

## Research Article



# Using Tea Waste as A Source of Protein in the Ration and its Impact on Productive Performance, Growth and Some Blood Parameters of Awassi Lambs

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**Abstract** | Three treatments each with fifteen of Awassi lambs (5-6 months aged and weighted 22.30 – 24.60 kg) fed on three rations for 100 days period were used. The rations was iso levels of crude protein (13.65, 13.75, 13.85%) and iso caloric (2597, 2545, 2506 K<sub>cal</sub>/kg, while were varied in proportion of tea waste (0, 7.5, 15%) respectively. The results showed high significant differences ( $P \leq 0.01$ ) between three treatments in rates of final weight and significant differences ( $P \leq 0.05$ ) in average of daily weight gains. As for slaughtering processes of lambs, the results appeared high significant differences ( $P \leq 0.01$ ) between three treatments on average of hot and cold carcass and significant differences ( $P \leq 0.05$ ) in rates of muscle area, between three treatments. While in separates fats the results shown significant differences ( $P \leq 0.05$ ) in averages of tail fat, total fats percentages between first treatments than for third treatment. As for blood traits, the results of the statistical analysis was indicated that there were a significant differences ( $P \leq 0.05$ ) in rates of concentrations of total protein, triglycerides, cholesterol and highly significant ( $P \leq 0.01$ ) in rates of albumin concentration between first treatment than third treatment in blood serum of Awassi lambs groups. The results concluded the possibility for using dried tea waste as a protein source in the components of fattening rations of local sheep and there was no negative effect on productive performance, carcass characteristics and blood traits.

**Keywords** | Tea waste, Productive performance, Carcass characteristics, Separate fats, Blood proteins.

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## INTRODUCTION

The low quantity and lack of quality of feed resources is one of the obstacles to the development of sheep production in the arid regions due to the worsening nutrition problem. The cost of feeding sheep constitutes about 70% of the total cost of the sheep breeding establishment. It is known that the type of feed intake has an effect on the degree of fattening and the quality of the meat produced (Abdullah et al., 1993). Therefore, the researchers seek to feed the animal to find suitable fattening diets that provide the animal with the necessary nutrient requirements (Shams AL-Din, 1997, Arafat, 2005). Most sheep producers in Iraq were used on barley and soybeans to feed and fattening the lambs. Since soybeans are high-quality, high-value protein sources that are added to the fatten-

ing diets of lambs with up to 18% (Arafat, 2005). That the increase in the prices of soybeans and the unavailability of locally available in the country and the dependence on imports from outside the country, led a part of the producers and researchers to partially and completely replace this to alternative sources of protein available locally and less expensive such as urea, damaged yeast, (Al-Gohary 1997; Gabor et al., 1998; El-Ayck et al., 1999, El-Gendy et al., 2001; Sadiq, 2001; Qasim et al., 2007; Almahdawi, 2013). The tea waste is a popular food drink in most parts of the world because of its usefulness to the human body. Moreover, it is a stimulant and it used in treatment of tumors and abscesses, diseases of bladder and inactivity. It produces about 100,000 tons of tea leaves every year as a result of daily consumption of tea drinks in large establishments such as companies, hotels, cafes and restaurants (Yang et

al., 2003, Kondo et al., 2004). However, should be caution to used because the fungi growth that may produce toxins that affects on animal health (Ismail, 2004). Furthermore, tea leaves contain nitrogen compounds, amino acids, vitamins, tannins and polyphenols, such as catechin, epicatechin, epigallocatechin, epigallocatechin gallate (Yamamoto et al., 1998, Hossain et al., 2012). Several studies have shown that tea residues can be substituted as a protein source to partially replace instead of commercial nitrogen sources imported in dairy cattle diets (Chiou et al., 1998, Huang et al., 1999). In the same vein, some studies have suggested that tea residues contain a small percentage of ether extract and some pigments (Chernet, 2000). In addition, the level of tannins ranged from 1.5 to 5% in concentrated rations that contained tea residues (Salawu et al., 1999; Santos et al., 2000). On the other hand, some sources indicated that tea residues or polyphenols compounds in the concentrated rations was led to decrease in cholesterol level of ruminant animals. Yang et al. (2003) was found a significant reduction in concentration of total cholesterol in blood plasma in the broilers groups which were consumed (1, 2%) of tea waste when compared with the control ration, which dealt with put down absorption of blood lipid in the animal gut (Vinson and Dabbagh 1998, Teddy et al., 1999, Raederstorff et al., 2003). In the feeding of ruminants, Yang (2003) was found a significant reduction in cholesterol levels when adding tea residues as a protein source in ruminants feed and its effect was greater than monogastric animals. Other studies have also reported that the use of tea residues has improved the rates of weight gains and increase in live weight and food conversion efficiency in pigs (Ko et al., 2008) and in meat cattle (Sarker et al., 2010) and broiler (Biswas and Wakita, 2001). Wang et al. (2011) were indicates a significant improvement in both weight gain and feed conversion efficiency when using tea saponins by 3gm/animal/day in fattening diets of goats. Other studies showed that the use of green tea wastes with probiotics did not have any negative effect on blood proteins in beef calves (Lee, 2005, Sarker et al., 2010).

This study aims at exploiting the dried tea residues that daily accumulate from the daily consumption of tea drink by individuals and large institutions in Iraqi society, this is on one hand, and on the other hand to reduce the percentage of environmental pollution and microbial harmful to human health and local environment. Because of the shortage of feed, especially the traditional protein sources and the increase to create an establishment of animal production projects, this has led to a rise in the prices of basic feedstuffs. Therefore, we have sought to use locally available protein alternatives, including dried tea wastes in fattening lambs, which can be exploited as a nitrogenous source of protein in fattening rations of local lambs because it was contained high crude protein which ranges from 22-35% C.P (Begum et al., 1996, Yang et al., 2003,

Kondo et al., 2004) and a good level of metabolize energy which estimated at about 2454 kcal/kg of feed intake (MAFF, 1975) and to knowledge their impact on the performance and growth of Awassi lambs and some carcass qualities and biochemical blood components of this one hand and on the other hand it used tea waste in nutrition and fattening of sheep, The first is to reduce the accumulation of environmental pollution of this article and secondly in terms of the economic feasibility of nutrition, it encourages breeders and farmers to adopt and benefit from the surplus waste and commercial exploitation in the fattening of lambs and thus achieve material returns to the breeder and investor and this contributes to role of positive reduction in prices of the red meat in the local market to support all local consumer groups.

## MATERIALS AND METHODS

### EXPERIMENTAL ANIMALS

This experiment was conducted in the animal field of the Animal production Dept. at the Faculty of Agriculture and Forestry/University of Mosul. Fifteen of Awassi lambs were used in this study for 100 days period which were homogeneous in age and live weight. These lambs were numbered by mineral numbers on ear flank, and were placed under veterinary health surveillance for two weeks to ensure have not diseases. During the preliminary period, these lambs were fed on roughage feed through daily grazing on the grass until the experiment began.

### PLAN OF THE EXPERIMENT

After numbering of lambs, the lambs were weighed at the beginning of the experiment by balance sheep. The lambs were randomly distributed into three homogeneous groups in live weight and age. At the beginning of the experiment, the initial weight was between 22.30 - 24.60 kg and its ages ranged between 5-6 months. These lambs were fed on three rations which were iso protein levels (13.55, 13.75 and 13.85%) and iso in metabolize caloric level (2597, 25545, 2506 K<sub>cal</sub> respectively. So that each group has its own nutritional treatment. Statistical analysis of primary weights was performed by using the Duncan test (Al-Zubaidy and Al-Falahy, 2018) to ensure that there were no significant differences in the initial weights.

### THE FEEDING

The ad libitum system was adopted in the fattening of lambs. The feedstuffs of the experimental animals were obtained from the feedstuff factory that belongs to Animal Production Dept., while the tea waste was obtained from the student club at the University of Mosul. The method of preparing the tea waste for use in feeding of lambs. The first was collected daily with plastic sacs or small plastic drums and then transferred from it source to the forages

store. They are spread in light layers on concrete soil and exposed daily to directly sunlight for drying and then were crushed by machine crunches with other forage materials according to the proportions specified in the rations (Table 1). In this experiment, were used three rations were iso in crude protein and isocaloric levels represented (Table 1). These ratios was differed in percentage of tea wastes as a protein source by 0, 7.5 and 15%. The rations were offered to animals groups with two meals, the first at 8:00 am and at 5:00 pm, to ensure that animals were fed on three amounts of food. In these diets, The needs of lambs were taken into account as nutrient compounds and according to N.R.C. (1996). The remaining fodder was collected every morning before serving a morning feed meal and then weighed and subtracted from the amount of feed provided to calculate daily amount of feed actually received daily, and continued this process throughout the duration of the experiment.

**Table 1:** Components and chemical analysis of the rations used in fattening of Awassi lambs.

Feedstuffs	First ration (control) (0% tea waste)	Second ration (7.5% tea waste)	Third ration (15% tea waste)
1. barley .	45	45	45
2. wheat bran .	33	33	33
3. coco nut meal .	15	7.5	0
4. tea waste .	0	7.5	15
5. wheat straw .	5	5	5
6. limestone .	1	1	1
7. salts .	1	1	1
Total	100%	100%	100%
Chemical analysis			
1.Dry Matter (%)	97.38	97.39	97.39
2.Ether Extract (%)	2.38	2.74	3.11
3.Crude Protein (%)	13.65	13.75	13.85
4.Crude Fiber(%)	12.25	11.74	11.23
5.Ash (%)	5.18	5.24	5.28
6.Nitrogen Free Extract (%)	63.92	63.92	63.92
7.Metabolize Energy (Kcal)	2597	2574	2506

The results of the chemical analysis of the three concentration rations were calculated according to Al-Khawaja et al.,(1978).

\* The metabolic energy of tea waste was calculated according to MAFF (1975).

### BLOOD PARAMETERS

10 ml of blood was withdrawn of all lambs from the jugular vein at the end of experiment. The serum was separated from thrombus formed by the centrifuge at 3000 cycles/

min for 15 minutes and placed in sealed plastic tubes and kept under 20 C° Biochemical tests. The tests were carried out using Biolabo's analysis to calculate total protein (Green and Clark, 1982), albumin measurement (Bush, 1998), cholesterol measurement (Allain et al., 1974) and triglycerides according to (Tietz et al., 1999). As for globulin, it was calculated from the difference between total protein and albumin, according to Otto et al. (2000).

### SLAUGHTERING PROCESS AND CARCASS CHARACTERISTICS

At the end of the experiment, all lambs were fasting for 12 hours before slaughter. On the following day and the lambs were weighting before slaughter. After the slaughter, The weights of the following parts were recorded: head, full and empty rumen, kidneys, lungs, spleen, testicles, mesenteric fat membrane, fat around the heart and kidneys, and then recorded weighed carcass after the slaughter and cleaning operations. This weight was considered as hot carcass. The carcasses were then placed in a refrigerated room at 4 C° for 18 hours. This weight was called a cold carcass and then has been removing kidneys and fat deposited around them, as well as the buttocks were recorded. The carcasses were cut into major cuts: thighs, rack, ribs, shoulders and minor parts which were neck, chest, flank, and shank, as described by Forrest et al. (1973).The separated fats were included, mesenteric fat membrane, heart lipid, fat surrounding the kidneys, and the proportions according to the carcass weight and separate fat were calculated as a percentage attributed to the weight of the cold carcass. The percentage of the offspring was calculated by weight of the live animal at slaughter, and it was calculated based on empty body weight (Everitz and Turry, 1966; Al Jalili et al., 1985). The rib eye muscle area was also measured at the 12<sup>th</sup> rib, according to Rouse et al. (1970) and Yacob et al. (1986) by drawing the area of the muscle on transparent tissue paper and counting the number of squares area of the ocular muscle was extracted. The thickness of subcutaneous fat above the 12<sup>th</sup> rib was measured using a normal transparent ruler according to the method of action taken by Abdullah and Awawdeh (2004).

### STATISTICAL ANALYSIS

Statistical analysis of the data was performed using Complete Randomized Design (CRD) according to AL-Rawi and Khalafallah (2000) in order to study the effect of partial or total replacement of tea residues in the diets of fecal lamination in the studied traits.

The mathematical model of the design was used as follows:

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

$Y_{ij}$  = the value of the observation (j) in the treatment (i).

$\mu$  = The overall average of all observations .

$t_i$  = Effect of treatment (i), this represents the partial or

total replacement of the tea wastes in this ration .

$e_{ij}$  = Random experimental error of the experimental unit, which is distributed naturally and independently at a mean of zero and variance of  $\sigma^2 e$ .

The statistical analysis was carried out using the electronic computer using the SAS program (2012). Duncan Multiple Rang test was compared with the probability level of 0.05 or 0.01, according to Duncan test (Al-Zubaidy and Al-Falahy, 2018) the significance of the differences between the averages of the studied traits.

## RESULTS AND DISCUSSION

### PERFORMANCE AND GROWTH OF LAMBS

The results show high significant differences ( $P \leq 0.01$ ) between both first, second treatments (0,750% tea waste) than the third treatment (15% tea waste) on the final weight and empty body weight (Table 2). At the same time, high significant differences ( $P \leq 0.01$ ) between the first treatment than the third treatment on rates of total weight gains. As for average of daily weight gains, the results of the statistical analysis showed significant differences ( $P \leq 0.05$ ) between the first treatments than third treatment in average of this trait. The final weight of the lambs were 40.60, 43.20, 47.20 kg and empty body weight were 35.83, 39.04, 43.06 kg and average of daily weight gain 183, 206, 228 gm/lamb/day and total weight gains 17.70, 20.60, 22.80 kg for the three treatments respectively. These results indicate a significant improvement in final weight, empty body weight, and daily and total weight gain of the lambs in the second and third treatments when compared to the control treatment it may be due to presence tea waste in experimental rations that reduces the proportion of protozoa in lambs rumen which consumed rations containing the tea residues. This was accompanied by a decrease in generation and production of methane in rumen, which leads to increase activity and growth of bacteria at the expense of protozoa inside the rumen which has contributed to increase amount of bacteriological protein formed in the rumen as a result of the utilization of protein tea residue and it is reflected an increasing amount of microbial protein create in the rumen and thus increase the value of net energy for the maintenance and growth and finally reflected to improvement of growth in all tissues of the animal body (Storry, 1970; Müller 1993; Zinder, 1993; Tokura et al., 1999). The results are accepted with the results of Sarker et al. (2010) who found significant differences in rates of daily and total weight gain and final weight in beef calves (hanwoo) that was treated with by 2% of green tea residue than other calves groups which were treated with antibiotic (110 ppm of neomycin) for 105 days of fattening period. These results were consistent with Wang et al. (2011) who they found significant improvement in

average weight gains of goats when were used tea saponins at 3gm/day in feeding of goat when compared to control group. These results were also consistent with Hossain et al. (2012), who observed significant differences in rates of daily and total weight gain and final weight in hybrid pigs (landrace  $\times$  large white) between experimental treatments than comparison treatment. When they were used different levels (0,0.5,1,2%) of green tea wastes instead of dried brewers grains in fattening rations of pigs. The results are not agreement with the results of Begum et al. (1996) in Bangladesh beef calves and Baruah, (1997) in feeding of hybrid milking cows (Assam local  $\times$  Jersey), Kondo et al. (2004) in dairy cows (Holstein) when were fed on experimental rations that had contained (tea waste) and Kondo et al. (2007) in fattening of goat who did not find any significant effect when addition tea residues in proportions as a nitrogen source in diet on daily and total weight gains, final weight of ruminant animals. As for statistical analysis of daily feed intake and feed conversion efficiency (Table 2) were not statistical analysis because of feeding group. The amount of daily feed intake were 1.468, 1.517, 1.642 kg and food conversion efficiency 8.29, 7.36, 6.76 kg of feed/kg of live weight for the three treatment respectively. These results indicate a similarity in the amount of dry matter consumed from the three diets and a marked improvement in feed conversion efficiency of the experimental lambs, especially the third diet, which contains 15% of tea residues of its components compared with other treatments. This is probably due to the decrease in methane production which led to the reduction of the proportion of protozoa inside of the lambs rumen which it were consumed rations was containing tea residues and this in turn contributed to increase the activity of microbial growth at the expense of protozoa inside of the rumen and this was reflected increase in amount of bacterial protein which resulted in utilization protein of tea residue and thus increase the net energy value for maintenance and growth, which affected the amount of energy and protein consumed and leads to increases feed for nutrient compounds and therefore was reflected on growth improved in the third treatment when compared to growth of the first and second treatments (Storry, 1970; Müller 1993; Zinder, 1993; Tokura et al., 1999). These results are consistent with the results of Begum et al. (1996) in beef calves, Baruah, 1997, Kondo et al. (2004) in milking cows and Müller 1993, Kondo 2007, Singer et al. (2008), in fattening of goat who they found no significant effect of tea waste as a nitrogen source in the diet on dry matter intake and food conversion efficiency. These results have been confirmed with results of Wang et al. (2011) who found account improvement in feed conversion efficiency when they used tea saponins at levels of 3,6gm/day when as compared with the comparison of goat group. Also, the results were consistent with Almahdawi, (2013), which found non-significant differences in amount of dry matter

**Table 2:** Effect of tea waste level in ration on the performance of Awassi lambs.

Traits	First treatment (0% tea waste)	Second treatment (7.5% tea waste)	Third treatment (15% tea waste)
1.No. of lambs.	5	5	5
2.Initial weight (kg). NS	22.30 ± 0.87 A	22.60 ± 0.81 A	24.60 ± 0.92 A
3. Final weight (kg) **	40.60 ± 1.86 B	43.20 ± 0.58 B	47.20 ± 0.37 A
4.Empty body weight (kg) **	35.83 ± 1.68 B	39.04 ± 0.79 B	43.06 ± 0.47 A
5.daily weight gains.(gm/d) *	± 183 17.25 B	206 ± 8.12 AB	228 ± 10.67 A
6.total weight gains. (kg) **	17.70 ± 2.13 B	20.60 ± 0.81 AB	22.80 ± 1.06 A
7.Feed intake (kg/d).	1.468	1.517	1.542
8.Feed conversion : (kg feed intake/kg gains)	8.29	7.36	6.76

The trait which have carried different letters horizontally indicate significant differences at probability level 0.05 or 0.01

NS = Non Significant .

\*: significant differences at 0.05 .

\*\*: high significant at 0.01 .

**Table 3:** Effect of tea waste level in ration on some carcass traits of Awassi lambs.

Traits	First treatment (0% tea waste)	Second treatment (7.5% tea waste)	Third treatment (15% tea waste)
1.No. of carcass .	5	5	5
2.Hot carcass weight (kg)**	18.22 ± 0.93 B	19.05 ± 0.46 B	21.48 ± 0.47 A
3.Cold carcass weight (kg)**	18.02 ± 0.88 B	18.85 ± 0.46 B	21.27 ± 0.47 A
4.Rib eye muscle area (cm <sup>2</sup> ).*	7.8 ± 0.66 B	9.0 ± 0.31AB	10.0 ± 0.71 A
5.Subcutaneous fat (ml). NS	8.20 ± 0.49 A	7.60 ± 0.51 A	6.60 ± 0.81A
6.Dressing percentage according to live weight. NS	44.36 ± 0.29 A	43.64 ± 0.68 A	44.85 ± 0.54 A
7.Dressing percentage according to empty body weight. NS	49.32 ± 0.99 A	48.32 ± 0.89 A	48.45 ± 1.19 A

The trait which have carried different letters horizontally indicate significant differences at probability level 0.05 or 0.01 .

NS = Non Significant .

\*: significant differences at 0.05 .

\*\*: high significant at 0.01 .

consumed and food conversion efficiency among groups of Awassi lambs which were using tea wastes (0, 5 and 10%) for 90 days period, while the results of this study were not agreement with the results of Sarker et al. (2010), they found significant differences in amount of dry matter consumed and food conversion efficiency of the beef calves (hanwoo) which treated by green tea residue with 2% than control and antibiotic groups. The results of this study did not agree with the results of Hossain et al. (2012), who observed significant differences in amount of dry matter consumed and food conversion efficiency in hybrid pigs (landrace × large white) between experimental treatments (0.5, 1, 2%) green tea residues than control treatment when using green tea residues as a protein source instead of brewers grains in fattening rations for 6 weeks period.

### CARCASS CHARACTERISTICS

The results of the study (Table 3) showed that there were high significant differences (P≤0.01) in rates of hot and cold carcasses between the first and second treatments than third treatment. The weight of hot carcass was 18.22, 19.05, 21.48 kg and cold carcass weights 18.02, 18.85, 21.27 kg for the three treatments respectively. These results indicate a significant improvement in rates on hot and cold carcasses for the third treatment that containing 15% of tea

wastes as compared to first and second groups were containing 0,7.5% tea waste due to the increase in live weight at slaughter (AL-Jeryan,1986,Taha et al.,1993, Kokja, 2001). This is due on one hand, and to a positive relationship between the live weight of animal at slaughter and the weight of the carcass (Khah and Meghaddam,1975).These results are consistent with those of Mohammed (2003), who observed significant differences in average of carcass weight when they were used palm fronds with broiler litters as an alternative protein source for soybeans in fattening of Awassi lambs for 10 weeks. The results was consistent with those of Hossain et al. (2012) who observed significant differences in carcass weight between the experimental treatments than for control treatment when were replacing of green tea wastes (0, 0.5, 1, 2% as substitute by dried brewers grains of hybrid pigs for 6 weeks of fattening period. Also, the results were consistent with Abdullah et al. (2012) who found significant differences on average of hot carcass weight among treatments for 90 days period .The results was not acceptance with as noted by Kokja, (2001), who observed that there were no significant differences on hot carcasses weight between there treatments when using different levels of Biggia hay as an alternative by barley grain of fattening rations of Awassi lambs. The results of the statistical analysis showed that there were high signi-

**Table 4:** Effect of tea waste level in ration on separate fats of Awassi lambs.

Traits	First treatment (0% tea waste)	Second treatment (7.5% tea waste)	Third treatment (15% tea waste)
1.No. of samples .	5	5	5
2.Percentage of mesenteric fat (%) . NS	1.62 ± 0.29 A	1.36 ± 0.20 A	1.10 ± 0.14 A
3.Percentage of fat around the heart (%) . NS	0.49 ± 0.03 A	0.44 ± 0.02 A	0.41 ± 0.01 A
4.Percentage of fat around the kidney (%) . NS	0.83 ± 0.03 A	0.77 ± 0.02 A	0.74 ± 0.14 A
5.Percentage of the tail fat (%) . *	9.18 ± 0.41 A	7.96 ± 0.63 AB	6.84 ± 0.67 B
6.Percentage of the total fats . (%) *	12.21 ± 0.46 A	10.54 ± 0.63 AB	9.12 ± 0.67 B

The trait which have carried different letters horizontally indicate significant differences at probability level 0.05 or 0.01 . NS = Non Significant . \*: significant differences at 0.05 . \*\*: high significant at 0.01 .

**Table 5:** Effect of tea waste level in ration on some biochemical blood traits of Awassi lambs

Traits	First treatment ( 0% tea waste)	Second treatment (7.5% tea waste)	Third treatment (15% tea waste)
1.No. of samples .	5	5	5
2. Total protein (gm/dl): *	6.13 ± 0.21 B	6.65 ± 0.30 AB	7.09 ± 0.24 A
3. Albumin (gm/dl): **	3.35 ± 0.05 B	3.79 ± 0.17 A	4.17 ± 0.15 A
4. Globulin(gm/dl): NS	2.78 ± 0.26 A	2.86 ± 0.22 A	2.92 ± 0.25 A
5. Triglycerides (mg/dl):*	55.60 ± 3.31 A	49.40 ± 2.87 AB	43.30 ± 0.62 B
6.cholesterol (mg/dl):*	62.40 ± 6.11 A	54.20 ± 3.42 AB	46.30 ± 1.77 B

The trait which have carried different letters horizontally indicate significant differences at probability level 0.05 or 0.01 . NS = Non Significant . \*: significant differences at 0.05 . \*\*: high significant at 0.01 .

ficant differences ( $P \leq 0.01$ ) on average of rib-eye muscle area between first treatment than third treatment and on the other hand there were no significant differences among treatments on the dressing percentage according to live weight of lambs and those calculated on the basis of the empty body weight , thickness of the subcutaneous fat layer of the lambs. The average of rib-eye muscle area was 7.80, 9.00, 10.00  $\text{cm}^2$ , and dressing percentage was 44.36, 43.64 , 44.85%, according on the basis of live weight , 49.32, 48.32, 48.45% calculated on the basis of empty body weight and thickness of subcutaneous layer 8.20, 7.60, 6.60 mm of the three treatments respectively. The results shown in (Table 3) indicate a significant increase in the proportion of rib-muscle area of in the third treatment which containing 15% of tea waste as compared to the first treatment (control treatment). This may be due to the increase in the carcass weights in the third group when compared to the weights of the first group, this is on one hand and other hand, there is a positive relationship between the carcass weight and rib-eye muscle area (Khah and Meghaddam, 1975). The results of this study showed that the improvement on dressing percentage by calculated with both methods it may due to increased proportion of tea waste in the rations or due to significant increase in the cold carcass weight and the live weight of the third lambs in the third treatment compared to the cold carcass weight, final animal weights in this first treatment. On the other hand, there is a positive correlation coefficient between the live weight of the lambs at slaugh-

ter and dressing percentage which were (0.682). Also, the results showed that there were no significant differences in rates of subcutaneous among three treatments. This may be due to the equal amount of metabolic energy in the three rations (2597, 2545, 2506 kg/kg dry matter), respectively. It is clear from these results that the fat layer was good and acceptable thickness, since the deposition of fat was a thin layer is important to appear the carcass in desired external color, which become to a good flavor and tenderness of the meat (Saeed, 1979). This results were agree with results of Kokja, (2001) who noticed no significant differences among treatments on average of dressing percentage and subcutaneous fat of lambs groups when he was using different levels of biggia hay (0,10, 20,30%) in fattening rations of Awassi lambs. Also, this results are consistent with the results Mohammed (2003), who obtained not detect significant differences on dressing percentage between the treatments when he was using palm fronds with broiler litter as a substitute protein for the soybean meal in fattening of the Awassi lambs. As well as the results of Hossain et al. (2012) who did not find any significant differences on thickness of lipid layer under the skin among there treatments when they were using different percentages of (0, 0.5, 1, 2% of green waste as replacing by brewers grains in rations of hybrid pigs. The results was constituent with results of Abdullah et al. (2012) was found significant differences in average of hot carcasses weight among treatments when they feeding different levels of black nigella sativa in fattening rations of Awassi lambs for 90 days pe-

riod. This results are not consistent with the findings of Kokja, (2001), who observed that there were no significant differences between three treatments on hot carcasses weight when he was using different levels of Biggia hay as an alternative by barley grains in fattening rations of Awassi lambs. While not agree with results of Abdullah et al. (2012) who found significant differences on thickness of fat layer under the skin when they feeding different levels of black nigella sativa as a protein source in the fattening rations of Awassi lambs for 90 days period.

### THE SEPARATE FATS

The results indicated in that there was a significant effect ( $P \leq 0.05$ ) of tea waste level in the diet on rates of tail fat and total fats percentages between the first and third treatments of Awassi groups (Table 4). The results showed significant decrease in percentages of tail fat deposition and total fat in third treatment carcass, with an increasing level of tea wastes in fattening rations of Awassi lambs. The percentages of tail fat were 9.18, 7.96, 6.84% and total fats were 12.21, 10.54, 9.12% for three treatments respectively. We noticed from the results a slight decrease in metabolize energy level represented from 2597  $K_{cal}$  in the first diet to 2506  $K_{cal}$  in the third diet as a result of the increase in level of tea wastes at the expense of the coconut meal levels in fattening rations lambs (Table 1) which leads to reducing the proportion of tail fat and total fats in the sheep body. These results indicated (Table 4) no significant effect of tea waste level on rates of mesenteric membrane fat, heart fat, kidney fats between the three treatments of Awassi lambs carcasses. The results of mesenteric membrane fat were 1.62, 1.36, 1.10% and heart fat rate 0.49, 0.44, 0.41% and kidney fats rate 0.83, 0.77, 0.74% for the three treatments respectively. The results were consistent with the results of Abdul-Raheem et al. (1995) who found significant differences in averages of fat tail weight deposition when they using different proportions of dry dates as replacing of barley grain in fattening rations of Awassi lambs for 90 days period. Also, the results were consistent with the findings of Al-Hilou et al. (2007), which indicated significant differences in weights of tail fat and total fat in lambs carcasses when they were feeding Arabi lambs on local barley and alfafa (3% barley, 1.50% barley + 1.50% alfalfa, 2% barley + 1% alfalfa, 1% barley + 2% alfalfa) which depending on body weight of Arabi lambs. While not agreement with results of Kokja (2001), who observed no significant differences among treatments in percentage of total fat deposition in the body lambs when he was using different levels of biggia hay as an alternative to barley grain in fattening rations of Awassi lambs.

### BLOOD PARAMETERS

The results showed a significant effect ( $P \leq 0.05$ ) of tea waste level on concentrations of total protein, cholesterol and triglycerides between the third treatment when com-

pared to the first treatment (control ration). While there were no significant differences between the two first of treatments this is one hand and another hand, between the second and third treatments. As for the concentration of albumin, the results of the statistical analysis showed that there were high significant differences ( $P \leq 0.01$ ) between first treatment than for second and third treatments, while there were no significant differences between the second and third treatments in the average of albumin concentration. The total protein concentration values were 6.13, 6.65, 7.09 gm, albumin were 3.35, 3.79, 4.17 gm, cholesterol 62.40, 54.20, 46.30 mg/100 ml serums and triglycerides 55.60, 49.40, 43.30 mg/100 ml for the three treatments respectively. As for globulin the results of the statistical analysis showed that there were no significant differences on this average of trait between the three treatments when feeding of lambs groups on the ascending percentage of tea residues (0, 7.5, and 15%) in fattening rations of lambs. The results showed in Table (5) that the concentration of total protein was increasing significantly in the third treatment as compared with the first treatment, due to the increase in amount of microbial protein (Thomas et al., 1994) or perhaps because there is a positive correlation between the dietary protein intake and total protein concentration in blood plasma (Boulos, 1983). The results obtained in Table (5) indicate a significant decrease in concentration of triglycerides by increasing the percentage of tea wastes in the second and third treatments. This is due to the fact that concentration of fat in blood always changes because the animal to do process metabolize of fats tissue stored in its body to meet the needs of the animal from energy (Saleh, 1985). In addition, the results showed a significant decrease in average concentration of cholesterol by increasing level of substituting tea wastes in the second and third treatments than for the control treatment. This may be due to significant decrease in concentration of triglycerides that mentioned in result of this study (Table 5) which caused a significant decrease in the concentration of cholesterol in blood serum of Awassi lambs. The results were consistent with the results of Bahrami and Azar, (2010), who observed significant differences in the concentration of triglycerides between the studied treatments when they were using the different percentages of (0, 5, 10, 15, 20%) of dried grapes instead of combinations (barly + alfaafa) with feeding of fattening bakhtiari lambs for fattening period 100 days. The results were consistent with Pietro and Robinson (2010), who observed significant differences in total protein and albumin concentrations in Holstein's blood plasma when using two rations the first was considered control ration which have not contained tea residue and the second was contained tea waste named type yerba mate (*Ilex paraguariensis*) in fattening rations of holstein calves. This results are consistent with the findings of Hos-sain et al. (2012) who showed that there was no significant difference in concentrations mean of globulin in the blood

of hybrid pigs (large × landrace white) between the experimental treatments than for the comparison treatment when using different percentages (0, 0.5, 1, 2%) of tea waste instead of brewers grains for 6 weeks period. Also, the results were consistent with the results of Shams Al-Din et al. (2012) who found significant differences in mean of total protein, triglycerides, cholesterol and insignificant differences in concentration of globulin among treatments when using sesame residues by 0, 6, 12% for 90 days period. While this results were not consistent with results of Kondo et al. (2004) in cholesterol concentration, who did not notice any significant effect of tea waste on this average of trait when were using three rations, the first ration was considered as control ration and the second, third was contained (2.5, 5%) of green tea wastes as partially replacing by soybean meal and alfalfa hay in the rations of dairy cows (Holstein). Also, this result was consistent with result of Al-Hilou et al. (2007), which indicated non-significant differences on concentrations of total protein and cholesterol in blood plasma of Arabi lambs groups when they were fed there lambs on local barley and alfalfa (3% barley, 1.50% barley + 1.50% alfalfa, 2% barley + 1% alfalfa, 1% barley + 2% alfalfa) which depending on body weight of Arabi lambs. The results of this study do not agree with what he mentioned of Bahrami and Azar (2010) who were observed no significant differences in concentrations of total protein and cholesterol between the treatments when using different percentages of dried chromium waste (0, 5, 10, 15, 20%) as partially replacing by barley and alfalfa in fattening rations of bakhtiari lambs. The results did not agreement with the results of Hossain et al. (2012) who was did not found significant differences on total protein, albumin and cholesterol concentrations in blood samples between experimental treatments than control treatment when using different percentages of green tea residue (0, 0.5, 1, 2%) as substitute for brewers grains in the diet of hybrid pigs (landrace × large white). The results did not agree with the findings of the study of the results Shams Al-Din et al. (2012) which appeared that there was no significant difference in albumin concentration in blood serum of lambs when using different levels of sesame residues (0, 6, 12%) in fattening rations of Awassi lambs.

We concluded of this results experiment appeared a significant improvement in lambs performance. This improvement was reflected in most post-slaughter characteristics of most lambs. The results showed reduce on concentrations of triglycerides and cholesterol in blood serum of lambs groups in favor which by treated tea wastes when compared with control ration . This study recommended the possibility of using tea residues as a protein source instead of the imported meals in fattening rations of Iraqi lambs. This will lead to the elimination of accumulations of environmental pollution in the cities in order to provide a healthy environment free of pollution suitable for human

and animal health.

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## CONFLICT OF INTEREST

The beneficiary of research is supporting scientific research and raising the level of quality of the college of Agriculture and Forestry.

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