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GRAZING BEHAVIOUR OF THE IBERIAN PIG IN THE MONTANERA FATTENING PERIOD.

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ABSTRACT

A group of 84 Iberian pigs have been studied in the "montanera" fattening period (between 100 to 160 kg. and since 1st November 2003 to 15th January 2004) at the "dehesa" agrosystem (clear forest of evergreen oaks, *Quercus rotundifolia*), in order to study their feeding activities and other grazing behaviours. From this group a sample of 5 randomly chosen and different pigs have been followed during 7 whole grazing days (10 uninterrupted hours, since 8:30 to 18:30) every 10 days. The obtained results are the following ones: 7 hours and 6 minutes of daily grazing activity; during the journey, each pig visits a mean of 97.2 evergreen oaks to consume 1468.5 acorns. Also during the journey each pig eats 1447.9 grass bites, drinks water 9.1 times and roots 67.7 times. Other daily registered activities during the grazing journey are: 1.3 mood baths, 5.8 scratches, 5 urinations and 10 defecations. Statistical analysis of data shows a high individual variations respecting to intake resources and significant differences ($p<0.0001$) to the activities along the grazing journey. These results are useful to determine set stocking, feed preferences, and farming inspection to control feeding quality and traceability (to asegurance acorn compsuption). Finally these results contribute to explain final fattening performance differences and meat quality.

Introduction

The Iberian pig is an autochthonous porcine breed developed traditionally in the southwest of the Iberian Peninsula (Spain and Portugal), being one of the scarce non-improved swine breeds which has survived the modern techniques of pig production (Lopez-Bote, 1998). The traditional exploitation system of the Iberian pig is linked to the "dehesa" *(Quercus rotundifolia* and *Q. suber* open woodlands), and based on making sustainable use of natural resources (acorn, pasture, roots, invertebrates, etc.). The maturation of acorns takes place from early November to late February. The super-abundance of feeds from the acorn maturation is used by the Iberian pigs for the late fattening phase in what is called "montanera" (Lopez-Bote, 1998). This system is of a great interest due to the differentiating

characteristics contributed by it, both to the carcasses and the products derived from them. So hams from pigs fattened grazing acorns and pastures during autumn, in the traditional way, called "montanera", are the most highly appreciated ones by consumers.

Nowadays it has been sufficiently proven that the characteristics of the Iberian pig fat basically depend on the type of feeding it has received at the end of its fattening period, and that the use of different diet types, based on acorns and grass or feed concentrates, have a significant repercussion on the fatty acid composition of the adipose tissues of its carcass (Flores et al., 1988; Casillas, 1994; De Pedro et al., 1995; Ruiz et al., 1998; García-Olmo et al., 2002;). So the most frequently used and studied technique to distinguish the type of feeding for the final fattening period is to analyse the fatty acid profile. However, there is a lack of studies about this breed grazing behaviour and its use of natural resources (Aparicio, 1992).

The level of production obtained from animals grazing vegetation depends on their ability to ingest a diet adequate to meet their nutrient requirements for maintenance, growth and reproduction. This in turn is regulated by a series of short-term decisions made by the animal about which plants to select and how long search between bites. These decisions influence rate of food intake and nutrient content of the diet (Gordon, 1995). Data on herbage intake of growing pigs are very scarce (Edwards, 2003). In the case of the Iberian pig fed with the montanera system is well known that its natural diet is deficient in proteins (Lopez-Bote, 1998; Vargas et al., 1999). Longer term decisions related to grazing concern the length of time to spend feeding and where to feed, given topographic influences on energy expenditure and distance travelled between foraging sites, water and shelter (Stuth, 1991). This suite of decision-making processes is defined as the foraging strategy of the animal (Gordon and Illius, 1992). If we are to make the most efficient use of the plant and animal resources available in marginal areas, it is essential to improve our understanding of the foraging strategies of livestock which use these ecosystems (Gordon, 1995).

Material and methods

Animals

According to the traditional fattening system, "montanera" (Lopez-Bote, 1998), this study was carried out with 84 Iberian pigs 341.33 ± 5.45 days old, weighing 113.44 ± 1.11 kg during the final fattening period (60 days prior to slaughter), since first November 2003 (when acorns fall and there is enough amount to graze) to first January 2004.

Study site and on-farm trials

Grazing surface was 111 hectares of "dehesa" with a mean of 27.4 adult and productive evergreen oaks (*Quercus rotundifolia*) per hectare.

The flock had already been grazed in this environment for 30 days, since first October, but in an enclosure of the paddock with few acorns fallen. Once free in the whole paddock, the adaptation period to eat acorns was 9 days before the observations began at day 10.

They were only allowed to graze in the study paddock, and only during daytime, from 8:30 to 18:30. Anyway, previously to the study grazing day was estimated. The flock grazed in this paddock everyday. No supplementary feed was given throughout the experiment, and they did not receive any supplement of salt licks and minerals at night in the night paddock.

Observation of individual behaviour

A direct in situ observation method was used, with continuous observation of ingestive bites taken by a continuously monitored individual.

Previously to the observation period there were several sampling observations in the same paddocks used for the study, in order to know the voluntary pig starting hour of grazing day and to identify and classify all possible activities and bite types carried out by the pigs.

Observation were made during full daytime periods, starting on the 10 day and every ten days. Every day five pigs within the flock were randomly chosen and colour ink spray marked for close and continuous focal observation during full daytime periods.

The observers followed the monitored animals for the whole day at a distance of approximately 0.5-2 m, in order to continuously observe their mouths, to listen to pigs chewing and to identify bites categories. The observers remained alongside the animal so as not to obstruct their spontaneous line of movement.

In order to know the chronology of feed choices and grazing behaviour/activity in real time every observer had a countdown or timer chronometer to distinguish successive intervals of 15 minutes.

Results

Pigs are active 429 minutes per grazing day, the main activity is related to grazing but this activity was not equally distributed during the 10 hours (grazing day) of observation as figure 1 shows. So the general grazing activity decreases radically from 16:30. Also statistical analysis of data shows a high individual variations respecting to consumed resources and significant differences ($p<0.0001$) to the activities along the grazing day.

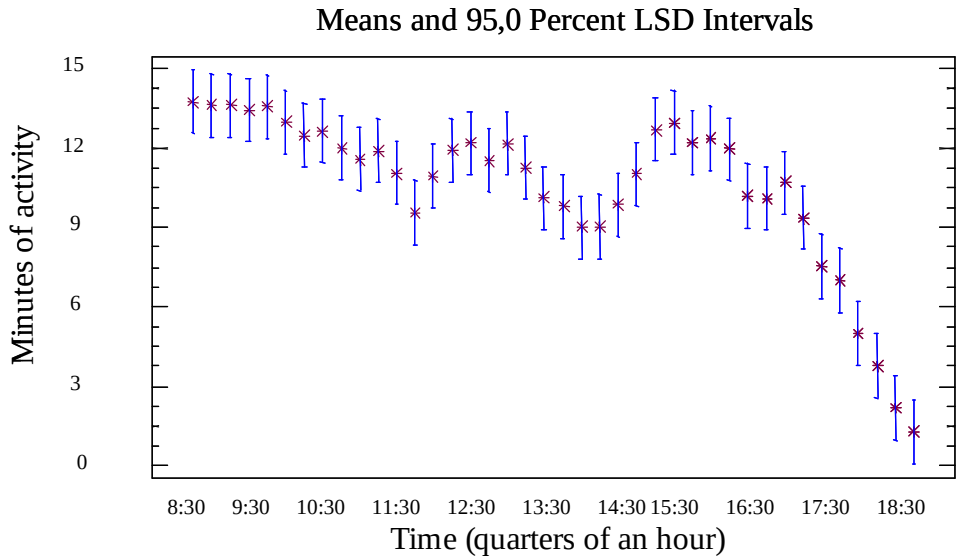

Figure 1. Mean time of activity per quarter of an hour during the grazing day (p<0.0001).

The pigs visited a decreasing mean number of evergreen oaks to eat acorns per quarter of an hour along the grazing day (figure 2). However, in spite of this tendency, the number of visited trees keeps constant during the central hours of the grazing day. Finally the mean number of evergreen oaks visited per day is 97.18 ± 6.74.

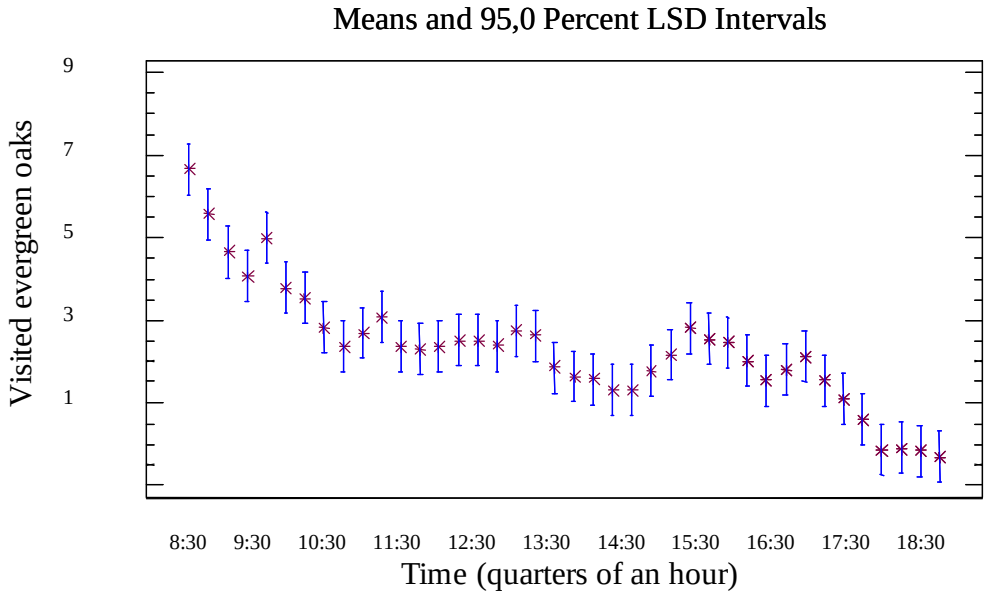

Figure 2. Mean number of visited evergreen oaks to eat acorns per quarter of an hour during the grazing day. (p<0.0001)

Also the mean number of consumed acorns per quarter of an hour decreased in a similar way to the mean number of visited evergreen oaks, and there is a similar constancy during the central hours of the grazing day (figure 3). The highest intake of acorn observed is after the

first half of an hour in spite of the prolonged fasting time during the night. However this first half of an hour looks to be like a "stretching time" after have slept or laying down, associated to a recent daybreak. The pigs ended their grazing day eating an average of 1468.5 ± 110.77 acorns.

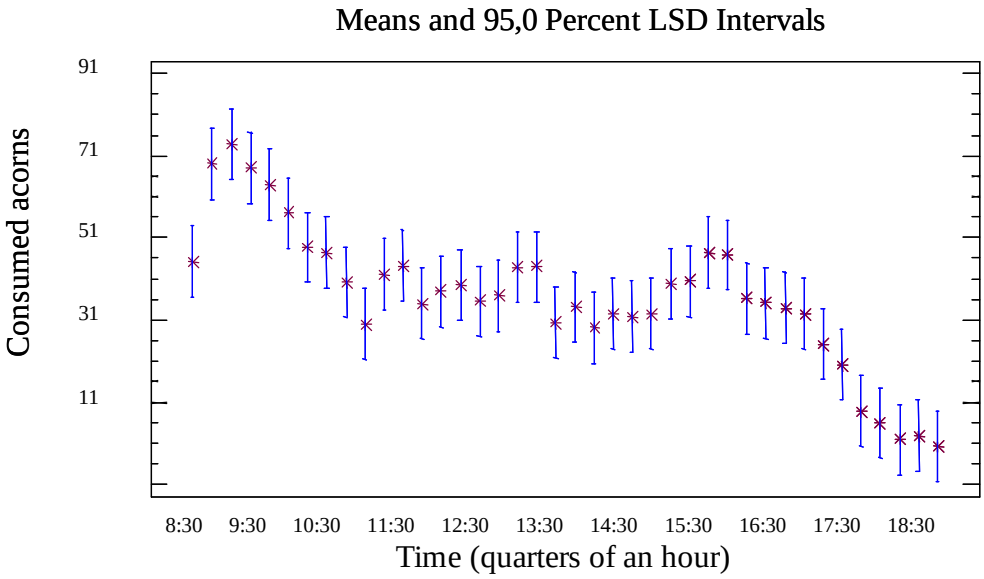

Figure 3. Mean number of consumed acorns per quarter of an hour during the grazing day.

In contrast mean number of bites of grass per quarter of an hour is minimum during the first hour of the day and it increased as the mean number of consumed acorns decreased, keeping constant during the central hours of the grazing day and increasing in the afternoon, when the highest mean number of bites of grass is located (figure 4). The pigs ended their grazing day eating an average of 1447.5 ± 149.07 bites of grass.

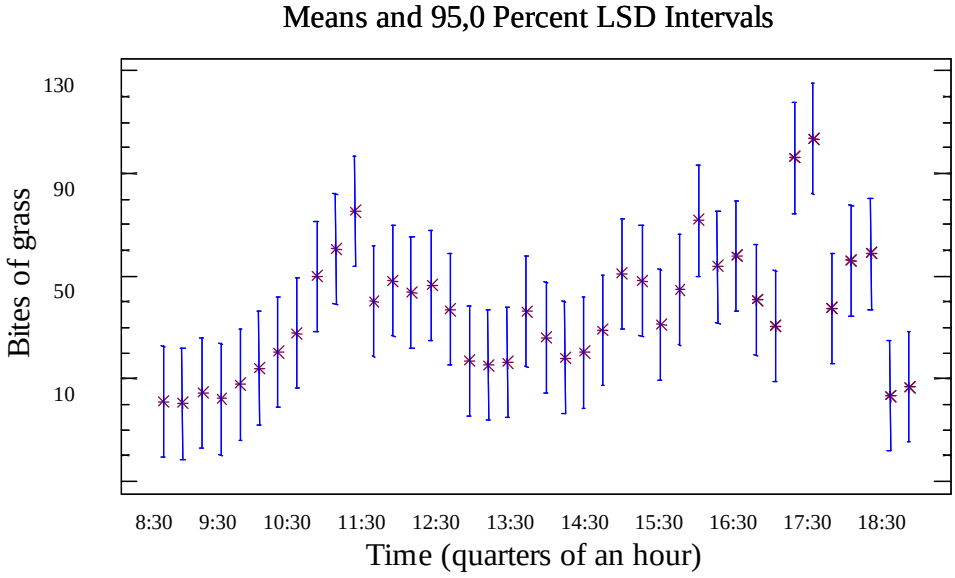

Figure 4. Mean number of bites of grass per quarter of an hour during the grazing day ($p<0.0001$).

Significant differences ($p<0.0001$) are found when compare grazing behaviour between morning and afternoon (table 1).

Table 1. Comparison of grazing behaviours between morning and afternoon (Mean ± S.E.).

	Morning (8:30-13:30)	Afternoon (13:30-18:30)	Grazing day (8:30-18:30)
Time of grazing activity (seconds /fifteen minutes)	$747.33^{a} \pm 12.01$	$538.1^{b} \pm 16.18$	643.49 ± 10.45
Number of visited evergreen oaks (nº trees/15 minutes)	$3.69^{a} \pm 0.12$	$1.78^{b} \pm 0.09$	2.74 ± 0.08
Consumed Acorns (Nº acorns/15 minutes)	$46.61^{a} \pm 1.51$	$26.85^{b} \pm 1.42$	36.73 ± 1.07
Bites of Grass (Nº bites/15 minutes)	$28.24^{a} \pm 3.04$	$44.2^{b} \pm 3.98$	36.22 ± 2.51
Bites of other resources (Nº bites/15 minutes)	$0.21^{a} \pm 0.03$	$0.14^{b} \pm 0.02$	0.17 ± 0.02

Values with different superscript within a row differ significantly ($p < 0.0001$)

Also, along the grazing day there are other behaviours or activities without relation with grazing or feeding (table 2).

Table 2. Other activities during the grazing day

Activities (Nº times/15 minutes)	Mean ± S.E.
Drinking	9.1 ± 0.83
Rooting	67.7 ± 12.47
Baths	1.3 ± 0.21
Scratching	5.8 ± 0.76
Urination	4.97 ± 0.39
Defecation	9.97 ± 0.84

Discussion and conclusions

The direct in situ observation method used, with continuous observation of ingestive bites taken by continuously monitored individuals have permitted to register every consumed resource and to describe the daily grazing activity and other associated behaviours.

According with references pigs spent more than 50 % of their active time foraging (Mauget, 1981; Graves, 1984; Stolba and Wood-Gush, 1989; Aparicio, 1992).

Foraging showed a clear diurnal pattern with an increasing activity after dawn and finishing it gradually before dusk.

A trend was detected in daily activity patterns and in intake resources. So intake of acorn decreased along grazing day while ingestion of grass was increasing. Intake of other nutritional resources (different of grass and acorn) was insignificant in spite it was expected according with references (Graves, 1984; Aparicio, 1992). This predominance of acorn and grass over other resources maybe explained by ease to find and graze the first ones. However

it is necessary to study the reasons to visit so many evergreen oaks changing of tree having remaining and enough acorns to eat easily under their crown.

Also it is worth to study the reasons for rooting in spite of nose rings and to obtain very few nutritional resources by rooting.

This study provides knowledge about which type of natural resources in the "dehesa" offers a pig satisfying behavioural leeway in composing its meals and reaching physical satiety. Also this work tend to discard pastoral management practices focused on biomass evaluation, and encourage further studies that will help qualify the nature and structure of acorns and grasses that offers adjustment nutritional possibilities of "dehesa" for fattening pigs during autumn and winter.

These results are useful to determine set stocking, feed preferences, and farming inspection to control feeding quality and traceability (to asegurance acorn compsuption for this appreciated traditional finishing system). Finally these results contribute to explain final fattening performance differences and meat quality.

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