Scientific Papers. Series D. Animal Science. Vol. LXI, Number 1, 2018
ISSN 2285-5750; ISSN CD-ROM 2285-5769; ISSN Online 2393-2260; ISSN-L 2285-5750

PATH ANALYSIS FOR DETERMINATION OF RELATIONSHIPS BETWEEN SOME CARCASS PARTS AND CARCASS WEIGHT OF ROSS 308 BROILERS

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Abstract

Direct, indirect and total effects of some carcass parts on carcass weight of Ross 308 broilers were investigated by using path analysis in this study. Feather-sexed 1day old chicks were fed for 42 days. At the end of the feeding period, data of carcass weight (CW), breast weight (BW), thigh weight (TW) and wing weight (WW) were obtained from totally 36 birds (18female-18male), slaughtered at 42 days old. The results indicated that BW, TW and WW had statistically important effects on CW of the broilers. Total and direct effects of TW and BW were higher than the effect of WW. However the indirect effect of WW on CW was higher than the effect of BW. Based on the data, it can be concluded that breast and thigh weights have a high correlation with carcass weight but wing weight also can be used for predicting total carcass weight due to the indirect effect on CW.

Key words*: broiler, carcass parts, path analysis.*

INTRODUCTION

Main purpose of the broiler industry is to obtain carcasses having high quality and weight. Carcass can be defined as the part without head, internal organs, feather and feet (Atasoy and Aksoy, 2005; Anonymous, 1987). The breast muscle is the most valuable part of the carcass. Reducing abdominal fat and increasing the proportional weight of the breast muscle is the way of improving the profitability of broiler production (Bihan-Duval et al., 1999). Breast has received more attention in lots of studies. Thigh muscles followed the breast muscle. A few studies have interested other carcass parts, such as wings, shank and head (Ikeobi et al., 2004; Park et al., 2006; Gao et al., 2009).
Direct, indirect and total effects of some carcass parts on carcass weight of Ross 308 broilers were investigated by using path analysis in this study.

MATERIALS AND METHODS

All feeding and husbandry conditions were same with the advices of company, producing the genotypes. The diet was a typical corn-soybean based, which was formulated to meet all nutrient recommendations in the Ross rearing guidelines (Aviagen, 2007). Chicks were vaccinated against infectious bursal disease and Newcastle disease via drinking water at 9 and 13 days old, respectively. At day 42, 18 male and 18 female birds, representing the average body weight of the herd were selected and slaughtered to obtain the carcass parts.
Path analysis was used to explore the direct, indirect and total effects of some carcass parts on carcass weight.

RESULTS AND DISCUSSIONS

Descriptive statistics of data (carcass weight, thigh weight, breast weight and wing weight) were presented in Table 1.
Correlations, expressing the relationship between the carcass parts and carcass weight were presented in Table 2. All correlations between carcass parts and carcass weight were determined to be positive and significant ($P<0.01$) except the correlation between breast and wing.
The results of regression analysis, in which standardized regression coefficients, standard error, t, statistical significant levels, tolerance

and VIF values were presented to explain the relationships between the carcass weight and carcass parts in Table 3.

Table 1. Descriptive statistics for explored traits of the broilers

Traits	n	Mean ± SD	Min	Max	CV %
CW	36	2111.4± 125.9	1901.0	2396.0	5.96
TW	36	571.4 ± 47.9	436.0	652.0	8.38
BW	36	796.4 ± 56.3	682.0	889.0	7.07
WW	36	209.4 ± 14.2	188.0	243.0	6.77

SD: Standard deviation, CV: Coefficient of variation, n: Sample size

Table 2. Correlations for some carcass parts and carcass weight

	CW	TW	BW
TW	0.833**		
BW	0.784**	0.545**	
WW	0.555**	0.533**	0.202

**P<0.01, CW: Carcass weight, TW: Thigh weight, BW: Breast weight, WW: Wing weight

It is obvious that thigh weight had the largest effect on carcass weight, but wing weight had the least contribution to carcass weight. Preliminary analysis detected that the VIF values were smaller than 10 and the tolerance values was greater than 0.1 in all cases as stated in Table 3.

Path coefficients of the explanatory variables of Ross 308 broilers were presented in Table 4. Direct effect of breast weight was positive and higher than other traits. Moreover, direct effect of breast (0.497) on carcass weight was higher than total indirect of thigh weight. However, it appears that indirect effect of wing weight (0.338) was higher than indirect effect of breast. Total indirect effect of wing weight on carcass mainly arose from the effect to the thigh weight.

Table 3. Results of the regression analysis

	Traits		
	TW	BW	WW
Coefficient (b)	1.173	1.111	1.928
Std. error	0.222	0.164	0.644
t values	5.275	6.795	2.996
P values	<0.001	<0.001	0.005
Tolerance	0.516	0.692	0.704
VIF values	1.937	1.445	1.420

Carcass weight, TW: Thigh weight, BW: Breast weight, WW: Wing weight

Carcass weight is the most important economic trait for broiler production. So, which part of carcass is more effective on the carcass weight should be determined. Owing to this purpose, the path analysis is very important for determining factors effecting carcass weight (Çankaya and Abacı, 2012). Direct effects are very essential for predicting the carcass weight but indirect effects of explanatory variables on response variable should be considered beside the direct effects (Arı and Önder, 2013).

CONCLUSIONS

The results indicated that BW, TW and WW had statistically important effects on CW of the broilers. Total and direct effects of TW and BW were higher than the effect of WW. However the indirect effect of WW on CW was higher than the effect of BW. Based on the data, it can be concluded that breast and thigh weights have a high correlation with carcass weight but wing weight also can be used for predicting total carcass weight due to the indirect effect on CW.

Table 4. Direct and indirect effects of some carcass parts on carcass weight of Ross 308 broilers

Trait	Correlation coefficient with CW	Direct effect	Indirect effect			
			TW	BW	WW	Total
TW	0.833**	0.446	-	0.271	0.116	0.387
BW	0.784**	0.497	0.243	-	0.044	0.287
WW	0.555**	0.217	0.238	0.100	-	0.338

CW: Carcass weight, TW: Thigh weight, BW: Breast weight, WW: Wing weight, **P<0.01

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