Short Communication
The Journal of Animal & Plant Sciences, 22(2): 2012, Page: 525-528
ISSN: 1018-7081

GROWTH RATE AND NUTRIENT APPARENT DIGESTIBILITY IN MEXICAN CUINO PIGS

C. Lemus, J. Bonilla, F. Grageola, M. G. Orozco, R. Almaguer[*] and J. Ly[*]

[*]Universidad Autónoma de Nayarit, Ciudad de la Cultura Amado Nervo, CP 63190 Tepic, Nayarit, México
[**]Instituto de Investigaciones Porcinas. Punta Brava, La Habana, Cuba
Corresponding author e-mail: drclemus@yahoo.com.mx.

ABSTRACT

Performance traits and nutrient apparent digestibility were evaluated in fourteen males (castrated) and females (1:1) Mexican Cuino pigs with a mean initial weight 20 kg. Pigs were fed a 14% crude protein commercial diet *ad libitum* for12 weeks and nutrient digestibility was determined at the end of growth trial. There was no difference (P>0.05) in feed intake between females and castrated males Cuino pigs, no sex effect was observed on feed conversion. Overall, Cuino pigs showed a slow growth rate. Total apparent digestibility of dry and organic matter was similar in both sexes, but N digestibility was significantly higher in females than in castrated males. Organic matter digestibility was significantly (P<0.05) correlated with dry matter (r, 0.454) and N (r, 0.802) digestibility. There were no significant (P>0.05) interdependence among performance traits and nutrient digestibility. It is considered that is necessary to obtain more information related to performance traits and nutrient digestibility of Mexican Cuino pigs, as affected by different factors which could influence these indices. On the other hand, this study shows that there are signs that females shows better performance and digestibility of nutrients than castrate males.

Key words: Cuino pigs, performance traits, digestibility.

INTRODUCTION

Mexican Cuino pigs are considered descendants from Asian, imported pigs to Mexico, during colonial period. In contrast to Mexican Pelon pigs, Cuino pigs traits, productivity and nutritional status are relatively unknown (Lemus and Alonso, 2005). This local breed has a small size, slow growth rate and a marked trend to accumulate adipose tissue (Lemus *et al*., 2003a, 2005, Grageola *et al*., 2007).

Cuino pigs are currently confined to remote, mountainous regions of Mexico. These animals are raised outdoors according to a subsistence economy of low input/output production system, therefore implying a feeding regimen based on crop residues and garbage, without any knowledge of nutrient utilization by this type of pigs (Grageola and Lemus, 2007; Lemus and Ly, 2010).

Experiments concerning with reproductive performance and body measurements have been conducted in Cuino pigs (Lemus *et al*., 2003a,b). However, little information if any is available with regards to performance traits and digestibility coefficients of Cuino animals, as measured under controlled confinement conditions, and related to an intensive pig production system. On the other hand, it has been suggested that besides the gene potential of Cuino pigs (Grageola and Lemus, 2007), these animals could be utilized in metabolic studies related to obesity, as it has been done with another Mexican local breeds of small size, due to his good characteristics for being used at laboratory scale, among other reasons (Panepinto *et al*., 1978).

The objective of this study was to determine growth performance traits, total apparent digestibility and some characteristics of digestive organs in Cuino pigs from the central Pacific region of Mexico.

MATERIALS AND METHODS

Fourteen Mexican Cuino pigs, seven females and seven castrated males, weighing on an average 20.0 kg and 230 days old, were used to study performance traits of economic interest, and nutrient apparent digestibility. The animals were procured from herds commonly raised in the rural milieu of the state by particular owners of the mexican state of Nayarit. The animals were housed individually in cement floored pens located in a closed building, at the Agriculture Academic Unit of the Autonomous University of Nayarit. All pens were provided with a through and drinking nipples. Pigs were fed *ad libitum* a 14% crude protein (N x 6.25) diet. Table 1 lists ingredient and nutrient characteristics of the experimental diet.

Pigs were weighed every two weeks during a 16 week-period. Faeces from all animals were obtained by digital stimulation of rectum, at time of weighing pigs at the end of the growth trial. Samples of faeces were conveniently identified and stored at -20ºC until analysis. Faeces were thawed and dry matter, ash and nitrogen content were determined in fresh aliquots of the samples

according to procedures described by AOAC (1990). Organic matter was considered 100 minus ash content. Acid insoluble ash was assayed in the ashed samples, according to the Van Keulen and Young (1977) technique. The same routine was applied to the used feedstuff. All analyses were conducted by duplicate.

Table 1. Characteristics of the experimental diet

Ingredients	% (dry basis)
Maize meal	79.52
Soybean meal	17.51
NaCl	0.50
$CaPO_4H.2H_2O$	1.30
$CaCO_3$	0.67
Premix	0.50
Total:	**100.00**
Chemical analysis %	
Dry matter	94.14
Ash	6.82
Organic matter	93.18
Crude fiber	3.04
Crude protein (N x 6.25)	14.24

Total apparent digestibility of dry matter, organic matter and nitrogen was calculated as outlined elsewhere (Ly, 2008a). Data were subjected to analysis of variance (Steel *et al*., 1999), through the SAS (2004) software by applying a general lineal model procedure, taking into account the effect of sex as the main effect, according to the following model: $Y_{ij} = \mu + S_i + E_i$, where μ = general mean; S_i = effect of sex; E_i = random error.

RESULTS AND DISCUSSION

Table 2 shows performance traits of the evaluated individuals. There were no differences (P>0.05) between female and castrated male Cuino pigs in feed intake, neither expressed as kg per day or g per $kg^{0.75}$. Females showed similar daily gain (P>0.05) than castrated males, although feed conversion was similar (P>0.05) in both sexes. Overall, growth rate was slow in this genotype, with a mean of 480 g per day, which it is in agreement with earlier results reported by Lemus and Alonso (2005). Effects of sex on several performance traits has been encountered in other pigs of Asian origin (Vasupen, 2007).

Data concerning to total apparent digestibility of nutrients are listed in Table 2. No sex effect was observed (P>0.05) on dry matter and organic matter digestibilities in Cuino pigs. However, nitrogen digestibility was significantly (P<0.05) higher in females than in castrated males. A non significant (P>0.05) effect of sex on rectal nutrient digestibility is commonly be observed in conventional animals (Ly, 2008b). Nevertheless, it has been observed the effect of sex on nutrient digestibility of crossbred pigs in earlier studies (Bowland, 1971; Holmes *et al*., 1980). In more recent evaluations, it has been found that female of improved, Large White pigs had a higher energy and nitrogen digestibility than castrated and entire male animals (Noblet *et al*., 1993). Vasupen (2007), observed that female, Kadon pigs from Thailand showed a noticeable higher digestive utilization than the male animals.

Faecal output of fresh material and water was significantly (P<0.05) higher in castrated males Cuino pigs than in females, and a trend was observed for faecal nitrogen output (P<0.10). Ly (2008c) could not observe a sex effect on faecal output of materials when female and castrated male pigs were offered semi-synthetic diets. Since faecal output can reflect nutrient manipulation of diets (Nyachoti *et al*., 2006) and feed intake (Hsiah and Lu, 1989), among other facts (Monteiro *et al*., 2010), it could be possible that the effect of sex on faecal output of materials would be masked by these other factors (Ly, 2008c). Undoubtely, more research should be interesting to conduct in this direction, due to the fact that, since Cuino pigs, are reared outdoors, manure integration to soil in this animal production system would be an important fact to be taken into account.

Table 2. Performance traits and apparent rectal digestibility and faecal output of Mexican Cuino pigs fed *ad libitum* corn-soyben meal based diet

	Female	sd	Castrated males	sd
n	7		7	
Feed intake, kg dry matter/day	1.77	0.31	1.68	0.23
Feed intake, g dry matter/$BW^{0.75}$	107.04	15	107.58	16
Mean daily gain, kg	0.493	0.13	0.468	0.05
Feed conversion (kg dry matter/kg gain)	3.71	0.61	3.60	0.24
Rectal digestibility (%)				
Dry matter	80.5	4.4	82.5	4.7
Organic matter	83.7	3.9	82.7	1.3
Nitrogen	77.0	6.6	71.0	4.7*
Faecal dry matter (%)	30.9	2.9	29.9	1.8
Faecal nitrogen (% dry matter)	2.9	0.2	2.9	0.3
Faecal output (g/kg dry matter intake)				
Fresh material	383.8	77.2	464.0	93.2*
Water	264.7	53.3	325.5	67.9*
Dry material	119.1	27.9	138.4	26.5
Nitrogen	3.6	1.1	4.1	0.9+

+ P<0.10; * P<0.05; sd: standard deviation.

Organic matter digestibility was positively, significantly (P<0.05) correlated with dry matter (r, 0.454) and nitrogen (r, 0.802) digestibilities (Table 3). On the other hand, dry matter conversion significantly (P<0.05) correlated with mean daily gain (- 0.728) and dry matter intake (0.858). There were no significant (P>0.05) interdependence among performance traits and nutrient digestibility in the examined animals.

Table 3. Pearson correlation matrix for performance traits and rectal nutrient digestibility in Mexican Cuino pigs

	DMI[1]	MDG	DMC	DMD	OMD
MDG	0.858				
DMC	-0.298	-0.728			
DMD	-0.082	-0.081	0.054		
OMD	0.217	0.314	-0.180	0.454	
ND	0.206	0.331	-0.185	0.322	0.802

[1] DMI, MDG, DMC, DMD, OMD and ND express DM intake, mean daily gain, DM conversion, DM digestibility, organic matter digestibility and N digestibility, in this order. P<0.05 for r>0.40 (n = 14)

Conclusions: It is considered that is necessary to obtain more information related to performance traits and nutrient digestibility of Mexican Cuino pigs, as affected by different factors which could influence these indices. On the other hand, this study shows that there are signs in the sense that in Cuino pigs, female animals shows a better performance and digestibility of nutrients than castrate male individuals.

Acknowledgment: Authors are thankful to Financial support provided by the COCYTEN-NAYARIT-2006-CO1-66170 fund

REFERENCES

Association of Official Analytical Chemists - AOAC. (1998). Official methods of analysis. 16 ed. Washington (USA): v.1-2, 1170p.

Bowland, J.P. (1971). Rapeseed as an energy and protein source in diets for growing pigs. Canadian Journal of Animal Science. 51: 503-510.

Grageola, F. and Lemus, C. (2007). Una reseña corta sobre el status de insulina y de los cerdos Cuino mexicanos. Revista Computadorizada de Producción Porcina. v. 14: 199-204. Grageola, F., Lemus, C., and Alonso, R.A. (2007). A note on serum insulin in Mexican Cuino pigs. Journal of Animal and Veterinary Advances. 6: 1155-1157.

Holmes, C.W., Carr, J.R., and Pearson, G. (1980). Some aspects of the energy and nitrogen metabolism of boars, gilts and barrows given diets containing different concentrations of protein. Animal Production. 31: 279-289.

Hsia, L.C. and Lu, G.H. (1989). The effect of season, sex and breed on pig food intake and performance. In: The voluntary food intake of pigs. British Society of Animal Producction Occasional Publication. 13: 119-120.

Lemus, C. and Alonso, M.R. (2005). El cerdo Pelón Mexicano y otros cerdos criollos. Tepic, Nayarit: Universidad Autónoma de Nayarit, (México). 251p.

Lemus; C., Alonso, M.R., and Alonso, M. (2003a). Morphologic characteristics in Mexican native pigs. Archivos de Zootecnia. 52: 105-108.

Lemus, C., Alonso, M.R., and Alonso, M. (2003b). Reproductive performance in Mexican native pigs. Archivos de Zootecnia. 52: 109-112.

Lemus, C., Alonso, R., and Herrera, J.G. (2005). Growth, morphometry and reproductive performance of creole Cuino pigs in Mexico. Journal of Animal and Veterinary Advances. 4: 855-858.

Lemus, C. and Ly, J. (2010). Estudios de sostenibilidad de cerdos mexicanos pelones y cuinos. La iniciativa nayarita. Revista Computadorizada de Producción Porcina. 17: 89-98.

Ly, J. (2008a). Fisiología Nutricional del Cerdo. J. Ly and C. Lemus editors. Universidad Autónoma de Nayarit. (México). 136p

Ly, J. (2008b). Una aproximación a la fisiología de la digestión en cerdos criollos. Revista Computadorizada de Producción Porcina. 15: 13-23.

Ly, J. (2008c). Studies on factors affecting faecal output in growing pigs. An approach to the effect of level of feed intake and of sex. Revista Computadorizada de Producción Porcina. 15: 255-260.

Monteiro, D.O., Pinheiro, V.M.C., and Mourao, J.L.M. (2010). Strategies for mitigation of nitrogen environmental impact for swine production. Revista Brasileira de Zootecnia. 39: 317-325.

Noblet, J., Shi, X.S., and Karege, C. (1993). Effets du type sexuel, du niveau d´alimentation, du poids vif et du stade physiologique sur l´utilisation digestive de l´énergie et des nutriments chez le porc: interactions avec la composition du régime. Journées de la Recherche Porcine en France. 25: 165-180.

Nyachoti, C.M., Artnfield, S.D., and Guenter, W. (2006) .Effect of micronized pea and enzyme supplementation on nutrient utilization and manure output in growing pigs. Journal of Animal Science. 84: 2150-2156.

Panepinto, L.M., Phillip, R.W., and Wheeler, R.W. (1978). The Yucatan miniature pig as a laboratory animal. Laboratory Animal Science. 28: 308-313.

Statistical Analyses System – SAS. (2004). User´s guide: statistics. 12 ed. New York: SCOTT, M.L. and Associates (USA). 1686p.

Steel, R.G.D., J. H. Torrie and D.A. Dickey (1997). Principles and procedures of Statistics. A biometrical approach. McGraw-Hill Book Company In Company. Toronto (Canada). 481p.

Van Keulen, J. and B.A. Young (1977). Evaluation of acid insoluble ash as a natural marker in ruminant digestibility studies. Journal of Animal Science. 44: 262-266.

Vasupen, K. (2007). Nutritional studies in natives, Thai Kadon pigs. Thesis Dr. Sci. University of Utrecht (Utrecht). 119p.