ACCURACY IMPROVEMENT OF PIG CARCASS COMPOSITION ESTIMATION USING A MATHEMATICAL MODEL

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SUMMARY: Four statistical models were analyzed with the aim of choosing the best which explained the greatest part of the total variation of carcass traits resulting in a decrease of the residual standard deviation (RSD). The effects of crossbreed, sex and sampling day were included. The best model which improved precisionand significance levels for each of the effects studied was that in which sampling was nested within crossbreed and which included an independent variable (CCW=cold carcass weight).

INTRODUCTION: Pig carcass composition is influenced by several factors like crossbreed, sex, nutrition, etc...(Cruz-Bustillo et al, 1983, 1985, 1987). Therefore, these effects must be controlled in order to obtain good estimations of these traits. The use of an adequate mathematical model can contribute to improve the precision of the estimation, although this can also be accomplished by increasing the number of observations, but the latter can be very expensive. Several authors (Evans and Kempster, 1979; Kempster, 1981; Mac Neil, 1983) have reported that it is better to get unbiased estimations instead of getting high precision biased estimations. Nevertheless, both precision and exactness must be present in an estimation. The objective of this experiment was to analyze the statistical results after using different mathematical models conceived to reduce the residual standard deviation of pig carcass composition traits.

MATERIALS AND METHODS: The statistical results of the dissection of 470 pig carcasses of five commercial crossbreeds (YLxCC21, YxLxD, YLxH, YDxY and YLxD, where Y=Yorkshire, L=Landrace, D=Duroc, H=Hampshire and CC21=new type of Cuban pig) barrows and gilts were analyzed. The main effects were crossbreed, sex and sampling day (four per crossbreed). Carcass traits studied were: carcass dressing (CD),%; sacral backfat thickness (SP), mm; weight of fat (FW) and of lean (LW) in commercial cuts,kg and percentage fat (FP) and lean(LP) in commercial cuts, %. In order to reduce RSD four different statistical models were used (Table 1).

Table1.Main effects included in the four models

Model	Effects
1	CRS SX SMP CRS*SX CRS*SMP
2	CRS SX SMP CRS*SX SMP(CRS)
3	CRS SX SMP CRS*SX CRS*SMP CCW
4	CRS SX SMP CRS*SX SMP(CRS) CCW

CRS=crossbreedSX=sex SMP=sampling day CCW=cold carcass weight

Model 1 considered the main effects and CRS interactions while in model 2 sampling day was nested whithin cross. Models 3 and 4 included the same effects and interactions as models 1 and 2 but also included cold carcass weight as an independent variable. The GLM procedure of SAS was used to analyze the data.

RESULTS AND DISCUSSION: Table 2 shows the residual standard deviations (RSD) for the four models used.

Table2. Residual standard deviations (RSD) for the four models used

Carcass traits	Statistical models			
	1	2	3	4
Carcass dressing, %	2.80	2.80	2.53	2.53
Backfat thickness, mm	5.13	5.12	4.53	4.52
Commercial cuts,:				
Fat, kg	2.07	2.07	1.36	1.15
Lean, kg	2.09	2.09	0.86	0.36
Fat, %	3.15	3.15	2.93	2.90
Lean, %	2.70	2.69	2.63	2.63

It is obvious that the RSD improved when CCW was included in both models. There is not much difference between models 3 and 4 but in analyzing the level of significance of the effects, the improvement of precision is evident in model 4 ($P<0.001$). The interaction crossbreed by sex was non significant whenever cold carcass weight was included as an independent variable. Nevertheless, crossbreed effect was always highly significant ($P<0.001$).

These results show that it is necessary to do a previous study of all the factors that may alter carcass composition and evaluate all the traits with possibility of being included as independent variables because this is one of the ways of improving precison in any estimation (Cochran, 1965; Menchaca, 1980). The RSD obtained in this experiment are within the allowed ranges for carcass composition traits (Martin et al, 1972; 1979).

CONCLUSION: The statistical model including the nested effect and cold carcass weight as an independent variable reduced the residual standard deviation of the carcass traits studied improving the levels of significance of each main effect and therefore, the precision, without increasing sample size.

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