A comparison of growth performance and feeding behaviour in Creole and Large White pigs: Preliminary results.

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Abstract: Growth performance and feeding behaviour traits were recorded on 70 Creole (CR) and 70 Large White (LW) pigs from day 100 to day 150 of age. Measurements of daily feed intake and feeding behaviour were obtained by electronic feed dispensers under ad libitum conditions. The experiment was conducted in Guadeloupe (French West Indies, latitude 16°N, longitude 61°W). Initial body weight were 32.9 ± 6.1 kg and 42.1 ± 7.6 kg for CR and LW pigs, respectively. The CR pigs have lower daily feed intake (2001 vs. 2167 g/d; $P < 0.01$), lower growth rate (649 vs. 869 g/d; $P < 0.01$), higher feed conversion (3.1 vs. 2.5 kg/kg; $P < 0.01$), and higher backfat thickness gain (+ 7.7 vs. + 4.4 mm; $P < 0.01$) than Large White pigs. The average number of meals was significantly lower ($P < 0.01$) whereas their size was higher in CR pigs than in LW pigs (6.9 vs. 8.4 meals/d and 318 vs. 282 g/meal, respectively). The rate of feed intake was lower (23.6 vs. 33.6 g/min; $P < 0.01$) and the total ingestion time was higher (88.0 vs. 67.3 min/d; $P < 0.05$) in CR than in LW pigs. For both breeds, hourly feed intake peaked twice daily near sunrise and sunset. The peaks size were significantly lower ($P < 0.05$) and the total time of feed occupation was higher (15:25 h vs. 12:12 h; $P < 0.01$) in Creole than in Large White pigs. Breed of pigs significantly affected the diurnal partition of feed intake: proportionately 75 and 69 % of total feed intake occurred during the day in Large White and Creole pigs. In conclusion, this study confirms that the feed intake pattern of growing pigs is influenced by genotype of pigs.

Keywords: Growing pigs, Creole, sex, growth, feeding behaviour.

Introduction: In Guadeloupe (F.W.I. 16°lat. N., 61°Long. W.), the Creole pigs represent approximately 20 to 30 % of the total pig's population and are locally very appreciated for the better fresh meat quality. However, Creole pigs are characterised by a reduced growth rate, a poor muscle development, and a higher propensity to fat deposition which limits their utilisation in semi-intensive production system (see review of Rinaldo et al., 2000). The growth performance and chemical composition of gain depends directly on the daily nutrients intake and their digestive and metabolic utilisation by the animal. However, there is little information on the voluntary feed intake and the feeding behaviour in Creole pigs.

The aim of the present study was to evaluate differences in growth performance, and feeding behaviour between Creole and Large White pigs using an electronic feed intake recording equipment.

Materials and methods: A total of 140 pigs were used in three replicates of 40 pigs and one replicate of 20 pigs to evaluate the effect of genotype (Creole vs. Large White) on growth performance and feeding patterns during seven weeks. Pigs were moved in an open-front fattening unit around 90 days of age. In the replicate of 40 pigs, animals were allocated to four pens of ten pigs per pen on the basis of breed and sex (female vs. castrated male). In the replicate of 20 pigs, only 2 pens were used; each pen contained an equal number of pigs from

each sex originating from the same breed. The pens were equipped with an 'Acema 48' feed dispenser and animals had 24-h access to feed and water. Feed was presented as pellets and contained 9.7 MJ. kg^{-1} net energy and 157 g. kg^{-1} crude protein. The experiment started at 110 days of age; the average body weight (BW) at the beginning of the experiment were 32.9 and 42.0 kg for Creole (CR) and Large White (LW) pigs, respectively. Ambient temperature, relative humidity, and photoperiod followed those of the outdoor conditions.

Pigs were weighed and backfat thickness was measured ultrasonically at 50 mm from the midline of the last-rib level at the beginning and the end of the experiment. All feed equipments were calibrated at the start of the study using a 1-kg test weight. The feed dispensers were equipped with a protective crate in front of the feed trough that allowed only one pig to access to the feeder at any time. After each visit to the feed station, the identity of the animal (via an ear tag transponder), the feeder entry and exit times and the amount of feed consumed were recorded and stored in the central monitoring equipment memory. Successive feeder visits were grouped into meals using the so-called 'meal criterion'. This criterion was defined as the maximum length of the within-meal interval; visits separated by interval longer than the 'meal criterion' were considered as belonging to different meal. The meal criterion of 2 min calculated by Labroue et al. (1999) using the same feed dispenser equipment was adopted in present study. Data on daily feed intake traits were used to calculate the number of meal per day, feed consumption (g/day and g/meal), ingestion time (min/day and min/meal) defined as the total duration of all the visits performed during the day or the meal, and the rate of feed intake (g/min) defined as the daily feed intake divided by the daily ingestion time.

The effects of breed, sex, replicate, and the breed × sex interaction on growth performance and feeding behaviour components were tested through an analysis of variance (general linear models procedure, SAS, 1990). For each pig, hourly values of feed consumption were calculated; these data were analysed through a repeated measurement analysis of variance (SAS, 1990) by comparison of hourly value to a reference value (i.e., mean hourly consumption value between 00:00 and 03:00). The effect of breed on the kinetics of feed ingestion was analysed from generation of contrasts between adjacent hourly values.

Results: As no interaction between breed and sex was found for all criteria studied, only the effects of breed are presented in the text. Least square means for genotype effects on growth performance were presented in table 1. The CR have lower average daily feed intake (ADFI) than LW pigs (2001 vs. 2167 g/d; $P < 0.01$). Expressed per kilogram of metabolic body weight, the ADFI was higher for CR pigs (112 vs. 100 g. d^{-1}. $kg^{0.75}$g/d; $P < 0.01$). However, the average daily gain (649 vs. 869 g/d; $P < 0.01$) was lower and feed conversion ratio and backfat thickness gain were significantly higher in CR pigs (3.1 vs. 2.5 kg/kg and + 7.7 vs. + 4.4 mm, respectively).

Feeding behaviour parameters were significantly affected by the genotype of the pig (table 1). The rate of feed intake was lower for CR pigs compared to LW (23.6 vs. 33.6 g/min; $P < 0.01$). Consequently, total ingestion time was greater for CR than LW pigs (88.0 vs. 67.3 min/d; $P < 0.01$). LW compared to CR pigs made more frequent visits to the feeder (42.1 vs. 26.0; $P < 0.05$). However, according to the high coefficient of variation (i.e., C.V. = 66 %), there was a considerable variation for both breeds between individual animals in the frequency of feeder visits. The daily number of meals was lower ($P < 0.01$) whereas their size was higher ($P < 0.05$) in CR than in LW pigs. The ingestion time per meal was higher in CR pigs in connection with the reduction of the rate of feed intake. From the comparison of hourly feed intake to basal value (i.e., between 00:00 and 03:00 h) or variation between successive hours, the hourly feed intake peaked twice a day for both seasons (Figure 1).

During the diurnal period, the hourly feed intakes were significantly higher ($P < 0.05$) in LW than in CR pigs between 06:00 and 09:00 h, and 14:00 and 16:00 h. In contrast, feed intake was higher ($P < 0.05$) in CR pigs at 01:00, 02:00, and 19:00 h. Moreover, the proportion of feed intake during the diurnal period was higher for LW compared to CR pigs (75 vs. 69 %; $P < 0.05$).

Discussion: According to the previous results obtained in our experimental station (Canope et Raynaud 1981, Deprès et al. 1992, and Renaudeau et al., unpublished results), the growth performances of CR were lower than those of exotics breeds reared in tropical conditions. Similar results were reported when Iberian (Serra et al., 1998) or Meischan pigs (Edwards et al., 1991) were compared to conventional breeds. As observed in Meishan pigs, the propensity to high fat deposition in CR pigs is related to their reduced growth rate or protein deposition.

Little information is available on the feeding behaviour in CR pigs. The reduction of ADFI in CR pigs was associated with a reduction of number of meals. This decrease of meal frequency was counterbalanced by an increase of meal size; it was also associated with a longer ingestion time per meal. These effects of pigs genotype on meal characteristics in the present study are in agreement with the results of Quiniou et al. (1999) based on individually Meischan and LW pigs studied over the same BW range. According to these authors, the higher propensity to fat deposition could explain the reduced number of meals. However, such a difference could be related to early maturity of the CR pig. At an average BW of 63 kg, the rate of feed intake of LW pigs was intermediate between values reported over the same BW range by Nielsen et al. (1995) (26.9 g/min) and Labroue et al. (1999) (38.1 g/min). Moreover, Quiniou et al. (1999) suggested that the rate of feed intake increases with the increase of BW. In consequence, the reduced rate of feed intake measured in CR pigs could be related to their smaller average BW. According to the reduction of the ADFI and the rate of feed intake, total ingestion time increased in CR pigs.

For both genotypes, the pattern of daily feed intake can be characterised by two peaks of feeding activity, one peak in the morning (i.e., similar to the sunrise) and the other one in late afternoon (i.e., before the beginning of the night). Our results suggest that the feeding activity of growing pigs is mainly driven by light intensity changes. However, the first peak can also be attributed to the beginning of the work of the staff of the experimental station. Breed of pigs also affected the feeding pattern. The reduction of the peaks size and the increase of the daily average of feeder occupation in CR pigs (+ 03:14 h) were connected to their lower rate of feed intake. These changes in feeding behaviour of CR pigs could be attributed to an increase of individual social competition for feeder access. Early morning and late evening feeding activity may have been performed by CR pigs that were unsuccessful at competing to feeder access during the light period (Young and Lawrence, 1994).

Conclusion: The results obtained in the present experiment confirm the reduced growth performance in CR pigs compared to a exotic breed and indicate that feeding behaviour can be affected by genotype of pigs. The change in nycthemeral pattern of feed intake observed in CR pigs can be attributed to their reduced rate of feed intake that would increase time of feeder occupation and competition to feeder access.

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Table 1 : Effect of breed on growth performance in growing pigs from day 100 to day 150 (adjusted means).

	Breed			Statistical
	Creole	Large White	RSD[a]	analysis[b]
Number of animals	70	70		
Growing performance				
Initial BW, kg	32.9	42.0	4.4	B**, R**
Final BW, kg	60.9	79.8	7.1	B**, R**
Initial backfat thickness, mm	9.4	5.8	1.3	B**, R**
Final backfat thickness, mm	20.5	10.2	2.1	B**, S**, R**
Daily feed intake, g. d^{-1}	2001	2167	331	B**, S**, R**
Daily feed intake, g. d^{-1}. $kg^{0.75}$	112	100	13	B**, S**, R**
Daily BW gain, $g.d^{-1}$	649	869	115	B**, S*
Feed conversion, $kg.kg^{-1}$ gain	3.1	2.5	0.3	B**, S**, R**
Feeding behavior				
Number of visits	26.0	42.1	22.9	B**, S**, R*
Number of meals	6.9	8.4	1.9	B**, R**
Meal size, g	318	282	89	B*, S**, R**
Ingestion time, min	88.0	67.3	13.7	B**, S**
Ingestion time, min/meal	13.5	8.4	2.9	B**, S**, R**
Rate of feed intake, $g.min^{-1}$	23.6	33.6	4.9	B**, R*

[a] Residual standard error.

[b c] Analysis of variance with breed (B), sex (S), replicate (R), and breed × sex interaction (B × S) as main effect. Levels of significance: * $P < 0.05$, ** $P < 0.01$.

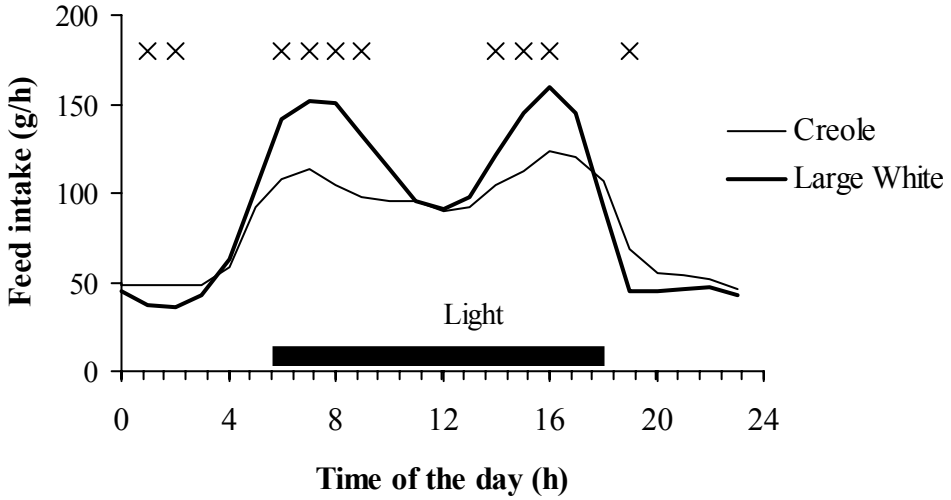

Figure 1: Effect of the breed and the time of the day on the average food intake per hour. × Hourly feed intake was significantly ($P < 0.05$) affected by breed.