THE EFFECT OF SEX , DIETARY PROTEIN AND ENERGY LEVELS ON QUAIL CARCASS COMPOSITION

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Background

The use of quail meat for food is becoming increasingly important in many countries. Although broiler and turkey carcass characteristics are now receiving considerable attention and have been extensively studied (Moran, 1977; Jackson et al., 1982; Leeson and Summers, 1980; Leeson et al., 1996; Orr et al.,1984) little information has been reported on those of the quail carcass (Edwards, 1981; Caron et al. 1990; Marks, 1993; Toelle et al., 1991).

Many factors affect the quality of the carcass including age, sex, genotype, brooding temperature and diet (Moran, 1977). According to Leeson & Summers (1997) while carcass yield is largely a factor of age and genetics, carcass composition can to a large extent be modified trough diet choice. It is known that diets high in energy produce fatter carcasses in broilers and vice versa. On the other hand, high protein diets produce broilers with leaner carcasses. The balance of protein to energy is quite important and broilers fed high protein diets tended to show leaner carcasses due to less fat deposition rather than to higher protein deposition (Leeson & Summers, 1997). However, Kirkpinar & Oguz (1995) studying the effect of dietary protein varying from 160 to 300 g/kg in isocaloric diets found that carcass protein content increased with higher dietary protein. Carcasses with the highest fat content were obtained from quails receiving the low protein diet. Edwards (1981) studying carcass composition of an unselected population of quails reported that the water content of the carcass decreased as the concentration of protein in the diet increased and the birds aged, whereas the carcass protein content increased with dietary protein and age. Carcass ash content did not change with age or diet, whereas the carcass fat content increased with age.

Objectives

The objective of the present study was to evaluate the influence of the sex and diets containing different protein and energy levels on carcass yield and composition of Italian quails for meat production.

Methods

768 one-day-old Italian quails, were reared during 42 days on floor. They were distributed in 48 groups of 16 birds, being 8 males and 8 females each. The experimental design was completely randomized in a factorial arrangement with 16 treatments including 4 levels of protein and 4 levels of metabolizable energy and 3 repetitions per treatment.

At the end of the experimental period six males and six females from each treatment (192 birds) were fastened for 4 hours, individually weighed, slaughtered (CO_2 stunning and bleeding), plucked and eviscerated. Carcasses were then weighed to determine carcass yield, individually packaged in polyethylene sacs and frozen at –20 ºC.

Proximal composition including moisture, fat, protein and ash were determined according to AOAC (1990) in samples prepared by grinding (5mm plate) 2 female carcasses and 2 male carcasses per repetition.

Data were subjected to analysis of variance by the General Linear Models procedures of SAS Institute (1990). Differences among means were determined by SNK test (Sampaio, 2000) with significance at $P< 0.05$.

Results and Discussion

Changes in dietary protein and energy levels (Tables 1 and 2, respectively) altered significantly ($P<0,05$) carcass composition. However sex affected just carcass yield (Table 3). Males had a higher percentage of carcass yield than females.

Protein and ash content of Italian quail carcasses were not affected by protein and energy levels of the diets. According to Leeson & Summers (1997) for broilers diet protein has no effect on the quantity of protein deposited in the carcass, except when very low protein diets are used. Contrary to these results Edwards (1981) and Kirkpinar & Oguz (1995) found an increase in quail carcass protein and ash content as the level of dietary protein increased.

Carcass moisture content was influenced by dietary protein and energy levels, increasing in a quadratic manner as the protein level increased. Moisture content reached a maximum point at the level of 23,39% of crude protein and after this point it decreased. However carcass moisture content showed a linear relationship with dietary energy levels, with water content decreasing as the energy level increased.

The fat content of quail carcass was affected linearly by dietary energy. As the dietary energy level changed from 2,700 to 3,150 kcal ME/kg the content of fat in carcass increased. Seaton et al. (1978) observed an increase in carcass fat and a decrease in carcass moisture of broilers with an increase in the dietary energy level while carcass protein was unaffected. These results are in according to those obtained in this trial using quails for meat. Also, Leeson & Summers (1997) stated that with low energy diets leaner broilers can be produced by reducing fatness, rather than by increasing lean meat deposition.

Conclusions

Quail carcass yield was affected by sex, but not by the dietary protein and energy levels studied.

Carcass fat content increased and carcass moisture decreased as the energy level of diets increased.

The increase in carcass moisture related in a quadratic manner with the increase in dietary protein levels.

Dietary protein and energy levels used in this study did not affect carcass protein and ash contents of Italian quail meat

References

AOAC. Official Methods of Analysis, 15th ed., vol. 1 & 2. Association of Official Analytical Chemists, Arlington. 1990. 1018p.

Caron, N., Minvielle, F., Desmarais, M. & Poste, L.M. Mass selection for 45-day body weight in Japanese quail. Poultry Science 60:1037-1045. 1990.

Edwards, H.M. Carcass composition studies 3. Influences of age, sex and calorie-protein content of the diet on carcass composition of Japanese quail. Poultry Science 60: 2506-2512. 1981.

Jackson, S., Summers, J.D. & Leeson, S. Effect of dietary protein and energy on broiler carcass composition and efficiency of nutrient utilization. Poultry Science 61: 2224 - 2231. 1982.

Kirkpinar, F. & Oguz, I. Influence of various dietary protein levels on carcase composition in the male Japanese quail (*Coturnix coturnix japonica*). British Poultry Science 36: 605-610. 1995.

Leeson, S., Caston, L. & Summers, J.D. Broiler response to diet energy. Poultry Science 75: 529-535. 1996.

Leeson, S. & Summers, J. D. Commercial Poultry Nutrition. University Books, Guelph, Ontario, Canada . 1997, 350p.

Leeson, S. & Summers, D. J. Production and carcass characteristics of broiler chickens. Poultry Science 59 : 786-798.1980

Marks, H.L. Carcass composition, feed intake and feed efficiency following long-term selection for four-week body weight in Japanese quail. Poultry Science 72: 1005-1011. 1993.

Moran, E.T. Growth and Meat Yield in Poultry In K.N.Boorman & B.J.Wilson (Eds) Growth and Poultry Meat Production, pp 145-173 (Edinburgh , British Poultry Science Ltd.) 1977.

Orr, H.L., Hunt, E.C. & Randall, C.J. Yield of carcass, parts, meat, skin and bone of eight strains of broilers. Poultry Science 59:786-798, 1984 .

Sampaio, I.B. Estatística aplicada à experimentação animal. Belo Horizonte: Fundação de Ensino e Pesquisa em Medicina Veterinária e Zootecnia, 2000. 221p.

SAS Institute, SAS Users guid:Statistics. Version 6.12 edition. SAS Institute Inc.. Carry, NC. 1990.

Seaton, K.W., Thomas, O.P., Gous, R,.M. & Bossard, E.H. The effect of diet on liver glycogen and body composition in the chick. Poultry Science, 57: 692-698. 1978.

Toelle, V.D., .Havenstein, G.B., Nestor, K.E.,& Harvey, W.R. Genetic and phenotypic relationships in Japanese quail 1. Body weight, carcass and organ measurements. Poultry Science 72 : 1679–1688. 1991.

Table 1. Effect of dietary protein levels on carcass yield and composition of Italian quail[1].

Dietary Protein (%)	Carcass yield (% LW)	Carcass moisture (%)	Carcass fat (%)	Carcass protein (%)	Carcass ash (%)
20	$79.03^{a} \pm 4.38$	$62.72^{b} \pm 3.12$	$17.66^{a} \pm 3.96$	$16.16^{a} \pm 0.78$	$2.71^{a} \pm 0.30$
22	$77.57^{a} \pm 4.37$	$64.49^{a} \pm 1.81$	$15.90^{a} \pm 2.41$	$16.61^{a} \pm 0.77$	$2.86^{a} \pm 0.28$
24	$78.46^{a} \pm 4.50$	$64.85^{a} \pm 2.75$	$15.62^{a} \pm 2.92$	$16.65^{a} \pm 0.95$	$2.74^{a} \pm 0.29$
26	$77.55^{a} \pm 4.64$	$63.57^{ab} \pm 1.94$	$16.54^{a} \pm 2.25$	$16.44^{a} \pm 1.18$	$2.66^{a} \pm 0.26$

[1] Mean values in column with no common superscripts differ significantly (P<0.05)

Table 2. Effect of metabolizable energy levels on carcass yield and composition of Italian quail[1].

Dietary Metab. Energy (kcal ME/kg)	Carcass yield (% LW)	Carcass moisture (%)	Carcass fat (%)	Carcass protein (%)	Carcass ash (%)
2700	$78.35^{a} \pm 4.51$	$64.82^{b} \pm 1.81$	$15.12^{b} \pm 2.26$	$16.66^{a} \pm 1.15$	$2.69^{a} \pm 0.31$
2850	$77.57^{a} \pm 4.71$	$64.49^{a} \pm 2.79$	$15.99^{ab} \pm 2.88$	$16.73^{a} \pm 0.88$	$2.85^{a} \pm 0.29$
3000	$78.68^{a} \pm 4.37$	$63.29^{a} \pm 2.61$	$17.60^{a} \pm 2.98$	$16.09^{a} \pm 0.84$	$2.71^{a} \pm 0.26$
3150	$78.00^{a} \pm 4.39$	$63.04^{a} \pm 2.63$	$16.98^{ab} \pm 3.42$	$16.37^{a} \pm 0.76$	$2.72^{a} \pm 0.29$

[1] Mean values in column with no common superscripts differ significantly (P<0.05)

Table 3. Effect of sex on carcass yield and composition of Italian quail[1].

Sex	Carcass yield (% LW)	Carcass moisture (%)	Carcass fat (%)	Carcass protein (%)	Carcass ash (%)
Male	$81.13^{a} \pm 2.43$	$64.37^{a} \pm 2.35$	$15.90^{a} \pm 2.49$	$16.64^{a} \pm 0.87$	$2.79^{a} \pm 0.26$
Female	$75.17^{b} \pm 4.07$	$63.44^{a} \pm 2.71$	$16.96^{a} \pm 3.41$	$16.29^{a} \pm 0.99$	$2.69^{a} \pm 0.31$

[1] Mean values in column with no common superscripts differ significantly (P<0.05)