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Effect of Sex, type of feed and age at slaughter on carcass yield characteristics of japanese quails *(cortunix japonica)* in Malawi

Abstract

The study was carried out to evaluate carcass yield characteristics of Japanese quails (Cortunix japonica). A total of 120 Japanese quails were slaughtered at three (3) different ages: five, eight and eleven weeks, to compare the effects of sex, type of feed and age at slaughter on carcass yield composition. The birds were randomly allocated to two treatments based on type of feed with 60 birds (30 males and 30 females) in each treatment. Treatment one used commercial feed; broiler starter mash with 22.5% Crude Protein (CP), 18.7% CP layers. Treatment two used on-farm formulated feed, with 24.6% CP starter and grower, and 20.2% CP layers. 20 quails (10 males and 10 females) from each treatment were slaughtered at the ages of five, eight and eleven weeks. Before slaughter the birds were starved overnight and then weighed individually. Thereafter, they were slaughtered, bled, scalded and plucked, eviscerated and dissected manually. Data collected included: live body weight, weight of gizzards, drum stick, thighs, heads, breast muscles, back, chilling loss, full and empty Gastrointestinal tract (GIT), wings, legs, necks, dressing out percentage, hot carcass and cold carcass weights. The results showed that sex, age and feed have significant effect ($P<0.05$) on carcass yield. The results also showed that quails at the age of 5 weeks have higher hot and cold carcass weights and higher slaughter weights at the age of 11 weeks. The results also showed significant differences ($P<0.05$) in some parts of the carcass between males and females with females having higher carcass parts than males. It was concluded that quails should be slaughtered around 5-6 weeks of age so as to obtain higher carcass yields.

Keywords: cold/hot carcass, on-farm, soybean, cortunix japonica

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Introduction

Japanese quail is one of the smallest avian species reared for meat and egg production.[1] Both quail meat and eggs are characterized by high nutritive value that is low in fat and cholesterol[2] which is of particular importance considering the increasing cases of cardiovascular diseases in humans worldwide. Diversification into quail rearing which have short generation interval with low production costs provide a clear solution to animal protein shortage in developing countries including Malawi with 85% of its population living in rural areas occupied by subsistence farming.[3]

Nutritional protein deficiency is a major problem in developing countries such as Malawi, chicken meat and eggs which is the cheap source of animal protein in most poor resource base rural communities in the world is not able to meet the increasing demand of protein.[4] Despite the human health benefits from quail products and the profitability of rearing quails as emerging non-conventional livestock in the world, most poultry farmers in developing countries have not adapted the quail rearing as a commercial livestock enterprise. This can be associated with lack of documented information about quail farming, health benefits, market for products and the small size of the bird by most farmers in Malawi and other developing countries. The study on quail carcass characteristics is important in determining the profit margins in commercial quail farming which depends largely on the number and productivity of the birds. According to Mussah and Phoya,[5] Malawi poultry industry is going through a gradual change in terms of product differentiation in response to consumer demands. The cheap nutritional poultry protein is important in developing countries such as Malawi with limited protein alternative sources compared to developed countries with a wide range of protein sources. Adoption of quail rearing for commercial purposes in Malawi will improve the livelihoods of the rural communities and provide them with a cheap supply of nutritional protein; quails can easily be integrated with other conventional livestock.

Materials and methods

Experimental design and study area

The study was conducted at Animal Science Department, Bunda campus of the Lilongwe University of Agriculture and Natural Resources (LUANAR), Malawi. One hundred and twenty (120) day old quails were used in this study, where they were reared under intensive management system in cages. The quails were randomly allocated to 2 treatment groups, 60 birds in each treatment with equal number of males and females per treatment. Treatment one had 22.5% CP (starter and grower feeds) and 18.7% CP (finisher and layer feeds). In treatment two on-farm formulated feed containing 24.6% CP (starter and grower feeds) and 20.2% CP (finisher and layer feeds) was used. A total of 20 Japanese quails (10 males and 10 females) were randomly selected and slaughtered at ages of 5, 8 and 11 weeks from each treatment. The feed ingredients included: Maize meal, soybean meal, fish meal, premix, salt, MCP, lime,

DL-methionine and L-lysine in proportions calculated according to nutrient requirement levels of each treatment and stage of growth of the birds. After the feed was formulated samples of both feed were taken for analysis in the animal nutrition research laboratory and it was found that the starter mash feed had 7587KJ gross energy while the layers' mash had 6596KJ gross energy and Crude Protein (CP) was found to be 24.6% and 20.2% respectively. While the commercial feed had 22.5% CP starter and 18.7% CP layers mash.

Data collection

Data which was collected at the ages of 5,8 and 11 weeks, included; live body weight, weight of gizzards, drum stick, thighs, heads, breast muscles, back, wings, legs, necks, chilling loss, feathers, full gastrointestinal tract empty gastrointestinal tract, head, kidney, dressing out percentage, hot carcass and cold carcass weights.

Data analysis

Data was analyzed using the General Linear Model (GLM) procedures of SAS 12.1.

Statistical Model

$$Y_{ijk}=\mu+F_i+A_j+S_k+(FA)_{ik}+(FS)_{jk}+(FAS)_{ijk}+\mathcal{E}_{ijk}$$

Where; Y_{ijk}=Observed carcass yield characteristics

μ=Overall mean of the observation

F_i=Effect of the Feed (i=1, 2)

A_j=Effect of the age (j=1, 2, 3)

S_K=Effect of the sex (k=1, 2)

$(FA)_{ij}$=Interaction effect of feed and age

$(FS)_{ik}$=Interaction effect of feed and sex

$(FAS)_{ijk}$=Interaction effect of feed, age and sex

$\mathcal{E}_{ijk}$=Random error component

Results and discussions

Effect of sex on carcass yield characteristics

Table 3 the main effect, sex, was significant ($P<0.05$) on full gastrointestinal tract (GIT) content, empty GIT content, cold carcass and gizzard %. Female quail birds had a higher mean value than the male counterpart (163.0g Vs 148.0g). These results concur with studies by[6] which reported that the Japanese quail is a sexually dimorphic bird with females having a larger body size than males unlike other poultry species. The quail birds showed differences in growth pattern between sexes, the males displayed slightly higher hot and cold carcasses percentages than the females (68.4% Vs. 65.0%) and (67.8% Vs. 64.0%) respectively. This difference could be associated with the aggressiveness of males over the females especially when reared together, the females are disadvantaged during feeding and watering.[7] However, the growth pattern variation was different with the results by in which female quails produced higher carcass yields than male quails, the smaller body weight and decrease in live weight in male quails was associated with higher metabolic rates and hormonal change respectively. Musa et al.[8] and Ilori et al.[9] in their studies postulated that the differences in growth pattern and carcass weight in male and female quails could be due to feed metabolism/onset of fattening and differences in hormonal profile, aggressiveness and dominance especially when both sexes are reared together respectively. Other parameters (Feather (%), Hot carcass (%), Dress (%), Chilling loss (%), Drumstick (%), Wings (%), Liver (%), Legs (%), Kidney (%), Necks (%), Thighs (%), Gizzard (%), Breast (%), and Back (%)) which showed insignificant differences could be associated with environmental and feed factors as suggested by.

Table 1 24% CP (starter and grower) formulated feed ingredients proportions

Ingredients	Amounts (Kg)
Maize	53.66
Soybeans	38.99
Fish meal	5
Salt	0.1
Premix	0.3
MCP	0.02
Lime	1.7
DL - Methionine	0.15
L - Lysine	0.08
Total	100

Table 2 20 % CP (Layers mash) feed ingredients proportions

Ingredients	Amounts(Kg)
Maize	59.6
Soybeans	28.2
Fish meal	5.00
Salt	0.10
Premix	0.30
MCP	0.30
Lime	6.30
DL - Methionine	0.15
L - Lysine	0.10
Total	100.0

Table 3 Effect of sex on carcass yield characteristics of Japanese quails

Sex/Attribute	Male	Female	SEM	P
Slaughter weight (g)	148	162.9	5.19	0.06
Feather (%)	5.01	4.86	0.186	0.575
Full GIT (%)	7.80[a]	9.15[b]	0.183	<0.001
Empty GIT (%)	6.13[a]	7.40[b]	0.15	<0.001
Hot carcass (%)	68.4	65.1	1.38	0.11
Cold carcass (%)	67.9[a]	64.0[b]	1.28	0.057
Dress (%)	68.4	62.8	2.09	0.083
Chilling loss (%)	0.551	0.992	0.295	0.312
Drumstick (%)	9.5	9.34	0.157	0.482
Head (%)	5.21[a]	4.32[b]	0.236	0.021
Heart (%)	0.870[a]	0.748[b]	0.031	0.028
Wings (%)	10.5	10.5	0.202	0.768

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Table Continued....

Sex/Attribute	Male	Female	SEM	P
Liver (%)	2.61	2.94	0.169	0.187
Legs (%)	1.72	1.68	0.079	0.737
Kidney (%)	1.1	0.992	0.054	0.181
Necks (%)	9.17	8.81	0.411	0.543
Thighs (%)	15.3	14.7	0.344	0.267
Gizzard (%)	2.40[a]	2.60[b]	0.123	0.012

[ab]: Means with different superscripts within rows are significantly different (P<0.05)

Effect of age on carcass yield characteristics

Table 4 The results show significant difference (P<0.05) in means of the Slaughter weight (g), at the age of 5, 8 and 11weeks, 130.6g, 166.7g and 169.0g respectively. Quails will attain the best slaughter weight (169.0g) at the age of 11 weeks under a good feeding management. According to Wilkkanowska et al.[10] quail carcass yield characteristics are affected by age, the body weight increases with age, older birds have higher carcass weight compared to young birds. The hot and cold carcasses percentages at 5, 8 and 11 weeks were (70.8% and 68.9%), (66.8% and 66.6%) and (62.6% and 62.3%) respectively. The dressing percentage had a similar trend, 70.8%, 66.8% and 59.3% in weeks 5, 8 and 11 weeks respectively. This indicates that at week 5 is the best age at which greater carcass yield can be realized, the dressing percentages, hot and cold carcass percentages are higher in week 5 compared to the percentages at weeks 8 and 11. Disposing the birds at this stage will therefore reduce the production costs in terms of reduced feed costs and increase the profit margins. These results are in agreement with those of[11] who suggested the appropriate age to slaughter the quail bird is between 5 to 6 weeks of age. Other parameters such as Feather (%), Full GIT (%), Empty GIT (%), Heart (%), Liver (%), Gizzard (%) showed significant differences (P<0.05) in relation to slaughter weight while the Drumstick (%), Wings (%), Legs (%), Thighs (%) had significant differences in relation to the cold carcass weight.

Effect of feed on carcass yield characteristics

Results in table 5 showed significant differences (P<0.05) on heart % and gizzard %. Treatment 2 showed higher average slaughter weight with 162.2g while in treatment 1, a mean of 148.7g was recorded. No significant differences (P<0.05) were observed in Slaughter weight (g), Feather (%), Full GIT (%), Empty GIT (%), Hot carcass (%), Cold carcass (%), Dress (%), Chilling loss (%), Drumstick (%), Head (%), Wings (%), Liver (%), Legs (%), Kidney (%), Necks (%), Thighs (%), Breast muscle (%), Back (%). The lack of significant differences between the two treatments for these parameters showed that the feeds the quails were fed during the study did not have any effect on the carcass characteristic traits; the two feeds had small differences in their CP levels. However, in another study by[12] in which two groups of Japanese quails were subjected to diets of varying dietary energy to protein ratio on productive performance and carcass characteristics had significantly different carcass yields, quails fed on higher CP diet producing higher carcass yields compared to those fed on low CP diet. The proportions of breast, legs, neck and back bone between treatments were significant (P<0.05).

Effect of interactions on carcass characteristics

Statistical analysis did not show significant differences of the interactions among the three factors (feed, sex and age), in all productive and measured vital organs of the Japanese quail.

Table 4 Effect of age on carcass yield characteristics of Japanese quails

Age/ Attribute	5 Weeks	8 Weeks	11 Weeks	SEM	P
Slaughter weight (g)	130.6[a]	166.7[b]	169.0[c]	6.35	<0.002
Feather (%)	5.74[a]	4.47[b]	4.59[c]	0.227	<0.004
Full GIT (%)	9.65[a]	8.31[b]	7.47[c]	0.224	<0.001
Empty GIT (%)	6.37[a]	7.26[b]	6.65[c]	0.184	<0.005
Hot carcass (%)	70.8[a]	66.8[b]	62.6[c]	0.1688	<0.005
Cold carcass (%)	68.9[a]	66.6[b]	62.3[c]	1.565	<0.001
Dress (%)	70.8[a]	66.8[b]	59.3[c]	2.562	<0.008
Chilling loss (%)	1.82[a]	0.233[b]	0.267[c]	0.361	<0.009
Drumstick (%)	10.7[a]	8.79[b]	8.77[c]	0.193	<0.000
Head (%)	4.82	5.02	4.46	0.289	0.631
Heart (%)	0.897[a]	0.771[b]	0.760[c]	0.037	<0.024
Wings (%)	11.8[a]	10.1[b]	9.65[c]	0.248	<0.001
Liver (%)	2.08[a]	3.65[b]	2.59[c]	0.207	<0.000
Legs (%)	1.64[a]	1.80[b]	1.67[c]	0.095	<0.261
Kidney (%)	0.949	1.05	1.14	0.053	0.296
Necks (%)	9.15	8.51	9.3	0.504	0.382
Thighs (%)	15.9[a]	14.1[b]	14.9[c]	0.421	<0.011
Gizzard (%)	2.86[a]	2.18[b]	2.46[c]	0.150	<0.007
Breast (%)	29.1	34.1	32.3	2.81	0.236

[abc] : Means with different superscripts within rows are significantly different (P<0.05)

Table 5 Effect of Feed on carcass yield characteristics of Japanese quails

Feed/attribute	Proto feed (T1)	Formulated feed (T2)	SEM	P
Slaughter weight (g)	148.7	162.2	5.19	0.091
Feather (%)	4.78	5.08	0.186	0.281
Full GIT (%)	8.38	8.57	0.183	0.475
Empty GIT (%)	6.63	6.89	0.15	0.252
Hot carcass (%)	67.8	65.7	1.38	0.306
Cold carcass (%)	66.7	65.2	1.28	0.426
Dress (%)	67.8	63.5	2.092	0.171
Chilling loss (%)	1.07	0.474	0.295	0.18
Drumstick (%)	9.36	9.49	0.157	0.573
Head (%)	4.79	4.74	0.236	0.879
Heart (%)	0.867[a]	0.752[b]	0.031	0.021
Wings (%)	10.8	10.2	0.202	0.065
Liver (%)	2.89	2.66	0.169	0.343

Table Continued....

Feed/attribute	Proto feed	Formulated feed (T2)	SEM	P
	(T1)			
Legs (%)	1.78	1.62	0.078	0.163
Kidney (%)	1.08	1.01	0.054	0.358
Necks (%)	9.09	8.88	0.411	0.724
Thighs (%)	14.9	15.1	0.344	0.614
Gizzard (%)	2.36[a]	2.64[b]	0.123	0.023
Breast muscle (%)	32.9	31.1	2.3	0.638
Back (%)	21.9	21.2	0.591	0.396

[abc]: Means with different superscripts within rows are significantly different (P<0.05).

Conclusion

Carcass yield of Japanese quail is affected by several factors such as age, sex and feed. Female quail birds registered higher carcass traits than the male counter parts. Female quail birds have higher slaughter weight as compared to the males. The study concludes that the optimal age to slaughter quail birds is around 5-6 weeks. Higher carcass yields as well as hot and cold carcass percentages are realized at this age.

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Conflict of interest

The author declares no conflict of interest.

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