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Utilization of Olive Pulp in Broiler Rations

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DEDICATION

This project is dedicated to my parents, brothers, sisters ,wife and my Son (Anas).The completion of this work was not possible without their support and encourage.

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ABSTRACT

Utilization of olive pulp in broiler Diets

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This research was conducted to study the effects of olive pulp on the performance, body weight gain, feed intake, feed efficiency, gastrointestinal tract, visceral organ mass and carcasses of chicks.

A total of **(260)** one day-old chicks were used in this study and were divided into five experimental groups with four replicates in each. Olive pulp was incorporated in four of the experimental groups at rates of **(0.0, 2.5, 5, 7.5 and 10%)** in both starter and finisher feeds to replace similar rates of corn. Chicks were fed these diets during the entire feeding trial which lasted for **(35)** days. The olive pulp ingredient was obtained by sieving raw olive cake which was bought from local market.

Chicks were housed on floor and managed as any regular broiler flock at the experiments farm of the faculty of agriculture. Chicks were weighed weekly basis till the end of the trial. At time of termination of the trial (**day 35**), four birds of each group were killed following similar routine as in regular slaughter houses. Chicks were evacerated and total gastrointestinal tract weight and its segments weights were recorded. The weights of visceral organs were recorded too.

The hot carcass weights were recorded and then were partitioned for breasts and thighs.

The removing of olive pits improved the nutritive value of the raw olive cake which was observed in the general performance of broilers consuming different levels of olive pulp. Weight gain of chicks was the same in all chicks consuming up to **(7.5%)** of olive pulp. However, weight gain of chicks fed the level of **(10%)** olive pulp was Significantly lower than the control . Similar trends were observed in chicks for feed intake, and feed efficiency.

The level of olive pulp had similar effects on visceral organ mass, however, livers from chicks receiving **(10%)** olive pulp had the heavier weights.

Similar trend was observed in the weights of gastrointestinal tract and the tract segments, where the different levels of olive pulp had similar effects except that small intestines of chicks consuming **(10%)** olive pulp had the heaviest weights.

Olive pulp level had no effect on carcass cuts and the dressing percent.

The research showed that olive pulp could be considered as potential low cost feed for livestock, especially the broilers. By achieving this, lots of savings could be guaranteed beside solving a pollution problem that may be caused by accumulation of olive residues.

Chapter 1

1. Introduction:

Agriculture in the Middle East is rain Fed farming. Irrigation occurs at varying degrees depending on the economic situation in the particular country or for the particular farmer and local availability of water. Depending on the region and rain fall, the availability of forage and cereal crops may be highly seasonal.

Middle East countries rely to a large extent on imported feed for local livestock operations. Because imported feed is expensive, it has been necessary to subsidize the feed for farmers to survive economically.

However to comply with the recent World Trade Organization (WTO) agreements, it is expected that the level of subsidy will decrease. As a consequence, the prices of cereals are expected to increase. Therefore, present profitable use of cereals in ruminant feeding may soon be uneconomical. Possible solutions related to dry farming include management for higher "output/input" ratios, crop diversification, integration of crop and livestock production.

1.1 Problems to be addressed:

Wherever crops, their residues and by-products are wasted, the consequences range from environmental problems to unnecessary or excessive imports of feeds. On the other hand, wherever the crops, crop residues and by-products are locally processed and used as animal feeds, employment opportunities develop, profitability for the farmer increases and environmental pollution is reduced.

Therefore, improved utilization of crop residues and by-products for animal feeding deserves more attention, as it constitutes a set of issues of common concern to many countries. Examples of important crop residues and agricultural by-products in Palestine, Israel, Jordan and Egypt are: wheat straw, cotton, rice, citrus pulp, tomato pulp, poultry litter and olive cake.

The production of olive oil is an important branch of industry in the Mediterranean countries. The only interesting thing for the producers is the end product olive oil. The resulting by-products are considered as troublesome waste, such as crude olive cake.

In Palestine large quantities of olive pulp are dumped all over the country side without control. Smaller quantities are also burned continuously in house ovens or directly after the harvest causing strong air pollution.

These uncontrolled disposing procedures create uncalculatable pollution of the environment and the fragile semi-arid ecosystems by releasing toxic substances.

The annual amount of crude olive cake is ranges between (40.000 - 80.000) tons, depending on the annual crop. Because of its specific composition the untreated cake does not decompose for a long time. So it is accumulating over the years, creating environmental problems.

In fact, this nuisance waste is a favorable source for profitable utilization. Especially in a country which is stamped on political and economic dependencies, leaving its people with minimal income, this wasting of natural sources is not tolerable.

The useful and controlled recycling of this by-product is one of the few contributions according to the central theme of "sustainable development" of the conference of Rio.

Nevertheless, there is the possibility to create a beneficial economic market value of this waste product to avoid the costs of a controlled disposal and to lower the production costs of the relevant processing. In regard of an industrial processing of the olive cake there is a good possibility of job creation.

Depending on the specific composition of crude olive cake, there are different recycling methods were tried :

a) Extraction of the oil from the crude cake using solvents and :

This is a usual process in many oil producing countries with a large amount of production (e.g.) Italy. In Palestine the operation of a refinery plant is not economic in view of the annual amount of cakeand fluctuation in it's production.

b) Composting:

The process of composting crude olive cake is very complicated because of its stable low pH-value and specific biocide features.

c) Food additive for human consumption: the possible utilization as a fiber fraction in baked products for human consumption fails because of the lack of acceptance of people.

d) Utilization of the nutritive value of olive cake as animal feed in the extensive production of meat and eggs in integrated farming.

The nutritive value of crude olive cake permits it's use as a nutrient source for animals. It can increase the efficiency and profitability of the production, and help to spare grains for human consumption.

Preliminary examinations have shown the potential benefit for all animals and the significant increase of profitability, when the roughage costs are the main factor of production.

Palestine is experiencing a shortage of red meat production . The local meat production is about 40% of total requirements (Ministry of Agriculture, 1999).

However, the shortage of roughage for livestock feeding is the most important problem.

Animal production sector plays an important role in the Palestinian economy. However, its development is facing many obstacles. One of these is the dependence on unrealable sources (imports from the Israeli market) for many materials used in animal rations. At the same time, disposal of agricultural wastes is becoming an environmental and health hazard in rural communities.

Agricultural wastes such as olive cake can be utilized in many ways to become an important source of beneficial materials especially to the agricultural community. Agricultural wastes could be used after proper treatment and handling as a source for animal feed. Two pioneer studies were published to be the first on this field, to shed light on the potentiality of waste materials as animal feeds (Shquir, 1984a; Shquir, 1984b).

It could be utilized in an integrated farm approach where waste is not any more a waste but a natural source instead. However, the long traditional agricultural activities performed by Palestinian farmers are somehow a kind of integrated farming.

Nearly all of the research done had focused on feeding olive by-products to ruminants. Studies concerning this by-product to monogastrics are limited. The objectives of this project are to investigate the performance of broiler chicks fed different levels of olive pulp as an olive by-product, its effect on other broiler parameters as gastrointestinal measurements, visceral organs, and carcass cuts, its effect on feed intake and feed conversion efficiency.

Chapter 2

2. LITERATURE REVIEW

2.1 The olive fruit:

There are at least ten varieties of olive trees in Palestine. These olive varieties vary in fruit production, olive oil production and resistant to various diseases. The area of land in Palestine planted with olive trees is about 1 million donums (Ministry of Agriculture,1999)

The components of an olive fruit is as following: epicarp, mesocarp and the endocarp. The percentages of these components are 2.5, 74 and 24%, respectively.

2.2 Olive pressing:

Olive pressers are used for pressing the olive fruits to get its oil content. This process involves, washing of the fruits, crushing, pressing, and centrifugation. However, there are differences among pressers as being old or modern pressers. In modern pressers the pressing stage is replaced by a new technology in order to speed the separation of oil (Mendoza, 1975).The products of the overall operation are olive oil, olive cake and water including some residues (FAO, 1985).

2.3 Olive cake composition:

Table (1): Composition of olive cake (Dry matter basis).

Composition	%
Dry matter	100
Crude protein	5.6
Crude fiber	57.5
Crude fat	3.5
Acid detergent lignin	38
Acid detergent fiber	68.0
Ash	13.0
Calcium	2.3
Phosphorus	0.3

* (Kiritsakis, 1990).

The composition of olive cake varies according to type of olive trees, method of handling the fruits prior to pressing and type of olive presser (Kiritsakis, 1990).

The fiber of olive cake is mainly composed of cellulose and hemicellulose (polysaccharides) and lignin (Cahan and Overend, 1982).

The nutritive value of cellulose varies from totally indigested to variable degrees of digestibility depending on the degree of lignifications (Van Soest, 1982). However, hemicellulose is associated with both cellulose and lignin in its microfibrillar structure (Bisaria, 1991).

The lignin of olive cake, as is in other roughages, is the main factor limiting digestibility (Van Soest, 1982). The nutritive value of olive cake can be improved either by biological or chemical treatments (Cahan, 1991).

2.4 Olive pulp composition:

Olive pulp is the remainder of olive cake after the removal of the seed fractions. This can be achieved by sieving the dry olive cake to separate most of the endocarp. About 30% of cell wall fraction will be removed by sieving, that leads to improvement in the digestibility of organic matter and crude fiber up to 40% (Nifzaoui, 1991). The chemical composition of olive pulp is shown in (Table 2).

Table (2): The chemical composition of olive pulp (Dry matter basis)

Composition	%
Dry matter	100
Crude protein	9.5
Crude fiber	30.0
Crude fat	12.0
Acid detergent lignin	22.0
Acid detergent fiber	36.0
Ash	7.5
Calcium	0.6
Phosphorus	0.1

* (Nifzaoui, 1991).

2.5 Olive cake as animal feed:

So far ,all conducted feasibility studies showed that there is agood intake for many livestock species without any harmful effect on health, blood parameters or carcass merits (Abo Omar et al.,1995; Chaabane et al., 1997; Alcaida et al., 1996; Blomeyer, 1976; Nefzaoui et al., 1982; Molina et al., 1996; Leto et al., 1981). The pulp is used more frequent in for ruminants rations(shqueir and Qawasmi, 1994), But there are also good results from experiments with monogastrics as pigs (Alcaida et al., 1997) and poultry (Abo Omar, Un-published data). The proportion of olive cake in livestock rations depends on the species, it was prorated that the acceptable levels ranged between 20 and 40% for sheep rations. Higher proportions cause lower digestibilities and less weight gain (Blomeyer, 1976; O'Donovan, 1984; Nefzaoui et al., 1982; Abo Omar et al., 1995; Rupec et al., 1998).

Several studies were conducted to study the chemical composition and nutritive value of olive cake. It was concluded that crude protein content in olive cake is 5.1- 6.5% (Karam, 1981; Razzaque and Omar, 1981), while that percent in olive pulp is 8-12.8% (Leto and Giacone, 1981; Eraso et al., 1978; Miladi and Hegsted, 1974). Olive pulp tended to have low levels of lysine, methionine and histidine (Leto and Giacone, 1981).

Levels of fat in olive cake vary according to pressing method. The traditional method of pressing results in olive cake of 14-23% fat

(Razzaque and Omar, 1981). While extraction of oil using solvents gives cakes of about 5% fat.

The total digestible nutrient values of olive cake ranged between 36 and 65% for olive cake and olive pulp, respectively (Morrison, 1957; Boza et al., 1970).

The metabolizable energy content of olive cake is 4-4.5MJ/kg dry matter (Morgan and Trinder, 1980). Olive cake is considered as a good source of calcium, copper and cobalt but poor in phosphorus, magnesium and sodium, and with fair levels of manganese and zinc.

Several research activities were conducted in Palestine and neighboring countries to investigate the effect of feeding olive cake to fattening animals. Addition of 20% olive cake in replacement of barley had no harm effects on animals performance and carcass merits (Abo Omar et al., 1995; Shurafa and Harb, 1982; Harb and Kamel, 1984) and the digestive tract measurements, but caused increase in the contents of the digestive tract especially when fed at levels higher than 20% of the ration (Abo Omar, 1996).

Some research activities aimed to feed olive cake to non-ruminants as pigs (Alcaide et al., 1997) and to broilers (Abo Omar, Un-published data). The content of toxic materials such as phenol or aromatics were confirmed, their influence on nutritive value is not yet determined (Nefzaoui, 1982).

Olive cake has a good ensiling suitability based on it's low pH value (Vesnik et al., 1993). So far, there is no form of practical application worked out.

The cake has a high proportion of lignin fraction so that the increase of digestibility is recommended. In in-vitro studies, Several methods of treatments were tried (enzymatic, alkali, radiation), with satisfying results (Al- Masri, 1997). The application of the above methods at the farm is not yet their .

The utilization of olive by-products as animal feed is an undoubtedly a good way of recycling this waste products. But there is a need to compose optimized rations for different animal uses to avoid metabolic disorders caused by the unproportioned rations of energy and protein and to reduce the tasty factors which might limit feed intake and then the animal performance that leads to low profitability.

The nutritive value of olive by-product permits it's use as a source of nutrients for livestock with several advantages as increases the efficiency and productivity and helps to spare grains for human consumption.

2.6 Visceral organ mass:

Olive pulp is a by-product of high fiber content. Diets of different levels of fiber showed certain influence on gastrointestinal tract weight, length and content (Abo Omar, et al, 1994; Johnson, 1985; Abo Omar, 1995; Pecas et al, 1983; Younoszai, et al, 1978). At the same time, variable effects of olive cake on visceral organs like heart, kidneys, lungs, spleen, esophagus and liver were identified in lambs consuming different levels of fiber (Abo Omar, et al, 1994; Abo Omar and Gavoret, 1996).

2.7 Carcass cuts:

The different levels of olive cake had no effect on carcass cuts of fattening lambs when fed olive cake at levels of 10, 20, 30, 40% (Abo Omar and Gavoret, 1995). Similar effects were observed in broilers fed olive pulp at levels up to 10% (Abo Omar, Un-published data). The carcass cuts considered were breast, thighs, back and wings.

Chapter 3

3. MATERIALS AND METHODS

3.1 Sampling and preparing of olive pulp:

Raw olive cake was collected from local olive pressing factory. This factory is a semi automatic one. It was chosen as most of olive pressing factories in Palestine belongs to this type of factories. The material was collected during the olive pressing season then transported to the experimental site at the Faculty of Agriculture farm in Tulkarem. Olive cake was spread on a plastic sheath for sun drying, mixing of the sample was performed every few hours to assure an efficient drying of the material. The material was covered during night to avoid moisture. Four days after, when the material was air dried, then separation of endocarp started. A 2-mm sieve was used in this process where most of the endocarp were removed. Olive pulp obtained by sieving was placed in tight plastic sacs for later use.

3.2 Chemical analysis:

Air dried sample of the pulp were used to determine the following: Moisture content (Appendix A-1), ash content (Appendix A-2), crude protein content (Appendix A-3), crude fat content(Appendix A-4), crude fiber content (Appendix A-5), the nitrogen free extract content which was determined by difference(Marrison and Frank, 1961), %NFE = %100 – (% ash + % crude fat + % crude fiber+ % crude protein),and gross energy contents (Appendix A-6).

3.3 Ration preparation :

The experimental rations were formulated at the experiment site. Raw ingredients were bought from local market then mixed into rations to fit the NRC (1994) requirements. Two types of rations were formulated, the starter ration which was fed from day 1 to day 22, and a finishing diet which was fed from age of 23 days till day 35 when the experiment was terminated .

The rations used in the experiment as shown in tables (3 and 4) were:

1. Basal diet without olive pulp (Diet 1) "control ".
2. Basal diet with 2.5% olive pulp (Diet 2).
3. Basal diet with 5% olive pulp (Diet 3).
4. Basal diet with 7.5% olive pulp (Diet 4).
5. Basal diet with 10% olive pulp (Diet 5).

Olive pulp was added to replace similar percentages of corn (Figure 1)and grap feed samples were collected for later chemical analysis.The feed and water were provided ad-libitum.

Figure (1): Replacement of Corn by Similar Percentage of Olive Pulp.

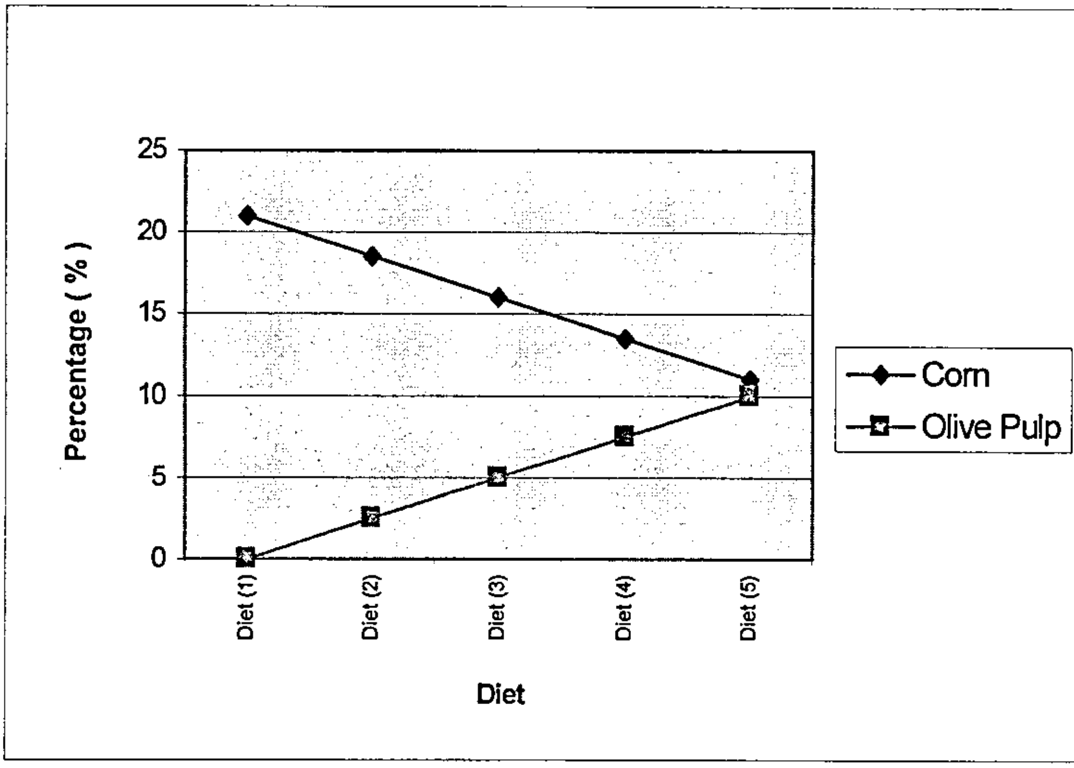


Table (3): Starter experimental rations used in the experiment

Diet	1	2	3	4	5
Diet composition (%)					
Corn	21	18.5	16	13.5	11.
Wheat	32	32	32	32	32
Soy bean meal	39	39	39	39	39
Dicalcium phosphate	1.6	1.6	1.6	1.6	1.6
Sand	1.4	1.4	1.4	1.4	1.4
Oil	4	4	4	4	4
Premix	1	1	1	1	1
Olive pulp	0	2.5	5.0	7.5	10
Chemical analysis (%)					
Dry matter	89	88.7	88.6	88.4	88.9
Crude protein	22.5	22.6	22.6	22.7	22.6
Ether extract	4	5.5	5.7	6.0	6.1
Crude fat	5	5.4	5.7	5.9	6.0
Ash	6.5	6.5	6.9	7.0	7.1
Calcium	1.2	1.1	1.2	1.2	1.2
Phosphorus	0.8	0.7	0.7	0.7	0.7

recorded. At the same time, total digestive tract length of each of the above segments were recorded.

Total cool carcass weight was recorded then each carcass was split into it's cuts, breast and thigh were each cut weight was recorded. Weights of wings, neck, head, feet were also recorded.

Data were analysed by ANOVA using the linear model procedure of SPSS (Cary, 1988) to determine the effect of experimental rations on feed intake, body weight and mortality rate weight gain, feed conversion, visceral organ mass, gastrointestinal tract components and carcass cuts.

Chapter 4

4. RESULTS AND DISCUSSION

4.1 Composition of olive pulp :

The composition of olive pulp is shown in Table 5.The values of nutrients determined by the chemical analysis are consistent with those reported by other researchers (Harb, et al., 1986; Abo Omar, Un-published data).

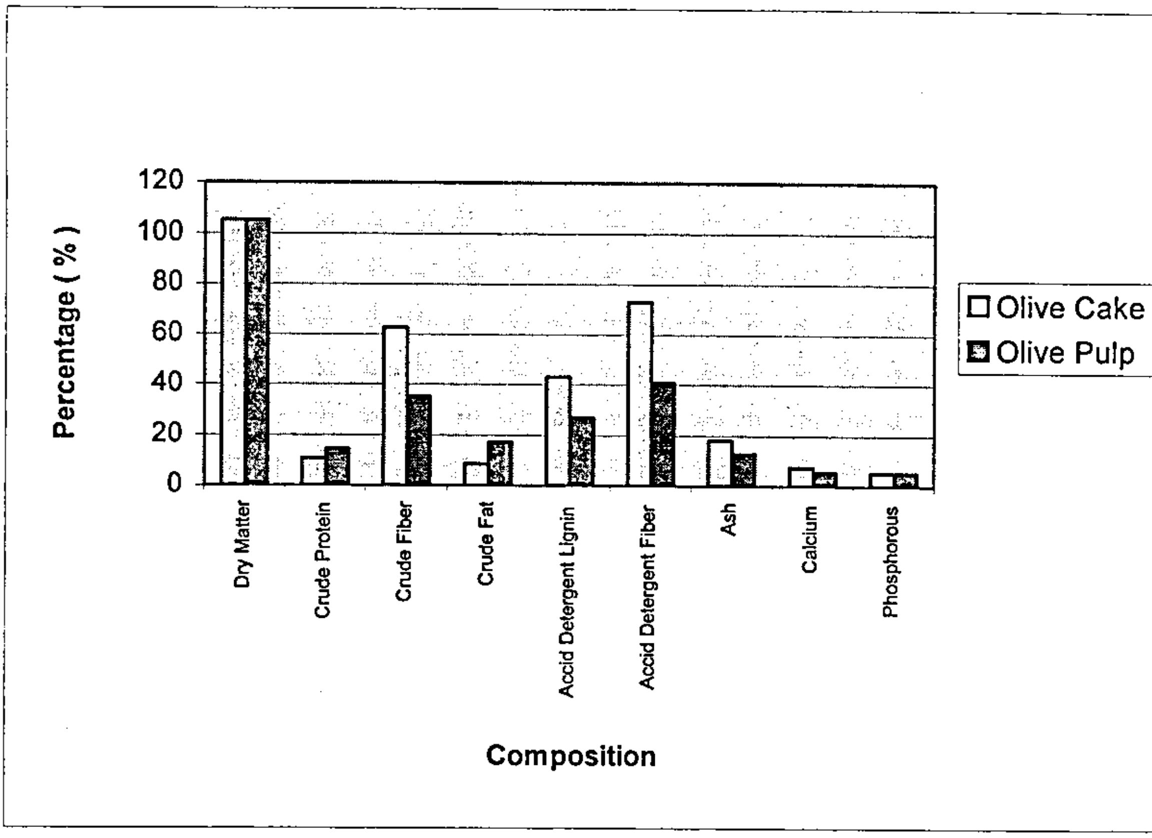
Table 5: Composition of olive pulp used in the feeding trial.

Composition	%
Dry matter	100
Crude protein	10
Crude fiber	29
Crude fat	12.4
Calcium	.63
Phosphorus	.12
Ash	7.8

*Dry matter basis

Comparing to nutrient composition of olive cake, removing of the seeds in olive pulp increases the crude protein content by about 5%. The removal of seeds also decreases the fiber content by at least 20% (Figure 2).

Figure (2): Comparison between Chemical Composition of Olive Cake and Olive Pulp



* Based on Table (1) and Table (2) data.

4.2 Broiler performance:

The broiler performance during the feeding trial is shown in Table 6. The results showed that the level of olive pulp in broiler ration had an influence on broilers performance.

The feeding trial showed that olive pulp had an effect that started to show from the first week of the study . At age of 7 days, the control chicks and chicks receiving 2.5% olive pulp had the highest ($p<0.05$) body weight compared to other feeding groups. At this stage of the feeding trial, the chicks on 7.5 and 10% of olive pulps diets had the lowest ($p<0.05$) weight gain compared to other feeding groups.

Table (6): Body weight development of broilers fed olive pulp feeding trial (g).

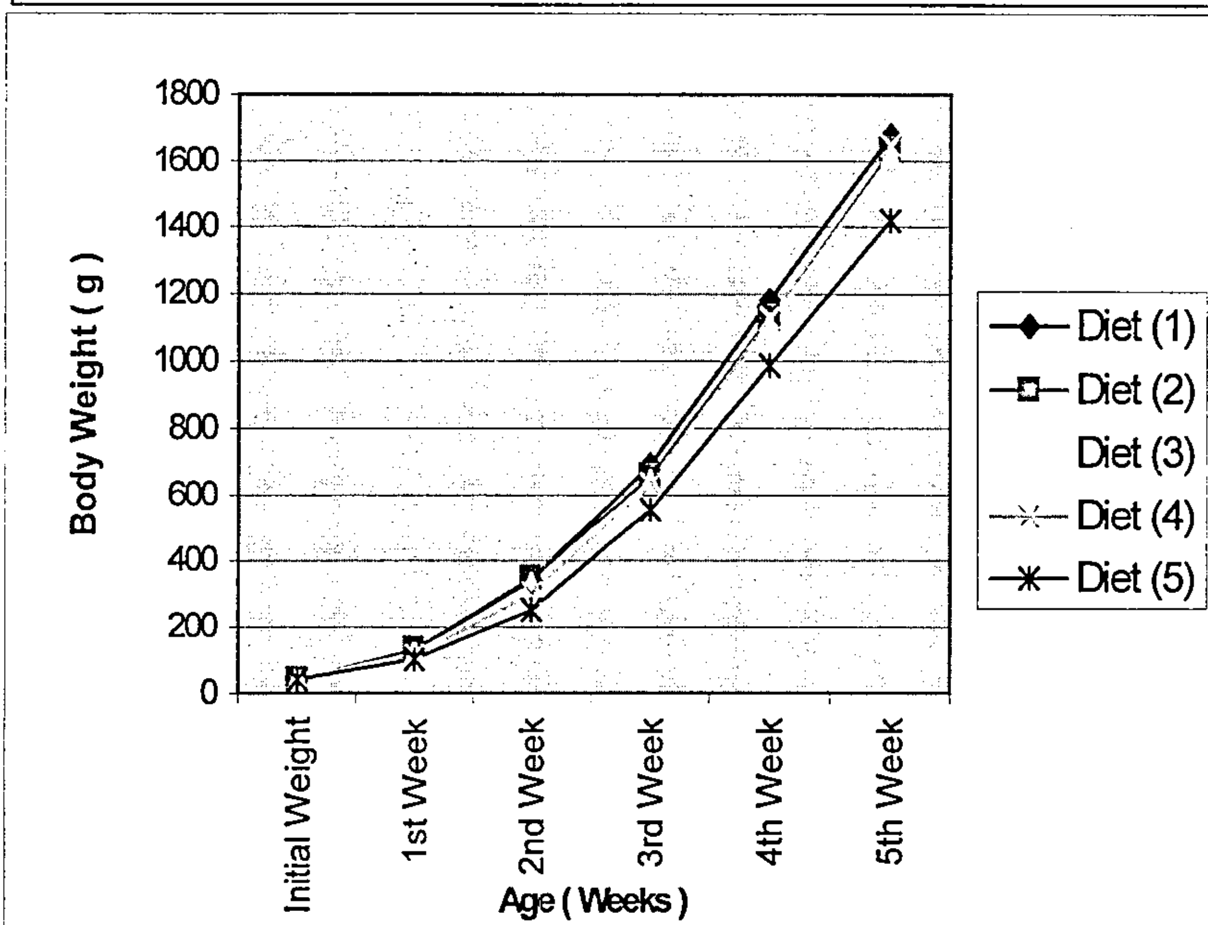
Age \ Diet	1	2	3	4	5
Initial weight	39.3	39.5	40.2	40.4	40.5
Weight at 7 days	127.1 ab	130.3 a	117.0 bc	109.7 cd	100.4 d
Weight at 14 days	337.7 a	343.9 a	326.1 ab	302.1 b	249.3 c
Weight at 21 days	689.9 a	655.4 a	639.9 a	634.2 a	553.6 b
Weight at 28 days	1180.5 a	1131.3 a	1107.7 a	1127.3 a	987.5 b
Weight at 35 days	1675.3 a	1634.0 a	1616.5 a	1648.5 a	1459.0 b

* Rows of different letters are significantly different at level of $p<0.05$

This trend was maintained during the second week of the feeding trial where both control and 2.5% olive pulp had the highest gain compared to other groups, and the 10% olive pulp group with the lowest gain (Figure3). For the rest of the feeding period, which lasted for 35 days, all groups of chicks gained the same as the control chicks except the chicks receiving the highest portion of olive pulps.

These findings indicate that feeding olive pulp to broilers at rates up to 7.5% will be beneficial and without any harm effects on chicks performance. However, it might be of more advantage to start feeding the experimental diets, especially the higher rates of olive pulp, in the broiler growing diets instead of being added to the starter diets.

Figure (3): Body Weight development of Broilers fed Olive Pulp through out the trial .



This result is in consistence with those reported by other workers when broilers fed high fiber diets, such as tomato dried pulp, date pits, dried citrus pulp and olive pulp (Kamel et al., 1981; El Moghazy and El Boushy, 1982b; Abo Omar, Un-published data).

4.3 Feed intake:

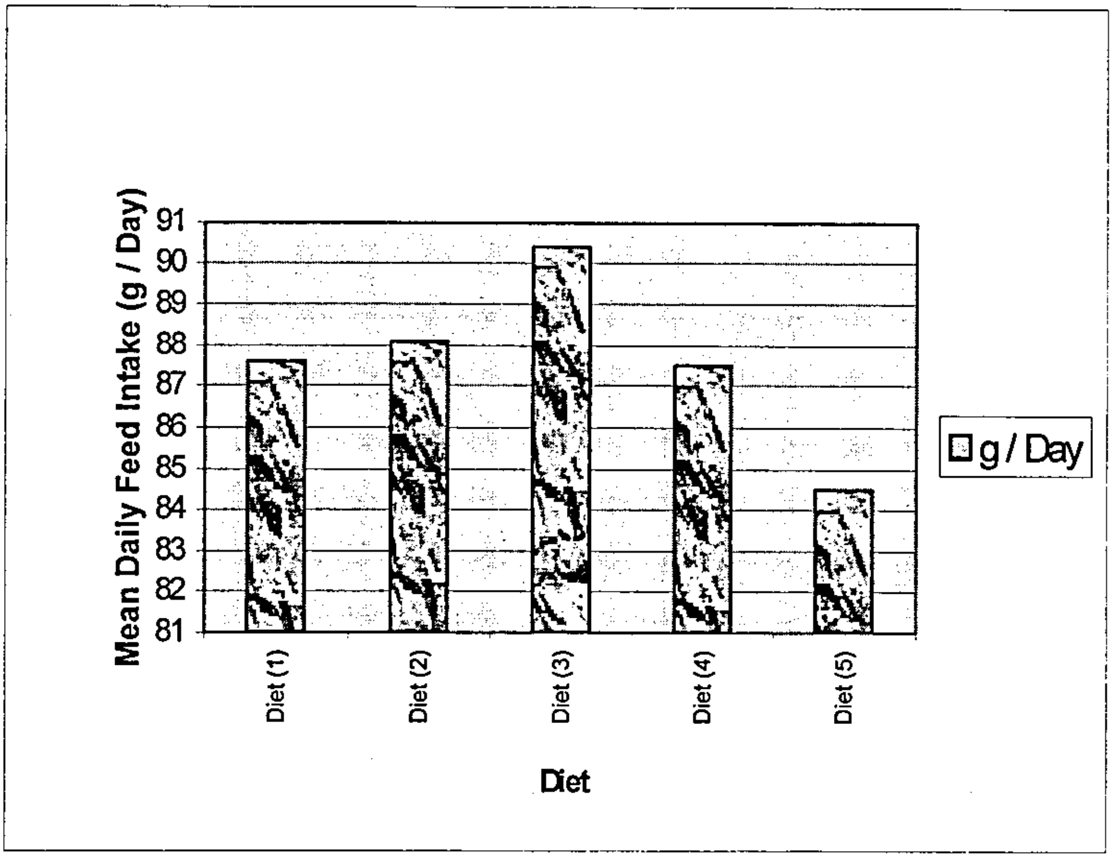
The experiment showed that there was no significant differences among the experimental groups in regard to feed intake (Table 7). However Chicks receiving the 10% level of olive pulp consumed less feed compared to other experimental groups (Figure 4).

Table (7): Effect of feeding olive pulp on the feed intake, body weight gain, cost of gain and the conversion efficiency of broilers.

Item	Unit	Diet 1	Diet 2	Diet 3	Diet 4	Diet 5
Olive pulp incorporation	%	0	2.5	5	7.5	10
No. of chicks	Chick	31	32	29	30	30
Days of experimentation	Day	35	35	35	35	35
Mean initial weight	g.	39.9	39.5	40.2	40.3	40.5
Mean final weight	g.	1675.3	1634.0	1616.5	1636.1	1459.0
Mean daily gain	g/day	46.7	45.6	45.0	45.6	40.5
Daily feed intake	g/day	87.6	88.1	90.4	87.5	84.5
Feed conversion efficiency	g diet/gm gain	1.88	1.93	2.01	1.92	2.10
Cost of diets	NIS/ Kg diet	1.09	1.07	1.05	1.03	1.01
Cost of total gain	NIS	3.34	3.30	3.32	3.15	3.00
Cost of 1 Kg gain (Live wt.)	NIS / Kg gain	**2.04**	**2.07**	**2.11**	**1.97**	**2.12**

The reason behind that lower intake might be the high level of olive pulp which caused depression of appetite. El Moghazy and El Boushy (1982b) reported similar intake when high fiber diets were fed to broilers.

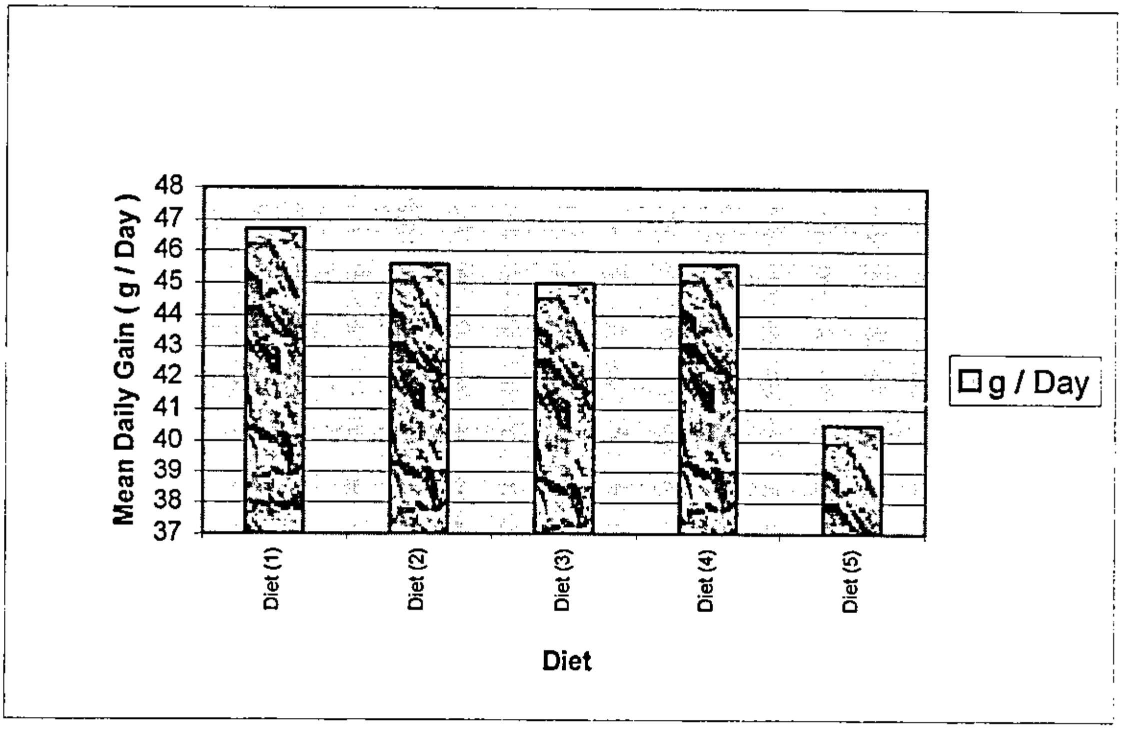
Figure (4): Effect of of Olive Pulp levels on Daily Feed Intake of Broiler Checks



4.4 Body weight gain:

Feeding olive pulp at rates up to 7.5% caused similar gain in broiler chicks receiving the commercial diet. The chicks receiving the 10% olive pulp had the lowest body gain (Figure 5). The reduced intake observed in chicks of this group might be the reason behind that. However, the high fiber intake by these chicks might caused rapid rates of passage in chicks digestive tracts which caused the depression in body weight gain.

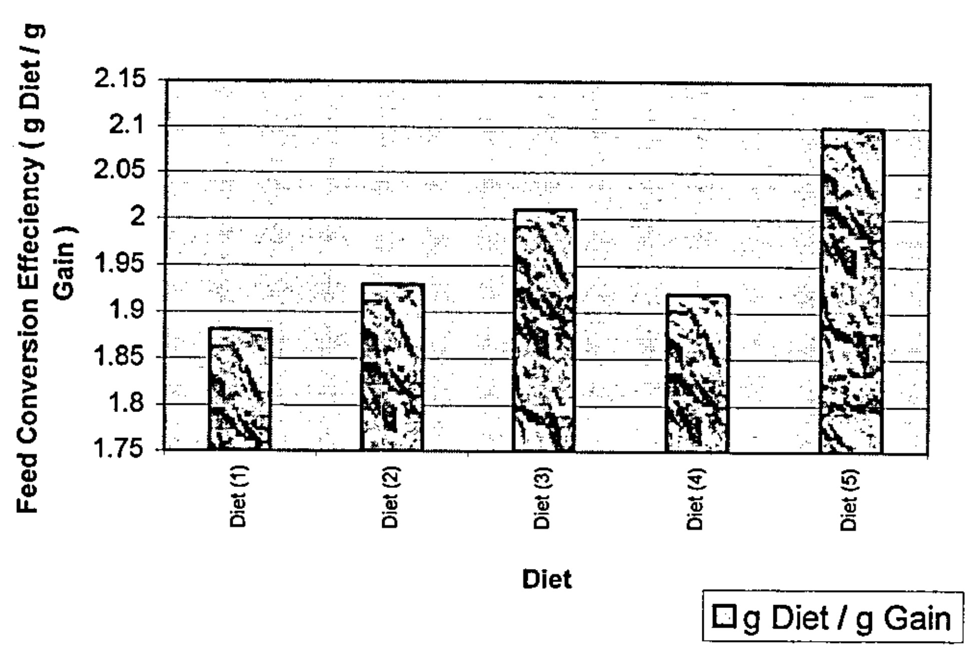
Figure (5): Effect of levels of Olive Pulp on Broiler Checks Mean Daily Gain



4.5 Feed efficiency:

The efficiency of feed conversion was statistically the same in all treatments, but lower efficiency was observed in the chicks receiving the highest olive cake level. However, the difference between the highest and the lowest conversion efficiency values is 0.22. (Figure 6). The values of feed conversion indicated that olive pulp can be added to broiler diets to levels up to 7.5% without any negative effect on feed efficiencies.

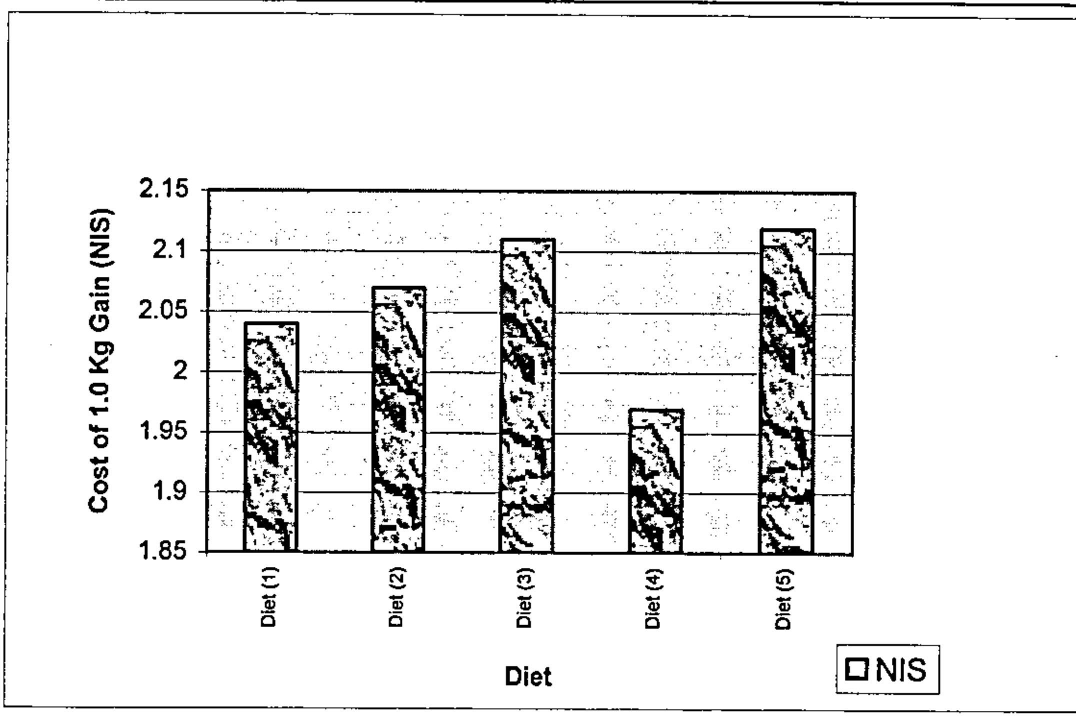
Figure (6): Effect of olive pulp fed to broiler checks on feed efficiency



4.6 Cost of gain:

The cost per kg gain is indicated in Table 7. This cost was the lowest for chicks consuming the 7.5% olive cake level . The incorporation of olive pulp at this rate in broiler diets will save similar amounts of corn. While taking other chicks performance parameters which were not negatively affected by this level of olive pulp, lots of savings can be achieved through feeding olive pulp especially at the rate of 7.5% compared to the broiler commercial diet . Anyhow, if we assume that the annual broiler production in Palestine is 60 million kg of broiler meat, and knowing that the cost per kg gain is 1.97 New Israeli Sheqel (NIS), as indicated by our findings, then about 4.2 million NIS can be saved to our broiler farmers each year (Figure 7).

Figure (7): Effect of levels of olive pulp on broiler checks cost of 1 kg gain



4.7 Visceral organ mass:

It was indicated by different researchers that fiber levels have certain influence on gastrointestinal tract and its asseccory organs,(Abo Omar el al, 1994, Abo Omar 1995 and Johnson 1985). Even though fibers had variable effects on the measured parameters, fiber differently exerts its effect. The small intestine and liver were the most organs to be affected by the level of fibers.

4.7.1 Edible parts:

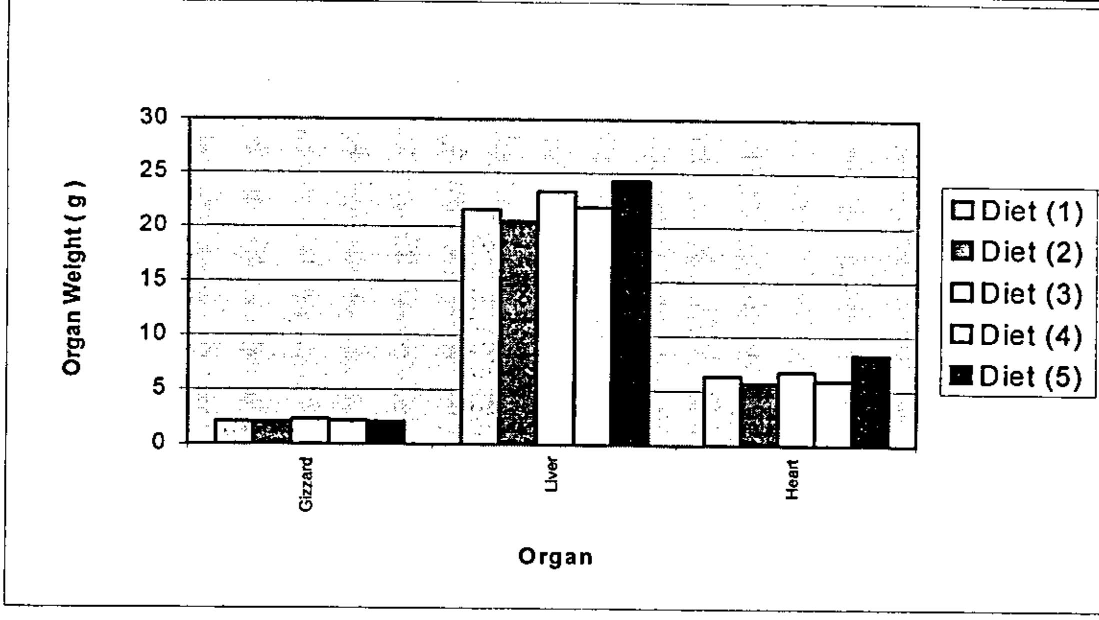
The parts considered by the investigation were: gizzard, liver and heart. Type of diet had no effect on weights of these edible organs, however, liver was the most affected (Table 8, Figure 8). Weights of the measured organs are similar to the standard weights of chicks slaughtered at any commercial slaughter house.

Table (8): Effect of levels of olive pulp on visceral organs (edible) weight (g/kg live wt.).

Organ \ Diet	1	2	3	4	5
Gizzard	2.1	2.1	2.3	2.2	2.1
Liver	21.6	20.5	23.3	21.8	24.3
Heart	6.3	5.7	6.7	5.9	8.3

Similar findings were reported when broilers were fed diets high in fiber in replacement of corn (Kamel et al.,(1981). Pekas et al.,(1983) reported a significant increase in liver weights of pigs fed high fiber diets.

Figure (8): Effect of levels of olive pulp on visceral (edible) organs



4.7.2 Non-edible parts:

The non-edible parts investigated were: esophagus, crop, lungs, provintriculus, and trachea Table 9.The level of olive pulp had no significant effect on the weights of these organs. However, the most effected organs were the esoghagus and provintriculus.

Table (9): Effect of different levels of olive pulp on weights of some visceral (non-edible) (g /kg live wt.).

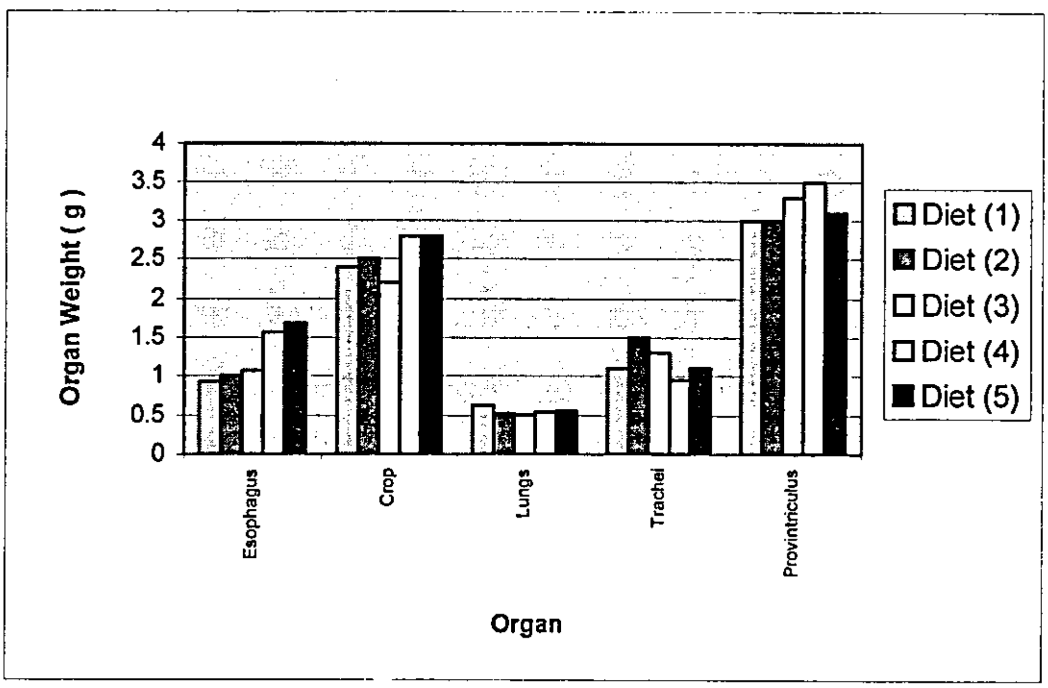
Organ \ Diet	1	2	3	4	5
Esophagus	.92	1.0	1.06	1.56	1.68
Crop	2.4	2.5	2.2	2.8	2.8
Lungs	.63	.53	.51	.55	.56
Trachea	1.1	1.5	1.3	.94	1.1
Provintriculus	3.0	3.0	3.3	3.5	3.1

The highest weight of esophagus was observed with chicks receiving the highest level of olive pulp, while lowest esophagal weight was observed in chicks receiving the control diet. This indicated that weight of esophagus increased as level of olive pulp in the diet in creased.

The highest weight of provintriculus was observed in chicks consuming 7.5% olive pulp, while the lowest weights were observed in chicks receiving 10% olive pulp (Figure 9).

Any how, the weights recorded for these organs are not different from those of broilers consuming regular diets.

Figure (9): Effect of levels of olive pulp on visceral (non-edible) organs



4.7.3 Gastrointestinal tract:

Type of diet has an important influence on total digestive tract, its components and content.

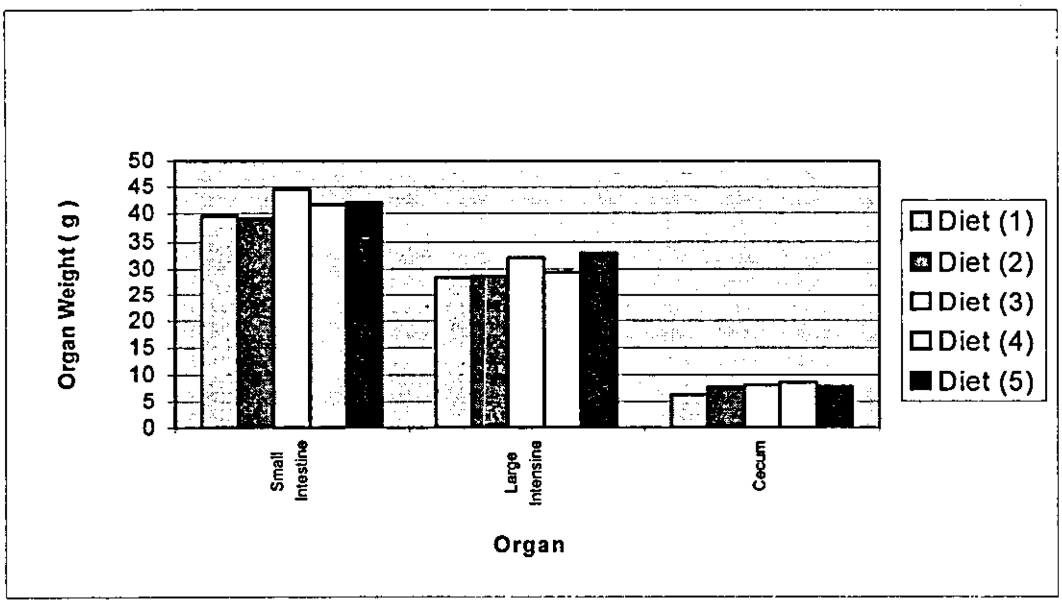
Olive pulp a material of high fiber content had effects on gastrointestinal weight and components (Table 10).

Table (10): E ffect of different levels of olive pulp on weights of gastrointestinal and its component (g/ kg live wt.).

Diet / Organ	1	2	3	4	5
Small intestine	39.6	39.0	44.5	41.5	42.1
Large intestine	28.3	28.6	32.0	29.2	32.8
Cecum	6.2	7.6	8.0	8.5	7.7

The chicks consuming olive cake at rate of 5% had the highest ($p<0.05$) weights of small intestine compared to other treatment groups, followed by those 10 and 7.5% olive pulp, respectively (Figure 10). Similar findings were observed when olive cake diets were fed to lambs (Abo Omar, 1995) and to broiler chicks (Abo Omar, Un-published data). Similar trend was in part observed in rats receiving a high fiber diet (Dunaif and Sheeman, 1981).

Figure (10): Effect of levels of olive pulp on weights of gastrointestinal and it's component



The highest weight of large intestine was in the chicks consuming 10% olive pulp in their diets, while the lowest weights were for chicks consuming the control diet. Similar trend was observed for weights of cecum, where the control chicks had the lowest cecum weights (Abo Omar, Un-published data). However, high fiber levels when fed to pigs increased the colon and rectum weights (Pekas et al., 1983).

4.8 Weight of some carcass cuts:

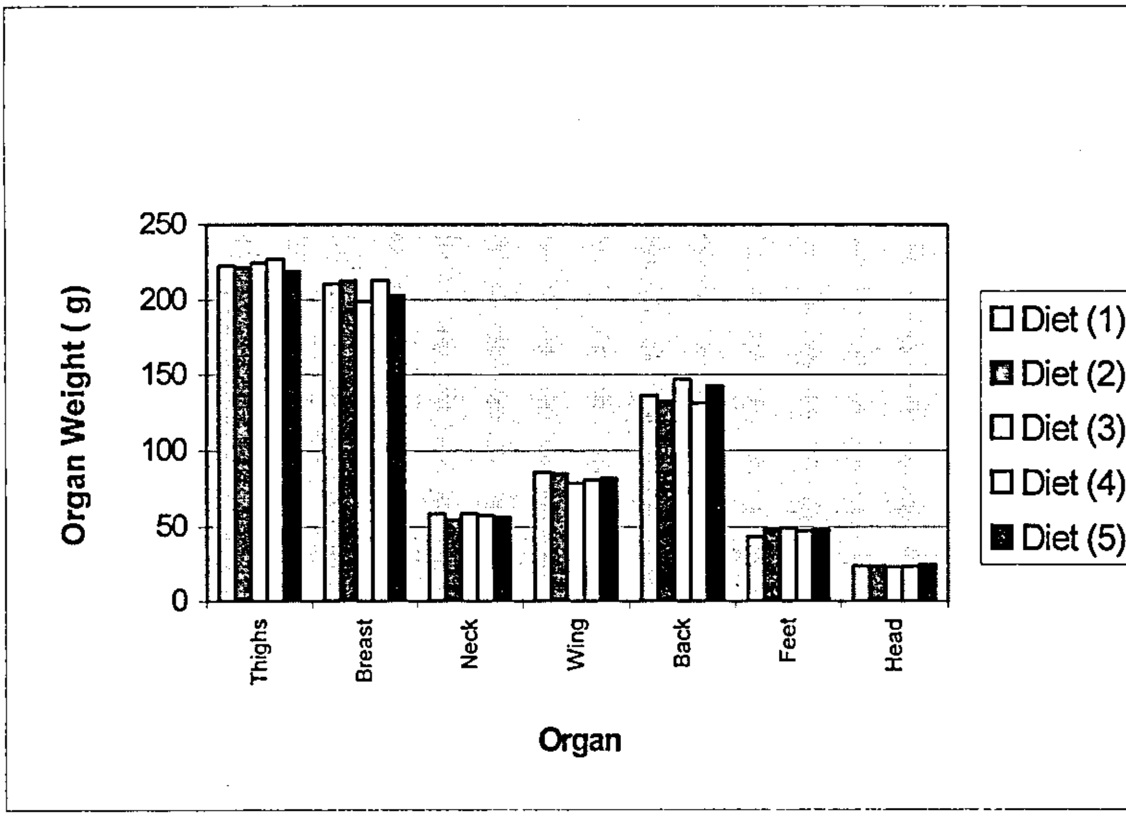
The cuts under investigation were: neck, head, feet, back, thigh, and breast Table 11.The level of olive pulp had no significant effect on carcass cuts weights.Variable effects were observed as shown in Table 11.

Table (11): Effect of different olive pulp on weights of carcass cuts (g/kg live wt.).

Organ \ Diet	1	2	3	4	5
Thigh weight	222.5	221.6	224.5	226.9	218.7
Breast weight	210.8	212.6	199.1	213.0	202.9
Neck weight	58.3	54.5	58.2	57.0	56.0
Wings weight	85.8	84.6	78.1	80.7	81.4
Back weight	136.1	132.4	146.9	131.2	142.4
Feets weight	48.1	48.2	49.0	47.2	47.8
Head weight	23.7	23.9	23.0	23.4	24.6

The best weights of both thighs and breast cut were observed in carcasses of chicks receiving 7.5% olive pulp. At the same time, these chicks had the lowest weights of non-edible cuts as head and feet. These findings may explain the increased live body gain and feed efficiencies observed in the chicks receiving 7.5% olive pulp compared to other chicks in other treatment group (Figure 11).

Figure (11): Effect of levels of olive pulp on carcass cuts



4.9 Gastrointestinal length:

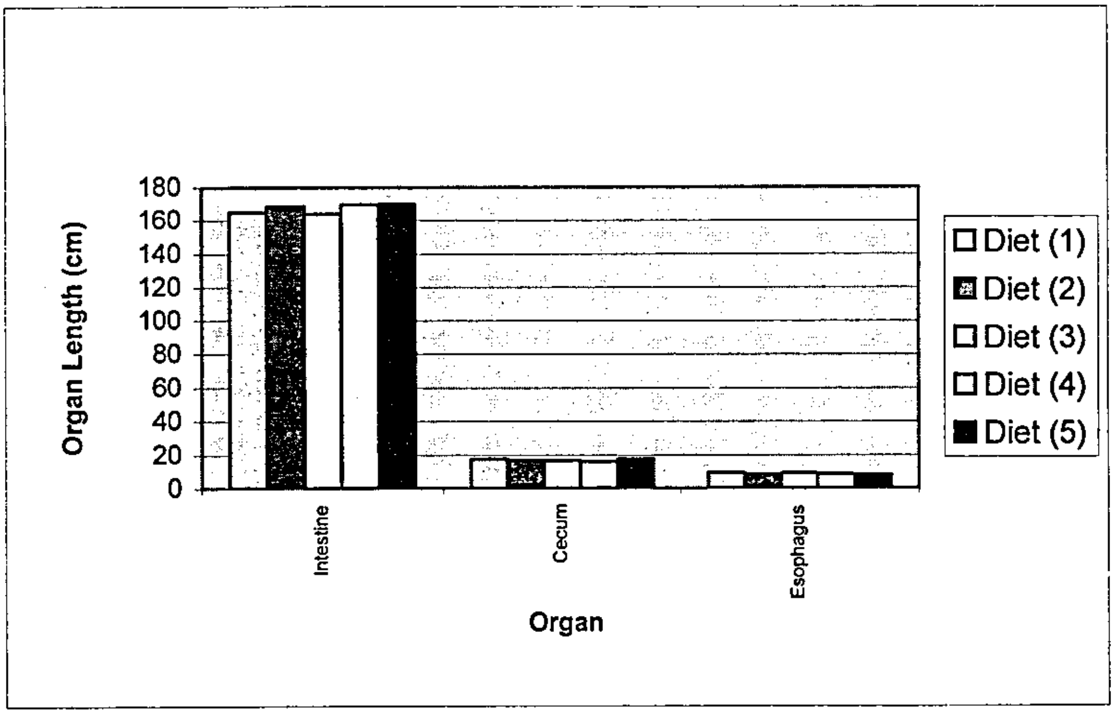
The level of olive pulp in broiler diets seemed to have no significant effect on gastrointestinal length and the length of its components Table 12.

Table (12): Effect of different levels of olive pulp on fed to broilers on gastrointestinal and gastrointestinal component lengths.(cm)

Organ \ Diet	1	2	3	4	5
Intestine	164.8	168.8	164.0	169.3	170.0
Cecum	17.7	17.3	16.5	16.3	17.5
Esophagus	9.5	8.6	9.0	8.5	8.0

The small intestine of chicks consuming 10% olive pulp were the longest, while small intestine of chicks consuming both the control and 5% olive pulp were the shortest. In contrast to this the length of control chicks cecum was the longest compared to other groups, especially the chicks consumed 7.5% olive pulp. Similar trend was observed in the esophagus length where control chicks had the longest esophagus (Figure 12).

Figure (12): Effect of levels of olive pulp on gastrointestinal and it's component lengths



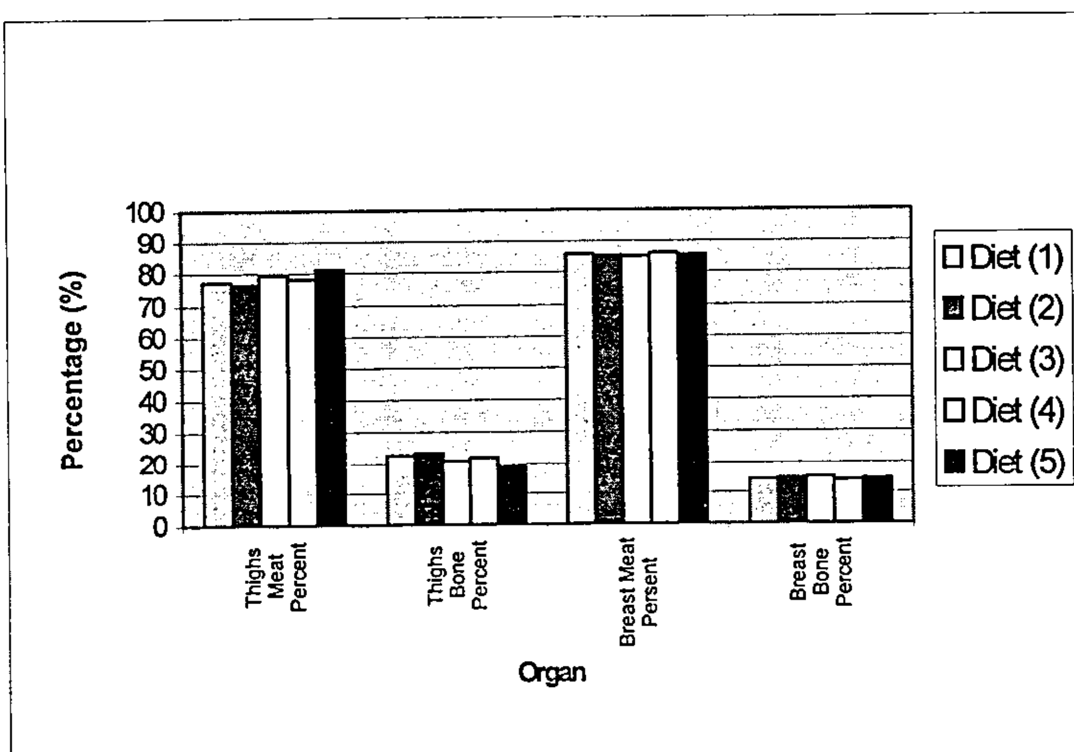
4.10 The Percentage in the thighs and breast :

The level of olive pulp in diets had no significant effect on carcasses contents of meet (lean) Table 13 . Generally we can say ,that , the percent of meet in thighs and breasts is improved by the increment of the olive pulp levels but insignificantly (Figure 13) .

Table (13): Effect of levels of Olive Pulp on Meat and Bones Thighs and Breast of Broilers fed Olive Pulp(Percent).

Organ \ Diet	1	2	3	4	5
Thighs wt. (g)	**222.5**	**221.6**	**224.5**	**226.9**	**218.7**
Meat Percent (%)	77.3	76.6	79.2	78.2	81.3
Bone Percent (%)	22.7	23.4	20.8	21.8	18.7
Breat wt. (g)	**210.8**	**212.6**	**199.1**	**213**	**202.9**
Meat Percent (%)	85.8	85.3	84.9	85.9	85.4
Bone Percent (%)	14.2	14.7	15.1	14.1	14.6

Figure (13) : Effect of levels of Olive Pulp on Meat and Bones Thighs and Breast of Broilers fed Olive Pulp(Percent).



4.11 The dressing percent:

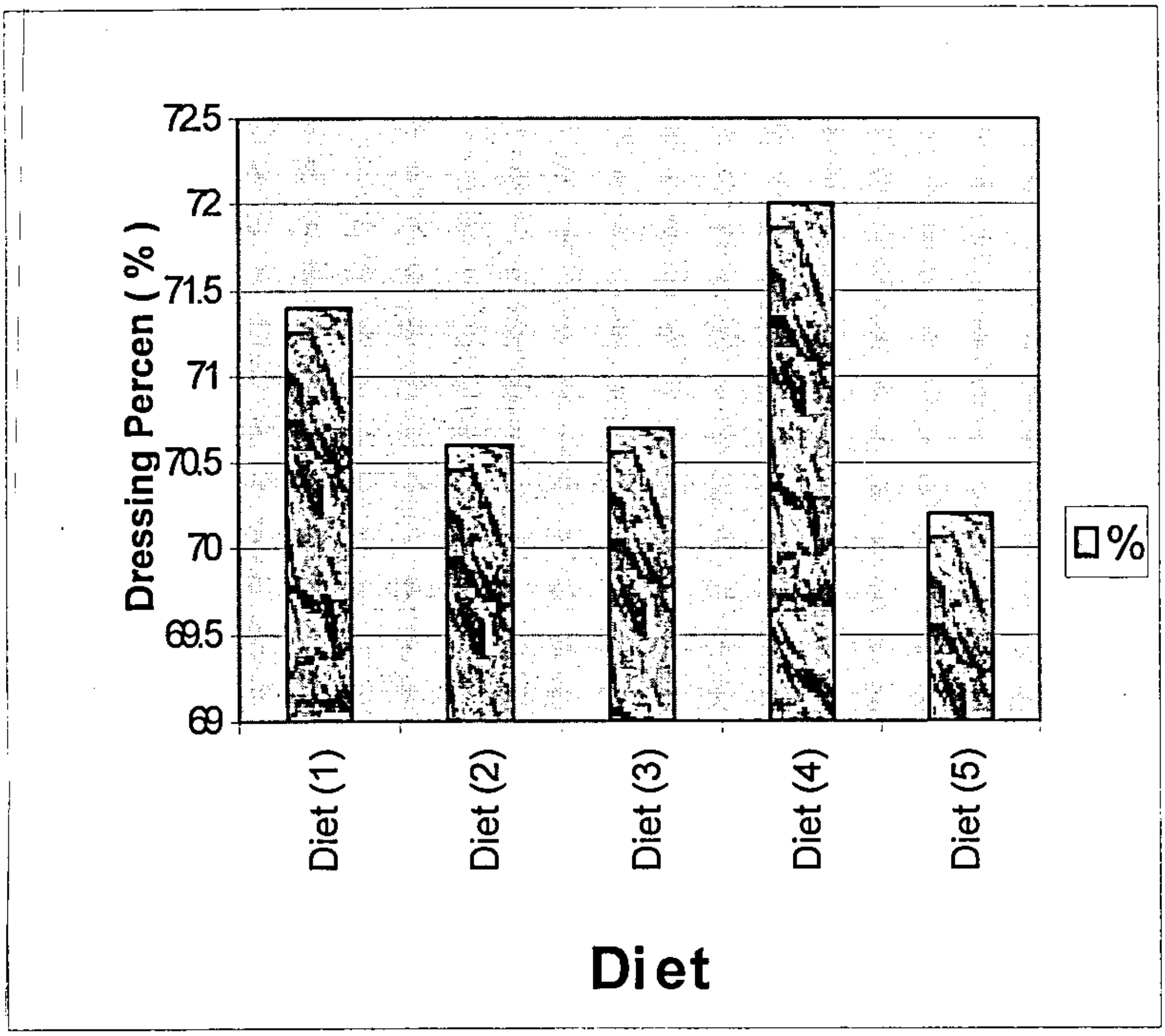
There are several factors that affect the dressing percent of an animal among these are type of diet which will have influence on performance of that animal. The diets used in this experiment had variable levels of fiber and showed variable effects on chicks performance.

Chicks consuming the diet containing 7.5% olive pulp had the highest dressing percent, while those consuming the 10% level of olive pulp had the lowest percentages (Table 14) (Figure13). Anyhow, dressing percentage values are consistence with the standard values.

Table (14): Effect of different levels of olive pulp on dressing percentages of broiler chicks.

Parameter \ Diet	1	2	3	4	5
Live weight (g)	1629.0	1654.0	1674.0	1639.0	1517.5
Carcass weight (g)	1163.3	1167.8	1183.8	1183.5	1066.0
Dressing percent (%)	**71.4**	**70.6**	**70.7**	**72.0**	**70.2**

Figure (14): Effect of different levels of olive pulp on dressing percentages of broiler chicks.



Chapter

5

5. Conclusions and Recommendations

5.1 Conclusions:

1. It is possible to improve the nutritive value of olive cake by the removal of its seeds (pits).
2. The content of protein and fat contents of olive pulp were higher by 30 and 10%, respectively, compared to the content of olive cake.
3. It is possible to feed olive pulp to broiler chicks starting from the age of one day till the market weight.
4. The best level of olive pulp in broiler diets as indicated by the study is 7.5% or lower.
5. Incorporation of olive pulp in broiler diets at levels up to 7.5% had no harm effect on broilers performance.
6. Addition of olive pulp up to 7.5% had no significant effect on visceral organ mass and dressing percentages of chicks.
7. Addition of olive pulp to broiler rations had no significant effect on gastrointestinal tract segment weights except the small intestine which was increased in chicks fed the 10% olive pulp.
8. Carcass cuts were not affected by feeding different levels of olive pulp.
9. Tangable amount of savings could be reached through feeding olive pulp at levels up to 7.5% in replacement of corn.

5.2 Recommendations:

1. More research is recommended to assure the positive effects of feeding olive pulp to broilers.
2. The stage of broiler growth at which olive pulp should be introduced needs confirmation.
3. It is recommended to conduct digestibility studies on chicks utilizing olive pulp in order to gain more information before final recommendations.

Chapter 6

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Chapter 7

Appendices

Appendix A : chemical Analysis procedures

Appendix A-1 Determination of moisture(A.O.A.C., 1995):

1. Heat the crucible for four hours in an oven at 105 C, cool and weigh.
2. Weigh by difference 2g into the can.
3. Place it in the oven at 105 C overnight.
4. Remove the can from the oven then transfer to a desiccator.
5. Allow to cool to room temperature then weigh.

Calculation:

$$\% \text{ Moisture} = \frac{(\text{weight of can + sample before drying}) - (\text{weight of can+sample after drying})}{\text{weight of sample}} \times 100\%$$

Appendix A -2 Determination of ash(A.O.A.C., 1995):

1. Heat the crucible for one hour in a muffle furnace at 500 C, cool and weigh as quick as possible.
2. Weigh by difference 2g into the crucible.
3. Place it in a cool furnace and slowly bring the temperature up to 600 C, leave to overnight.
4. Remove the crucible from furnace then transfer to a desiccator.
5. Allow to cool to room temperature then weigh.

Calculation:

$$\% \text{ Ash} = \frac{(\text{Weight of ash})}{\text{Weight of sample(dry matter)}} \times 100\%$$

Appendix A-3:

Crude Protein Determination (Kjeldahl Method):

Reagents:

1. Sulfuric acid (concentrated 98%).
2. Boric acid: 4% solution.

Dissolve 4g boric acid in 100ml volumetric flask and complete to the mark.

3. Sodium hydroxide: dissolve 500g sodium hydroxide in 1000ml
4. Volumetric flask, cool and make up to 1000ml.
5. Indicator solution: screened methyl red indicator solution:
    - Dissolve .2g methyl red in 100ml of 96% V/V ethanol.
    - Dissolve .1g methyl red in 100ml of 96% V/V ethanol.

6. Digestion mixture: add to each digestion flask .19g of $CuSO_4.5H_2O$ and 9.7g K_2SO_4 and mix.
7. Anti foaming granules.
8. Hydrochloric acid solution .01N.

Procedure:

1. Weigh about 1.0 g sample into 100ml Kjeldahl flask.
2. Add 20ml of concentrated sulfuric acid, then add 10g of digestion mixture and few antifoaming granules into the digestion flask.

3. Digest the mixture until the solution becomes clear.
4. Transfer the digestion tube to connect the distillation unit, allow 50ml of distlled water to add into the digestion tube.
5. Add 40ml of sodium hydroxide 50% to digestion tube.
6. Place a receiving flask containing 30ml of 4% boric acid with few drops of mixed indicator.
7. Allow distillation to proceed to assure ammonia is free from the sample.
8. Titrate the ammonia collected in the receiving flask with standard 0.1N HCl solution.

$$\%nitrogen = \frac{Vol.\ HCl \times N\ HCl \times 14.007 \times 100 \times 100}{100 \times Weight\ of\ sample}$$

% Crude proteine = % nitrogen x 6.25

Appendix A-4 :

Crude Fat determination:

1. Weigh 2g sample into the extraction thimble.

2. Clean and dry solvent flasks in 105 C for one hour, then cool to room temperature and weigh.

3. Place thimble at the extraction apparatus.

4. Add 40ml diethylether to the solvent flask.

5. Turn on water that cools the hot plates until they are in contact with the flasks and on the heaters.

6. After the extraction is completed, remove the thimble and allow the solvent to evaporate.

7. Dry the flask at 105C for 30 minutes, cool to room temperature and weigh.

$$\% \text{ Crude Fat} = \frac{\text{Wt. Of flask after extraction} - \text{Weight of flask before extraction}}{\text{weight of sample}} \times 100$$

Appendix A- 5:

Crude Fiber Determination:

Reagents:

1. Sulphuric acid solution 0.255N

2. Sodium hydroxide 0.313N

Dissolve 1.25g sodium hydroxide in 100ml volumetric flask and complete with distilled water to the mark.

3. Ethyl alcohol and diethylether.

Procedure:

1. Weigh 2g sample and transfer to 600ml flask.
2. Add 200ml of 0.255N sulphuric acid.
3. Place the beaker on the heating unit, turn heat on, boil for exactly 30 minutes.
4. Filter through filter paper.
5. Transfer to 600ml beaker and add 200ml 0.313 sodium hydroxide.
6. Boil for 30 minutes from the onset of boiling.
7. Filter through a new filter paper.
8. Rinse the filter with 15ml of alcohol and then with about 15ml of diethylether.
9. Dry the filter paper at 105C, cool and weigh.

$$\% \text{ Crude Fiber} = \frac{M1 - M0}{M2} \times 100$$

Where, M0 = Weight of filter paper and the sample before drying

M1 = Weight of filter paper and the sample after drying.

M2 = Weight of the sample (dry matter basis).

Appendix A-6:

Gross Energy Content: (A.O.A.C., 1984):

Gross energy was determined using bomb calorimeter.

Equipment:

- Oxygen bomb and accessories.
- Balance with a accuracy of .1g

Reagents:

- Standard sodium carbonate solution.
- Methyl orange indicator.
- Benzoic acid tablets.

Procedure:

1. Weigh about 1g sample.
2. Weigh the metal crucible and put sample in it.
3. Cut off a 10 cm length of fuse wire, thread through the two holes of the oxygen bomb lid.
4. Assemble the bomb.
5. Fill the bomb with oxygen.
6. Press test button to if it is ready to fire.
7. Measure 2000 ml and have it always at 22-23C.
8. Put the bomb in the bucket and close the cover.
9. Put the heaters on.

10. When ready to fire press the firing button.

11. Read the amount of energy value on the assembly panel.

12. Take the bomb, release the oxygen out, open it and measure the length of the remaining fuse.

13. Rinse the bomb with distilled water, collect the washings then titrate it with sodium carbonate with methyl red indicator.

$$GE(cal/g) = \frac{\text{final T-initial T x hydrothermal equavalent of bomb-length of fuse wire burned X cal.}Na_2CO_3}{\text{Weight of sample}}$$

Appendix B : Weight of chicks according to age .

Appendix B-1:
The initial weight of chicks (g / replicate)

Replicate / Diet	Replicate 1	Replicate 2	Replicate 3	Replicate 4
1	330	316	312	320
2	323	313	310	318
3	310	322	320	335
4	316	320	332	322
5	322	320	324	330

Appendix B-2:
Weight of chicks at 7 days of age (g / replicate)

Replicate / Diet	Replicate 1	Replicate 2	Replicate 3	Replicate 4
1	988	940	1010	1128
2	1027	1066	1025	1053
3	1012	853	890	868*
4	825	902	914	869
5	774	871	743	722*

* Total chicks in replicate is 7 (one chick died).

Appendix B-3:
Weigh of chicks at 14 days of age (g / replicate)

Replicate / Diet	Replicate 1	Replicate 2	Replicate 3	Replicate 4
1	2460	2685	2660	3000
2	2618	2840	2770	2775
3	2793	2330	2610	2365*
4	2372	2340	2510	2140*
5	1930	2200	1560*	1805*

* Only 7 chicks in these replicates.

Appendix B-4:
Weight of chicks at 21 days of age (g / replicate)

Replicate / Diet	Replicate 1	Replicate 2	Replicate 3	Replicate 4
1	4990	5529	5434	6044
2	4924	5274	5429	5344
3	5370	4725	5084	4634*
4	5184	4879	4999	4578*
5	4350	4829	3634*	3834*

* Only 7 chicks in each replicate.

Appendix B-5 :
Weight of chicks at 28 days of age (g / replicate)

Replicate / Diet	Replicate 1	Replicate 2	Replicate 3	Replicate 4
1	7775*	9620	9274	10007
2	8930	9027	9532	8710
3	9395	8090	8880	7948*
4	8968	8458	8380*	7935*
5	7770	8560	6580*	6780*

* Only 7 chicks in each replicate.

Appendix B-6:
Weight of chicks at 35 days of age (g / replicate)

Replicate / Diet	Replicate 1	Replicate 2	Replicate 3	Replicate 4
1	11055*	13664	13307	14003
2	12942	13166	13700	12478
3	13465	11967	11355*	9990**
4	13021	12589	11802*	11601*
5	10682	12722	10000*	10373*

* Only 7 chicks in each replicate.
** Only 6 chicks in this replicate.

Appendix C:
Mortalities of broiler chicks according to treatments

Age \ Diet	1	2	3	4	5
Day 1					
Day 7			1		1
Day 14				1	1
Day 21					
Day 28	1			1	
Day 35			2		
Total	1	0	3	2	2
Mortalities (%)	3.1	0	9.4	6.3	6.3

Appendix D : Feed intake by chicks according to age .

Appendix D-1:
Feed intake at 7 days of the feeding trial (g / replicate)

Diet \ Replicate	Replicate 1	Replicate 2	Replicate 3	Replicate 4
1	822	834	831	980
2	847	915	802	910
3	898	725	824	738
4	815	826	887	811
5	736	837	764	686

Appendix D-2:
Feed intake by chicks at age of 14 days of the feeding trial (g / replicate)

Replicate / Diet	Replicate 1	Replicate 2	Replicate 3	Replicate 4
1	3094	3121	3052	3143
2	2917	3188	3035	3140
3	3125	3113	3054	3027
4	3049	3167	2914	2903
5	2797	2831	2834	2679

Appendix D-3:
Feed intake by chicks at age of 21 days of the feeding trial (g / replicate)

Replicate / Diet	Replicate 1	Replicate 2	Replicate 3	Replicate 4
1	4580	4500	4580	4240
2	4588	4580	4580	4480
3	4200	4579	4080	4520
4	4260	4400	4580	4330
5	4360	4300	4400	4270

Appendix D-4:
Feed intake by chicks at age of 28 days of the feeding trial (g / replicate))

Replicate / Diet	Replicate 1	Replicate 2	Replicate 3	Replicate 4
1	6530	7245	7741	7150
2	8150	7400	7550	7600
3	7180	6610	6820	6610
4	6740	7425	6857	6572
5	7190	7083	6304	6693

Appendix D-5:
Feed intake by chicks at age of 35 days of the feeding trial (g / replicate)

Replicate / Diet	Replicate 1	Replicate 2	Replicate 3	Replicate 4
1	8035	8066	8174	8299
2	8881	7953	8175	8845
3	8190	7822	7668	7977
4	8179	7963	7650	7535
5	8010	7798	6855	7292

Appendix E : Chicks organ measurements.

Appendix E-1:
Visceral organ mass and some gastrointestinal tract measurements (g) of chicks fed on a control diet

Replicate / Organ	Replicate 1	Replicate 2	Replicate 3	Replicate 4
Carcass wt.	1043	1299	1182	1129
Breast wt.	308	370	344	351
Thighs wt.	319	407	380	346
Wings wt.	133	139	152	134
Neck wt.	86	108	91	95
Back wt.	197	275	215	203
Head wt.	32	45	40	38
Liver wt.	30	44	39	29
Heart wt.	10	11	10	10
Lungs wt.	10	17	7	8
Intestine wt.	57	81	65	56
Esophagus wt.	2	2	1	1
Trachea wt.	1	1	2	3
Provintriculus wt.	3	4	3	4
Gizzard wt.	43	45	49	48
Cecum wt.	7	13	13	8
Crop wt.	3	5	4	4
Feet wt.	72	82	81	78
Breast meat wt.	267	315	301	295
Breast bone wt	41	55	43	56
Thighs meat wt.	229	324	299	273
Thighs bone wt.	90	83	81	73
Lengths (cm)				
Intestine	134	182	171	172
Cecum	14	21	18	18
Esophagus	10	8	8	12

Appendix E-2:
Visceral organ mass and some gastrointestinal tract measurements (g) of chicks fed on a 2.5% olive pulp diet

Replicate / Organ	Replicate 1	Replicate 2	Replicate 3	Replicate 4
Carcass wt.	1226	1089	1243	1113
Breast wt.	368	325	362	351
Thighs wt.	370	350	400	346
Wings wt.	154	127	164	127
Neck wt.	81	84	100	100
Back wt.	253	203	217	220
Head wt.	37	39	44	32
Liver wt.	36	31	40	34
Heart wt.	10	8	9	10
Lungs wt.	11	9	7	6
Intestine wt.	67	60	69	65
Esophagus wt.	2	2	2	1
Trachea wt.	3	2	2	1
Provintriculus wt.	3	3	4	3
Gizzard wt.	49	46	45	42
Cecum wt.	14	10	19	12
Crop wt.	4	4	5	4
Feet wt.	83	73	85	69
Breast meat wt.	325	270	310	308
Breast bone wt	43	55	52	40
Thighs meat wt.	285	265	300	284
Thighs bone wt.	85	85	100	70
Lengths (cm)				
Intestine	163	181	170	161
Cecum	18	16	18	17
Esophagus	8	10	9	8

Appendix E-3:
Visceral organ mass and some gastrointestinal tract measurements (g) of chicks fed on a 5% olive pulp diet

Replicate / Organ	Replicate 1	Replicate 2	Replicate 3	Replicate 4
Carcass wt.	1206	1095	1198	1236
Breast wt.	390	310	348	316
Thighs wt.	365	363	374	401
Wings wt.	122	133	133	134
Neck wt.	107	76	96	112
Back wt.	235	213	246	273
Head wt.	38	39	40	37
Liver wt.	37	38	38	43
Heart wt.	11	10	11	13
Lungs wt.	8	7	8	11
Intestine wt.	72	74	78	74
Esophagus wt.	2	2	2	1
Trachea wt.	2	2	2	3
Provintriculus wt.	3	3	4	4
Gizzard wt.	46	52	59	51
Cecum wt.	18	8	16	12
Crop wt.	4	4	3	4
Feet wt.	88	85	77	78
Breast meat wt.	309	265	293	265
Breast bone wt	50	45	55	52
Thighs meat wt.	275	295	285	335
Thighs bone wt.	90	68	89	67
Lengths(cm)				
Intestine	165	169	161	163
Cecum	18	16	20	12
Esophagus	10	8	9	9

Appendix E-4:
Visceral organ mass and some gastrointestinal tract measurements (g) of chicks fed on a 7.5% diet

Organ \ Replicate	Replicate 1	Replicate 2	Replicate 3	Replicate 4
Carcass wt.	1137	955	1344	1298
Breast wt.	352	253	383	420
Thighs wt.	385	311	401	390
Wings wt.	138	113	132	145
Neck wt.	91	90	93	96
Back wt.	171	188	255	247
Head wt.	41	33	37	42
Liver wt.	35	31	37	40
Heart wt.	11	7	9	12
Lungs wt.	8	10	9	9
Intestine wt.	68	56	75	73
Esophagus wt.	3	3	2	2
Trachea wt.	1	2	1	2
Provintriculus wt.	3	3	3	4
Gizzard wt.	54	49	58	55
Cecum wt.	15	14	12	14
Crop wt.	5	5	3	5
Feet wt.	87	65	80	77
Breast meat wt.	293	212	333	375
Breast bone wt	59	41	50	45
Thighs meat wt.	295	230	322	320
Thighs bone wt.	90	81	79	70
Lengths (cm)				
Intestine	167	152	170	188
Cecum	18	10	20	17
Esophagus	11	7	8	8

Appendix E-5:
Visceral organ mass and some gastrointestinal tract measurements (g) of chicks fed on a 10% diet

Replicate / Organ	Replicate 1	Replicate 2	Replicate 3	Replicate 4
Carcass wt.	847	1180	1032	1205
Breast wt.	240	370	275	354
Thighs wt.	258	380	311	385
Wings wt.	106	127	122	137
Neck wt.	67	90	91	91
Back wt.	176	213	233	238
Head wt.	34	36	38	40
Liver wt.	29	40	38	40
Heart wt.	16	13	8	12
Lungs wt.	8	10	8	8
Intestine wt.	64	67	61	74
Esophagus wt.	3	3	2	2
Trachea wt.	1	3	2	1
Provintriculus wt.	4	3	4	3
Gizzard wt.	36	41	45	51
Cecum wt.	11	10	8	18
Crop wt.	4	6	4	5
Feet wt.	65	75	74	73
Breast meat wt.	195	320	240	306
Breast bone wt	45	50	35	48
Thighs meat wt.	202	315	255	315
Thighs bone wt.	56	65	56	70
Lengths(cm)				
Intestine	170	165	160	185
Cecum	18	16	19	17
Esophagus	8	11	6	7

ملخص

استخدام جفت الزيتون في صناعة العلائق العلفية للدجاج اللاحم

عمل الطالب

اياد علي ذياب عبد الغني

المشرف الأول

د. جمال أبو عمر

المشرف الثاني

د. راتب عارف

جاءت هذه التجربة من أجل معرفة تأثير جفت الزيتون المتروع النوى على أداء الصيصان اللاحم في حالة إضافتها إلى العلائق العلفية بنسب مختلفة .

أستخدم في التجربة(**٢٦٠**) صوص عمر يوم حيث تم تقسيمها إلى خمس مجموعات وكل مجموعة قسمت إلى أربع تكرارات وقد تمت إضافة الجفت المتروع النوى إلى علائق الصيصان بنسب مختلفة حيث كانت (**٢,٥ % ، ٥% ، ٧,٥ % ، ١٠%**) وذلك على حساب نسبة الذرة بالإضافة إلى عليقة الشاهد ،وقد غذيت الصيصان على هذه العلائق طوال فترة التسمين من عمر يوم – عمر (**٣٥**) يوم وقد تمت تربية الصيصان في مزرعة كلية الزراعة حسب نظم التربية التجارية العادية ، وطوال فترة التجربة كان يتم وزن الصيصان أسبوعياً وكذلك وزن كمية

العلف المستهلكة والمتبقية في نهاية التجربة تم اختيار أربعة صيصان من كل مجموعه وبشكل عشوائي، حيث تم ذبحها كما هو متبع في مسالخ الدواجن ، ومن ثم أخذ أوزان الأحشاء والأعضاء الداخلية وأطوال الجهاز الهضمي وأجزاءه ، كما تم أخذ وزن قطع الذبائح

بينت التجربة أن التركيب الكيميائي لمادة الجفت منزوع النوى كانت مشابهة إلى درجة كبيرة إلى ما هو مسجل في دراسات سابقة ، هذا وقد أدت إزالة النوى من الجفت إلى تحسين القيمة الغذائية لهذه المادة، وبينت التجربة أيضاً أن الزيادة الوزنية كانت أكثر جدوى بالنسبة للمجموعة التي غذيت على العليقة المحتوية على نسبة (٧,٥%) بينما كانت الزيادة الوزنية للصيصان التي غذيت على(١٠%)جفت هي الأقل مقارنة بالمجموعات الأخرى وهذه النتيجة هي نفسها بالنسبة لكمية العلف المستهلك وكذلك نسبة التحويل الغذائي، نسبة الجفت في العليقة كان لها التأثير نفسه على قياسات الأحشاء للطائر وقد لوحظ أن المجموعة التي غذيت على العليقة المحتوية على نسبة (١٠%) من الجفت سجلت أعلى وزن للكبد.

وقد كان التأثير مشابهاً على الجهاز الهضمي وأجزاءه ، حيث لم تكن هناك فروق معنوية على هذه الأجزاء إلا أن النسبة الأعلى للجفت أدت إلى وزن أعلى للأمعاء الدقيقة هذا وقد لوحظ بأن اختلاف نسبة الجفت لا تؤثر بشكل معنوي على صفات الذبيحة أو على قياسات القطع المأكولة .

هذه الدراسة أكدت إمكانية استخدام الجفت المنزوع النوى في تغذية الدجاج اللاحم واعتبارها كمصدر رخيص للأعلاف وفي نفس الوقت العمل على التقليل قدر الإمكان من تلوث البيئة حيث أن تراكم هذه المادة يعتبر من المشاكل البيئية في منطقتنا ...