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Article *in* Journal of Animal and Veterinary Advances · January 2005

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Journal of Animal and Veterinary Advances 4 (10): 855-858, 2005

Growth,Morphometry and Reproductive Performance of Creole Cuino Pigs in Mexico

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Abstract: Several biotypes of the Mexicanc creole pig are in danger of extinction. This study was carried out in order to characterize the Mexican cuino pig. Growth, morphometry and reproductive traits are statistically described analysing the reproductive performance of 12 Cuino sows kept under confinement conditions. Average live weight was monitored at birth and 6 months later (0.86 and 43.84 kg, respectively). Results show that Cuino pigs tend to deposit more backfat than commercial breeds, their growth rhythm was adjusted to a polynomial equation (Y = 1.1138x2 - 4.0804x + 5.1355 R2 = 0.9955); it is slow at the beginning and after 91 days animals showed an accelerated growth. Average daily feed intake increased until pigs were five months old, from 0.403 to 1.930 kg., with an improved polynomial adjustment (Y = 0.2363x2 - 1.3129x + 5.7951 R2 = 0.82). Feed conversion was 4.596 in the first post-weaning month and 5.174 in the last month of fattening at 6 months. Cuino pigs are small, with short snout and a small number of teats. The variation in all the measured morphological variables was low (7.5 to 16.7%), this suggests that their morphology does not vary much. Prolificity of these pigs was low; the average number of pigs born alive was 4.95 with a litter birth weight of 4.35 kg and 4.12 weaned pigs with 16.09 kg at weaning. Present results indicate that the cuino pig has not been genetically improved since the time it has been in Mexico.

Key words: Mexican cuino pig, morphometry, creole pig, growth, feed conversion

INTRODUCTION

Approximately 30% of all breeds of domestic animals in the world are facing extinction, mainly those autochthonous breeds that are exploited in a traditional way in rural areas; moreover, it is estimated that 25 to 35% of pigs worldwide belong to local breeds[1].

The exploitation of the Mexican Creole Pig (MCP) (*Sus scrofa)* is still important for Mexican peasants. Three types of MCP have been recognized by the Domestic Animal Diversity Information System (DAD-IS), which are: Birish, Cascote Pig and Cuino that correspond to the Mexican Hairless Pig (MHP), the Mulefoot Pig (has a solid hoof resembling that of a mule) and the Cuino Pig (CP),[1,2]. The Food and Agriculture Organization[1] considers that these pigs are at risk of extinction by being absorbed by modern breeds and also due to lack of conservation programs and lack of technical programs for the use of these animals.

MCP is raised in rural communities under very poor husbandry conditions, taking advantage of tubers, forages and agriculture by-products. This pig is recognized by its ability to produce fat and to adapt to local conditions. Its importance in rural communities is two-fold; on one hand this animal improves the peasant's or breeder´s diet and on the other it can be fattened to market[3]. It is not possible to talk about a pure breed because systematic selection programs have not been carried out yet and the populations of these pigs have a high heterozygote level[4].

Populations of Mexican creole pigs can be a very important reservoir of genetic variation to be used for preservation and evaluation matters and as a source of new alelee for the future of commercial pig lines[4].

In Mexico, the Mexican hairless pig is the most abundant of the three types of MCP, followed by the Cuino Pig that was probably introduced by ships that arrived from China and traded with Mexico during the 16th century[5,6]. In the past, the cuino pig was fairly abundant in the same environment as the MHP; it was

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Fig. 1: Cuino boar

Fig. 2: Cuino sow with litter

fed exclusively with kitchen wastes with the purpose of slaughtering it for family parties[7]. These small pigs were highly appreciated by the peasants; originally they were as a fat source and they are tending to disappear from the national panorama due to the increased use of vegetable oils and due to their low prolific characteristics too [8]. The CP has remarkably curly hair (Fig.1), but it can also be hairless. The most common color is black although it can also be found in red and spotted. It has a gentle nature; reaches a weight o f 49±9 kg at most, a height of 53 to 65 cm. at withers, because its body is small with tendency to accumulate fat (Fig. 2). This animal has a concave-type face and short snout, with high abundance of fat deposit in masseters. Cuino pigs are considered almost extinct by FAO World Watch List for Domestic Animal Diversity[9].

At present there are few reported data available on the Mexican cuino pig. Therefore it is important to encourage efforts to study their productive performance, characterize and protect them. The objective of the present study was to evaluate the performance of the Cuino pig and provide a statistical description of the growth, morphometry and reproduction traits.

MATERIALS AND METHODS

Site and study animals: The study was carried out in the Faculty of Veterinary Medicine and Animal Husbandry (FMVZ), of the Autonomous University of Nayarit, under a low semi-warm sub-humid Weather (AcW), with summer rains and an annual average temperature of 22°C.

The production performance of 12 sow (between the first and second parities) Cuino pigs was analyzed. Animals were the result of the natural mating with three Cuino boars. The breeding herd was kept under confinement conditions; lactation duration was of 35 days. Animals were fed with balanced food, providing 1.5 kg daily during gestation and 2.5 kg in lactation; diet consisted of 14% Crude Protein (CP) and 3.150 Kcal of Digestible Energy (DE).

Born alive piglets were identified with ear notches and were weighed at birth; then after 21 days and at 35 days after weaning and continued to be weighed every four weeks until completing 6 months of age. Pigs received food *ad libitum*, with 18% of CP and 3,200 Kcal. of DE during two months in their nursery stage; 17% of CP and 3.150 Kcal of DE, also two months during their growth stage and two months with 14% of CP and 3,100 Kcal. of ED during the fattening period.

All piglets were used to monitor their weight gain and morphometry; only 33 weaned piglets were grouped in three lots in order to register their feed intake and feed conversion.

Weight gain, average feed intake and average feed conversion were calculated for every stage, from weaning to the end of the fattening period.

Morphometric measurements of fattening pigs: At the end of the fattening period the following individual measurements were carried out: Height at Withers (HW), Body Length (BL), Snout Length (ST), Thoracic Perimeter (TP), Number of Nipples (N); Backfat (BF) and Loin-Eye Depth (LED) to the height of the tenth rib by means of ultrasound (A-Scan Plus V 1.6 Sonic Industries, 1998).

Reproductive performance: The following indicators were evaluated in each farrowing: Litter Size (LZ), Pigs Born Alive (PBA), Litter Birth Weight (LBW), Weaned Piglets (WP), Weaned Litter Weight (WLW), pre-weaning mortality percentage (% MOR). Descriptive statistics were obtained to characterize the Cuino pig and measure its variations.

Table 1: Statistics for the different weights (kg) of different growth stages in Cuino pigs

Statistics	AWPBA	W_{21}	WW_1	W_2	W_3	W_4	W_5	W_6
Median	0.86	3.11	3.79	6.24	11.19	20.66	31.67	43.84
Mode	0.90	3.00	4.00	7.00	17.00	25.00	33.00	55.00
Standar deviation	0.22	0.76	1.16	2.39	5.37	8.01	8.97	10.55
Minimum	0.40	1.50	1.70	1.90	2.00	3.90	13.00	24.00
Maximum	1.50	5.10	7.35	11.50	26.00	36.00	49.00	70.00
Number	109.00	99.00	94.00	64.00	64.00	59.00	57.00	57.00
Variation coefficient	25.73	24.39	30.71	38.26	48.03	38.76	28.33	24.07

AWPBA: Average weight of pigs born alive. W_{21}: Weight at 21 days. WW1: Weaning weight at 35 days of age. W_2: Weight at 63 days of age. W_3: Weight at 91 days of age. W_4: Weight at 119 days of age. W_5: Weight at 147 days of age. W_6: Weight at 175 days of age

RESULTS AND DISCUSSION

Growth performance: Table 1 shows that all measured variables had a variation between 24.07 and 48.03%; low birth weights were observed; for AWPBA a difference of 1.1 kg was obtained between the lowest and the highest weight. The final weights were low too, they varied between 24 to 70 kg with a great number of animals weighing 55 kg.

Growth weights were adjusted to a polynomial equation (Y = 1.1138x2 - 4.0804x + 5.1355R2 =0.9955) and did not show a lineal tendency, moreover, it was slow at the beginning and it accelerated after 91 days. This could be due to the fact that Cuino pigs tend to deposit fat, their growth rhythm is slower compared with commercial white pig breeds.

The variation in weight gain was from moderate to high, fluctuating between 45.17 and 75.95%. As shown in Table 2, it increased in each stage until reaching 13.126 kg in the last stage, corresponding to an average daily gain of 468 g., with a minimum daily gain of 89 g. A polynomial adjustment was observed (Y = -0.4141x2 + 5.162x-2.3174 R2 = 0.9992) in the weight gains, noticing an increase after 91 days, with a tendency to decrease at the final stage.

Data regarding feed intake in the Cuino pig is provided in Table 3. Daily feed intake was increased an average of 0.403 up to 1.930 kg. until pigs were five months old, decreasing in the last stage. This decrease in feed consumption was observed in the three groups that were formed with a better polynomial adjustment (Y= 0.2363 x2 - 1.3129x + 5.7951 R2 = 0.82). Cuino pig grows slower, with less weight gain than the commercial pig, it also consumes less food; however, it is less efficient since it has more need for food for each gained kilogram. As Showed in Table 3, as a general average the CP needs more than 4 kg of food to produce one kilogram of live weight. The pigs from commercial breeds show feed conversions from 2.5 up to 3.1 kg, thus being more efficient than the Cuino pigs, since the latter have not been improved in this trait either.

Morphometry: According to the results shown in Table 4, Cuino pigs are small, with short snout and very low number of teats.

Table 2: Statistics on weight gain for cuino pigs at different growth stages

Statistics	WG1-2	WG2-3	WG3-4	WG4-5	WG5-6
Median	2.50	6.17	9.60	11.68	13.13
Mode	1.00	8.50	13.00	12.00	13.00
Standar Deviation	1.73	3.15	4.76	5.28	9.97
Minimum	0.10	0.40	1.00	2.00	1.40
Maximum	6.50	14.50	22.00	24.30	56.60
Number	64.00	64.00	59.00	57.00	57.00
Variation coefficient	69.21	51.03	49.62	45.17	75.95

WG1-2: weight gain from weaning to 2 months; WG2-3: weight gain from 2 to 3 months; WG3-4: weight gain from 3 to 4 months; WG4-5: weight gain from 4 to 5 moths; WG5-6: weight gain from 5 to 6 months.

Table 3: Average feed intake and feed conversion of Cuino pigs at different growth stages

Traits	PD_1-P_2	P_2-P_3	P_3-P_4	P_4-P_5	P_5-P_6
Animals	33	31	29	29	29
Days	28	28	28	28	28
Total feed weight (kg)	363.5	828	1017	1567.5	1396.5
Initial weight (kg)	3.804	6.257	12.158	21.576	34.032
Final weight (kg)	6.257	12.265	21.576	34.032	43.340
Daily feed intake (per animal)	0.403	0.954	1.252	1.930	1.720
Feed conversión (kg)	4.596	4.445	3.724	4.339	5.174

W_1-P_2: Period from weaning to 2 months; P_2-P_3: Period from 2 to 3 months; P_3-P_4: Period from 3 to 4 months; P_4-P_5: Period from 4 to 5 months; P_5-P_6: Period from 5 to 6 months

Variation found in all measured morphological traits was low (7.5 to 16.7%), except for backfat (29.6%), suggesting that its morphology does not vary much, being important to characterize the breed. The tendency of modern pigs is to produce less fat and more muscle, characteristic that cuino pigs do not have, mainly because there has not been a selection in creole pigs to reduce fat or increase in lean meat.

Reproductive performance: Results on the reproductive performance of Cuino sows are shown in Table 5. The variation in all the characteristics went from moderate with a tendency to high, the variation coefficient was 31.03 to 58.25%. There was a 20% decrease on litter size at farrowing since there were 4.45 pigs born alive; the prolificity was low too, observing that the maximum number of born alive piglets was 9. Therefore we conclude that Cuino pigs have not been genetically improved during the time these animals have existed in Mexico.

Cuino sows surpassed acceptable pre-weaning mortality rates for commercial swine production;

Table 4: Morphometric traits of fattening cuino pigs

Statistics	HW (cm)	BL (cm)	SL (cm)	TP (cm)	N (number)	BF (mm)	LED (mm)
Median	47.60	65.25	11.95	87.28	10.18	26.94	59.13
Mode	45.00	54.00	11.00	85.00	10.00	28.30	57.60
Standar Deviation	4.14	7.69	1.70	7.39	0.77	7.98	9.91
Minimum	40.00	54.00	9.50	67.00	8.00	9.00	35.00
Maximum	59.00	80.00	17.00	102.00	12.00	42.10	79.40
Number	57.00	57.00	57.00	57.00	87.00	56.00	56.00
Variation coefficient	8.71	11.79	14.24	8.46	7.56	29.62	16.76

HW: height at withers; Bl: Body Length; St: Snout Length; Tp: Thoracic Perimeter; N: Nipples; Bf: Backfat; Led: Loin-eye Depth

Table 5: Reproductive performance of Cuino sows

Statistics	LZ	PBA	LBW	WP	WLW	% MOR
Median	6.16	4.95	4.35	4.12	16.09	78.89
Mode	4.00	6.00	5.00	2.00	11.50	100.00
Standar deviation	1.92	2.41	2.34	2.37	9.37	24.49
Minimum	2.00	1.00	0.40	1.00	4.30	37.50
Maximum	9.00	9.00	7.90	8.00	32.83	100.00
Number	19.00	19.00	18.00	17.00	17.00	17.00
Variation coefficient	31.220	48.806	53.668	57.523	58.254	31.038

LZ: Litter Size; PBA: Pigs Born Alive; LBW: Litter Birth Weight (kg.); WP: Weaned Piglets; WLW: Weaned Litter Weight (Kg); % MOR: pre-weaning Mortality Percentage

given that litters are small, these animals should have greater possibilities for survival, however it is possible that the high mortality rate in Cuino sows is because they do not have good maternal and milk production abilities, further physio-ethological studies will let use know if this is the case.

ACKNOWLEDGEMENTS

Authors acknowledge the financial support of SEP-PIFI-2001-UAN. FONDOS SAGARPA-CONACYT 2002-PROY. CO1-1472, Mexico.

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