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Effect of Different Marketing Age on Productive and Economic Efficiency of Broiler Chickens

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ABSTRACT

Broiler marketing decisions and the length of the production cycle are critical when considering productivity and profitability. Therefore, the purpose of this study was to evaluate the effects of different marketing ages on the Ross chickens' growth performance, carcass characteristics, and economic efficiency. A total of 120 one-day-old Ross chicks were received, weighted, and then divided by chance into five treated groups (each with four subgroups and six chicks per subgroup) according to marketing age (D1:33 days; D2: 35 days; D3: 37 days; D4: 39 days and D5: 41 days). Our findings declared that changes in broiler marketing age were associated with highly significant changes in final body weight, body weight gain, average daily gain, relative growth rate, feed intake, feed conversion rate (FCR), feed cost, total cost, total cost per day, total return per day, and total return. The highest values were recorded with the highest marketing age (41 d.), while the lowest values of the same parameters were observed with the lowest marketing age (33 d.). A significant increase in dressing percentage was observed as broiler age progressed from 33 to 39 days at the market; afterward, it decreased. D1 had significantly the highest net profit per kilogram live body weight, profitability index, and benefit-cost ratio compared to D5, along with a significantly lower FCR, which indicates a better economic efficiency of lower marketing age. So we concluded that birds marketed at 33 d. can be used efficiently to reduce expenses and obtain better FCR and profitability than birds marketed at 41 d.

1. INTRODUCTION

Chicken meat is the most widely consumed meat produced worldwide due to the short production cycle of broiler chicks (Abioja and Abiona, 2021). Genetically, broilers have significant potential for weight gain over a very short period (Mramba and Mapunda, 2024). The weight of broiler at marketing was 2 kg which attained around 5-7 weeks of age (Abioja and Abiona, 2021; Kpomasse et al., 2021). They are responsible for more than 92% of the whole production of poultry-meat in the world in various regions. The growth performance of broiler chickens has significantly improved over the past three decades, primarily attributed to advancements in genetics, enhancements in nutritional practices, and the establishment of controlled environments. As a result, these chickens can now achieve a final body weight of approximately 2 kg in about 33 days. (Wilson, 2005). In addition to optimizing live performance in chicken production, genetic improvements have made it possible to reduce the age to market. The demands for various product types, and production expenses are linked to the genetic line and market age (Mendes et al., 1993). The average annual decrease in slaughter age was 0.75 days (Szőllősi et al., 2014). There are no hard-and-fast guidelines for increasing broiler production profits. However, it could be accomplished by selling the product at a higher price and/or lowering the variable cost as much as feasible in order to obtain the largest margin over the variable cost. (Samarakoon and Samarasinghe, 2012). In addition

to immediately increasing body weight, raising the marketing age has a detrimental effect on the feed conversion ratio and livability % (Shehata and Elsokary, 2024). As a result of the decrease in the average daily weight gain of broilers after a certain period, feed consumption and other inputs continue to increase. The production input-output relations may be used to describe this situation. It has been noted that the yield does not rise linearly as the input quantity rises. On the other hand, the yield quantity increased at a decreasing rate. This problem is known as "The Law of Diminishing Returns" in economics (Müftüoglu, 1999). When the maximum income is attained, production should stop in compliance with this legislation. So, this study aimed to assess how varied marketing ages affected the Ross chickens' growth performance, carcass characteristics, and economic efficiency.

2. MATERIALS AND METHODS

The current experiment took place at the Centre of Experimental Animal Research, Faculty of Veterinary Medicine, Benha University, Egypt. Ethical approval was granted for the study BUFVTM: 34–06–23. The research involved 120 one-day-old Ross chicks to assess how marketing age impacts the productivity, carcass traits, and economic efficiency of Ross chickens at five various market ages.

2.1. Design of experiments, bird care, and handling:

A total of 120 one-day-old Ross chicks were acquired from a nearby hatchery. Every young bird experienced the same living conditions regarding management and hygiene. The chicks were received, weighted, wing banded and then divided by chance into five treated groups (each with four subgroups and 6 chicks per subgroup).

The five categories were the following:

D1: Birds will be prepared for sale at 33 days old.
D2: Birds will be prepared for sale at 35 days old.
D3: Birds will be prepared for sale at 37 days old.
D4: Birds will be prepared for sale at 39 days old.
D5: Birds will be prepared for sale at 41 days old.

2.2. Growth performance parameters

Growth performance including body weight (BW), body weight gain (BWG), average daily gain (ADG), feed intake (FI), feed conversion ratio (FCR), average daily feed intake (ADFI), and relative growth rate (RGR) was measured as outlined in studies by (Kamel et al., 2020; Mohammed et al., 2021) and European Broiler Index (EBI) was calculated in the way outlined by (Sallam et al., 2021).

Relative growth performance

Relative ADG, ADFI, and FCR were calculated relative to the lowest marketing age (D1) and relative to the highest marketing age (D5).

2.2. a. Growth performance relative to D1 as the following

$$\text{Relative ADG} = \frac{\text{ADG per day of tested group}}{\text{ADG of D1}} \times 100$$

$$\text{Relative ADFI} = \frac{\text{ADFI per day of tested group}}{\text{ADFI of D1}} \times 100$$

$$\text{Relative FCR} = \frac{\text{FCR per day of tested group}}{\text{FCRI of D1}} \times 100$$

2.2. b. Growth performance relative to D5 as the following

$$\text{Relative ADG} = \frac{\text{ADG per day of tested group}}{\text{ADG of D5}} \times 100$$

$$\text{Relative ADFI} = \frac{\text{ADFI per day of tested group}}{\text{ADFI of D5}} \times 100$$

$$\text{Relative FCR} = \frac{\text{FCR per day of tested group}}{\text{FCRI of D5}} \times 100$$

2.3. Carcass characteristics

Carcass traits were evaluated by measuring them at the end of each rearing period (33, 35, 37, 39, and 41 days).

The birds were gathered randomly from each group and then allowed to fast for 12 hours. The weight of every bird's body was determined both before slaughter and after being fully dressed. The dressing percentage was calculated following the methodology described by (Brake et al., 1995). The relative weights of certain internal organs (Heart, Gizzard, Proventiculus, Liver (excluding gall bladder), Spleen, Thymus, Bursa, Abdominal fat, and Gizzard fat) were determined (Shehata et al., 2021).

2.4. Evaluation of economic efficiency

Calculating both production costs and returns determined the economic efficiency of production. The total costs (TC) comprised the total fixed costs (TFC), which included depreciation on equipment, and the total variable costs (TVC), which included feed cost, chick price, management cost, and total veterinary management cost (TVM) (Mohammed et al., 2021; Sallam et al., 2021; Shehata et al., 2021). The criteria for measuring returns included total return (TR), gross margin (GM), net profit (NP), and benefit-cost ratio (BCR) which were determined following the method outlined by (Shehata et al., 2021). The profitability index was calculated according to (Atapattu et al., 2017).

2.4.1. Partial economic efficiency

Include the total cost, TR, and NP per kg live weight obtained by dividing each of them by live body weight per kg. Additionally, TC and NP were calculated per day obtained by dividing each of them per their rearing period (33, 35, 37, 39, and 41 d).

2.4.2. Relative economic efficiency

Relative TC, TR, and NP per day were calculated relative to the lowest marketing age (D1) and relative to the highest marketing age (D5).

2.4.2. a. Economic efficiency relative to D1 as the following

$$\text{Relative TC} = \frac{\text{TC per day of tested group}}{\text{TC per day of D1}} \times 100$$

$$\text{Relative TR} = \frac{\text{TR per day of tested group}}{\text{TR per day of D1}} \times 100$$

$$\text{Relative NP} = \frac{\text{NP per day of tested group}}{\text{NPper day of D1}} \times 100$$

2.4.2. b. Economic efficiency relative to D5 as the following

$$\text{Relative TC} = \frac{\text{TC per day of tested group}}{\text{TC per day of D5}} \times 100$$

$$\text{Relative TR} = \frac{\text{TR per day of tested group}}{\text{TR per day of D5}} \times 100$$

$$\text{Relative NP} = \frac{\text{NP per day of tested group}}{\text{NPper day of D5}} \times 100$$

2.5. Statistical analysis: The data was statistically assessed with IBM SPSS 'version 21'**(SPSS, 2012),** ANOVA was conducted to differentiate between the various treatment groups by analyzing the means. Tukey's test was utilized to determine statistical significance. The average value and the standard error (SE) of the average were the results that were shown.

2.5.1. Conducting the production and cost functions were done by linear regression (a logarithmic form of data) to assess how the marketing age change (an independent variable) affects the dependent variables (BW, BWG, FI, FCR, TR, total feed cost, TC, and NP) and ascertain the significance of the F test, t-test, and modified R^2 value.

3. RESULTS

3.1. Growth performance

Tables 1 & 2 summarize the impacts of varied marketing ages on growth performance and carcass traits. Our findings declared that changes in broiler marketing age were associated with highly significant changes in final body weight (BW), BWG, ADG, RGR, FI, FCR, and ADFI but associated with a non-significant change with European broiler index (EBI). The highest values of BW, BWG, ADG, RGR, FI, FCR, and ADFI were recorded with the highest marketing age (41 d.), while the lowest values of the same parameters were observed with the lowest marketing age (33 d.). Increasing the marketing age of broiler chickens from 33 to 41 d. results in an increase in final body weight and feed consumption by about 628.43 and 1427.31 g, respectively. The worst FCR (1.73) recorded in the group market at the highest age (41 d.) was a consequence of an increase in feed intake. A significantly increasing dressing percentage was observed with the increasing broiler age at the market from 33 to 39 days afterward, there was a decline in dressing percentage observed with an increasing marketing age from 39 to 41 d. Marketing age had a significant effect on the percentage of gizzard and heart, and a highly significant effect on abdominal fat and lung %.

Figures 1 & 2 showed relative average daily gain, average daily feed intake, and feed conversion rate. Relative ADG, ADFI, and FCR of varied marketing age groups compared to those markets either at 33d. or 41d. of age were significantly different. Compared to the broilers marketed at 33 d. age, those marketed at the age of 41 d. were higher in ADG, ADFI, and FCR by 17.70, 37.8, and 16.87, respectively. Additionally, a group that was marketed at 33 days occurred a reduction in ADG, ADFI, and FCR by about 15.02%, 27.43 %, and 14.41 %, respectively compared to the group marketed at 41 days.

3.2. Economic efficiency

Concerning the economic efficiency, the economic indices are presented in table (3). The feed cost, total cost, TC per day, TR per day, and total return significantly increased gradually by increasing the marketing age. Additionally, D5 (41 days) showed the highest values of these parameters (82.36, 101.88, 2.48, 3.59 &147.29 EGP, for feed cost, total cost, TC per day, TR per day, and total return, respectively), while the lowest values were recorded in D1(48.11, 64.79, 1.96, 3.08 & 101.80 EGP, for feed cost, total cost, TC per day, TR per day, and total return, respectively). Concerning net profit, it significantly differed among the groups. Moreover, D5 and D4 recorded higher NP (45.41 and 46.05 EGP, respectively) than D1 (37.01 EGP), which achieved the least profit. Birds that were marketed at 33 days had a significant increase in NP per kg live body weight, profitability index, and benefit-cost ratio (BCR) over D5 which was marketed at 41, this indicates better economic efficiency of lower marketing age. Relative economic efficiency, which

includes relative TC per day, relative TR per day, and relative NP per day represented in Figures 3 & 4. Comparing different groups to groups that were marketed at 33 d., both relative TR and relative costs increased gradually with increasing marketing age and D5 recorded the highest TR and TC, additionally, they increased TR& TC more than D1 by 16.48 and 26.58 %. While D5 recorded a similar NP to D1. Additionally, the group that was marketed at 33 d. reduced TR and TC by about 14.07 % and 20.96%, respectively to the group marketed at 41 days. So, birds marketed at 33 d. can be used efficiently to save costs and obtain similar NP.

3.3. Production and cost function of all experimental groups

A notable positive relationship was observed between market age and BW, BWG, total feed intake, FCR, TR, TC, and NP, as presented in table 4.

Table (1): Effect of different marketing ages on the growth performance of Ross chicken.

	33 d	35 d	37 d	39 d	41 d	P value
Initial weight	41.75±1.18	43.00±1.08	42.00±1.08	42.00±1.22	42.25±1.31	NS
Final weight	1400.12^{e}±22.76	1586.65^{d}±14.25	1709.35^{c}±24.28	1914.46^{b}±15.87	2028.55^{a}±13.42	<0.001
Body weight gain	1358.37^{e}±23.13	1543.65^{d}±13.19	1667.35^{c}±23.8	1872.46^{b}±14.83	1986.30^{a}±12.57	<0.001
ADG	41.16^{c}±0.7	44.10^{b}±0.38	45.06^{b}±0.64	48.01^{a}±0.38	48.45^{a}±0.31	<0.001
RGR	188.41^{d}±0.41	189.45^{cd}±0.17	190.41^{bc}±0.21	191.42^{ab}±0.19	191.84^{a}±0.22	<0.001
Feed intake	2004.51^{e}±44.44	2410.84^{d}±35.39	2703.46^{c}±43.18	3089.82^{b}±74.34	3431.82^{a}±70.28	<0.001
FCR	1.48^{c}±0.05	1.56^{bc}±0.02	1.62^{ab}±0.01	1.65^{ab}±0.03	1.73^{a}±0.03	<0.01
ADFI	60.74^{d}±1.35	68.88^{c}±1.01	73.07^{bc}±1.17	79.23^{ab}±1.91	83.70^{a}±1.71	<0.001
Broiler index	280.05±14.59	282.58±5.31	266.38±3.98	279.08±3.23	268.93±3.55	NS

Means within the same rows carrying a-b-c-d significantly differ. NS (non-significant).

Table (2): Effect of different marketing ages on the carcass traits of Ross chicken.

	33 d	35 d	37 d	39 d	41 d	P value
Dressing %	70.09^{b} ±1.37	72.70^{ab} ±1.3	74.50^{a} ±1.56	74.72^{a} ±0.72	73.25^{ab} ±0.13	≤0.05
Liver %	3.1±0.56	2.22±0.05	2.47±0.25	2.6±0.09	2.5±0.08	NS
Gizzard %	3.45^{a}±0.6	2.15^{ab}±0.1	3.00^{ab}±0.38	1.68^{b}±0.09	1.91^{ab}±0.25	<0.05
Heart %	0.61^{ab}±0.12	0.54^{ab}±0.05	0.46^{b}±0.02	0.84^{a}±0.08	0.61^{ab}±0.1	≤0.05
gizzard fat %	0.99±0.08	0.7±0.19	0.59±0.32	0.76±0.15	0.5±0.2	NS
abdominal fat %	0.51^{b}±0.31	0.99^{ab}±0.05	1.57^{a}±0.15	1.09^{ab}±0.1	0.45^{b}±0.14	< 0.01
Intestine %	5.8±0.64	5.83±0.5	6.29±1.13	8.19±0.78	5.8±0.56	NS
Lung %	0.56^{ab}±0.03	0.55^{b}±0.04	0.46^{b}±0.01	0.47^{b}±0.01	0.73^{a}±0.06	<0.01
Proventiculus %	0.66±0.1	0.48±0.06	0.54±0.06	0.54±0.06	0.59±0.08	NS
Spleen %	0.24±0.09	0.09±0.05	0.15±0.05	0.3±0.03	0.18±0.02	NS
Thymus %	0.73±0.13	0.51±0.04	0.51±0.01	0.71±0.08	0.51±0.07	NS

Means within the same rows carrying a-b-c-d significantly differ. NS (non-significant).

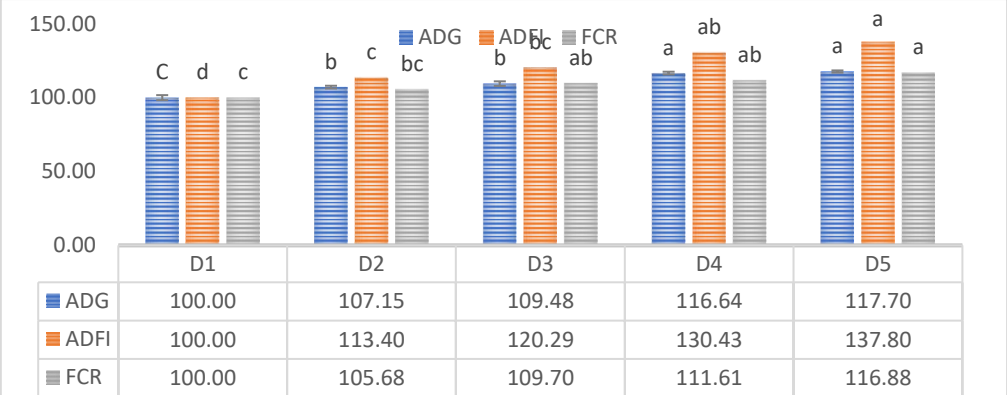
Table. 3. Effect of different marketing ages on the economic efficiency of Ross chicken.

	33 d	35 d	37 d	39 d	41 d	P value
Chick price	5.00	5.00	5.00	5.00	5.00	
Management cost	9.24^{e}	9.80^{d}	10.36^{c}	10.92^{b}	11.48^{a}	<0.001
Feed cost	48.11^{e}±1.07	57.86^{d}±0.85	64.88^{c}±1.04	74.16^{b}±1.78	82.36^{a}±1.69	<0.001
TVM	2.24^{e}	2.38^{d}	2.52^{c}	2.65^{b}	2.79^{a}	<0.001
TVC	64.59^{e}±1.07	75.04^{d}±0.85	82.76^{c}±1.04	92.73^{b}±1.78	101.63^{a}±1.69	<0.001
TFC	0.20^{e}	0.21^{d}	0.22^{c}	0.23^{b}	0.25^{a}	<0.001
TC	64.79^{e}±1.07	75.25^{d}±0.85	82.98^{c}±1.04	92.96^{b}±1.78	101.88^{a}±1.69	<0.001
Bird selling	100.81^{e}±1.64	114.24^{d}±1.03	123.07^{c}±1.75	137.84^{b}±1.14	146.06^{a}±0.97	<0.001
Litter sale	0.99^{e}	1.05^{d}	1.11^{c}	1.17^{b}	1.23^{a}	<0.001
TR	101.80 ^{e} ±1.64	115.29 ^{d} ±1.03	124.18 ^{c} ±1.75	139.01 ^{b} ±1.14	147.29 ^{a} ±0.97	<0.001
GM	37.21^{b}±2.51	40.25^{ab}±1.11	41.42^{ab}±0.9	46.28^{a}±0.88	45.65^{a}±1.17	<0.01
NP	37.01^{b}±2.51	40.04^{ab}±1.11	41.20^{ab}±0.9	46.05^{a}±0.88	45.41^{a}±1.17	<0.01
Profitability index	0.36^{a}±0.02	0.35^{ab}±0.01	0.33^{ab}±0	0.33^{ab}±0.01	0.31^{b}±0.01	<0.05
BCR	1.57^{a}±0.05	1.53^{ab}±0.02	1.50^{ab}±0.01	1.50^{ab}±0.02	1.45^{b}±0.02	<0.05
TC per live BW	46.34^{b}±1.4	47.43^{ab}±0.57	48.55^{ab}±0.28	48.55^{ab}±0.59	50.22^{a}±0.63	<0.05
TR per live BW	72.71^{a}±0.01	72.66^{b}±0.01	72.65^{b}±0.01	72.61^{c}±0.01	72.61^{c}±0.008	<0.001
NP per live BW	26.37^{a}±1.39	25.23^{ab}±0.57	24.10^{ab}±0.27	24.06^{ab}±0.59	22.39^{b}±0.63	<0.05
TC per day	1.96 ^{d} ±0.03	2.15^{c}±0.02	2.24 ^{bc} ±0.03	2.38 ^{ab} ±0.05	2.48 ^{a} ±0.04	<0.001
TR per day	3.08 ^{c} ±0.05	3.29 ^{b} ±0.03	3.36 ^{b} ±0.05	3.56 ^{a} ±0.03	3.59 ^{a} ±0.02	<0.001
NP per day	1.12±0.08	1.14±0.03	1.11±0.02	1.18±0.02	1.11±0.03	NS

Means within the same rows carrying a-b-c-d significantly differ. NS (non-significant).

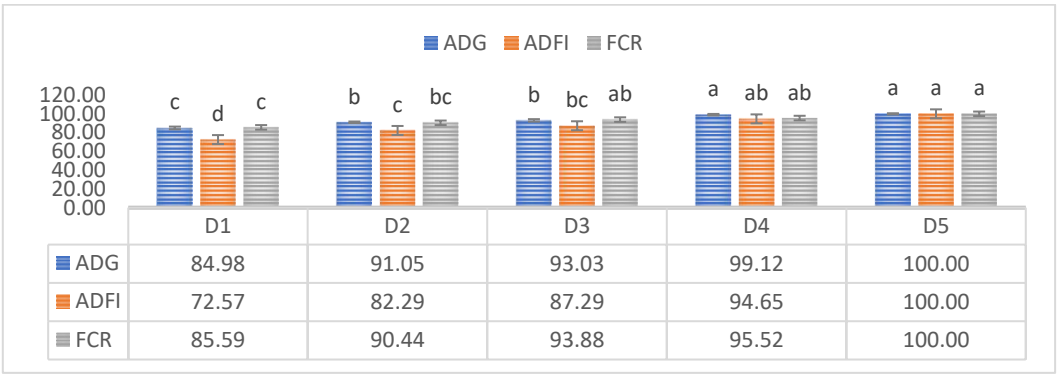
Table .4. Production and cost function of marketing age.

Parameters	Logarithmic function	F	R^{-2}
Production function market age and body weight	Log market age = 0.54+1.71 log BW t (4.81)*** (23.93)***	573.06***	0.968
Production function market age and body weight gain	Log market age =0.46 +1.76 log BWG t (4.06)** (24.27)***	589.03***	0. 969
Production function market age and total feed intake	Log market age = -0.40 + 2.44 log TFI t (-2.25)* (21.48)***	461.54***	0.96
Production function market age and FCR	Log market age = -0.86 + 0.68 log FCR t (-4.90)*** (6.06)***	36.82***	0.65
Production function market age and TR	Log market age =- 0.58+1.71 log TR t (-5.26)*** (24.07)***	579.43***	0.968
Cost function market age and total feed cost	Log market age = -2.02 + 2.44 log total feed cost t (-11.33)*** (21.48)***	461.54***	0.96
Cost function market age and total cost	Log market age = -1.31 + 2.06 log total cost t (-9.57)*** (23.55)***	554.65***	0.967
Production function market age and NP	Log market age = -0.01 + 1.04 log NP t (-0.029) (4.90)***	24.08***	0.549



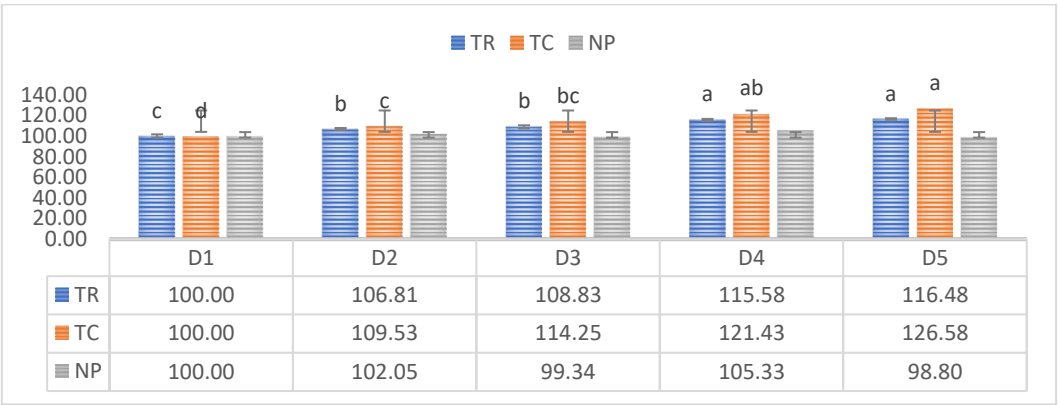
	D1	D2	D3	D4	D5
ADG	100.00	107.15	109.48	116.64	117.70
ADFI	100.00	113.40	120.29	130.43	137.80
FCR	100.00	105.68	109.70	111.61	116.88

Fig. 1. Growth performance relative to the lowest marketing age (33 d)



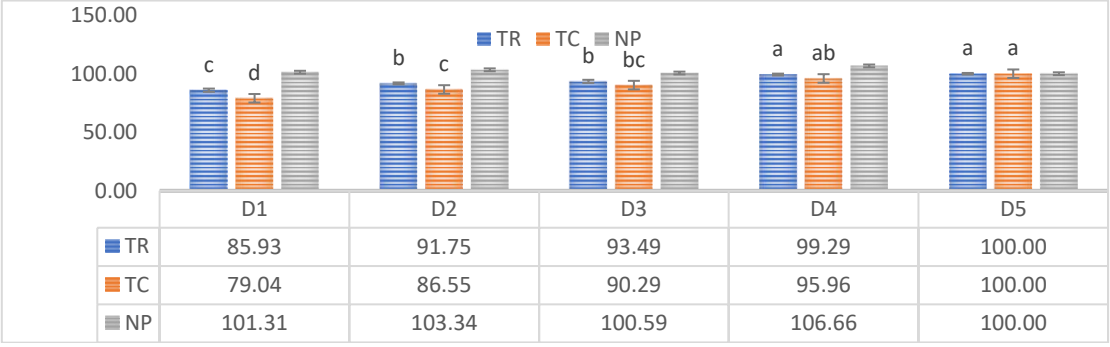
	D1	D2	D3	D4	D5
ADG	84.98	91.05	93.03	99.12	100.00
ADFI	72.57	82.29	87.29	94.65	100.00
FCR	85.59	90.44	93.88	95.52	100.00

Fig.2. Growth performance relative to the highest marketing age (41 d)



	D1	D2	D3	D4	D5
TR	100.00	106.81	108.83	115.58	116.48
TC	100.00	109.53	114.25	121.43	126.58
NP	100.00	102.05	99.34	105.33	98.80

Fig. 3. Economic efficiency relative to the lowest marketing age (33 d)



	D1	D2	D3	D4	D5
TR	85.93	91.75	93.49	99.29	100.00
TC	79.04	86.55	90.29	95.96	100.00
NP	101.31	103.34	100.59	106.66	100.00

Fig. 4. Economic efficiency relative to the highest marketing age (41 d)

4. DISCUSSION

The length of the production cycle and choices made about selling broilers are significant considerations, along with efficiency and financial success (Szőllősi et al., 2014). Our results noted that BW, BWG, ADG, RGR, FI, FCR, and ADFI were significantly increased with the increasing marketing age. Regarding the effect of marketing age on studied variables (Table 4), about 96.8% of the change in BW was due to the change in marketing age, and a 1% increase in marketing age resulted in a 1.71% increase in BW. Moreover, about 96.9% of the change in BWG was due to the change in marketing age, and a 1% increase in marketing age resulted in a 1.76 % increase in BWG. The findings of this study were consistent with Połtowicz, (2012) who found that FBW increased as the marketing age increased. Moreover, the results in this study were similar to observations of Szőllősi et al. (2014) who demonstrated that the average body weight exhibited a gradual increase with age, rising approximately 52.01% from 1.98 kg at 35 days to 2.99 kg at 49 days of age. Concerning the influence of market age on FI, it was revealed that about 96 % of the change in TFI was due to the change in marketing age, each 1% increase in marketing age resulted in a 2.44 % increase in FI. Regarding the effect of marketing age on FCR it is revealed that about 65 % of the change in FCR was due to the change of marketing age, and 1% increase in marketing age led to a 0.68 % increase in FCR. These results agreed with Shehata and Elsokary (2024) who recorded increasing FCR with increasing marketing age in broiler chickens.

On the same trend, FI was increased with increasing age as showed by Wang et al. (2012). Our results agreed with Abougabal and Taboosha (2020) who noted that FCR increased with the increasing age of birds. Also, Schmidt (2008) recorded a 2.1% increase in FCR per day of increasing marketing age. As birds grew older, their feed conversion ratio increased because they needed more energy to maintain their bodies, generate body fat, and engage in activities, all of which contributed little to their overall weight. It is widely recognized that FCR improves as the bird's age increases (Lesson, 2000).

The food conversion rate is regarded as the most effective metric for assessing the ability of broilers to transform feed intake into increased live weight. The primary objective of broiler breeders is to achieve rapid growth in broilers, enabling them to attain their final weight in a shorter timeframe while minimizing feed consumption. This approach serves as a favorable economic indicator for meat production initiatives (Majeed, 2009). As the marketing age increased from 33 to 39 d., the dressing % increased after that it decreased. Our results agreed with Abougabal and Taboosha (2020) who reported that delaying the marketing age of broilers caused a significant and positive increase in BW of birds which reflects an increase in the whole carcass (dressing %). Similar to our observations were also found by Połtowicz (2012) who found that the age of birds had a significant effect on the gizzard percentage. However, these results disagreed with Smaldone et al. (2021); Tavaniello et al. (2022) who noted that there are no substantial differences in gizzard % in broiler chickens.

Regarding economic efficiency measures such as the feed cost, total cost, TC per day, TR per day, and total return, significantly increased gradually by increasing the marketing age. Concerning the effect of market age on total feed cost (Table 4), it revealed that about 96% of the change in total feed cost was due to the change in market age, and 1% increase in market age resulted in 2.44% increase in total feed cost. Additionally, market age has a positive effect on total cost, revealing that about 96.7% of the change in total cost was due to the change in market age, and a 1% increase in market age resulted in 2.06% increase in total cost. This is caused by the increasing rearing period which resulted in increasing feed consumption which resulted in increasing feeding cost and increasing total cost as feed cost, is the main item in the variable cost, making up to 70% of it (Samarakoon and Samarasinghe, 2012). This was mainly because as the marketing age increased, the FCR progressively rised. A high FCR level rised the total cost (Karaman et al., 2023). Regarding the effect of marketing age on NP revealed that about 54.9 % of the change in NP was due to the change of market age, and the 1% increase in marketing age resulted in 1.04 % increase in NP.

Additionally, the duration of the cycle is significant in determining the broiler industry's yearly profit. Increasing the duration of the cycle resulted in a higher return per bird while reducing the time that took for the birds to grow leading to more harvests in a year (Samarakoon and Samarasinghe, 2012).

Birds that were marketed at 33 d. had a significant increase in NP per kg live body weight, profitability index, and benefit-cost ratio (BCR) over D5 which was marketed at 41, this indicated better economic efficiency of lower market age. Additionally, birds marketed at 33 d can be used efficiently to save costs

and obtain similar NP to those of 41 d, Similarly, Yalçın et al. (2014) showed that some producers thought that selling their chickens sooner is preferable and offer a market advantage. Similarly, if we adopted the market age to 33 days it would result in more than an extra cycle per year, these results were in agreement with Kleyn (2002) who observed adopting a 38-day cycle length with an 11-day cleanout period would yield an extra harvest each year, in contrast to the traditional approach of 42-day cycles accompanied by 14-day downtime intervals.

5. CONCLUSION

This study was intended to assess how different marketing ages affected the Ross chickens' growth performance, carcass characteristics, and economic efficiency. Our findings declared that changes in broiler marketing age were associated with highly significant changes in BW, BWG, ADG, RGR, FI, FCR, ADFI, feed cost, total cost, TC per day, TR per day, and total return. Birds that were marketed at 33 d. had a significant increase in NP per kg live body weight, profitability index, and benefit-cost ratio (BCR) over those marketed at 41d., this was explained by the best FCR which was recorded at market age of 33 d. this indicates better economic efficiency of lower market age.

Author's declarations

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