable oil because it is highly digestible. Oils are expensive because of the opposition with human food, which limits its use when formulating least-cost foods (Wilson and Bayer, 2000). (Rose, 2001), reported that up to a maximum of 6%, vegetable oils or animal fat can be utilized as a source of energy. It becomes hard to sustain pellet quality or to mechanically transfer the sticky feed as it is not pelleted when the concentration is more than 6%. For improving palatability and reducing dustiness of the diet, one percent supplemented fat is cited of other economic or nutritional considerations identified the following sources

with respective energy values as the ones mostly used in poultry feed. However, poultry fat and fish oil give a high level of energy, which is even higher than some of the plant oils, because poultry fat and fish oil contain a high proportion of unsaturated fatty acids. (Hamilton,1999)

## **2.5. Chemical Structure of Fats**

Fat and oil added to diets, each as specific produces or present within oilseeds, are mixtures of triglycerides and free fatty acids. Digestion of fats produces a mixture of both these mechanisms. It is obvious that the better the degree of unsaturation of lipid, the higher is its dietary energy value for poultry (March and Biely, 1957). More recent studies have attempted to quantify this effect and the approach agreed has been to examine the influence of the ratio of unsaturated to saturated fatty acid in a fat mixture. This has discovered that the greater improvement in dietary energy value is to be expected when the ratio increases from about 1 to around 2.1 (Wiseman and Lessire, 1987a). It is likely that u/s ratio could be expressed in terms of amounts of palmitic (C16:0) and stearic (C18:0). A further important chemical variable within fats is the proportion of free fatty acids (FFA) in the mixture. Numerous studies have investigated the influence of FFA levels on the dietary energy value of fats. This has led to the general conclusion that high levels of FFA are associated with lower dietary energy value (Renner and Fliu, 1961; Young, 1961).

## **2.6. Nutritive Value of Vegetable Oils**

The diversity of fats and oils must be taken into account when assessing their nutritive value. Therefore dietary energy value may change considerably to the degree of saturation of the combination and free fatty acids content. Furthermore, the quantity to be added to the compound diet will also affect their nutritive value, as will the age of bird to which they are fed. Edible oils are major dietary components and play the important nutritional role as a concentrated source of energy and a transporter of fat-soluble vitamins. It also imparts flavors and taste to foods and provides essential fatty acids. Some vegetable oil particularly wheat germ oil and cottonseed oil are the good source of vitamin C (Schuphan, 1967). Khalil, (1979) reported that edible oil used as hot media perform two main roles. Their action as heat transfer media and by suitable engrossed in the foodstuff to a better or smaller range, they become important

nutritional ingredients. (King, 1983) informed that vegetable oil contributes calories, too fat soluble vitamins ADEK and vitamin C is essential fatty acids (EFA) to diet. The important of EFA (which can't be synthesized in the human body) is that the deficiency of which may main to serious biological issues. Scott *et al.* (1982) shown that of all lipids only linoleic acid is an essential nutrient for chicken, all other lipids are important primarily as sources of energy as a solvent which aid in the absorption of fat-soluble vitamins, as the material which decrease the dustiness of feeds, which help diets. This perhaps helps the palatability of some feeds.

## **2.7. Type of Vegetable Oil and Anima Fat**

### **2.7.1. Canola oil or Rapeseed Oil**

Lesson and Summers (2001), declared that a rapeseed that 2 below 2% erucic acid (docosanoic acid, C22:1) regarding the overall fatty acid and less than 30 umoles of glucosinolates in every gram of free oil on seed dry substance basis is called Canola. Lesson and summers (2001) reported that in chicken, supplementation of erucic acid to the diets has a negative impact on growth, the apparent digestibility total lipid and separate fatty acids and intake. Moreover, birds fed with diets comprising erucic acid deposit less fat and use energy from this lipid less regularly. This observation approves the advantage of using vegetable oils for birds rather than acidulated soybean oil soapstock and tallow like we energy sources. Thacker *et al.*, (1994) reported that higher ratio of long chain fatty acids and higher triglycerides contents caused better growth rates. For evaluating the influence of various sources of lipid on the chemical and physical characteristics of thigh meat. Souza *et al.*, (2001) declared that when compared to the meat of birds fed with oil of canola, sunflower or soybean, feeding broilers with lard and corn oil causes higher red-colored meat, nevertheless did not vary from the poultry fat.

### **2.7.2. Sunflower oil**

Sunflower oil is the nonvolatile oil removed from sunflower (*Helianthus*) seeds. Sunflower oil has been valued as a component for spreads in Europe because of its high linoleic fatty acid content and absence of linolenic fatty acids (Lisk *et al.*, 2000). Alao and Balnave, (1984) described better development and feed conversion in birds fed diets

containing sunflower oil in comparison to birds fed olive oil. Vegetable oil was proposed the difference function of the fatty acid composition. In the study of Sanz *et al.* (1999) stated that higher abdominal fat deposits are produced than unsaturated fats when broilers fed with sunflower oil or a mixture of beef tallow/lard and the application of saturated fats. Feeding chickens with sunflower oil or a combination of beef tallow/lard and the application of saturated fats caused better abdominal fat deposits than unsaturated fats (Sanz *et al.*, 1999). In accordance to Sanz *et al.*, (2000a), the application of an origin of unsaturated lipids reduces fat and rises protein on the broiler carcasses. Sunflower oil is characterized by its high content of tocopherols (up to 35.17 mg) higher than those of other oils such as soybean and peanut to mention a few, as well as, it is considered to have the highest stability due to its high content of natural antioxidants (Bramley *et al.*, 2000; Shahidi, 2005).

### **2.7.3. Corn oil**

Corn oil was extracted from the corn seed *Zea mays* L., a plant appropriate to the grass family is native to both North and South America (Strecker, 1996). Corn oil belongs to the group of oils with high levels of linoleic and oleic fatty acids whereas, like most other oils, It will change based on the seed type, climatic conditions, and growing season, furthermore, corn oil from the United States corn belt is the highest in polyunsaturated fatty acids. This could be because of climate and growing conditions and corn oil produced in other countries is generally lower in linoleic acid content and higher in oleic acid (Haumann, 1996). Corn oil is an excellent source of essential fatty acids; it typically exceeds 60%, contributed predominantly by linoleic (C-18:2) and usually less than 1.5% linolenic (C-18:3) acids (Strecker, 1996). The relatively high tocopherol content (about 0.1%), along with the presence of a small amount of another antioxidant component, also contributes to the excellent oxidative stability of corn oil (Leibovitz and Ruckenstein, 1983; Weiss, 1983).

### **2.7.4. Animal fat**

Animal fat is commonly expended in the material as milk, butter, lard, schmaltz and dripping or more commonly as stuffing in factory produced meat, pet, and fast-food products. USDA, (2012) Stated that dairy products are animal secretions which contain varying levels of fats, oils, water and animal cells from circulatory and the

systems of lymphatic like mammary glands and blood. Diets with comparable nutritive values supplemented with 4, 7 and 10% of animal fat were utilized by (Deaton *et al.*, 1991). The study noticed that escalating fat concentrations of the diet augmented the amount of abdominal fat. Similar results were reported by (Yalçın *et al.*, 1998). The difference in protein growth was accredited to the level of the fat saturation. While the energy derived from saturated sources are less promptly used and accumulated as body fat, the energy originated from unsaturated fat might be used for other metabolic purposes.

## **2.8. Importance of Dietary Fat to Poultry**

The net quantity of energy attained by chicks is 60% of the proteins metabolizable energy, 75% of the carbohydrates metabolizable energy, and 90% of the fats metabolizable energy, according to (Scott, *et al.*, 1982). Baião and Lara (2005) detected that the oil inclusion in the diet of the starter improved the digestibility of fat in broiler chicks throughout the first week of life. In addition, it also caused improved performance over 21 days of age in comparison to the chicks received feeds without oil. Moreover, Carew and Hill, (1964), Lipstein and Bornstein, (1975) reported that when a part of the carbohydrate portion of the diet was substituted with acidulated soybean soap stock or corn oil, chicks use metabolizable energy more effectively for growth. For growing chicks, De Groote, (1968) stated that in comparison to carbohydrate-rich feed ingredients; yellow corn and milo, the net accessibility of metabolizable energy from corn oil was around 10% bigger. Likewise, Dvorin *et al.*, (1998) revealed that levels of lipogenesis and adipose fat were higher in chicks fed diets empty of supplemental fat.

## **2.9 Advantages of Dietary Fat Supplementation**

### **2.9.1 Essential fatty acids**

Birds are not capable of manufacturing all fatty acids and thus, some are careful metabolically essential. linoleic (18:2) and linolenic (18:3) fatty acids. Nevertheless, until now merely the dietary necessities for linoleic acid they are defined by NRC (NRC, 1994). According to Dvorin *et al.*, (1998), these essential fatty acids are absorbed from the feed, where dietary fat is the biggest source. Scragg *et al.*, (1987) expressed that fatty acids attained from corn oil and crude soybean oil contain the

extremely high amount of unsaturated fatty acids, with a great amount of linoleic acid. The production of the egg is negatively affected by the deficiency of linoleic. Furthermore, Shutze and Jensen, (1963); Balnave, (1971) confirmed that the addition of linoleic acid upsurges egg weight. Low growth (especially in male chickens) may be the first sign of an insufficient supply of essential fatty acids (Wiseman, 1984). Additionally, according to Cook *et al.*, (1993), it has been reported that the conjugated isomers of linoleic acid are influential in diminishing reduced growth rates via averting the catabolic impact of immune stimulation.

### **2.9.2. Micronutrients**

In the absorption of fat-soluble vitamins (A, D, E, and K), dietary fats have a substantial role via acting as their "carriers" - apart from ration as big sources of these vitamins (Iqbal and Hussain, 2009). The fat-soluble vitamins are merged into portomicrons for transportation after absorption, and are also deposited in body lipid stores (Drevon, 1991). From this time, the most severe consequence of a dietary shortage of fat is the damage of the fat-soluble vitamins absorption (Jacob, *et al.*, 2011).

Friedman and Sklan, (1989a) expressed that Corn oil and acid oil are rich vegetable sources of carotenoids that are predecessors for the combination of vitamin A. Vitamin A has a substantial role in controlling cell growth, particularly epithelial cells. Vitamin A affects both the production of antibody and T-lymphocyte propagation responses, therefore an insufficiency might cause immune responses reduction. Furthermore, it has been monitored that for highest immune response in growing chickens, it might be advantageous for including dietary vitamin A at larger concentration compared to (NRC, 1994) recommendations (Sklan, *et al.*, 1994).

In accordance to Fritts and Waldroup, (2003); Jacob, *et al.*, (2011), for ordinary calcium absorption and utilization Vitamin D is essential, thus insufficient concentration of vitamin D brings deficiency of calcium causing reduced the production of egg. in the chickens immune responses, Vitamin D has a significant role (Aslam, *et al.*, 1998). Lately, it has also been stated that bile acid combinations controlled by vitamins A and D, therefore regulating the absorption of fat and their own absorption (Schmidt, *et al.*, 2010).



The major causes of the deterioration of meat quality throughout storage are myoglobin oxidation and lipid (Jensen, *et al.*, 1998). In addition, among all meats, poultry meat is more sensitive to the damages of oxidation. According to (Tichivangana and Morrissey, 1985), the ordered of meats in accordance to susceptibility to oxidation are turkey > chicken > pork > beef > lamb. It is positively proven that the  $\alpha$ -tocopherol content of muscle membranes in many animals are significantly augmented by the supplementation of dietary vitamin E (Lauridsen, *et al.*, 1997). It acts as an antioxidant of lipid and free radical scavenger (Hsu and Guo, 2002). Besides, heat stress in chickens is profoundly improved by vitamin A and E (Sahin, *et al.*, 2001). effective application of dietary vitamin E and lipid metabolism are required because of the exposes factor of dietary vitamin E addition (Zouari, *et al.*, 2010).

### **2.9.3. Lecithin**

Lecithin (phosphatidylcholine) is a phospholipid that is extracted commercially from soybeans. (Cho, *et al.*, 2008) expressed that lecithin stimulates the combination of fatty acids into micelles via performing like an emulsifier, which facilitates the absorption of fat. via supplying surfactant lecithin for the PM envelope and secondary mucosal protein biosynthesis, dietary lecithin plays a significant in triglycerides transportation out of intestinal mucosa (O'Doherty, *et al.*, 1973). the serum hormone levels are also altered by Lecithin, impacts the expression of the hepatic gene (Huang, *et al.*, 2008). Sibbald and Kramer, (1980) lecithin addition resulted in the escalation of the metabolizable energy of supplied fat, however availability of equivalent lipid. for improving the meat tenderness, lecithin has also been practical (Collins, *et al.*, 2011). lecithin considerably augmented percentage of yolk, enhanced haugh unit score and yolk color when it is added at 6%. At the same time, supplementing plasma total lipids and digestibility of fat (Attia, *et al.*, 2009).

### **2.10. Fat Digestibility in Young Chicks**

In the growth of young broilers, it has been proven that digestibility of fat is not a limiting factor (Noy and Sklan, 1996). The study stated that in four-day-old chicks, the unsaturated fatty acids true digestibility was more than 85%, which indicates that the lipases and bile salts activity by the fourth day of age were sufficient for near

completion of digestion of fat. The study also shows that fats of vegetable origin are more digestible in young birds. In chickens, the metabolizable energy of a corn-soy was maximized as early as two weeks of age when the diet is supplemented with soybean oil (Batal and Parsons, 2002). once broilers fed with soy oil at a dietary inclusion concentration of 3.5%, a day-old broiler chicks had augmented obvious fat digestibility (Zollitsch, *et al.*,1997). The process of digestion and absorption fat as shown in Figure 2.1.

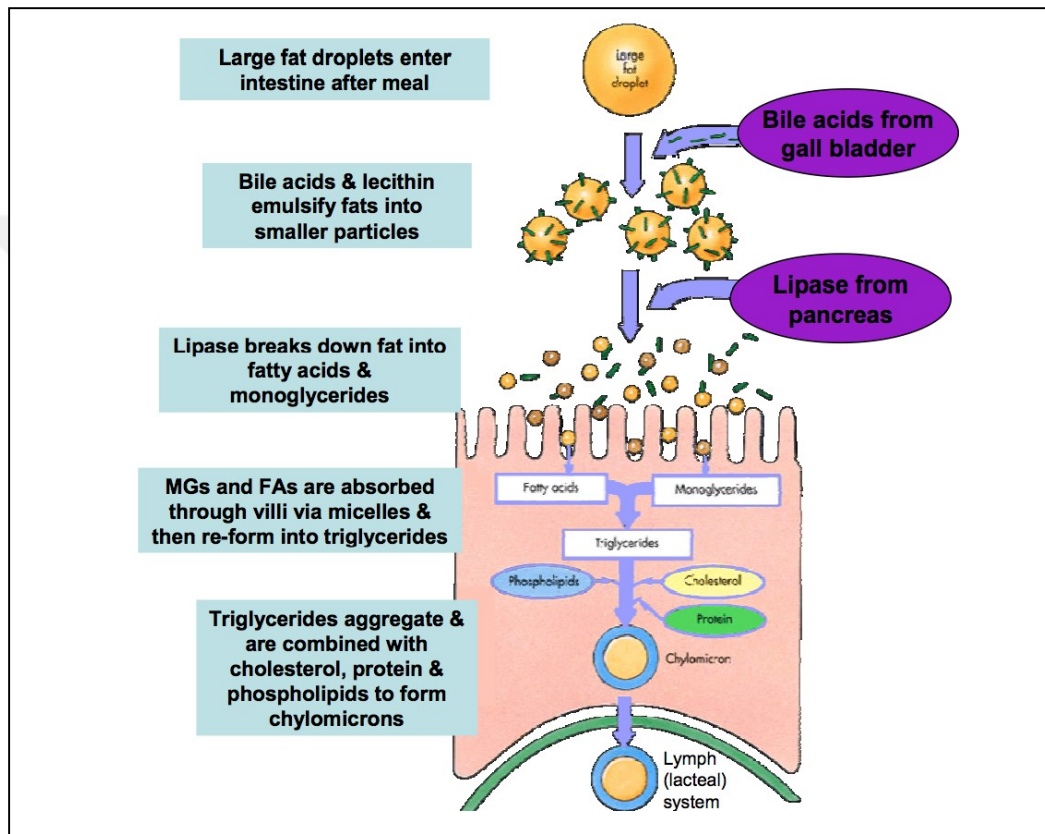


Figure 2.1. Stages of fat digestion and fat absorption

## 2.11. The Effect of Dietary Fat on Broiler Performance

### 2.11.1. The effect of dietary fat on body weight:

The highest body weight was obtained in birds fed on canola oil when comparing to birds fed poultry fat. According to (Baiao and Lara, 2005), feeding canola oil has noteworthy influence on body weight. Canola oil has a key impact on optimal lipid metabolism and following body weight because it is a source of free fatty acids, unsaturated fatty acids (such a-linolenic acid) and omega-3 fatty acids in comparison to poultry fat (Taylor, 2000). in agreement with results of (Taylor, 2000), body weight was

bigger with supplementing 6% oil. Nevertheless, Rahimi *et al.*, (2011) reported slight decreasing in body weight of broilers fed canola seed, which is contradicting to our findings. (Sahito *et al.*, 2012) alleged in comparison to the control group, feeding poultry with diets comprising fish oil caused lower feed intake and body weights and poorer efficiency of feed conversion than diet. In addition, (Newman *et al.*, 2002) expressed that a substantial improvement in feed conversion ratio and body weight is results from the addition of 3% of canola oil in broiler diet. Wongsuthavas *et al.*, (2007) declared that the combination of soybean oil and addition animal fats did not have any substantial impacts on eventual body weight or feed conversion ratio of broilers. Showed oil has a significant impact on the broilers live body weight Hake *et al.*, (2005). Sharifi *et al.*, (2013) showed that oil in the feed resulted increased body weight in broiler chicken.

#### **2.11.2. The effect of dietary fat on feed intake**

Several studies showed that the addition of fat to practical broiler diets affected the feed intake. Isshilgi *et al.*, (1986) added 4, 6 and 8% beef tallow to a broiler diet with 50% barley. Results showed that feed intake decreased in all groups given tallow. Moreover, Sibbald *et al.*, (1962) also reported that birds that received fat supplemented diets consumed less than those of the control diets. However, Yanovich, (1988) revealed that addition of fat to broiler chicken feed mixture improved the efficiency of feed utilization and carcass quality. On applying different levels and types of fat in the broiler diets; (Fuller and Mario, 1977) proved that energy and nutrients intake was higher for all diets containing fats. It indicated that feed intake is influenced by heat increment of the diet as well as by the energy level.

Pesti and Smith, (1984) reported that broilers which were given corn oil tended to regulate their energy intake better than where fed on poultry and tallow fat. Bartov, (1987) found no effect on feed intake resulting from dietary fat source (tallow, soybean oil) during summer. He added that on the contrary, tallow-supplemented diet improved feed intake in chicks during winter. Christmas and Harms (1988) showed that daily feed intake was significantly improved by the addition of 6.8% animal fat in broiler diet. In contrast, Ourat *et al.*, (1989) found that there was no variation in feed intake between poultry fat, yellow grease and various blends of two in broiler diets. Moreover, the addition of corn oil in broiler diet at 8.5 and 17% levels reduce feed consumption per

unit body weight (Mittelstaede *et al.*, 1980). This result is in accordance with the results of Nwoche *et al.*, (2003), found that feed consumption was the highest. Olorede and Longe (1999) reported that supplementation of palm oil in broiler diet improved feed intake which is important to the present study. The inclusion of fish oil in poultry diets has been reported to have no effect on the consumption of feed (Huang *et al.*, 1990). Pesti *et al.*, (2002) proven that the average live weight of broilers consuming a diet with soybean oil was not different from those consuming a diet of animal or vegetable blend and poultry grease. Scaife *et al.*, (1994), Al Athari and Watkins (1988) stated that when broilers fed on dietary tallow have bigger feed intake compared to rapeseed oil diets.

### **2.11.3. The effect of dietary fat on body weight gain**

Stanley *et al.*, (1988) reported significant improvement in body weight gain of broiler with increasing levels of supplemental fat. On the other hand (Nash *et al.*, 1995) reported that the inclusion of fish oil in poultry diets has no effect on live weight compared to control diet with no fed added. Body weight gain improved when supplemental fat was added at 4% level (Sell and Owings, 1983), while Moran *et al.*, (1982) reported that 5% fat had a beneficial effect on body weight (Bowyer and Woldroup, 1988). Bohnsack *et al.*, (2002) showed that weight gain increased as the level of fat was increased in the diet containing corn and poultry fats. Bilal, *et al.*, (2000), reported that a significant difference in live weight was found between the group fed sunflower oil and the group fed animal tallow. Peoples *et al.*, (1999) noted that addition of 1.5 or 3% corn oil to the breeder diet increased body weight gain. Brake, (1989) found that the body weight of female breeder increased by increasing level of dietary fat at levels of 2, 4 and 6%. Atteh *et al.*, (1983) found that increasing the dietary fat levels (5, 10 and 15) significantly increased the body weight of the broiler chickens. When soybean oil is encompassed in particular kind of poultry diets, it encouraged the growth rate of broilers Carew *et al.*, (1961). An disposition for improved feed intake results from the supplementation of fats or oils to diets, Subsequently, it escalated other nutrient and energy intake. This resulted in the increase of live weight gain in broilers (Ensminger and Olentine, 1990; Manilla *et al.*, 1999). Weight gain increase is mainly because of bigger ME intake in the similar unit of diets by poultry. Huang *et al.*, (1990) reported that the addition of fish oil to chicken diets bring about higher weight gain of broilers, however, in the present research, it resulted

in no statistical enhancement in weight gain. (Newman *et al.*, 1998), (Crespo and Esteve-Garcia, 2001), (Crespo and Esteve-Garcia., 2002) and (Lopez Ferrer *et al.*, 2001) reported similar findings of weight gain of broilers. Fish oil, which might efficiently stimulate growth, is rich fatty acid, which declined the catabolic response made by immune stimulation (Chin *et al.*, 1994).

#### **2.11.4. The effect of dietary fat on feed conversion ratio**

Gomez *et al.*, (1987) reported that vegetable oil or tallow did not affect growth while feed conversion ratio was improved in the starter period 28 days old as at 56 days old, feed conversion was improved when fat was added to the poultry rations (Fuller and Rendon, 1979). Alao and Balnave, (1985) reported that fats and oils from 30 g to 90 g/kg improved feed conversion ratio of broiler chickens without a significant increase in carcass fat content. There was a significant improvement in feed conversion when animal fat was added to broiler chicks diets at 6.8% level (Christmas and Harms, 1988), while (Skinner and Woldroup, 1989) revealed that there was a significant difference in feed conversion when fat was added up to 8% level. Feed conversion was significantly improved for birds receiving sunflower oil diet (Chung *et al.*, 1993). (Aloe and Balnave 1984) fed sunflower and olive oils diets to male broiler chickens and reported faster growth rate, with no significant improvement in feed conversion ratio, in chickens fed the sunflower oil diets. Pesti *et al.*, (2002) showed that increasing fat level from 3 to 6% decreased feed conversion ratio. Peebles *et al.*, (1999) showed a reduction in feed conversion between 22 and 42 days when added corn oil to breeder diets. Reid and Maiorino (1980) noticed that layer could utilize up to 10.5% fat in the diet and this resulted in a significant improvement in feed conversion. Studies (Harms *et al.*, 2000); (Bryant *et al.*, 2005). These features can improve the feed efficiency because of significant impacts on the digestibility of nutrients (Jamroz *et al.*, 2003; Hernandez *et al.*, 2004) and antimicrobial activities (Dorman and Deans, 2000). Al Athari and Watkins (1988) found no difference in the FC of broiler diets including 5% supplemented soybean oil or saturated fat. Nonetheless, Sanz *et al.*, (2000a); Abas *et al.*, (2004) approved that the source and concentration of various fats and the rates of utilization have no impact the conversion of feed of broiler.

### **2.11.5. The effect of dietary fat on dressing percentage**

Shingari *et al.*, (1975) Conducted an experiment to examine the effect of high-density ration containing groundnut oil on the growth of the broiler chickens. They found that the addition of oil has no effect on the percent dressed weight and percent edible meat. In another study, Essary and Dowson (1965) proved that the different levels of fats or protein from one day old to 10 weeks of age did not appreciably influence the dressing percentage. Janky *et al.*, (1976) showed the influence of energy level of the dressing percentage on the weight broiler and observed that feeding diets containing more than 3005 kcal/kg of feed increase dressing percentage. Similarity, Harms *et al.*, (1957) proved that the dressing percentage of broiler was significantly increased as the energy level of the diet increased. But, Hamid, (1979) found that the dressing percentage in broiler were 75.17 and 75.69% for cooled and un-cooled ready to cook dressing respectively. These findings are in agreement with the results of Amouzmehr *et al.*, (2013); Dieumou *et al.*, (2012) who stated that garlic essential oil did not have any substantial impact on percentage carcass dressing of broiler chickens. On the other hand, Dieumou *et al.*, (2012) stated that dressing percentage of broiler chicks fed on diets supplemented with either garlic essential oil or streptomycin sulfate were better significantly than values obtained from those fed on control diet.



### **3. MATERIAL VE METHODS**

This research was conducted at the Poultry Farm of Animal Sciences Department of College of Agricultural Sciences of the University of Sulaimani. The experimental period from 8<sup>th</sup> March 2017 to 27<sup>th</sup> April 2017. A total of 260 unsexed one-day-old broiler chicks of hybrid Ross-308 were used. The experiment was designed to study the effects of different vegetable oils and animal fat on performance and carcass traits of broiler chicks, where the chicks were randomly distributed on the treatments.

#### **3.1. Experimental Layout**

The chicks were brought up to Poultry farm consisting of two separated part with an area of (10 × 10 m). A total of 260 unsexed one day-old Ross-308 broiler chicks, (average body weight 41.21 g) were used. Chicks were distributed randomly into 20 groups of 13 chicks in each cage. The chicks groups were assigned to 5 treatments with four replicates. The measurements of temperature and humidity of the farm were taken at the height of 30-40 cm from the ground by special electronic tools of measuring temperature and humidity. Environmental conditions during the rearing period were provided with brooders and adequate ventilation. The cages floors were covered by 5 cm deep dry litter. Chicks were feed with plastic chick tray feeder and plastic handing watering one day to 49 days. The experimental design and studied traits are shown in Figure 3.1.

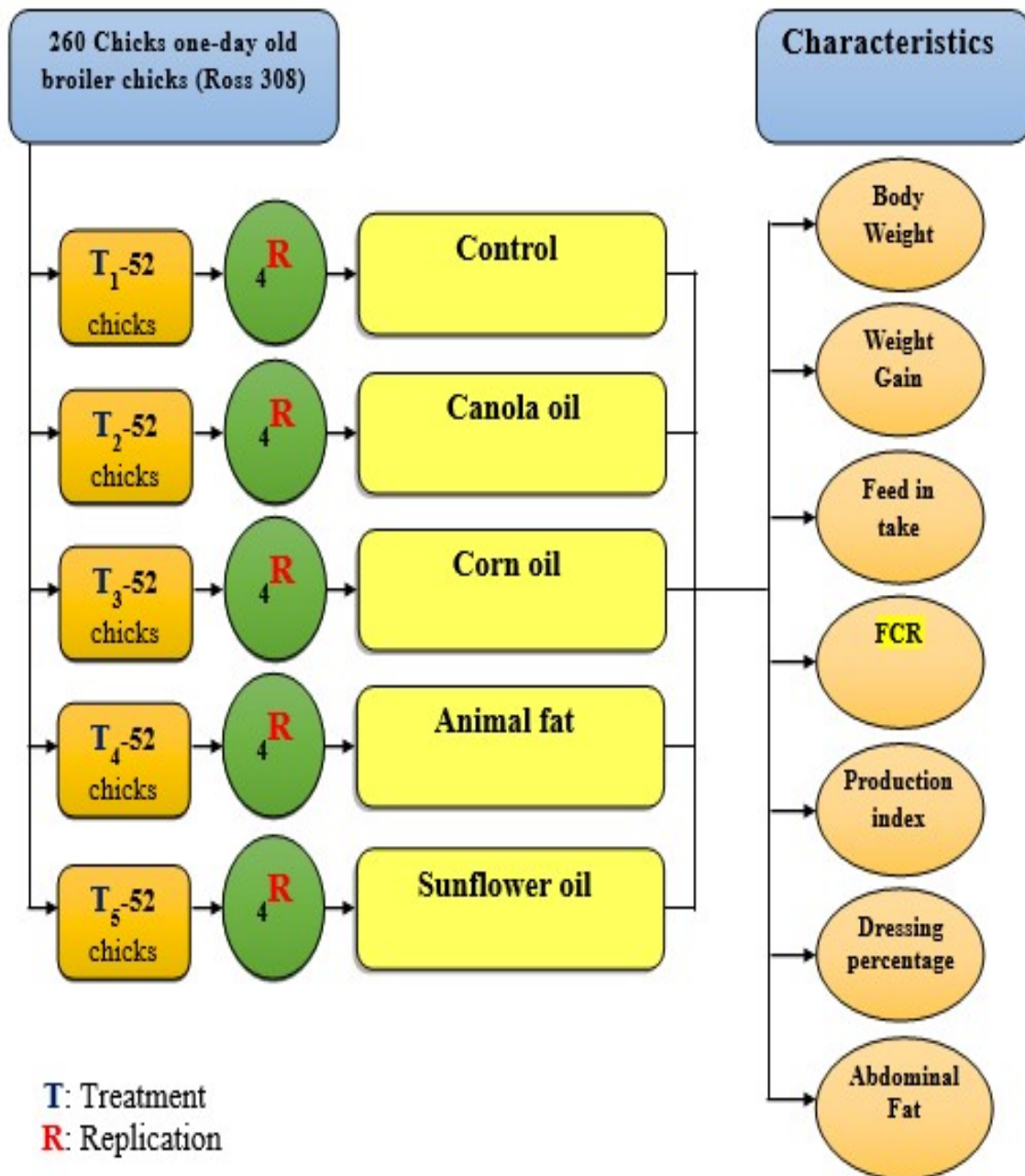


Figure 3.1. Experiment design

### 3.2. Feeding

The chicks were fed by handing, chick tray feeders of circular shape from one day- old to 15 day of age shown in Figure 3.2, and after 15 days it was replaced by the plastic hanging poultry feeders with a capacity of 10 kg shown in Figure 3.3. The height of the poultry feeders was increased gradually due to the height of the chicks backs as they grow older so as to avoid loss in the amount of the feed caused by the chicks. Feed

and water were given to the chicks in an *ad libitum* manner during the age between one-49 days.



Figure 3.2. Tray feeders and small drinker

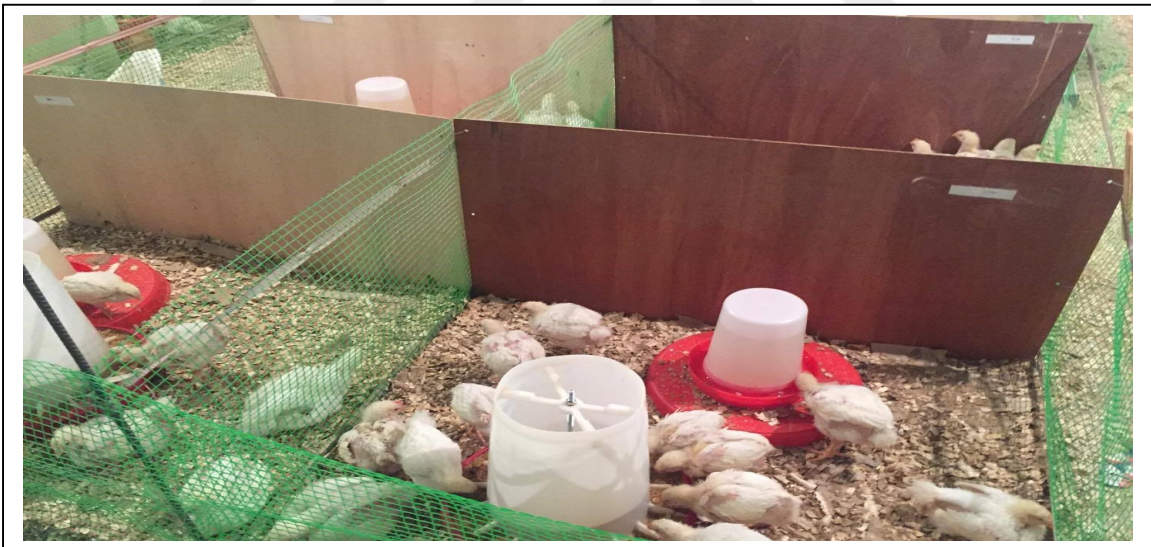


Figure 3.3. Plastic handling poultry feeder

### 3.2.1. Ingredient composition of the basal diet and its analysis

Ingredient composition of the diet provided to the broilers from one to 49 days of age is shown in the Table 3.1., 3.2., 3.3., 3.4.

Table 3.1. The composition of the diet without oil.

Without Oil	Finisher	Grower	Starter
Protein Concentration	7	5	5
Soybean	23	18	16
Wheat	20.2	28.2	28.2
Corn	49	48	50
Limestone	0.8	0.8	0.8
Total	100	100	100
CP %	20.833	18.668	17.878
Energy Kcal/Kg	3080.08	3127.76	3144.4
Methionine % + Cys	0.6755	0.6005	0.5941
Lysine %	1.1153	0.9233	0.8693
Fat %	2.9986	2.8916	2.9576
Fiber %	3.26	3.161	3.091
Calcium %	0.8315	0.6929	0.6881

Table 3.2. The composition of the diet canola oil.

Canola Oil*	Starter	grower	finisher
Protein	5	5	5
Soybean	25.8	22	17.2
Wheat	16	20	14.6
Wheat Bran	8	6.8	7
Methionine	0.1	0.1	0.1
Lysine	0.1	0.1	0.1
Oil	4	4	4
Limestone	0.8	0.8	0.8
Corn	40.2	41	51
Salt	0	0.2	0.2
Total	100	100	100
CP %	21.1	19.9	17.685
Energy Kcal/Kg	3112	3161	3208.4
Methionine % + Cys	0.70	0.69032	0.67034
Lysine %	1.21	1.1121	0.9737
Fat %	6.7	6.729	7.0018
Fiber %	4.0	3.739	3.585
Calcium %	0.71	0.7807	0.6914

Table 3.3. The composition of the diet Corn oil.

Corn oil**	Starter	Grower	Finisher
Protein	5	5	5
Soybean	27.5	20	17
Corn	42.7	42.2	40.2
Oil	4	4	4
Methionine	0.1	0.1	0.1
Lysine	0.1	0.1	0.1
Wheat	12	21.6	26.6
Wheat Bran	7.6	6	6
Limestone	0.8	0.8	0.8
Salt	0.2	0.2	0.2
Total	100	100	100
CP %	21.6495	19.111	18.201
Energy Kcal/Kg	3115.008	3191.744	3205.104
Methionine +Cys %	0.70082	0.6861	0.6815
Lysine %	1.249	1.0593	0.9883
Fat %	6.7121	6.7724	6.7714
Fiber %	3.9865	3.628	3.548
Calcium %	0.71562	0.70002	0.69482

Table 3.4. The composition of the diet animal fat and sunflower oil.

	Animal Fat***		
	Sunflower oil****		
	Starter	Grower	Finisher
Protein	5	5	5
Soybean	27	22	18
Oil	4	4	4
Methionine	0.1	0.1	0.1
Lysine	0.1	0.1	0.1
Wheat	11.6	19	16
Wheat Bran	9	6.6	4.6
Corn	42.2	42.2	51.2
Limestone	0.8	0.8	0.8
Salt	0.2	0.2	0.2
Total	100	100	100
CP %	21.521	19.797	17.922
Energy Kcal/Kg	3088.064	3167.408	3253.408
Methionine +Cys%	0.6991	0.69002	0.67382
Lysine %	1.2403	1.1105	0.9885
Fat %	6.7324	6.7566	6.9546

\*In the table (4) sunflower oil and animal fat has the same diet, because the two oil have the same proportion energy and the same proportion of protein in their composition of the diet.

\*\*Protein concentrate used in the diets was produced in Holland \*Protein concentrate used in the diets was produced in Holland (WAFI) which contains: 40% crude protein, 2100 kcal ME/kg, 5% (WAFI) which contains: 40% crude protein, 2100 kcal ME/kg, 5% crude fat, 2% crude fiber, 6.5% calcium, 2.50% phosphorus, crude fat, 2% crude fiber, 6.5% calcium, 2.50% phosphorus, 3.85% lysine, 3.70% methionine and 4% cystine.

\*\*\*Limestone: Super Vita used in the diets: (Vitamin. A 1.800.000 IU; Vitamin. D3 200.000 IU; Vitamin. E 525 IU; Vitamin. B1 200 mg; Vitamin. B2 400 mg; Nicotinamide. 1000 mg; Folic acid 50 mg ; CA-D-Pantothenate 500 mg; Iron 5 gm; Manganese 20 mg; Zinc 25 mg; Cobalt 20 mg; Copper 100 mg).

\*\*\*\*The calculated composition of the diets was determined according to NRC (1994). Trt. = Treatment according to NRC (1994). Trt. = Treatment.  
 Item: \*Canola oil. 884 kcal per 100 g \*\*Corn oil. 900 kcal per 100g \*\*\* Animal fat. 886 kcal per 100g  
 \*\*\*\* Sunflower oil. 886 kcal per 100g.

### 3.3. Preventive Health Program:

Table 3.5. shows the programs that have been undertaken for the health management of the flock chicks were vaccinated by the Newcastle and Gumboro vaccines through distilled water (chlorine free). Chicks were made thirsty three hours before vaccination, and a mixture of vitamins was added to their drinking water for one day after vaccination.

Table 3.5. Programs of health management

Age (days)	Vaccination	Through
11	Newcastle vaccine strain to Assuta	drinking water
21	Newcastle vaccine strain to Assuta	drinking water
27	Gumboro vaccine strain to Assuta	drinking water
40	Newcastle vaccine strain to Assuta	drinking water

### 3.4. Production Traits:

#### 3.4.1. Live body weight

Birds were weighed every week in each experimental unit throughout the experimental period. During rearing period, LBW was recorded at days 7, 14, 21, 28, 35, 42, 49 of broilers age, (Mohammed, 2006).

#### 3.4.2. Weight gain

Weight gain was calculated for each replicate after the end of each period according to the following equations (Hadmi, 1994):

Body weight gain = Live body weight at the end of the period – Live body weight at the beginning of the period

#### 3.4.3. Feed intake

Feed intake in each replicate was recorded and measured at the end of each week by subtracting non-eaten feed from total amount of feed supplied and daily feed intake was found by divided weekly feed intake on 7 days.



Feed intake was calculated using the following formulas (Hadmi, 1994):

$$AFI = \frac{\text{Feed Provided at the beginning of period (g)} - \text{feed provided at end of period (g)}}{\text{Total number of birds}}$$

AFI= Average feed intake

#### 3.4.4. Feed conversion ratio

Feed conversion ratio is the amount of feed intake estimated to unit weight for each weight gain estimated in the same unit and calculated by the following formulas:

$$FCR = \frac{\text{Average of feed intake by one bird in aduration}}{\text{Average of weight gain by one bird in same duration}}$$

FCR= Feed conversion ratio

#### 3.4.5. Mortality and viability percentage:

Mortality was recorded for each replication, if any, by the date of occurrence. The ratio percentages were calculated according to the following equation (Hadmi, 1994):

$$MP = \frac{\text{Number of live birs at the end of the experiment}}{\text{The total number of chicks in the beginning of period}} \times 100$$

MP= Mortality percentage

Viability percentage = 100 – Mortality percentage

### 3.5. Evaluate the Productive Performance of The Flock:

#### 3.5.1 Production Index (PI)

Production index calculated by the following formulas (Naji, 2006):

$$PI = \frac{\text{Average body weight (g)} \times \text{viability percentage}}{\text{Number of days breeding} \times \text{feed conversion ratio}} \times 10$$

### 3.6. Slaughtering and Preparation of Birds

Slaughtering process was achieved manually using a sharp knife after a period of starvation, and followed the method of hand scalding after 1.5 minutes of slaughter, were caught by the hands from legs and dipped carcass in the basin scalding 1.5 for 2 minutes. They were de-feathered and then legs manually been cut from the knee joint. It then has to evisceration viscera manually by incision about 5 cm abdominal areas. Finally, the carcass was cut up into parts separately following the same method for each carcass and their parts weighed.

### 3.7. Carcass Traits

#### 3.7.1. Dressing percentage

One male and one female were chosen randomly from each replication (one male and one female from each treatment) on the basis of body weight, weighed alive and sacrificed to estimate weight for dressing, breast, and thigh percentage. The dressing percentage calculated by the equation (Fayad and Naji, 1989):

$$DP \text{ (without edible viscera)} = \frac{\text{Weight of carcass (g)}}{\text{live weight (g)}} \times 100$$

#### 3.7.2. Abdominal fat pad (AFP) weights into the live body weight:

The AFP was calculated according to the following, (Hadmi, 1994):

$$\text{AFP percentage} = \frac{\text{Weight of AFP (g)}}{\text{Live body weight (g)}} \times 100$$

### 3.8. Statistical Analysis

All data were analysed by one-way analysis of variance (ANOVA) utilizing XL Stat (2004, version-7.5) program for Windows. The level of significance was chosen at  $p < 0.05$  and the results are presented as mean  $\pm$  SE. Duncan's multiple range tests (Duncan, 1955) was used to determine the significance of differences among means.

$$Y_{ij} = \mu + T_i + e_{ij}$$

Where:

$Y_{ij}$  = Observation  $j$  in treatment  $i$

$\mu$  = Overall mean.

$T_i$  = Effect of treatments (diets)

$e_{ij}$  = Experimental error





## 4. RESULTS AND DISCUSSION

### 4.1 The Effect of Vegetable Oil and Animal Fat on Body Weight

The effect of different vegetable oils and animal fat on performance and carcass traits of broiler chicks fed on the diet containing corn oil, canola oil, sunflower oil and animal fat during 1th day to 49 th. The value of body weight in all treatments at the one day to 49 day old were significant differ ( $p < 0.05$ ).

Table 4.1. showed live body weight of the end of each week of the experiment. In period (one) day old, effective treatments had no significant on body weight. Effect of treatment was significant on body weight in periods (7-14-21-28-35-42-49) day. T5 recorded the highest weight (107.290g), compared with (T1) control which (93.238) in period (7) day old. The best LBW was (193.925g) in T5 for period (14) day old, compared with (T1) control recorded lowest weight (165.05g). T2 reached to (398.800g) which is the highest, compared with T1(control) which (326.475g) the lowest weight, in period (21) day old. T2 reached to (884.750g) the highest weight compared with (T1) which (668.500g) the lowest, in period (28) day old. T3 recorded the highest weight (1476.5g) in period (35) day compared with T1 (control) which (963.5g), and at the same T3 had significant compared with all treatments. T3 recorded highest weight (2128g) in period (42)day old compare with T1 recorded lowest weight (1443g). T3 recorded highest weight (2671g), in period (49) day old compared with T1 (control) which (1918g), and at the same T5 had significant compared with T5.

Chicken fed canola oil caused the biggest body weight compared to birds fed fat. In addition, Baiao and Lara, (2005) reported momentous consequence of feeding canola oil on body weight. In the present study, chicks fed diets containing corn oil showed the significant difference in body weight. Wongsuthavas *et al.*, (2007), showed that combinations of dietary animal fats did not have any significant impacts on the last body weight of broilers. Vegetable oils are more digestible than animal fats; consequently, they provide more energy. Additionally, the age of bird impacts the availability of the nutrient (Wiseman *et al.*, 2003). The amount of fat was significantly increased live weight Bohnsacts *et al.*, (2002) showed that inclusion of these level in broiler diet results in the non-significant increase in body weight gain. Bilal *et al.*, (2000), reported that a significant difference in live weight was found between the group fed sunflower oil and the group fed animal tallow. Moreover, Newman *et al.*,

(2002) declared that a substantial enhancement in body weight is results from the addition of 3% of canola oil in broiler diet. Addition of fats may result in increased body weight in some cases (Sell et al., 1986). Canola oil has a key influence on best lipid metabolism and following body weight because it is a source of free fatty acids, unsaturated fatty acids (such a-linolenic acid) and omega-3 fatty acids compared with (Taylor, 2000). Stanley et al., (1988) reported significant improvement in body weight of broiler with increasing levels of supplemental fat. Taylor, (2000) found that chickens fed dietary fat showed higher live weight in compared to birds fed with no supplemental fat.



Table 4.1. The effect of different vegetable oil and animal fat on body weight (gm) of broiler chicken . (Mean  $\pm$  SE).

T	1	7	14	21	28	35	42	49
<b>T1</b>	41.20 $\pm$ 0.744 <sup>a</sup>	93.24 $\pm$ 0.435 <sup>b</sup>	165.05 $\pm$ 6.578 <sup>b</sup>	326.48 $\pm$ 16.536 <sup>b</sup>	668.50 $\pm$ 31.407 <sup>b</sup>	963.50 $\pm$ 18.932 <sup>c</sup>	1443.50 $\pm$ 38.318 <sup>b</sup>	1918.75 $\pm$ 51.655 <sup>c</sup>
<b>T2</b>	41.26 $\pm$ 1.214 <sup>a</sup>	103.80 $\pm$ 2.074 <sup>a</sup>	191.70 $\pm$ 4.733 <sup>a</sup>	398.80 $\pm$ 13.646 <sup>a</sup>	884.75 $\pm$ 28.727 <sup>a</sup>	1327.75 $\pm$ 49.916 <sup>b</sup>	2059.00 $\pm$ 74.754 <sup>a</sup>	2605.00 $\pm$ 68.496 <sup>a</sup>
<b>T3</b>	41.43 $\pm$ 0.519 <sup>a</sup>	105.35 $\pm$ 0.999 <sup>a</sup>	187.50 $\pm$ 1.071 <sup>a</sup>	371.30 $\pm$ 23.817 <sup>ab</sup>	864.50 $\pm$ 24.998 <sup>a</sup>	1476.50 $\pm$ 30.894 <sup>a</sup>	2128.00 $\pm$ 76.408 <sup>a</sup>	2671.25 $\pm$ 63.192 <sup>a</sup>
<b>T4</b>	41.53 $\pm$ 1.326 <sup>a</sup>	105.81 $\pm$ 2.981 <sup>a</sup>	191.78 $\pm$ 2.442 <sup>a</sup>	391.80 $\pm$ 7.993 <sup>a</sup>	811.50 $\pm$ 22.761 <sup>a</sup>	1278.50 $\pm$ 73.694 <sup>b</sup>	1959.25 $\pm$ 57.537 <sup>a</sup>	2412.50 $\pm$ 55.434 <sup>b</sup>
<b>T5</b>	40.78 $\pm$ 1.413 <sup>a</sup>	107.29 $\pm$ 3.060 <sup>a</sup>	193.93 $\pm$ 5.961 <sup>a</sup>	393.75 $\pm$ 5.411 <sup>a</sup>	830.00 $\pm$ 42.722 <sup>a</sup>	1331.00 $\pm$ 41.124 <sup>b</sup>	2006.00 $\pm$ 104.918 <sup>a</sup>	2625.00 $\pm$ 66.144 <sup>a</sup>

\*a, b, c: Means within columns with different superscripts differ significantly (p<0.05).

\*T1= (control)diet without oil, T2=( canola oil) %4, T3=( corn oil) %4, T4= (animal fat) %4, T5=( sunflower oil) %4

#### 4.2. The Effect of Vegetable Oil and Animal Fat on Weight Gain

Weight gain shows the effects of different vegetable oils and animal fat on performance and carcass traits of broiler chicks fed on the diet containing corn oil, canola oil, sunflower oil and animal fat during 1th to 49th. The value body weight gain in all treatments at the one to 49 day old was significant differ ( $p < 0.05$ ).

Table 4.2. show weight gain of the end of each week of the experiment. effect of treatment were significant on weight gain in periods (1-7), (8-14), (15-21), (22-28), (29-35), (36-42), and (43-49) days. T5 recorded the highest weight (66.513g), compared with (T1) control which (52.038g) in period (1-7) day old. The best weight gain was (87.898g) in T2 (canola oil) for period (8-14) day old, compared with (T1) control recorded lowest weight (71.813g). T2 reached to (207.105g) which the highest, compared with T1 (control) which (161.425g) the lowest weight, in period (15-21) day old. T3 (corn oil) reached to (493.200g) the highest weight compared with (T1) which (342.025g) the lowest, in period (22-28) day old. T3 recorded highest weight (612.000g) in period (29-35) day compared with T1 (control) which (295.000g), and at the same T3 had significant compared with T2. T2 recorded highest weight (731.250g) in period (36-42) day old compared with T1 recorded lowest weight (480.000g). In period (43-49) day, effect T2, T3, T4, T5 had no significant on weight gain compared with T1, but T5 had significant increase compared with T4, and T5 recorded the highest weight (619.000g), compared with T4 recorded lowest weight (453.250g).

An increased daily weight gain compared to the group without oil by adding fish oil to the base diet was reported via (Chekani-Azar *et al.*, 2010). Sanz *et al.*, (2000b), Pesti *et al.*, (2002) Showed that digestion and absorption of fat in poultry might be influenced by various fatty acids and dietary fats. Stanley *et al.*, (1988) reported significant improvement in body weight gain of broiler with increasing levels of supplemental oil. Even though in several cases body weight gain is similar, however with enhanced feed efficiency (Pesti *et al.*, 2002). Newman *et al.*, (1998), Crespo and Esteve-Garcia (2002) and Lopez Ferrer *et al.*, (2001) have the same result of body weight in broilers. Also Joshi and Sell (1964) reported that addition of fat to poultry diets improved feed utilization and weight gain. Ahmed *et al.*, (2013) showed that combination of canola and olive-canola oils in broilers ration increased body weight gain, improved feed conversion. El Shanti *et al.*, (2011) reported that the BWG was improved by 6% oil sediments. Shingari *et al.*, (1975), using graded levels of ground nut



oil in broiler ration, showed that the critical differences among the treatments revealed that the addition of oil at 6% level in the diet significantly improved the body weight gain of chicken. (Sell and Owings, 1983) reported that Body weight gain improved when supplemental fat was added at 4% level. Bohnsack et al., (2002) showed that weight gain increased as the level of fat was increased in the diet containing corn and poultry fats. Peoples et al., (1999) noted that addition of 1.5 or 3% corn oil to the breeder diet increased body weight gain. Abas et al., (2004) showed that significant effect of supplementing different sources of oil with the diets of broilers on weight gain.



Table 4.2. The effect of different vegetable oil and animal fat on weight gain (g) of broiler chicken. (Mean  $\pm$  SE).

T	1-7	8-14	15-21	22-28	29-35	36-42	43-49
T1	52.04 $\pm$ 0.831 <sup>b</sup>	71.81 $\pm$ 6.372 <sup>b</sup>	161.43 $\pm$ 10.224 <sup>b</sup>	342.03 $\pm$ 20.949 <sup>b</sup>	295.00 $\pm$ 21.459 <sup>c</sup>	480.00 $\pm$ 29.769 <sup>b</sup>	475.25 $\pm$ 47.472 <sup>ab</sup>
T2	62.54 $\pm$ 2.041 <sup>a</sup>	87.90 $\pm$ 3.802 <sup>a</sup>	207.11 $\pm$ 9.763 <sup>a</sup>	485.95 $\pm$ 31.380 <sup>a</sup>	443.00 $\pm$ 45.334 <sup>b</sup>	731.25 $\pm$ 64.935 <sup>a</sup>	546.00 $\pm$ 62.074 <sup>ab</sup>
T3	63.93 $\pm$ 1.414 <sup>a</sup>	82.14 $\pm$ 1.521 <sup>ab</sup>	183.81 $\pm$ 23.358 <sup>ab</sup>	493.20 $\pm$ 17.130 <sup>a</sup>	612.00 $\pm$ 19.753 <sup>a</sup>	651.50 $\pm$ 75.889 <sup>ab</sup>	543.25 $\pm$ 23.869 <sup>ab</sup>
T4	64.28 $\pm$ 1.976 <sup>a</sup>	85.97 $\pm$ 2.619 <sup>a</sup>	200.02 $\pm$ 8.801 <sup>ab</sup>	419.70 $\pm$ 19.478 <sup>ab</sup>	467.00 $\pm$ 64.894 <sup>ab</sup>	680.75 $\pm$ 48.481 <sup>a</sup>	453.25 $\pm$ 17.858 <sup>b</sup>
T5	66.51 $\pm$ 2.072 <sup>a</sup>	86.64 $\pm$ 2.969 <sup>a</sup>	199.83 $\pm$ 8.899 <sup>ab</sup>	436.25 $\pm$ 39.235 <sup>a</sup>	501.00 $\pm$ 62.142 <sup>ab</sup>	675.00 $\pm$ 68.549 <sup>a</sup>	619.00 $\pm$ 74.102 <sup>a</sup>

\*a, b, c: Means within columns with different superscripts differ significantly (p<0.05).

\*T1= (control)diet without oil, T2=( canola oil) %4, T3=( corn oil) %4, T4= (animal fat) %4, T5=( sunflower oil) %4.

### 4.3. The Effect of Vegetable Oil and Animal Fat on Feed Intake.

The effects of different vegetable oils and animal fat on performance and carcass traits of broiler chicks fed on the diet containing corn oil, canola oil, sunflower oil and animal fat during 1th to 49th. The value of feed intake in all treatments at the one day to 49 days old was significant differ ( $p < 0.05$ ).

Table 4.3. show feed intake of the end of each week of the experiment. Shows there are a significant improvement ( $p < 0.05$ ) in periods (1-7), (15- 21), (22-28),(29-35) days. In period (1-7) day T2, T3, T4, T5 there are no significant compared with T1 (control), whereas T2 was significant compared with T3, T4, T2 reached to (98.618g) the highest compared with T3 (76.055g) which the lowest, and the same time T1 (control) reached to (86.099g), the cause of significant of T2 because their diet based that consist of animal fat. In period (15-21) day T2, T3, T5 were significant compared with T1 (control), the highest feed intake was (331.332g) in T2 compared with T1control which reached to (290.453g) the lowest. T2 recorded highest feed intake (591.552g), compared with (T1) control the lowest which reached to (415.124g) in period (22-28) day old. T2, T3, T4, T5 were significant compared with T1in period (29-35) day, the highest feed intake was (1000.165g) in T2 compared with T1 which (748.304g) the lowest. Effect treatments were no significant on feed intake in periods (8-14), (36-42), (43-49) days, in the period (8-14) day the recorded highest to T2 (168.008g), whereas the recorded lowest weight in T1 (157.541g) and T4 (157.304g). The highest feed intake was (1312.019g) in T2 for period (36-42) days whereas T1 recorded lowest feed intake was (1210.611g). In period (43-49) day's end of the experiment, the highest feed intake was (1402.404) in T2, compared with other treatments.

This result is in agreement with Nobakht et al., (2011), who report that feed intake increased by the addition of sunflower oil at 4 % in the starter diet of broiler chicks. According to what Bryant et al., (2005), Ahmed *et al.*, (2013) asserted dietary energy regulation by fat addition is one of the utmost effective approaches for adjusting feed consumption of broilers. On applying different levels and types of fat in the broiler diets; Fuller and Mario (1977) proved that energy and nutrients intake was higher for all diets containing fats. Christmas and Harms (1988) showed that daily feed intake was significantly improved by the addition of 6.8% animal fat in broiler diet. Higher feed

intake in broilers fed on dietary tallow than rapeseed oil diets was reported by (Scaife et al., 1994; Al Athari and Watkins 1988). Saleh et al., (2009) stated that the addition of 1.5% of oil in chicken diet escalated the consumption of feed which agrees with findings the present research. Increasing feed intake was related to the increasing sensitivity of adult chicks to fishy smell in the supplemented diet with oil (Abas et al. 2004). In the result of Jeffri et al., (2010) feed intake decreased by increasing fat sources to the diets of broiler chicks. According to Hulan et al., (1988), Chekani-Azar et al, (2010), broilers fed on oil-containing diets have lower feed consumption. In addition, Harms et al., (2000); Bryant et al., (2005) indicated that augmenting fat addition or dietary energy reduced feed consumption and enhanced Feed Conversion Ratio (FCR) of broiler chicks. Rahimi et al. (2011) showed that use of oil in the broiler diet had no significant effect on feed consumption. Dieumou et al., (2009) showed that the significant effect on feed intake when they study the effect of ginger and essential oils on growth performance of broiler chicks. Atteh and Leeson., (1983) reported that increase of and absorption canals and subsequently their further fat content on feed intake were not significant. The results of Nwoche et al. (2003) showed that feed consumption was the highest. Olorede and Longe (1999) reported that supplementation of palm oil in broiler diet improved feed intake.

Table 4.3. The effect of different vegetable oils and animal fat on feed intake (g) of broiler chicken. (Mean  $\pm$  SE)

Treatment	1-7day	8-14day	15-21day	22-28day	29-35day	36-42day	43-49day
T1	86.1 $\pm$ 2.794 <sup>ab</sup>	157.54 $\pm$ 6.103 <sup>a</sup>	290.45 $\pm$ 11.856 <sup>b</sup>	415.12 $\pm$ 17.220 <sup>b</sup>	748.30 $\pm$ 32.624 <sup>c</sup>	1210.61 $\pm$ 60.902 <sup>a</sup>	1378.37 $\pm$ 30.316 <sup>a</sup>
T2	98.62 $\pm$ 1.331 <sup>a</sup>	168.01 $\pm$ 3.019 <sup>a</sup>	331.33 $\pm$ 10.540 <sup>a</sup>	591.55 $\pm$ 33.306 <sup>a</sup>	1000.17 $\pm$ 18.334 <sup>a</sup>	1312.02 $\pm$ 25.782 <sup>a</sup>	1402.40 $\pm$ 41.060 <sup>a</sup>
T3	76.06 $\pm$ 11.369 <sup>b</sup>	163.50 $\pm$ 5.346 <sup>a</sup>	323.06 $\pm$ 4.619 <sup>a</sup>	559.23 $\pm$ 19.343 <sup>a</sup>	914.09 $\pm$ 20.029 <sup>b</sup>	1211.04 $\pm$ 26.095 <sup>a</sup>	1392.17 $\pm$ 39.190 <sup>a</sup>
T4	91.34 $\pm$ 3.162 <sup>ab</sup>	157.30 $\pm$ 3.026 <sup>a</sup>	313.75 $\pm$ 7.437 <sup>ab</sup>	564.02 $\pm$ 22.128 <sup>a</sup>	957.68 $\pm$ 17.668 <sup>ab</sup>	1234.88 $\pm$ 12.844 <sup>a</sup>	1330.15 $\pm$ 4.360 <sup>a</sup>
T5	96.13 $\pm$ 2.382 <sup>a</sup>	161.20 $\pm$ 6.021 <sup>a</sup>	325.91 $\pm$ 11.107 <sup>a</sup>	587.71 $\pm$ 26.327 <sup>a</sup>	964.14 $\pm$ 21.441 <sup>ab</sup>	1300.91 $\pm$ 43.973 <sup>a</sup>	1370.47 $\pm$ 22.292 <sup>a</sup>

\*a, b, c, Values within columns within different letters are different (p<0.05)

\*T1= (control)diet without oil, T2=( canola oil) %4 T3=( corn oil) %4, T4= (animal fat) %4, T5=( sunflower oil) %4.

#### 4.4. The Effect of Vegetable Oil and Animal Fat on Feed Conversion Ratio.

The effects of different vegetable oils and animal fat on performance and carcass traits of broiler chicks fed on the diet containing corn oil, canola oil, sunflower oil and animal fat during 1th to 49th. The value of feed conversion ratio in all treatments at the 1th to 49th old was significant differ ( $p < 0.05$ ).

Table 4.4. show feed conversion of the end of each week of the experiment. The effect of treatment were significant differences ( $p < 0.05$ ) on feed conversion in periods (1-7), (8-14), (29-35), (36-42) day, except in periods (15-21), (22-28), (43-49) days, there is no significant differences. T3 was significant compared with T1 control, whereas T3 reached to (1.196) the lowest compared with T1 recorded highest feed conversion (1.655) in periods (1-7) days. In period (8-14) days, the effect of T2, T4, T5 had significant on feed conversion compared with T1 control, while T4 reached to (1.834) which the lowest, compared with T1 reached to (2.228) which the highest. In period (29-35) days T3 was significant compared with T1 control, while T3 reached to (1.498) the lowest, compared with T1 which was (2.573) the highest. T2, T4 had significant compared with T1 control for period (36-42), while T2 reached to (1.845) which the lowest compared with T1 which was (2.563) the highest. The effect of treatment were no significant differences, in period (15-21) days, T3 reached to (1.857) the highest while T4 reached to (1.576) the lowest compared with T1 control which was (1.812). In period (22-28) days T5 reached to (1.385) the highest, while T2 which was (1.139) the lowest. In period (43-49) day T1 control reached to (2.986) the highest, whereas T5 which was (2.341) the lowest.

The outcomes agree with the results of Chekani-Azar *et al.* (2010), who stated better conversion of feed in broilers fed a diet with fish oil in comparison to control group without oil. High-energy diets have been shown to improve growth and feed efficiency (Sahito *et al.*, 2012). Broilers fed with a ratio of feed with 8% of beef tallow in the diet effect significant feed efficiency in comparison to birds fed sunflower oil (Newman *et al.* 2002). Jeffri *et al.*, (2010) expressed that the quantity of feed consumption declined and feed efficiency was improved, by escalating fat sources to broiler diet. Zollitsch *et al.* (1997) have reported an improved feed conversion in broilers when dietary PUFA intake increased. Gomez *et al.* (1987) reported that vegetable oil or tallow did not affect growth. Degroote *et al.*, (1971) reported that there

was no significant difference in feed conversion among different fats. Pesti *et al.*, (2002) observed no significant differences in feed conversion due to different fat sources. El Yamany *et al.*, (2008) indicated that increasing feed consumption does not improve the feed conversion.



Table 4.4. The effect of different of vegetable oils and Animal fat on FCR (g) of broiler chicken. (Mean  $\pm$  SE)

Treatment	1-7day	8-14day	15-21day	22-28day	29-35day	36-42day	43-49day
<b>T1</b>	1.66 $\pm$ 0.057 <sup>a</sup>	2.23 $\pm$ 0.131 <sup>a</sup>	1.81 $\pm$ 0.091 <sup>a</sup>	1.22 $\pm$ 0.057 <sup>a</sup>	2.57 $\pm$ 0.207 <sup>a</sup>	2.56 $\pm$ 0.261 <sup>a</sup>	2.99 $\pm$ 0.289 <sup>a</sup>
<b>T2</b>	1.58 $\pm$ 0.032 <sup>a</sup>	1.92 $\pm$ 0.096 <sup>b</sup>	1.61 $\pm$ 0.041 <sup>a</sup>	1.23 $\pm$ 0.091 <sup>a</sup>	2.31 $\pm$ 0.185 <sup>a</sup>	1.85 $\pm$ 0.192 <sup>b</sup>	2.66 $\pm$ 0.266 <sup>a</sup>
<b>T3</b>	1.20 $\pm$ 0.187 <sup>b</sup>	1.99 $\pm$ 0.049 <sup>ab</sup>	1.86 $\pm$ 0.265 <sup>a</sup>	1.14 $\pm$ 0.059 <sup>a</sup>	1.50 $\pm$ 0.055 <sup>b</sup>	1.94 $\pm$ 0.238 <sup>ab</sup>	2.58 $\pm$ 0.175 <sup>a</sup>
<b>T4</b>	1.43 $\pm$ 0.076 <sup>ab</sup>	1.83 $\pm$ 0.056 <sup>b</sup>	1.58 $\pm$ 0.064 <sup>a</sup>	1.35 $\pm$ 0.076 <sup>a</sup>	2.19 $\pm$ 0.332 <sup>ab</sup>	1.85 $\pm$ 0.169 <sup>b</sup>	2.95 $\pm$ 0.105 <sup>a</sup>
<b>T5</b>	1.45 $\pm$ 0.046 <sup>ab</sup>	1.87 $\pm$ 0.086 <sup>b</sup>	1.64 $\pm$ 0.092 <sup>a</sup>	1.39 $\pm$ 0.154 <sup>a</sup>	2.01 $\pm$ 0.226 <sup>ab</sup>	1.98 $\pm$ 0.192 <sup>ab</sup>	2.34 $\pm$ 0.359 <sup>a</sup>

\*a, b, c: Means within columns with different superscripts differ significantly (p<0.05).

\*T1= (control) diet without oil, T2= (canola oil) %4 T3= (corn oil) %4, T4= (animal fat) %4, T5= (sunflower oil) %4



#### 4.5. The Effect of Vegetable oil And Animal Fat on Production Index

The effects of different vegetable oils and animal fat on performance and carcass traits of broiler chicks fed on the diet containing corn oil, canola oil, sunflower oil and animal fat during 1st to 49 th. The value of Production Index in all treatments at the 1st to 49 th days old was significant differ ( $p < 0.05$ ).

Table 4.5. showed the effect of treatment were significant differences ( $p < 0.05$ ) on production index in periods (1-7),(8-14),(22-28),(29-35),(36-42),(43-49) days, except at the period (15-21) which there are no significant differences found ( $p \leq 0.05$ ). In period (1-7) day T3 had significant compared with T1 control, while T3 recorded highest production index (140.707), compared with T1 recorded lowest production index (80.747). For period (8-14) days T2, T3, T4, and T5 were significant compared with T1 control, whereas T4 reached to (74.955) the highest but T1 reached to (53.825) the lowest. In period (22-28) days T3 was significant compared with T1 control, while T3 recorded highest production index (273.187) compared with T1 which was (197.309) the lowest. The best production index was (283.076) in T3 for period (29-35) day, compared with (T1) control recorded lowest production index (109.099). In period (36-42) day T2, T3, T4, T5 were significant compared with T1 control, whereas the best production index was (276.691) in T2 compared with (T1) control recorded lowest production index (138.585). Effect of treatments were significant at T2, T3, and T5 had a significantly ( $P < 0.05$ ) higher Production Index compares with T1 control, for period (42-49) day whereas T5 reached to (241.592) which is the highest, compared with T1 reached to (135.076) the lowest, As a result we find out that T5 which is a sunflower oil was the best production index. In period (15-21) day there are no significant differences ( $p < 0.05$ ), the best production index was (119.239) in T4 while T1 recorded lowest production index (86.812).

The production index is counted as one of the important factors of assessment of production performance of birds, as the higher production index gives the economic indicator for a good breeding, so depended on productive efficiency factor in the evaluation of breeding for broiler chickens. The superiority of the index of treatments 2, 3, 4, and 5 are due to the superiority of the same treatment in the increase in body weight and increase in the weight gain that consider one of the important factors in the calculation of factor productivity efficiency (Awad *et al.*, 2009; Ross *et al.*, 2014).

Table 4.5. The effect of different vegetable oils and animal fat on Production Index (g) of broiler chicken, (Mean  $\pm$  SE).

treatment	1-7day	8-14day	15-21day	22-28day	29-35day	36-42day	43-49day
<b>T1</b>	80.75 $\pm$ 2.804 <sup>b</sup>	53.83 $\pm$ 5.152 <sup>b</sup>	86.81 $\pm$ 7.695 <sup>a</sup>	197.31 $\pm$ 15.703 <sup>b</sup>	109.1 $\pm$ 9.016 <sup>c</sup>	138.59 $\pm$ 14.982 <sup>b</sup>	135.08 $\pm$ 14.088 <sup>c</sup>
<b>T2</b>	94.04 $\pm$ 3.447 <sup>ab</sup>	72.01 $\pm$ 5.542 <sup>a</sup>	118.88 $\pm$ 6.967 <sup>a</sup>	262.41 $\pm$ 26.092 <sup>ab</sup>	168.93 $\pm$ 21.574 <sup>bc</sup>	276.69 $\pm$ 35.282 <sup>a</sup>	206.40 $\pm$ 21.252 <sup>ab</sup>
<b>T3</b>	140.71 $\pm$ 31.733 <sup>a</sup>	67.41 $\pm$ 1.619 <sup>a</sup>	102.52 $\pm$ 17.537 <sup>a</sup>	273.19 $\pm$ 14.961 <sup>a</sup>	283.08 $\pm$ 13.811 <sup>a</sup>	274.70 $\pm$ 36.770 <sup>a</sup>	213.31 $\pm$ 12.475 <sup>ab</sup>
<b>T4</b>	107.15 $\pm$ 7.633 <sup>ab</sup>	74.96 $\pm$ 2.872 <sup>a</sup>	119.24 $\pm$ 7.071 <sup>a</sup>	217.03 $\pm$ 16.321 <sup>ab</sup>	182.16 $\pm$ 34.178 <sup>b</sup>	257.85 $\pm$ 22.578 <sup>a</sup>	167.73 $\pm$ 7.446 <sup>bc</sup>
<b>T5</b>	106.42 $\pm$ 6.413 <sup>ab</sup>	74.95 $\pm$ 5.602 <sup>a</sup>	115.58 $\pm$ 7.645 <sup>a</sup>	225.28 $\pm$ 34.168 <sup>ab</sup>	198.33 $\pm$ 27.229 <sup>b</sup>	250.66 $\pm$ 34.049 <sup>a</sup>	241.59 $\pm$ 28.555 <sup>a</sup>

\*a, b, c: Means within columns with different superscripts differ significantly (p<0.05).

\*T1= (control) diet without oil, T2= (canola oil) %4 T3= (corn oil) %4, T4= (animal fat) %4, T5= (sunflower oil) %4.

#### 4.6. The Effect of Vegetable Oil and Animal Fat on Dressing Percentage.

The results in Table 4.6. show the effects of different vegetable oils and animal fat on dressing percentage of broiler chicks fed on the diet containing corn oil, canola oil, sunflower oil and animal fat during one to 49 days. The value on dressing percentage (DP) in all treatments at the one to 49 days old was no significant differ ( $p < 0.05$ ).

Table 4.6. The effect of different vegetable oil and animal fat on dressing percentage (g) of broiler chicken. (Mean  $\pm$  SE)

Treatment	DP
T1	70.21 $\pm$ 2.951 <sup>a</sup>
T2	68.66 $\pm$ 0.313 <sup>a</sup>
T3	69.80 $\pm$ 0.836 <sup>a</sup>
T4	68.46 $\pm$ 0.416 <sup>a</sup>
T5	65.75 $\pm$ 0.784 <sup>a</sup>

\* T1= (control)diet without oil, T2=( canola oil) %4, T3=( corn oil)%4, T4= (animal fat)%4, T5= (sunflower oil)%4.

Effect of treatments was no significant on dressing percentage, T1 reached to (70.21) which is the highest percentage, while T5 reached to (65.75) which is the lowest percentage compared to control group.

Keren, *et al.*, (1990) expressed that oil addition reduced carcass deposition. These impacts might clarify the reason why the content of fat of the carcass was decreased via inclusion of dietary plant oils. Dieumou *et al.*, (2012) reported that oil did not have any significant influence upon dressing percentage of broiler chicks. These results are not approved by the findings of Navidshad, (2009) who examined the impact of concentration of fat on a percentage of the carcass of broilers. Newman *et al.*, (2002) found no substantial variation in the carcass traits and organ weight. Hulan *et al.*, (1988) found no significant difference in dressing percentage. Therefore, because of using similar breed birds with same age different fat levels had no significant effect on carcass traits (NRC, 1994). Ozdagan and M.Aksit, (2003) so according to have birds with the same age and different fat levels have no any significant effect on carcass traits. Essary

and Dowson (1965) proved that the different levels of fats or protein from one day old to 10 weeks of age did not appreciably influence the dressing percentage.

#### 4.7. The Effect of Vegetable Oil and Animal Fat on Abdominal Fat

The results in table 4.7. show the effects of different vegetable oils and animal fat on abdominal fat of broiler chicks fed on the diet containing corn oil, canola oil, sunflower oil and animal fat during one to 49 days. The value of abdominal fat in all treatments at the one to 49 days old was no significant differ ( $p < 0.05$ ).

Table 4.7. The effect of different vegetable oil and animal fat on abdominal fat (g) of broiler chicken . (Mean  $\pm$  SE).

Treatment	Abdominal fat
T1	0.93 $\pm$ 0.186 <sup>a</sup>
T2	1.65 $\pm$ 0.105 <sup>a</sup>
T3	1.36 $\pm$ 0.247 <sup>a</sup>
T4	1.44 $\pm$ 0.478 <sup>a</sup>
T5	1.44 $\pm$ 0.271 <sup>a</sup>

\* T1= (control)diet without oil, T2=( canola oil) %4, T3=( corn oil)%4, T4= (animal fat)%4, T5= (sunflower oil)%4.

Effect of different vegetable oil and animal fat on abdominal fat had no significantly. T2 (canola oil) reached to (1.645) which is the highest, compared with T1 (Control) reached to (0.931) which is the lowest.

The most important nutrient factor for abdominal fat is the energy level of diet (Azman *et al.*, 2004) thus because of having diets with same energy levels the effects of treatments were not significant (Ferrini *et al.*, 2008), (Wongsuthavas *et al.*, 2008) decrease of abdominal fat deposition in broilers. Crespo and Esteve-Garcia (2001) suggested that decrease in abdominal fat in broilers ration a diet supplemented with oil appears to be a result of larger oxidation of lipid regardless of the bigger combination of endogenous fatty acids. In broilers, the abdominal fat reduction is of particular interest, because the content of abdominal fat at slaughter might denote above 3 % of live weight (Sanz *et al.*, 1999).

In comparison to broiler chickens fed diets encompassing saturated fatty acids, broiler chickens fed diets supplemented with polyunsaturated fatty acids have a smaller amount of abdominal fat or overall body fat deposition. In broilers fed sunflower oil, declined abdominal fat was discovered (Sanz *et al.*, 1999). Escalating the concentration of fatty acids does not merely decrease the concentration of saturated fatty acids in the carcass, however, it also decrease these in the abdominal fat pads of broilers (Danicke, 2001). This causes healthier birds. In comparison to abdominal fat content in broilers fed animal fat, (Sanz *et al.*, 1999) found a lower abdominal fat content in broilers fed sunflower oil. The results of this study are in contradiction with the results of Wongsuthavas, *et al.*, (2007) and Potenca *et al.*, (2008) discovered no influence on the performance and abdominal fat pad deposition in broilers fed an animal or vegetable dietary lipids. Therefore, for reducing abdominal fat deposition, PUFA-rich oils might be an alternative because of their high capacity of oxidation (Sanz *et al.*, 2000a).



## **5. CONCLUSION AND RECOMMENDATION**

### **5.1. Conclusion**

In this research, we found out that the best oil is corn oil which given the best live body weight and weight gain. The best treatment is T3 which is corn oil which has given the least conversation ratio, so this is evidence that T3 was the best treatment. T2 (canola oil) is the best treatment in production index which had the highest rate in period (36-42) day, and T5 (sunflower oil) for periods (43-49) day which had the highest rate. T1 (control) is the best treatment in abdominal fat, while T3 (corn oil) had given the least abdominal fat.

### **5.2. Recommendation**

Investigating the following

1. We are suggesting that the oils should be mixed in order to estimate their effects.
2. Changing the quantity of the oil from higher and lower to find the differences.
3. Using vegetable fat to compare it with vegetable oil and animal fat.
4. Using the oil of butter and free animal fat (which is produced from bones known as hila oil).





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### WORK EXPERIENCE

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-	-	-

### AREA OF SPECIALIZATION

### FOREIGN LANGUAGES

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### OTHER FEATURES YOU WANT TO SPECIFY

### PUBLICATIONS