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Studies on Growth of Pelón Mexicano Pigs: Effect of Rearing Conditions on Performance Traits

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Abstract: A 2×2 factorial arrangement was used for evaluating performance traits during 16 weeks in 2 groups of 22 Yorkshire x Landrace (YL) and 13 Pelón Mexicano (PM) castrate male and female pigs 63 days old which were allotted at random into 2 rearing systems consisting of total (15 and 7 pigs) or partial confinement (7 and 6 pigs). Partial confinement included rearing animals outdoors in a grass prairie (*Brachiaria brizantha*) from 9:00-16:00 h. No significant differences ($p<0.05$) for the interaction rearing system x genotype were found in any measured performance trait. It was observed that treatments involving Yorkshire x Landrace animals had a high significant ($p<0.001$) live weight at any age, as compared to the PM pigs. It was evident that YL pigs had a higher daily feed intake than PM animals and on the other hand, results from animals in confinement clearly indicated that feed intake in those pigs was higher than in the others, permitted to graze during 8 h every day. Calculated daily gain was 820 and 757 g in YL pigs when reared in total confinement or partially outdoors, whereas this same trait was 414 and 335 g in PM pigs. When a comparison was made between improved and local pigs reared in total confinement, feed conversion was on average, 3.07 kg kg^{-1} in the YL animals and 5.03 kg kg^{-1} in the PM pigs.

Key words: Pigs, Pelón Mexicano, performance traits, rearing systems

INTRODUCTION

Local pigs in Mexico are known as Pelón Mexicano (PM) or Mexican hairless and Cuino pigs. It has been said that these animals are not good for marketing, since they have a market price very low, due to the fact that they show a high backfat thickness, which has to be discounted from the original price, which accounts for some 30-40% of lowering of its original monetary value (López *et al*., 1999; Lemus and Alonso, 2005; Méndez *et al*., 2002; Lemus *et al*., 2003), even though it has been shown that human consumption of this type of fatty meat does not imply any harmful consequence, since its composition in unsaturated fatty acid is high (Pérez *et al*., 1999a, b).

In fact, the hairless, Pelón Mexicano pig offers indeed several advantages for rearing from the point of view of management and feeding, since this type of animal can be fed on forage, fruits, roots, tubers, crop residues and kitchen wastes generated from the family which keep them. Furthermore, neither special housing nor sophisticated management is required by the Pelón Mexicano pig, which in turn allows the exploitation of these animals under a low input system. Besides, the Pelón Mexicano pig is a productive alternative, because meat sausage and products elaborated from meat of these animals are of better quality, appearance and taste than those from improved breeds.

The objective of the current investigation was to define the influence of the rearing regime on performance traits of growing Pelón Mexicano pigs as compared to an improved pig breed.

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MATERIALS AND METHODS

Location and environment of the study: The trial was carried out at the Nayarit University Research Farm at the Faculty of Veterinary Medicine, Compostela Municipality, Nayarit, Mexico. Climate characteristics in Nayarit are similar to that a warmth condition.

Treatments and design: Two rearing systems and two pig genotypes were evaluated according to a 2×2 factorial arrangement through growth traits of the animals during 16 weeks. The two rearing systems were total or partial confinement and the genotypes were the local breed, Pelón Mexicano (PM) and a Yorkshire x Landrace (YL) crosses.

Animals and housing: The animals were female and castrate male pigs of 63 days old at the start of the trial. In that moment the average live weight or PM and YL pigs were on average 9.49 and 16.93 kg, respectively. The pigs were raised according to breed (PM, 13; YL, 22) and sex in total or partial confinement. Total confinement consisted on housing in pens of an open stable, or raising the animals at a grassland parcel during 8 h, from 9:00-16.00. The parcel was a grass prairie covered with *Brachiaria brizantha*.

Feeding regime: During penned, the animals were kept in groups and had free access to food and drinking water. The feed was a balanced, commercial concentrate which contained 3.10 Mcal DE kg^{-1} feed and either 17 or 14% crude protein (N×6.25) during the first and last 8 weeks periods, respectively. The balanced concentrate consisted of sorghum grain meal and a supplement with 30% crude protein. During the 8 h grazing, the animals which were kept outdoors had no access to this concentrate. On the other hand, grass consumption was not recorded.

Measurements: The animals were weighed at the start of the experiment and then every 4 weeks during 16 weeks. The pigs were weighed before feeding in the morning. The feeds offered and refused were recorded daily. Feed intake of the concentrate feedstuff was recorded daily by collection of feed refusal from the previous day.

Statistical analysis: The data on feed intake, feed conversion and weight change were subjected to analysis of variance (Steel *et al*., 1997) including initial live weight as co-variable, using the least squares General Linear Model (GLM) procedure of SAS. The statistical model employed was:

$$Y_{ijk} = \mu + A_i + B_j + (AB)_{ij} + \beta(X_i - \chi) + E_{ijk}$$

Where:

Y_{ijk} = Response variable
μ = General mean
A_i = Effect of factor A at i level (rearing system)
B_j = Effect of factor B at j level (genotype)
$(AB)_{ij}$ = Effect of interaction AB at ij level
β = Regression coefficient
X_i = Co-variable (initial live weight)
χ = General mean of the co-variable
E_{ijk} = Random error on the k repetition, level j of B and level i of A

Orthogonal contrasts were used to determine statistical differences in the means per treatments for the evaluated variables. In some cases, when differences in treatment means were significant at the probability level of $p<0.05$ the means were compared using the Tukey test.

RESULTS

A sharp difference in initial live weight was observed in this trial (Table 1) and therefore, an adjustment of data was made in any performance trait, during the conduction of the analysis of variance. On the other hand, no significant differences ($p<0.05$) for the interaction rearing system x genotype were found. It was observed that treatments involving Yorkshire x Landrace animals had a highly significant ($p<0.001$) live weight at any age, as compared to the Pelón Mexicano pigs. Differences between the 2 rearing systems assayed were less substantial. For example, significant differences were detected when the pigs were 91 days old and this was more noticeable in Pelón Mexicano ($p<0.038$) than in the improved animals ($p<0.067$). Afterwards, there were not evident differences between rearing systems, although at 175 days of age, pigs in total confinement attained heavier live weights than those animals which were daily grazing: 94.4 and 84.3 kg in Yorkshire pigs, 83.3 and 76.6 kg in Pelón Mexicano pigs. On the other hand, both types of animals had a linear growth, although the slope of both growth curves was evidently dissimilar.

Table 2 lists gain in weight of the animals, expressed every 4 weeks and overall, as influenced by the type of breed and the rearing system. Obviously, the gain in weight either for every weeks or for the entire period of observation, followed the results relative to the evolution of the live weight of the animals, with differences highly significant ($p<0.001$) in favor of the Yorkshire x Landrace type as contrasted to the Pelón Mexicano animals. Differences between rearing systems within each breed

Table 1: Live weight of pigs as affected by breed and rearing system (expressed in kg)[1]

	Age of the animals (days)				
	63	91	119	147	175
Yorkshire x Landrace (YL) genotype					
Confinement (C)	15.23±0.59[2]	29.24±0.76	48.68±0.76	64.42±1.00	94.49±1.73
Grazing (G)	20.57±1.59	26.21±1.65	47.88±1.24	65.83±1.49	84.34±2.69
Pelón Mexicano (PM) genotype					
Confinement	11.17±0.63	24.16±1.22	38.21±1.15	62.51±1.63	83.35±3.00
Grazing	7.55±0.60	23.56±1.74	42.67±1.57	60.68±1.88	76.64±3.61
Orthogonal contrasts	Probability (α)				
PM vs YL	0.001	0.001	0.001	0.001	0.001
YL (C) vs YL (G)	0.001	0.067	0.136	0.082	0.748
PM (P) vs PM (G)	0.017	0.038	0.380	0.235	0.078

[1]Adjusted to initial live weight, [2]Mean and standard error

Table 2: Gain in weight of pigs every four weeks and overall as affected by breed and rearing system (expressed in kg)[1]

	Age of the animals (days)				
	63-91	91-119	119-147	147-175	63-175
Yorkshire x Landrace (YL) genotype					
Confinement (C)	15.34±0.99[2]	24.13±1.02	20.98±0.65	31.37±1.17	91.89±3.03
Grazing (G)	13.75±0.80	25.32±1.26	23.50±1.82	22.27±1.92	84.85±4.37
Pelón Mexicano (PM) genotype					
Confinement	9.18±0.36	8.21±0.73	13.50±0.60	15.50±2.80	46.40±3.22
Grazing	7.61±0.80	9.91±1.17	10.91±1.52	8.10±1.06	37.60±2.59
Orthogonal contrasts	Probability (α)				
PM vs YL	0.001	0.001	0.001	0.001	0.001
YL (C) vs YL (G)	0.038	0.380	0.235	0.078	0.153
PM (P) vs PM (G)	0.067	0.136	0.082	0.748	0.163

[1]Adjusted to initial live weight, [2]Mean and standard error

Table 3: Feed intake of pigs as affected by breed and rearing system (expressed in kg day^{-1})

	Age of the animals (days)			
	63-91	91-119	119-147	147-175
Yorkshire x Landrace (YL) genotype				
Confinement (C)	1.72	2.37	2.49	2.96
Grazing (G)	1.48	2.52	3.61	2.99
Pelón Mexicano (PM) genotype				
Confinement	1.71	1.44	1.96	1.97
Grazing	1.31	1.04	1.63	1.65

Table 4: Feed conversion efficiency of confined pigs as affected by breed (expressed in kg day^{-1})

	Age of the animals (days)			
Genotype	63-91	91-119	119-147	147-175
Yorkshire x Landrace	3.39±0.31[1]	2.83±0.13	3.37±0.11	2.69±0.10
Pelón Mexicano	5.27±0.22	5.19±0.51	4.12±0.19	5.56±2.17
Significance	p<0.05	p<0.05	ns	ns

[1]Mean and standard error

were less evident, but the general trend was for high gains in weight when the animals were in total confinement, in comparison to that treatment where the pigs were grazing the *Bracharia brizantha* grass for 8 h each day.

A somewhat different result was obtained when feed intake was compared among the 4 treatments. Overall, although it was not possible to run a statistical comparison, amongst other reasons, because grass intake was not recorded, it was evident that Yorkshire x Landrace pigs had a higher daily feed intake than Pelón Mexicano animals and on the other hand, results from pigs in confinement clearly indicated that feed intake in those pigs was higher than in the others, permitted to graze during 8 h per day (Table 3). On the other hand, it was evident that feed intake values of Yorkshire x Landrace pigs allowed to grazing, were higher than those of the same breed subjected to total confinement and the estimated percentage was on average 109.5%. The reverse was true in Pelón Mexicano pigs (estimated percentage, 78.9%).

When a comparison was made between Yorkshire x Landrace and Pelón Mexicano pigs subjected to total confinement, it was found that feed conversion was higher when the local breed was taken into account in contrast to those same trait measured in the Yorkshire x Landrace animals. These differences were significant ($p<0.05$) between 63 and 91 days of age and between 91 and 119 days of age (Table 4). Overall, feed conversion was on average, 3.07 kg kg^{-1} in the Yorkshire x Landrace animals and 5.03 kg kg^{-1} in the Pelón Mexicano pigs.

DISCUSSION

Calculated daily gain was 820 and 757 g in YL pigs when reared in total confinement or partially outdoors, whereas this same trait was 414 and 335 g in PM pigs. When a comparison was made between improved and

local pigs reared in total confinement, feed conversion was on average, 3.07 kg kg^{-1} in the YL animals and 5.03 kg kg^{-1} in the PM pigs. These values clearly reflect that, from the point of view of performance traits as measured by a conventional manner, Pelón Mexicano pigs are in disadvantage when compared to those highly improved, not locally breed, such it is the F_1, Yorkshire x Landrace pig. On the other hand, performance traits in the Yorkshire x Landrace animals utilized here, did not reveal great differences from the point of view of performance traits to what has been claimed to occur in similar circumstances in improved breeds (Fuller, 1984, cited by English *et al*., 1992).

The Pelón Mexicano pigs used in this trial had a total gain in live weight equal to 46.4 and 37.6 kg in 112 days of test of total or partial confinement. In this connection, Plata (2000) cited by Lemus and Alonso (2005) encountered lower values, 45.9 and 26.0 kg in total gain for this genotype reared in either semi-warm or warm environment. A calid climate determined a total gain of 32.2 kg as it was reported by Cabello (1969) cited by Trujillo *et al*. (1998), López *et al*. (1999), Méndez *et al*. (2002) and Lemus and Alonso (2005) in an experiment conducted in tropical lowland, particularly in Veracruz. From the point of view of feed conversion, animals of this local breed had a higher efficiency as compared to that of other Mexican investigations (Cabello, 1969 cited by Trujillo *et al*., 1998; López *et al*., 1999; Méndez *et al*., 2002; Lemus and Alonso, 2005; Vázquez *et al*., 1972; Romano *et al*., 1980 cited by Lemus and Alonso, 2005; Tello and Cisneros, 1990 cited by Lemus and Alonso, 2005; Plata, 2000 cited by Lemus and Alonso, 2005).

It is noteworthy, to remark the outstanding difference between Pelón Mexicano and Yorkshire x Landrace pigs when these 2 breeds were subjected to partial confinement, then allowing them to grazing during 8 h of the day: the intake of the commercial feedstuff was considerably low in the Pelón Mexicano when this trait was compared to that the improved examined breed. The explanation for this is very difficult to establish, since grass intake could not be measured in the current investigation. Even so, it could be thought that perhaps a certain preference of Pelón Mexicano pigs for grass intake could be present, therefore determining a saciety of the animals, either by the bulking effect in the gastrointestinal tract (Ly, 2008), of by certain physico-chemical characteristics of the grass fibre, such as the capacity of retention of water (Kyriazakis and Emmans, 1995) and then influencing negatively the consumption of the balanced concentrate feed. Other factors to be taken into consideration could be different feeding habits between Pelón Mexicano and Yorkshire x Landrace pigs, such as those described by Renaudeau *et al*. (2005) in the case of the creole pig from Guadeloupe. It must be remembered that animals subjected to grazing outdoors during the experiment, only had access to the concentrate in the night.

It is suggested that a total or partial confinement, consisting on daily grazing outdoors, rearing system, has less influence on growth traits in pigs when Pelón Mexicano and Yorkshire x Landrace pigs are compared. On the other hand, a somewhat instinct for grazing does remain in improved breeds, although these types of animals use to be selective when balanced, commercial feedstuffs are offered to them. It is considered that more research is needed, in order to evaluate the grazing capacity of Pelón Mexicano pigs in outdoors conditions.

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