HEAT STRESS EFFECT IN PERHYB PIGS PRODUCTION

Cristina Dinu[1], Monica *Pârvu2*, Ioana Andronie[3]

[1]The Physiology and Ethology Department, [2]Animal Production Department, 3Veterinary Hygiene DepartmentFaculty of Veterinary Medicine "SPIRU HARET", Bucharest, Romania

Key words: pigs, heat stress, production

Introduction

The investigations conducted during the recent years targeted two aspects, namely production enhancement and a thinner layer of fat (produced genetically). Besides the positive outcomes yielded in both directions, a sensitisation of the animals to the environmental conditions also resulted. The heat stress induced by the high environmental temperatures affects particularly the animals of 80-100 kg body weight [3].

Material and Methods

The experiments were conducted on 18 Perhib pigs with an average weight of 86.55 kg. Two animals were slaughtered in the beginning of the experiment in order to determine the chemical composition and the caloricity of the initial body mass. The remaining animals were assigned to two groups of 6 animals each. The control group (1) was exposed to a constant environmental temperature of 20^0C, while the experimental group (2) was exposed for 10 hours to 35^0C ± 1^0C and 14 hours to 20^0C ± 1^0C, on a daily basis. The relative humidity was 72%.

The experimented ended when the animals reached 100 kg body weight.

The pigs were housed in air-controlled rooms, in cages that allowed feed intake and excreta measurement.

The animals had free access to standard, isoprotein and isocalory diets. Feed intake was measured on a daily basis. The animals had free access to water.

The samples of feed, excreta, as well as the biologic samples were assayed chemically with the method of Weende. The energy value of the samples was assessed with the new system of nutritive value assessment [2].

The coefficients of diet digestibility were determined on the basis of 4 such experiments, each of them of 5 days.

The energy and protein balance was calculated using the method of comparative slaughtering.

The slaughtering yield was determined both as “warm” and “cold”.

The experimental data were processed statistically with the significance test of Student.

Results

Group 1 reached the target 100 kg weight after 16 experimental days, while group 2 reached the same weight after 30 days (Table 1). The difference was significant ($p \leq 0,05$). The average daily weight gain was 795 g in-group 1 and 560 g in-group 2 ($p \leq 0.05$).

The warm slaughtering yield was 78.3% (group 1) and 78.1% (group 2), while the cold slaughtering yield was 75.4% and 75.1%, respectively.

Table 1. Pig performance and carcass traits

Specification	MU	G1 20^0C	G2 35^0C/20^0C
Initial weight	kg/animal	86.4	86.7
Final live weight	kg/animal	99.1	103.5
Experimental period	days	16	30
Average daily gain	g	795	560
Compound feed intake	kg	3.85	3.17
Carcass weight	kg	78.5	77.9
Warm yield	%	78.3	78.1
Cold yield	%	75.4	75.1
Average thickness of the fat layer	mm	13.25	11.42

The fat layer thickness was 13.25 mm in-group 1 and 11.42 mm in-group 2. The exposure to alternate heat stress induced a 13.8% depression of this parameter if compared to group 1.

The following coefficients resulted from the digestibility experiments: organic matter (OM) 87.34% (G1) and 87.10% (G2); crude protein (CP – apparent digestibility) 89.25% (G1) and 89.96% (G2); energy 86.35% (G1) and 86.57% (G2).

The energy balance (Table 2) shows values of 1025 kJ/$G^{0.75}$ corrected metabolisable energy (MEc), 635 kJ/$G^{0.75}$ metabolisable energy for production (MEp) and 62% efficiency of MEc utilisation as MEp for group 1. The corresponding values for group 2 were 945 kJ/$G^{0.75}$ MEc, 520 kJ/$G^{0.75}$ MEp and 55% efficiency of MEc utilisation as MEp.

The energy retained as gain (RE) was 16.7 kJ/$G^{0.75}$, of which 8 kJ/$G^{0.75}$ in protein (PEr). The corresponding values for group 2 were 13.6 kJ/$G^{0.75}$ RE, of which 7 kJ/$G^{0.75}$ PEr. The efficiency of MEc utilisation as PEr was 0.78% in-group 1 and 0.74% in-group 2 ($p \leq 0.05$). The efficiency of MEc utilization as LEp (energy retained in fat) was 0.85% in-group 1 and 0.70% in-group 2, with 17.5% lower ($p \leq 0,05$).

Table 2. Energy balance (by $G^{0.75}$)

Specification	G1	G2
MEc, kJ	1025	945
MEp, kJ	635	520
RE, kJ	16.7	13.6
PEr, kJ	8.0	7.0
LEr, KJ	8.7	6.6
ME p/MEc	62	55
PEr/ MEc	0.78	0.74
LEr/ MEc	0.85	0.70

Discussion

The daily exposure of group 2 animals to 35^0C for 10 hours increased the fattening period by 14 days. The average daily weight gain decreased with 30% in-group 2 compared to group 1 ($p \leq 0.05$). During late fattening, the average daily weight gain was 300 g at a constant temperature of 30^0C. The constant exposure to 32^0C depressed the average daily weight gain by up to 65%. The exposure to 38^0C for 12 days resulted in a negative balance [1,5].

The exposure to heat did not influence the slaughtering yield, the average values being statistically similar.

At the constant temperature of 30^0C, the fat layer thickness dropped by 25% [4].

The exposure to heat stress did not influence significantly diet digestibility in neither of the two groups.

The literature [5] mentions that the efficiency of metabolisable energy utilization for protein retention (PEr/ MEc) and for fat retention (LEr/ MEc) varied in 75-110 kg pigs between 0.57 and 0.92 [1]. In the pigs between 40 – 110 kg, the gain of 10 kg is associated with a 0.042 units decrease of nitrogen utilization in the muscle tissue [1]. At the temperature of 30^0C, protein retention was significantly higher for the lower feeding levels; lipid retention was significantly lower for all feeding levels, being rather dependent on the environmental temperature.

Conclusions

1. The daily exposure to 35^0C for 10 hours increased the fattening period by 14 days.
2. The alternate exposure to heat stress depressed the average daily weight gain by 30% if compared to the exposure to constant 20^0C.
3. Fat layer thickness decreased by 13.8% in the animals exposed to heat stress if compared to 20^0C.
4. The efficiency of metabolisable energy utilization as energy retained in fat decreased by 17.5% in the animals exposed to heat stress if compared to exposure to 20^0C.

References

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