EFFECT OF DIFFERENT FEEDING LEVELS ON PRODUCTIVE PERFORMANCE AND ECONOMIC FEASIBILITY OF PEKIN DUCKS IN KURDISTAN REGION OF IRAQ

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ABSTRACT

This study aimed to investigate the effect of different feeding levels of Alfalfa pellet ration (APR) on the productive performance and economic feasibility of Pekin ducks (*Anas platyrhynchos*). A total of 270 one-day-old ducklings were used. The birds at seven-day-old were assigned to 9 indoor pens of (1×2.2m) with outdoor and swimming pool (1×9.8m) and Each box represented an indoor replicate with 30 ducklings. The feeding program for Pekin Duck group treatments with alfalfa pellet rations (47% alfalfa) was used as a replacement to the basal diet at different percentages (0%, 25%, and 50%) for control (T0), first (T1) and second (T2) groups. The results showed no significant differences among treatments except accumulative feed intake, feed conversion ratio, and mortality percentage, which showed significant differences among the treatments, the second treatment (50%) resulted in a higher accumulative feed intake, lower production index, and lower mortality% compared to the control and first treatment. The economic profit of the second treatment was the highest. The treatments showed a non-significant effect on carcass percentage except back and neck cuts. There were significant effects of sex on live body weight at marketing age and on the neck and breast cuts, male neck% were significantly higher than females, while females showed significantly higher breast%. In general, feeding ducks with a 25% of Alfalfa pellet ration improved production performance, while feeding ducks with a 50% Alfalfa pellet ration improved economic values.

Keywords: body weight, carcass, profit, ration, weight gain, birds
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تأثير مستويات مختلفة من التغذية على الأداء الإنتاجي والجدوى الاقتصادية لبط البكيني في أقليم كوردستان العراق

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المستخلص

استهدفت هذه الدراسة إلى معرفة تأثير مستويات التغذية المختلفة لعلف أقراص الجت على الأداء الإنتاجي والجدوى الاقتصادية لبط البكيني. تم إحضار 270 فرخة عمرها يوم واحد من مفقس مزرعة نوروز – أربيل. تم تخصيص 9 حظائر داخلية مغلقة بمساحة (1 × 2.2 م) لأفراخ عمرها 7 أيام ومع خارج الحضيرة وحوض السباحة (1×9.8 م)، وكان كل صندوق يمثل تكرارًا داخليًا به 30 فرخة بط. وتم اتباع برنامج التغذية لمعاملات مجموعة البط البكيني باستخدام علف أقراص الجت (47٪ الجت) كإحلال من الغذاء الأساسي وبنسبة مئوية مختلفة (0٪، 25٪ و50٪) لثلاث مجموعات على التوالي. أظهرت النتائج عدم وجود فروقات معنوية بين المعاملات في معظم صفات الأداء الإنتاجي باستثناء كمية العلف المتناول الكلي، كفاءة التحويل الغذائي ونسبة الهلاكات التي أظهرت وجود فروقات معنوية بين المعاملات، وأشارت المعاملة الثانية الى كمية العلف المتناول الكلي أكثر ودليل الإنتاجية أقل وهلاكات أقل مقارنة إلى الكونترول والأولى. وبالنسبة للربح الاقتصادي فقد كان للمعاملة الثانية أكثر. وأما لصفات الذبيحة فقد أظهرت تأثير غير معنوي لنسبة الذبيحة بين المعاملات ماعدا قطع الظهر والرقبة. وفيما يتعلق بتأثير الجنس على قطع الرقبة والصدر حيث أن الذكور كان أكثر معنويا من الإناث في قطع الرقبة ولكن في قطع الصدر كانت الإناث أكثر معنويا من الذكور. بصورة عامة، تغذية البط بنسبة 25٪ من علف أقراص الجت أدت إلى تحسين الأداء الإنتاجي، في حين أن تغذية البط بنسبة 50٪ من علف أقراص الجت أدت إلى تحسين القيم الاقتصادية.

الكلمات المفتاحية: وزن الجسم، الذبيحة، الربح، العلف، الزيادة الوزنية، الطيور
*** جزء من بحث أطروحة دكتوراه للباحث الأول**

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INTRODUCTION

Ducks (*Anas platyrhynchos*) are now intensively and commercially bred after being intermittently consumed in the past. Despite the fact that their feathers also have a market value, they are mostly bred for their meat and eggs. Comparable to chicken, duck meat provides humans with a replacement supply of protein, minerals, and other nutrients. Ducks are more suited to a variety of environmental circumstances than chickens, require less maintenance, and have higher disease resistance (1). The Pekin duck is frequently raised for its meat. Improvements in White Pekin strains make use of the duck's inherent capacity for rapid growth and its resilience to illnesses to which other poultry are vulnerable. Consequently, producers can lower input costs while enhancing the quality of the carcass and feathering (6). Furthermore, Alfalfa (*Medicago sativa L.*) in ducks feed, is primarily grown for and used in animal feed, as it is a good source of easily assimilated protein and high in minerals and vitamins content, it contains vitamins (C, K, D, E, U, provitamin A, B1, B2, B6, B12, folic acid/B9, biotin, niacin). It also contains several minerals, such as (calcium, phosphorus, iron, magnesium, potassium, zinc, copper, selenium, organic silicon, and manganese), as well as β-carotene and eight essential amino acids (alanine, lysine, arginine, histidine, cysteine, proline, methionine, tyrosine), and include crude fibers (cellulose, hemicellulose, and lignin) (4). It is high in xanthophyll's and carotenoids, which give the carcass its yellow color (18, 22). The higher quantity of alfalfa in the diet causes an increase in crude fiber content. The reduction in feed consumption was impacted by the high amount of crude fiber. The less consumption of feed when contains more fiber means bulky, the reduction in feed consumption was also limited (19). This study looked into the impact of various alfalfa pellet feeding levels on productive performance and economic feasibility of Pekin ducks in Kurdistan region of Iraq.

MATERIALS AND METHODS

Experimental Design and Management

This study was conducted at the private's field at Nowruz farm - Qushtapa - Erbil during the period from 9 Sept. 2020 until 11 November 2020 for different feeding levels for Pekin Duck (*Anas platyrhynchos*). A total of 270 one-day-old ducklings were brought from Nowruz farms hatchery – Erbil. The birds at seven-day-old were assigned to 9 indoor pens (1×2.2m) with outdoor and separated swimming pools (1×9.8m); each box represented an indoor replicate with 30 ducklings. The feeding program for Pekin Duck group treatments about (starter, growing, and finisher), and alfalfa pellets ration (47% alfalfa) were used at different levels (0%, 25%, and 50%) for three groups respectively, feed and water were provided *ad libitum*. Basal diet ingredients, Alfalfa pellet ration ingredients, and calculated chemical composition of the mixed them as shows in Table (1, 2, 3), respectively. The duckling was in a clean well-ventilated hall and belonged to a regular healthy program applied on the farm. All ducklings were vaccinated (Table 4). In the first week, the ducklings were fed collectively on the starter full requirements of Basal Diet reared indoor house according to NRC (15) only and freely in a hall where the number of lighting hours was about 22 hours and an area of 27 birds / m^2. Vitamin C was given (ANOVA JOINT VENTURE Co., Ltd-Vietnam) about 1 g/ 1 liter of water after vaccination of the ducklings with Newcastle and influenza on three consecutive days. The multi-vitamin was also given (INTROCHICK ORAL -Venray - Holland) by drinking water 1 ml / 1 liter of water three times a day for three consecutive days during the first week of the experiment. To improve the amount of feed intake, the alfalfa pellet ration was crushed and presented during the first week of the experiment. Also, di-calcium phosphate was given in the liquid form (D-CAL-PHOS manufactured by organic Herbs I.N.C -India. MRA Co. Ltd, Sulaymaniyah, Kurdistan region - Iraq), about 6 ml / 1 liter water, from 2 to 4 weeks of age, for three consecutive days each week. At one week old, 30 birds per replication were randomly assigned to each of three treatment groups, and then different dyeing color was used to label each treatment. Treatments included a control treatment group (T0): that obtained complete needs of a basal diet in accordance with NRC (15) using broiler feed, first treatment (T1): birds fed %25 alfalfa

(*Medicago sativa*) pellet ration + 75% of full requirements of basal diet, second treatment (T2): birds fed %50 alfalfa pellet ration + 50% of full requirements of basal diet. For 15 days, birds are enabled to reach the swimming pool (10m×1m×30cm) through separate holes from indoor to outdoor. The measures of the area in indoor and outdoor with swimming pool 1 × 12 m (1 m^2/4 bird) for each box and divided by fences. The external area was designed to provide natural activity for the birds. All birds were supplied by clean water *ad libitum* as well as a clean water pool.

Table 1. Basal Diet ingredients (%).

Ingredients	Starter 1-14 days	Grower 15-35 days	Finisher 36-49 days
Wheat	19.5	23	18.6
Wheat bran	1	2.5	4
Wheat flour	10	10	15.5
Corn	23	24	30.5
Soybean	39.85	34.3	24.7
Oil	1.85	1.5	2
Limestone	1.9	1.8	1.8
Premix	2.5	2.5	2.5
Optifeed*	0.005	0.005	0.005
Oleobiotec*	0.005	0.005	0.005
VeO*	0.005	0.005	0.005
Lysin	0.02	0.03	0.04
Methionine	0.05	0.05	0.05
Avimatrix**	0.05	0.05	0.05
Herb – All (COCC-X) ***	0.05	0.05	0.05
Antitoxin	0.075	0.075	0.075
Chemical composition (%)			
Protein	23	22	18.5
Metabolic Energy(Kcal/Kg)	2850-2900	2900-3000	3000-3100
Moisture	11	10.9	10.5
Fat	3.4	3.8	3.5
Fiber	3.6	3.5	4.0
Ash	5.1	5.0	4.8

*** It is a mix of flavoring substances.**
**** It also contributes to improving feed conversion and optimal production efficiency.**
***** It is a complementary feed to improve and strengthen gut health for all animal species**

Table 2. Alfalfa pellet ration ingredients (%).

Ingredients	%
Alfalfa	47
Soybean	8.6
Wheat bran	2.5
Wheat flour	33.6
Oil	2
Sodium carbonate	0.3
Antitoxin	0.1
Dicalcium phosphate	0.5
Limestone	2
Salt	1
Premix (vitamins, Lysin, Methionine, and minerals)	1
Dates juice	1.5
Chemical composition (%)	
Protein	15.9
Metabolic Energy (Kcal/Kg)	2400 - 2600
Moisture	12.0
Fat	1.3
Fiber	8.8
Ash	8.1

Productive performance

Weekly body weight and gain: After weighting the birds at one day old on an electronic scale (Ming Heng Electronic Digital scale MH-777-China) to the nearest 0.1g, and then weekly till marketing day on 7 weeks on an electronic scale (TSC-Electronic platform scale to the nearest 10g - China). Weekly feed intake and feed conversion ratio: Feed Intake in each pen or replicate was recorded and measured weekly. Mortal birds were removed from fed intake at each period. Feed conversion was calculated as a ratio between feed intake and body weight gain for each period (14).

Mortality percentage

Mortality% was recorded daily for each replicate to calculate the mortality proportion (2). As for mortalities, it is caused by either falling on the back or drowning in water at an early age (mechanical).

Table 3. Calculated chemical composition (%) of the mixed Basal diet and Alfalfa pellet rations

	Starter 7-14 days			Grower 15-35 days			Finisher 36-49 days		
Chemical composition (%)	T0 Control BD* (100%)	T1 APR** (25%) + BD (75%)	T2 APR (50%) + BD (50%)	T0 Control BD (100%)	T1 APR (25%) + BD (75%)	T2 APR (50%) + BD (50%)	T0 Control BD (100%)	T1 APR (25%) + BD (75%)	T2 APR (50%) + BD (50%)
Protein	23	21.225	19.45	22	20.475	18.95	18.5	17.85	17.2
Metabolic Energy (Kcal/Kg)	2850-2900	2737.5-2825	2625-2750	2900-3000	2775-2900	2650-2800	3000-3100	2850-2975	2700-2850
Moisture	11	11.25	11.5	10.9	11.175	11.45	10.5	10.875	11.25
Fat	3.4	2.875	2.35	3.8	3.175	2.55	3.5	2.95	2.4
Fiber	3.6	4.9	6.2	3.5	4.825	6.15	4.0	5.2	6.4
Ash	5.1	5.85	6.6	5.0	5.775	6.55	4.8	5.625	6.45

*** BD: Basal Diet ** APR: Alfalfa Pellet Ration T0: Control T1: First treatment T2: Second treatment**

Health control of pekin duck

The duckling was in a clean well-ventilated hall and belonged to a regular health program. All ducklings were vaccinated based on production purposes.

Table 4. Vaccination program for Pekin duckling

AGE DAY	VACCINE	ROUTE
3	IB Ma5+ ND Clone 30	Spray
7	InfluenzaH9N2+ ND	Injection

Production Index (PI): The production index for each replicate was calculated using the following formula: (11)

$$\text{Production index} = \frac{\text{Body weight (kg)} \times (100 - \%\ \text{mortality}) \times 100}{\text{Fattening duration (days)} \times \text{feed conversion ratio (kg feed intake/kg weight gain)}}$$

Economic profit feasibility of pekin duck production:

A-Rearing period: ducks from 1 day to 7 weeks with all expenditure (ducklings, feed, vaccine, electric, water, labor, and other materials like calcium phosphate and vitamins) cost 8,190 ID per 1 duck. 219 duck = 219× 8,190 = 1,793,610 ID

B-Production period

1- The cost of one ton of a basal diet with transportation was 540 000 ID.

2- The cost of one ton of alfalfa pellet ration with transportation was 370,000 ID

3-Other expenditure and materials cost, labor, vaccine, electric, water, and other materials like calcium phosphate and vitamins… 1,263,000 ID during the experiment

All above expenditure are called inputs. Fixed costs were not involved in the analysis

C- Duck price in the market:

1 duck 7 weeks at marketing = 10,500 ID

219×10,500=2,299,500

The above point is the outputs

D- Profit = R- C

R: Returns (Outputs) **C**: Costs (Inputs)

Outputs: total revenue from duck sales

Inputs: total expenditure at the beginning of the project.

E- The following formula was used to derive the benefit-cost ratio (BCR):

BCR =Profit / (TVC) total variable cost (Table 6).

Carcass characteristics

Carcass measurements: At the end of the experiment, 2 birds were randomly selected per replicate, starved for twelve hours, weighed immediately before slaughtering, and exsanguinated by bleeding their neck. After slaughtering, the birds were de-feathered by hand plucking, all inedible parts (viscera, head, and shank) were removed and the carcass was weighed on an electronic scale (Ming Heng Electronic Digital scale MH-777-China) to the nearest 0.1 g. Afterward, the thigh, wing, back, and breast have separated the proportion of each part was calculated by dividing the weight of the part by the carcass weight of the bird. The carcass percentage was determined using the following equation: (7)

$$\text{Carcass percentage } (\%) = \frac{\text{Carcass weight (g)}}{\text{Slaughter weight (g)}} \times 100$$

Measurements of proportion of body cuts: The percentage of a particular body cuts and edible parts including breast, back, thigh, wing, neck, gizzard, heart, liver, spleen, and skin were separated and weighed individually. Their percentage was determined by dividing their weight by carcass weight multiplied by 100, and other parts were determined by dividing their weight by live weight multiplied by 100.

Statistical analysis: The statistical analysis system (SAS) (21) was used to analyze the data, and the Complete Randomized Design (CRD) was used to design the experiment. The impact of sex (male or female) was added to the module of carcass traits. The proceeding of Duncan's multiple range tests (5) at a level of P≤0.05 was detected to diagnose the significant differences between treatments.

RESULTS AND DISCUSSION

Production performance: Mostly, productive performance traits results of this study, which included the live body weight at the marketing age of 49 days, total body weight gain, accumulative feed intake, feed conversion ratio, mortality percentage with production index, showed no significant differences among the studied treatments except for accumulative feed intake, feed conversion ratio and mortality percentage (%) which showed significant differences (P≤0.05) among the treatments, and the control (T0) gave lowest accumulative feed intake and highest production index compared to the first (T1) and second (T2) ones, while mortality percentage (%), in the control group, recorded significantly (P≤0.05) highest value mortality percentage (18.00%) than first (8.02%) and second treatment (7.04%), respectively (Table 5). Likewise, about live body weight at the age of marketing, it was higher in control (T0) (%0 alfalfa pellet ration) than in first (T1) group (%25 alfalfa pellet ration) and second (T2) group (%50 alfalfa pellet ration) but the amount of accumulative feed intake for the second treatment group was significantly (P≤0.05) higher, followed by the first and then control group. The feed conversion ratio for the control group was better than the first and second groups (Table 5).

Table 5. The effect of treatment on Production performance

TRAITS	TREATMENTS			SEM	P-VALUE
	T0 Control BD* (100%)	T1 APR** (25%) + BD (75%)	T2 APR (50%) + BD (50%)		
AVERAGE HATCHING WEIGHT (G)	53.67	53.67	53.67	------	------
BODY WEIGHT AT 7 DAYS OLD (G)	209.54	200.98	197.47	------	------
LIVE BODY WEIGHT (G) / DUCK AT 49 DAYS OLD	3281.02	3129.62	3020.71	42.52	0.1160
TOTAL BODY WEIGHT GAIN (G) / DUCK	3071.48	2928.64	2823.23	42.63	0.1350
ACCUMULATIVE FEED INTAKE (G) / DUCK	6710.45 [c]	7387.87[b]	7648.17[a]	32.31	<.0001
FEED CONVERSION RATIO FEED INTAKE (KG) / WEIGHT GAIN (KG)	2.19[b]	2.52[a]	2.71[a]	0.03	0.0020
MORTALITY PERCENTAGE (%)	18.00[a]	8.02[b]	7.04[b]	0.97	0.0065
PRODUCTION INDEX	294.32	272.05	246.83	9.42	0.2013

Means followed by the different letters in the same raw are significantly different (P≤0.05). SEM: Pooled Standard Error of the Mean. * BD: Basal Diet ** APR: Alfalfa Pellet Ration

Previous studies have shown that the impacts of alfalfa on performance in birds may vary. Jiang *et al.*, (8) reported by adding 0, 3, 6, and 9% of alfalfa meal for 8 weeks to the dietary treatments for 7-week-old growing layer ducks had no significant impact on body weight, average daily gain, mortality, feed intake, and gain-to-feed ratio. Suwignyo and Sasongko, (26) referred in their study on 75 hybrid ducks in battery cages, fresh alfalfa feed were offered 6%, hay alfalfa 6%, and control commercial feed for 4 weeks which pointed to that supplement of 6% fresh alfalfa and control had improved feed intake and feed conversion ratio in second, third, and fourth weeks and body weight gain showed significantly increased in second and third weeks compared to hay alfalfa supplementation, and noted that

the higher palatability of fresh alfalfa compared to hay may have increased feed consumption in the duck, and the low body weight gain from 6% hay alfalfa may have been caused by the high fiber content. The digestion of the feed's high fiber content will take some time, and the duck's body weight gain will decline as a result of the low nutritional content being absorbed. Moreover, Rini *et al.*, (19) reported in their experiments on 90 hybrid ducks that were housed in cages for 7 weeks in adding 3%, 6% fresh alfalfa to commercial feed and offered twice a day, with increased significantly feed intake and body weight gain in the second and third week in supplementation 3% alfalfa, because of rapidly increasing of growing the body and production of duck. However, supplementation 6% alfalfa was reducing feed intake, and the feed conversion ratio did not have a different between treatments. More crude fiber content in the diet due to the higher alfalfa proportion. The consumption of feed decreased because of the high crude fiber content means bulky, whereas the quantity of consumed feed is restricted. Rompas *et al.*, (20) reported that low digestibility was caused by a high amount of fiber components (lignin and silica) that were not digested, and it was verified by the findings of Murray *et al.*, (12), indicating that the high feed movement proportion in a duck's digestive tract was caused by the high crude fiber content, which in turn shortened the digestive enzyme's active period and reduced digestibility. Rompas *et al.*, (20) referred that there was a strong correlation between the large amount of dry matter that was digested and the amount of nutrients that were absorbed. Suwignyo *et al.*, (24) suggested that fresh alfalfa supplementation 3% and 6% had a significant impact on the body weight gain and feed consumption of hybrid ducks ($P \leq 0.05$). Ration with 3% fresh alfalfa increased body weight gain which means increasing of growth performance but ration with 6% fresh alfalfa and without alfalfa supplementation decreased the body weight gain and feed conversion ratio did not have differences among treatments. However, Suwignyo *et al.*, (25) reported that hay alfalfa supplementation 10% to the free mixed and 10% to the alternative feeds for hybrid duck had a significant treatment on feed intake and had not significant impact on body weight gain and feed conversion ratio, and that 10% to the free mixed feed showed the highest feed intake and body weight gain, and 10% to the alternative feeds showed the lowest feed conversion ratio. On the other hand, Mustafa and Al-Sardary, (13) showed in their study on the local Kurdish slow growing broiler fed organic feed, commercial feed with pasture in different level groups a significant difference ($p \leq 0.01$) on body weight, body weight gain, feed consumption and feed conversion ratio which that group fed *ad libitum* organic feed with pasture gave highest significant production performance than other groups. According to Rini *et al.*, (19) Ducks are more able to tolerate higher crude fiber levels than other poultry. According to reports, ducks will tolerate up to 10% fiber content (26). In addition, the study by Palupi *et al.*, (17) concluded that 0.5% of propionic acid added to the diet might increase the digestibility of crude fiber content in rations, enhance broiler chicken production, and improve carcass quality. However, AL-Ghabban and AL-Hassani (3) referred that the season had significant effect on production performance of Pekin duck under harsh Iraqi climatic conditions, birds bred in summer season had high tolerate for high temperature than winter season, in comparison with winter, birds reared in summer revealed a significant ($p<0.01$) decrease in live body weight and feed consumption, and no significant difference in feed conversion ratio.

Economic values: As for the economic profit, the second (T2) treatment had more an economic profit significantly rate of (2683) Iraqi dinars (ID)/duck, followed by the first (T1) treatment with a lower profit (2593) ID, the control (T0) treatment group was much less than the first (T1) and second (T2), where it was (1634) ID and verse versa for the total variable cost (TVC) / duck (ID), second treatment had less total variable cost (7817) ID than the control (8866) ID and first (7902) ID, and the control group had more significant cost than others, and the benefit-cost ratio (BCR) was recorded more significantly to the first (0.33) and second (0.34) treatment than control (0.19) treatment (Table 6).

Table 6. Economic values for each treatment

PARAMETERS	TREATMENTS			SEM	P-value
	T0 Control BD** (100%)	T1 APR*** (25%)+ BD (75%)	T2 APR (50%)+ BD (50%)		
FEED COST/DUCK (ID)	3500[a]	3467[a]	3366[a]	42.66	0.4565
OUTPUT/DUCK (ID)	10500	10500	10500	-------	-------
TVC*/DUCK (ID)	8866[a]	7902[b]	7817[b]	99.99	0.0092
ECONOMIC PROFIT/DUCK (ID)	1634[b]	2598[a]	2683[a]	99.99	0.0092
BENEFIT-COST RATIO (BCR)	0.19[b]	0.33[a]	0.34[a]	0.02	0.0139

Means following various letters in the same raw are significantly different (P≤0.05). SEM: Pooled Standard Error of the Mean. * TVC: Total variable cost ** BD: Basal Diet * APR: Alfalfa Pellet Ration**

The carcass and its parts, giblets, and inedible parts: Table (7) shows the effect of the treatments on the carcass and its parts with giblets and inedible parts, as it described that there were no significant differences between the treatments on most traits, and it indicates the effect of treatments significantly only on the back and neck that the first (T1) and second (T2) treatment were more recorded on the back and the neck, respectively. Likewise, the second (T2) group recorded more wings, thighs without skin, and giblets with less abdominal fat compared with the first (T1) and control (T0) groups, respectively. Previous studies have shown vary. Omojola, (16) refers that the carcass proportion of Rouen ducks is 68.9%, Pekin ducks 66.7%, and Muscovy ducks 71.18%. Kokoszynski *et al.*, (9) reported in their study from different genotypes of Pekin duck types aged 49 days had significant differences among them on most carcass traits. Suwignyo *et al.*, (23) suggested that the supplementation of fresh alfalfa 6% and hay alfalfa 6% to the basal diet for a hybrid duck at age 35 days had no significant impact on weight of carcass and percentages.

Effect of sex on carcass traits

Sex had a significant (P≤0.05) impact on the neck and breast percentages, that males (17.67%) were greater than females (16.68%) on the neck, but on the breast, females (32.01%) were greater than males (29.88%). The male carcass shows a non-significantly lower percentage of the thigh, wings, Abdominal fat, Bursa of Fabricius, and Inedible parts and a higher percentage of the carcass, back, giblets, and skin with subcutaneous fat compared to the female carcass (Table 7). Kokoszynski *et al.*, (9) referred that the carcass traits had different percentages between males and females among different Pekin duck types, and males were distinguished by a higher percentage in most parts of the carcass. Kokoszynski *et al.*, (10) reported that the percentage of breast was higher (P≤0.05) in females than in male carcass. In comparison to the female carcass, the male carcass had a non-significantly higher proportion of wings, leg muscles, and abdominal fat. In comparison to males, females had higher percentages of subcutaneous fat and the remainder parts of the carcass and skin.

Table 7. Effect of treatment and sex on carcass parts, giblets, and inedible parts (%) at marketing (mean ± standard error).

TRAITS	TREATMENTS			SEX	
	T0 Control BD* (100%)	T1 APR** (25%) + BD (75%)	T2 APR (50%) + BD (50%)	M	F
LIVE WEIGHT G	3253.33±77.08	3286.67±72.84	3238.33±76.53	3431.11±48.59[a]	3087.78±39.97[b]
CARCASS %	70.81±0.53	70.02±1.05	69.59±0.42	70.35±0.32	69.93±0.77
BREAST %	31.98±0.72	30.65±0.72	30.22±0.87	29.88±0.62[b]	32.01±0.57[a]
THIGH %	18.95±0.26	19.24±0.36	18.76±0.40	18.95±0.27	19.01±0.28
WINGS %	13.57±0.25	13.77±0.23	14.22±0.36	13.68±0.19	14.03±0.27
BACK %	10.19±0.44[b]	11.49±0.34[a]	10.34±0.25[b]	10.80±0.27	10.54±0.35
NECK %	16.44±0.42[b]	16.98±0.47[ab]	18.11±0.43[a]	17.67±0.41[a]	16.68±0.33[b]
THIGH WITHOUT SKIN AND FAT %	15.58±0.25	15.38±0.45	15.86±0.34	15.74±0.24	15.48±0.33
HEART%	0.70±0.02	0.71±0.02	0.72±0.02	0.72±0.02	0.71±0.01
LIVER%	2.68±0.08	2.75±0.09	2.81±0.07	2.84±0.06	2.65±0.07
GIZZARD%	3.35±0.13	3.57±0.13	3.62±0.06	3.63±0.09	3.40±0.09
SPLEEN %	0.07±0.01	0.06±0.00	0.06±0.01	0.06±0.01	0.06±0.00
SKIN WITH SUBCUTANEOUS FAT %	7.50±0.30	6.85±0.34	7.18±0.39	7.27±0.31	7.09±0.26
ABDOMINAL FAT %	0.57±0.05	0.54±0.07	0.45±0.04	0.50±0.03	0.55±0.06
BURSA OF FABRICIUS %	0.11±0.01	0.09±0.01	0.10±0.01	0.09±0.01	0.10±0.01
INEDIBLE PARTS%	23.32±0.57	24.00±1.08	24.45±0.40	23.56±0.33	24.29±0.78

Means following various letters in the same raw are significantly different (P≤0.05). * BD: Basal Diet ** APR: Alfalfa Pellet Ration

it was concluded that feeding ducks with a 50% of Alfalfa pellet ration showed the lowest for each of the production index value, mortality percentage, total variable cost, and showed the highest economic profit/duck (ID), and the benefit-cost ratio. Likewise, 50% of Alfalfa pellet ration improved carcass parts and giblets percentages that showed the lowest abdominal fat. On the other hand, the feed conversion ratio for the control (T0) group was better than the first (T1) and second (T2) groups, respectively. Finally, feeding Pekin ducks' basal diet replaced with alfalfa pellet ration had a positive effect on production performance. Additionally, feeding ducks with a 50% alfalfa pellet ration improved economic values.

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