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Carcass and meat quality traits of wild boar (*Sus* scrofa *s.* L.) with 2*n* = 36 karyotype compared to those of phenotypically similar crossbreeds (2*n* = 37 and 2*n* = 38) raised under same farming conditions. 1. Carcass quantity and meat dressing

O. Skewes [a,*], R. Morales [a], F. González [a], J. Lui [b], P. Hofbauer [c], P. Paulsen [c]

[a] *Department of Animal Production, Faculty of Veterinary Science, University of Concepción, Av. Vicente Mendez 595, 3801061 Chillán, Chile*
[b] *Department of Animal Genetic, Faculty of Agriculture and Veterinary Medicine, State University Paulista (UNESP), Prof. Paulo Donato Castenalle s/n, 14884-900 Jaboticabal, SP, Brazil*
[c] *Department of Veterinary Public Health and Food Science, University of Veterinary Medicine, Veterinärplatz 1, 1210 Vienna, Austria*

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ABSTRACT

The aim of this study was to compare wild boar (chromosomal number 2*n* = 36) to phenotypically similar animals of 2*n* = 37 and 2*n* = 38 chromosomes (crossbreeds) with respect to live weight, carcass yield, meat yield, fat and weight of inner organs. All animals were born and raised on the same farm and slaughtered at 39 weeks. The final live weight of wild boar 2*n* = 36 was significantly lower (47.2 kg) as compared to crossbreeds (80.0 kg). Animals 2*n* = 36 had more carcass yields (65.5%) than 2*n* = 37 karyotype (64.9%) and 2*n* = 38 (64.4%). Wild boar had the highest yields for the cuts with bones and boneless cuts compared to crossbreeds. Therefore, variations in karyotype are accompanied by differences in some carcass quantitative traits, i.e., 2*n* = 36 grow and fatten slower than crossbreeds 2*n* = 37 and 2*n* = 38.

1. Introduction

Wild boar and domestic pig belong to the same species (*Sus scrofa* L.). Within this species, three different karyotypes are observed, upon which wild boars in Western Europe have 2*n* = 36, whereas most wild boars from Central Europe and from Asia, as well as all domestic pigs, have 2*n* = 38 chromosomes (Fang, Berg, Ducos, & Andersson, 2006; Grop, Giers, & Tettenborn, 1969; Popescu, Quere, & Franceschi, 1980; Rittmannsperger, 1971; Tikhonov & Troshina, 1974; Zivkovic, Jovanovic, Isakovic, & Milosevic, 1971).

Karyotype polymorphism present in some populations of free ranging wild boar showed diploid chromosome numbers of 2*n* = 36, 37 or 38 (Bosma, 1976; Macchi, Tarantola, Perrone, Paradiso, & Ponzio, 1995; Rejduch, Slota, Rozycki, & Koscielny, 2003) leading to the suspicion that some "pure" wild boars were in fact crossbreeds with domestic pigs.

In effect, hybrids of wild boar and domestic pigs or feral hogs may express similar phenotypes but can have 2*n* = 36, 37 or 38 chromosomes (Gustavsson, Hageltorn, Zech, & Reiland, 1973; Mauget, 1980; Mayer & Brisbin, 1991). Crossbreeds with 2*n* = 37 are viably reproducible (Mauget, 1980; Sysa, Slawomirski, & Gromadzka,1984; Tanchev & Katsarov, 1993), and can cross with both wild boars as well as domestic pigs, the offspring being of wild boar phenotype with 2*n* = 37 or 38 chromosomes (Lui, 2000).

Although wild boar is the principal source of modern European domestic pigs (Larson et al., 2005), several studies indicate that European wild boar has some favourable meat characteristics that distinguish it from meat of domestic pigs (Essen-Gustavsson & Lindholm, 1984; Ruusunen & Puolanne, 2004; Solomon & West, 1985; Zochowska et al., 2005). Crossbreeding of domestic pig and wild boar could result in improved pork quality, a hypothesis which has been substantiated by a number of studies on quality trait loci in the genome of crossbreeds (Japanese wild boar: Nii et al., 2005; European wild boar: Geldermann et al., 2003; Knorr et al., 1994).

The question remains, as to whether the crossbreeds with 2*n* = 37 and 38 chromosomes actually differ in their carcass and meat quality traits, or not. Macuco (2000) demonstrated that such differences can be observed, although statistical significance could not be demonstrated.

In Chile, there is increasing pork production from farmed wild boar (Skewes & Morales, 2006) originating from specimens from the wilderness. Wild boar is a species quite recently introduced to Chile. Some wild boars originating from imports from Europe in ca. 1936 were deliberately released in 1946–1948 (Gomez Luna,

* Corresponding author. Tel.: +56 42 208834; fax: +56 42 270201.
E-mail address: oskewes@udec.cl (O. Skewes).

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1984) and from the 1950s to the 1980s, invasions of wild boars (originally imported from Europe around 1900) from Argentine were observed (Skewes, 1990). Individuals with $2n = 36$ karyotype are considered "pure" wild boars. This criterion of genetic purity was first proposed by Mauget (1980) and Goustat, Darre, and Berland (1994) and followed in South American countries (Lui, 2000; Miranda, 2000). In Chile there are also naturally occurring crossbreeds of male wild boars with free range domestic pigs with similar phenotype and $2n = 37$ (Skewes & Morales, 2006).

In South America, technical aspects (Vieites, Basso, & Bartolini, 2003) and meat quality traits (Marchiori & de Felicio, 2003) of farming of wild boars ($2n = 36$) for meat production have been studied, but studies on farmed crossbreeds are lacking. As the production of pork from wild boar aims to control all production factors (descendance, feeding, prophylactic medical treatments and slaughter), studies on the effect of the variations in the karyotypes on carcass and meat quantitative traits should be conducted. This paper presents data on the yield of meat (commercial cuts) and slaughter by-products of wild boar and crossbreeds raised under identical conditions in Chile, with a focus on the possible influence of the karyotypes.

2. Materials and methods

2.1. Animals and determination of the karyotypes

Animals of both sexes and of three genetic groups ($2n = 36$, 37 or 38), piglets $2n = 36$ descending from parents $2n = 36 \times 2n = 37$ and animals $2n = 37$ and 38 from crossing animals $2n = 37 \times 2n = 37$, were included in this study. All experimental animals and parents resembled the wild boar phenotype and were raised on the wild boar farm.

The karyotype was determined for each animal. For this purpose, 5 ml of blood from the jugular vein was collected in a heparinized Vacutainer® tube (Becton–Dickinson®, Santiago, Chile). The sample was kept at 5 to 7 °C during transport to the laboratory. In the laboratory, the lymphocyte culture was carried out following the technique described by Moorhead, Nowell, Mellman, Battips, and Hungerford (1960). Once the lymphocytes were obtained, they were placed on a microscopic slide and the karyotype was characterized according to standard procedure in the Genetic Laboratory of the Veterinary Faculty of the State University Paulista, Brazil.

At weaning (60 days) and according to karyotype ($2n = 36$, 37 and 38) three groups of seven animals each with similar weights were formed.

2.2. Location and facilities

The animals were born and raised on a Chilean commercial wild boar farm, located in the county of Chillan, 36°34′S 72°06′W, 118 m above sea level, with an annual mean precipitation of 1034 mm; annual mean temperature of 14 °C, with a maximum mean for the hottest month (January) of 28.8 °C and a minimum mean for the coldest month (July) of 3.5 °C (Hajek & Di Castri, 1975). Animals were kept in outdoor pens with 22 m^2 per animal, wooden feeders on the ground (providing an access of linear 0.3 m/animal), a sucking drinker for every 15 animals, a soil-covered floor, and a hay bed for refuge and community housing with 1 m^2/animal.

2.3. Feeding and management

The animals were fed with mixed pellets, containing 16.3% crude protein, 2.2% crude fat, 2.9% fiber and 3028 kcal/kg metabolizable energy. The amount of feedstuff was 4% of the live weight/animal/day and was adjusted every 15 days. At weaning the animals received Erysipelas vaccine, antiparasitic treatment (Ivermectin Baymec® 1 ml/33 kg live weight s.c., Bayer®, Santiago, Chile), vitamins A, D, E (Vigantol®, 0.5 ml per animal i.m., Bayer®, Santiago, Chile). This regimen, except for vitamins A, D, E, was repeated when the animals reached 6 months. All animals were slaughtered at 39 weeks, independent of their weight.

2.4. Slaughter, dressing of the carcass, chilling regime and cutting scheme

At 39 weeks the animals were weighed and transported to a commercial slaughterhouse. After electrical stunning, the animals were subsequently exsanguinated, skinned, and eviscerated (including the removal of reproductive tract and urinary bladder). The distal parts of the legs were cut at the carpal and tarsal joints. Inner organs, mesenteric, perirenal and perigastric fat were weighed separately.

The dressed (head-on, deskinned, distal ends of legs removed) hot carcass was washed and weighed. The cold carcass weight was obtained after 24 h of chilling at 0 °C ± 1 °C. Carcasses were subsequently beheaded; subcutaneous fat was trimmed and peritoneal fat was stripped from the carcass. Carcasses were split; from the left half, boneless cuts were prepared, from the right half, cuts with bones were obtained in order to verify possible differences between the same cuts with and without bones. The cuts were: ham (pulp), cutlet (loin), spare-rib, shoulder (pulp), neck loin, hands and legs according to Chilean standards (INN, 1499:2000) for domestic pig (Fig. 1). The weight of fat and muscle cuts was recorded and the ratio to the weight of the cold half was calculated.

2.5. Statistical analysis

The Statistical analysis was carried out with the SAS statistical package (SAS Institute., 2001). The results were analyzed using the General Linear Model (GLM) procedure. For analysis, the model

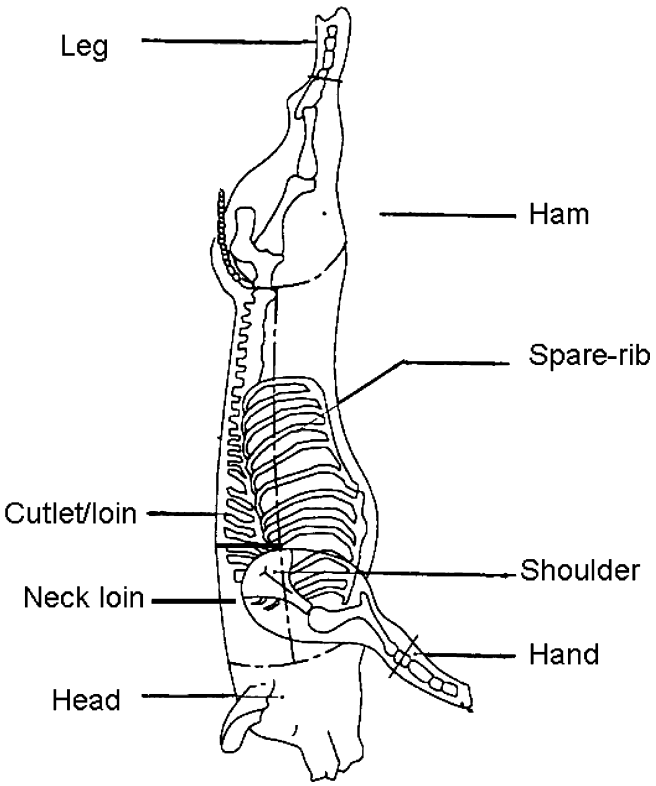

Fig. 1. Meat cuts of pig according to Chilean regulation (INN, 1499:2000).