

# Effect of the season of the year on growth performance of pigs in the West region of Chaco, Argentina

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## Abstract

High temperatures have a major effect on growth performance in pigs especially in subtropical zones. The objective of this study was to evaluate the effect of the season of the year on growth performance of pigs during the nursery period in the West of Chaco, Argentina. A total of 4951 animals were used to calculate average daily gain (ADG), voluntary feed intake (VFI) and feed conversion ratio during the nursery phase ( $6\pm 1.1$  kg to  $25\pm 1.2$  kg). All pigs had the same diet, facilities and sanitary management. Data were analysed using Analysis of Variance (ANOVA) procedure of the INFOSTAT® statistical software. During summer and spring months there were a significant reduction in ADG and VFI ( $p\leq 0.05$ ) whereas FCR was not affected by seasons ( $p\geq 0.05$ ). In conclusion, hottest seasons of the year had a negative effect on ADG and VFI but they did not alter the FCR in pigs.

**Key words:** feed efficiency, high temperatures, swine nutrition

## Introduction

Animal productivity is optimized within narrow environmental conditions (Baumgard et al 2012). Due to their limited thermoregulatory system, pigs are especially susceptible to suffer heat stress (Collin et al 2001). When this occurs different mechanisms are used by the animal in order to reduce heat production. A significant reduction (up to 50%) of voluntary feed intake (VFI) is the most important sign of heat stress and it is thought to be the most negative effect on pig performance (Ross et al 2015). In practice, this reduction of VFI leads to a longer period of time taken to reach slaughter weight in growing pigs (Kiefer et al 2005).

Although heat stress is an occasional challenge in temperate countries, it is a constant problem in tropical and sub-tropical areas, such as the Chaco region in Argentina (Renadeau et al 2012). In this region, temperatures through the year can easily overpass the upper limit of the thermoneutral zone ( $24^{\circ}$  to  $25^{\circ}\text{C}$  for growing pigs) (Quiniou et al 2001), leading up to a low performance and consequently to economic losses for the farmer.

Thus, understanding how variations in temperature over the seasons impact on performance of growing pigs will facilitate the development of more efficient environmental management and feeding strategies (Patience et al 2005). The objective of this study was to evaluate the effect of season of the year on average daily gain (ADG), VFI and feed conversion ratio of pigs during the nursery period in the West region of Chaco, Argentina.

## Material and methods

## Location and environmental conditions of the study area

This study was conducted at a commercial farm located in Concepción of Bermejo in the West region of the province of Chaco, Argentina. Mean annual temperature is 21°C with variations from -10 to 55°C. Annual relative humidity and annual precipitation vary from 75 to 80% and 600 to 1100 mm respectively.

For each season of the period of study (2017-2018) mean monthly temperatures and relative humidity in the area where the farm is located were registered by the Agrometeorological Information and Management System (SIGA, INTA) (Table 1).

**Table 1.** Mean temperatures and relative humidity according to season and year of study

	Years							
	2017				2018			
	Su	Au	Wi	Sp	Su	Au	Wi	Sp
Temperature, °C#	27,5	22,0	18,7	26,1	28,1	22,5	17,0	25,8
Relative humidity, %#	67,0	76,3	62,4	56,0	62,2	67,9	63,6	63,6

Su (Summer), Au (Autumn), Wi (Winter), Sp (Spring)

# According to Agrometeorological Information and Management System (SIGA, INTA)

## Facilities, diets and animal management

All animals received the same standard maize/soybean diets which were formulated to meet or exceed the requirements for all nutrients (NRC 2012) (Table 2). The pigs had free access to feed and water during the study. They received the same sanitary management and were clinically healthy during the period of data recollection.

**Table 2.** Composition of the diet used in the study

Dry matter, %	68,3
Metabolizable energy, kcal/kg	3475
Crude protein, %	21,8
Crude fiber, %	3,19
Ether extract, %	6,12
Calcium, %	0,830
Phosphorus, %	0,360
Arginine, %	0,020
Lysine, %	0,950
Methionine, %	0,740
Threonine, %	0,220
Tryptophan, %	0,550

After weaning (21±1 days) piglets were moved from the farrowing crates to group pens (25-27 pigs per pen) with fully slatted floor and one wet/dry feeder shared by two pens, with supplementary heat from electric lamps. On reaching a body weight of 27±1 kg (30-40 days) they were moved to pens with a concrete floor, one feeder in the center of the pen and no supplementary heat.

Temperature inside the facility was regulated by a rolling curtain system. Curtains were opened and closed by manual winch; relative humidity was not regulated.

## Measurements and data collection

During 2017 and 2018, data from 4951 weaned piglets during the nursery phase (6±1.1 kg to 27±1 kg) were used in this study. Data from animals that died during the period of study were not used for the final analysis (mortality ≤2%).

The pigs were weighed at weaning and at the end of the nursery phase ( $27 \pm 1$  kg). Voluntary feed intake (VFI) was estimated as the difference between the amount of feed supplied and remained in each feeder. Feed conversion ratio (FCR) was determined as the ratio between VFI and ADG.

## Statistical analysis

Data were analysed using Analysis of Variance (ANOVA) procedure of the INFOSTAT® statistical software. Multiple comparisons were analysed using LSD Fisher's test. Differences were considered significant at  $p \leq 0.05$ . Results are presented as the mean values and standard error of the mean (SEM).

## Results

Differences among seasons in 2017 were detected for ADG but not for VFI or FCR (Table 3). In contrast, in 2018, seasons of the year had a strong influence on VFI and ADG with the lowest values of these variables during spring and summer.

**Table 3.** Effect of the season of the year on average daily gain, voluntary feed intake and feed conversion ratio for each year of study

		Summer	Autumn	Winter	Spring	SEM	<i>p</i>
<b>2017</b>	AVG, kg/day	0,387a	0,473ab	0,514b	0,423ab	0,0380	0,0486
	VFI, kg/day	1,23a	1,49a	1,48a	1,28a	0,106	0,255
	FCR, kg/kg	3,23a	3,24a	2,94a	3,05a	0,380	0,927
<b>2018</b>	AVG, kg/day	0,388a	0,553b	0,594b	0,420a	0,0360	0,00970
	VFI, kg/day	1,26a	1,37a	1,5b	1,14c	0,033	0,000400
	FCR, kg/kg	3,33a	2,49b	2,54b	2,77ab	0,229	0,109

*Means within rows without common superscripts differ at  $p < 0.05$*

## Discussion

Season of the year as reflected in temperature and relative humidity had a strong influence on growth rate and voluntary feed intake. In contrast, feed conversion ratio was not affected for these factors.

The influence of high temperatures on feed utilization has been widely studied, with a particular interest in non-ruminant species such as the pig (Christon 1988; Patience et al 2015; Ross et al 2015). Control mechanisms of feed intake are complex and influenced by several factors (Perondi et al 2017). Among these, environmental temperature is considered one of the most important variables for growing pigs. This is caused by the increased heat production during digestion that impairs the pig thermal homeostasis (Renadeau et al 2011). Reduction in feed consumption is directly related with a decreased rate of live weight gain.

In contrast with other reports (Agostini et al 2014), feed conversion ratio in the present study did not show differences due to season of the year. This might be explained by several factors such as sex and genotype (De Haer et al 1993) and environmental variations within years.

Some studies have demonstrated the importance of relative humidity as affecting growth performance in pigs (Nyachoti et al 2004; Huynh et al 2005). Effects of high humidity on VFI, ADG and FCR are more pronounced during periods of high rather than low temperature (Sainsbury 1972). Even when air temperature remains constant an increase in relative humidity may cause lower growth performance in pigs. This is because high humidity reduces the ability of pigs to dissipate heat through evaporation. In this study relative humidity was not actively controlled due to lack of facilities.

## Conclusion

- Season of the year had an effect on voluntary feed intake and average daily gain but did not affect feed conversion ratio in pigs during the nursery phase in a farm in the West region of Chaco, Argentina.

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