THE INFLUENCE OF MICROCLIMATES CONDITIONS ON PRODUCTION PERFORMANCE IN PIGS

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Abstract

This study is realised for appreciate the influence of physical and chemical factors of the microclimate and their impact on the health and production of swine. The research has been done in 2 types of housing (shelter classic and shelter summer) from an intensive swine farm in spring, summer and autum conditions. The physical (temperature, U.R. and stream of air) and chemical (CO_2, NH_3 and H_2S) factors features of the microclimate have been determined through methods specific. The study has also had in view assessment the medium weight from weaning to finishing and pigs mortality. The level of the microclimatic factors analysed did not correspond always to growth parameters of pigs. The results obtained show significant differences between the 2 type of housing systems. The weight at 280 days was 98.3 kg for pigs increase in shelter classic versus 101.2 kg for pigs increase in shelter summer. For fattening period average daily gain was 0,385 kg/day versus 0,407 kg/day and feed conversion rate was 4.72 kg versus 4.52 kg. At pigs studied, no mortality was recorded throughout the experiment, which shows very good resistance of this to deseases.

Key words: pigs, microclimate, growth, production, Mangalica

INTRODUCTION

The microclimate significantly influences the health and production of all age categories swine [6, 7, 9].

From the environmental factors, temperature is the basic factor that acts on the metabolism and animal health. Temperature may act directly or indirectly on animal body etc.

Direct influence is when acting directly on animals, influencing: health, reproduction, growth and body development, production levels, quality productions, increased mortality, emergence of new diseases etc [4].

Indirect influence of temperature on domestic animals is manifested by its action on forage and pasture, influence both the quantity and quality, thereby replacing traditional species with new species, resistant or creating new varieties or hybrids of plants acclimated to these conditions [1].

The optimal temperatures or thermal comfort zone for animals depends on a number of factors: species, age, breed, level of feeding, degree of acclimatization, air humidity, air flow rate, etc [10].

The thermal comfort ranges for adult swine generally between 15 and 20^0C with differences according to age piglets as follows: for piglets 0-7 days old - 32 - 30ºC; piglets 8-14 days old 30 - 28ºC, piglets 15 - 21 days old - 28 - 24ºC; piglets 22-28 days old - 24 - 22ºC, youth swine - 18-22ºC [2, 3, 16].

Elevated environmental temperatures lead to the following changes: reduced appetite and feed consumption, increased thirst, increased water consumption, lower production levels, changing metabolism, elimination in the environment of a quantity of heat, increased respiratory rate, increased heart rate and changes in behavior [16].

An increase in temperature from 27ºC to 33ºC, increases in weight pigs were reduced by 21% [9, 11]. The temperatures at 38ºC and higher not only allow weight gains in pigs, but leads to a decrease in body mass, the sows

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milk secretion diminishes over 22ºC ambient temperature, the piglets optimum temperature is 20ºC [6, 7].

MATERIAL AND METHOD

Our research was conducted on two groups of pigs (E1 and E2) of Mangalica breed, that were maintained in different microclimate conditions in the 2 types of housing (shelter classic and shelter summer) from an intensive swine farm in spring, summer and autum conditions.

In the run-up experiment, all 40 pigs studied were subjected to detailed clinical observation, observing that appetite is unchanged, are lively, in good health, pursuing parallel and weight curve.

Both groups had in component 20 individuals each, pigs were followed from age 30 days until age 280 days.

Research period was superimposed over nursery and growth-fattening period on pigs.

To determine the impact of environmental conditions were studied some factors commonly fall within the microclimate and have an important action on animal welfare and production indicators, as follows:

- Air temperature
- Humidity in air
- Air currents
- Concentration of harmful gases: CO_2, NH_3 and H_2S.

Primary data were btained from own measurements being collected morning and evening, at the same time (8a.m. and 8 p.m.) throughout the experiment both in the shelter classic and shelter summer.

All animals from experimental groups were fed under standardized conditions, both quantitatively and qualitatively, each of them were receiving the specific ration for age type, without exception, throughout the experiment.

Feeding conditions were identical but was differentiated housing and microclimate being studied following parameters:

- Dynamic weight gain – by individual weighings, periodically, performed on individual pigs from each group; - Average daily gain;
- Food consumption;
- Feed conversion rate;
- Health status of pigs - by recording the mortality and determine their causes.

For assesment the dynamics of body weight and to calculate average daily gain was using an electronic balance with a great sensitivity that was previously checked metrological.

Feed conversion rate is obtained by dividing the total amount of the gain realized fodder throughout fattening, or a shorter period.

Collected data were subjected to statistical computation, using ANOVA single factor algorithm, to find out any significant differences.

RESULTS AND DISCUSSIONS

To highlight the impact of changing microclimate factors on production performance in pigs, were monitored during the experiments the following parameters: temperature, relative humidity, air currents and concentration of harmful gases: CO_2, NH_3 and H_2S. Average values obtained from these parameters are shown in Table 1.

From the data presented in Table 1 it is observed that, in general, for both experimental groups, microclimate parameters were close to optimal for swine species.

Differences between groups were recorded in the temperature and humidity. During the period 30-90 days for group E1 average temperature was 24.2ºC compared to group E2 the average temperature was 18.6ºC, similar situations being recorded for the other two periods.

Regarding the differences between groups, for harmful gases, these are less, the mean values being in optimum parameters for swine species. It appears some breaches of these rules in group E1 which maintained in classic shelter. From the data presented in Table 1 it is observed that, in general, for both experimental groups, microclimate parameters were close to optimal for swine species.

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Table 1 The mean value of microclimate parameters

Specification		Season / Age of pigs					
		Spring 30-90 days		Summer 90-180 days		Autumn 180-280 days	
		E1	E2	E1	E2	E1	E2
T (°C)	Min.-Max.	22.3-28.4	16.2-22.4	18.5-30.1	18.3-27.6	16.3-25.4	15.2-22.7
	Mean	24.2	18.6	23.3	20.4	19.3	17.3
	Comfort	**22-26**		**18-22**		**16-21**	
U (%)	Min.-Max.	56 – 68	65-79	55-62	55-74	60-70	61-72
	Mean	59	72	59	62	62	67
	Comfort	**55-70**		**55-70**		**55-70**	
Air currents (m/s)	Min.-Max.	0.2-0.3	0.3-0.5	0.2-0.4	0.3-0.5	0.2-0.5	0.3-0.7
	Mean	0.25	0.4	0.3	0.4	0.3	0.5
	Comfort	**0.1 – 0.3**		**0.2-0.5**		**0.2-0.5**	
CO_2 (%)	Min.-Max.	0.1-0.3	0.1-0.2	0.1-0.4	0.1-0.3	0.1-0.3	0.1-0.3
	Mean	0.25	0.15	0.27	0.22	0.25	0.21
	Comfort	**> 0.3**		**> 0.3**		**> 0.3**	
NH_3 (ppm)	Min.-Max.	0.01-0.035	0.01-0.02	0.02-0.03	0.01-0.02	0.02-0.03	0.01-0.02
	Mean	0.02	0.014	0.025	0.016	0.025	0.012
	Comfort	**> 0.03**		**> 0.03**		**> 0.03**	
H_2S (ppm)	Min.-Max.	0.001-0.004	0.001-0.002	0.001-0.003	0.001-0.002	0.001-0.003	0.001-0.002
	Mean	0.0023	0.0012	0.002	0.0014	0.002	0.0014
	Comfort	**> 0.002**		**> 0.002**		**> 0.002**	

Regarding the differences between groups, for harmful gases, these are less, the mean values being in optimum parameters for swine species. It appears some breaches of these rules in group E1 which maintained in classic shelter.

Body weight is a factor that will have a significant extent over meat production to be obtained from a pig.

Body weight of pigs from experience is an ascending line with my slow growth in the first experimental period followed by a more rapid development in next periods (table 2).

Table 2 Indices of growth to Mangalica breed

Specification	Weight to 30 days (kg)		Weight to 90 days (kg)		Weight to 180 days (kg)		Weight to 280 days (kg)	
	E1	E2	E1	E2	E1	E2	E1	E2
Average	6.85	6.77	27.14	26.2	59.8	60.5	98.3	101.2
V%	9.15	8.72	12.36	14.21	14.84	14.32	15.24	14.92
Fisher Test	**n.s.**		**s**		**s**		**s**	

The data analysis presented in table 2 shows at the beginning of the experiment, the weight piglets in two groups was closer, differences exceeding 100 g, but at the end of the experience there were weight differences between groups of about 3 kg. At the age of 90 days was recorded between group E1 (100%) and E2 group (96.5%) a difference in weight of 0.94 kg, which is about 3.5%. At the age of 180 days, are maintained differences between groups, but the higher average was recorded in group E2. Thus at pigs coming from E1 group, mean body weight was 59.8 kg (100%) compared to the group E2 what the average weight was 60.5 kg (101.1%). Regarding the age at slaughter, it was 280 days, during which the pigs from group E1 achieved an average weight of 98.3 kg (100%) and pigs from group E2 had an average weight of 101.2 kg (102.9%) difference between groups was 2.9%.

The character studied was less homogeneous, the calculated values for the coefficient of variation indicating a low variability for the first experimental time and variability medium for other periods experimental.

Evolution of body weight from the two groups was in concordance with the data presented in literature [1, 5, 12, 15].

Average daily gain is an important indicator of production, the possibility of expressing the performance of growing and fattening swine, being in close contact with other productivity indicators (specific consumption, precocity, etc.).

Throughout the experimental period, average daily gain had different values depending on the period of growth and experimental groups (table 3). During the ages of 30-90 days, the biggest average daily gain was recorded in the experimental group E1 (0.338 kg) difference from experimental group E2 (0.323 kg) is + 4.5% (15g).

In the age of 90-180 days, the highest average daily gain was observed in the group E2 (0.381 kg), the difference from batch E1 (0.362 kg) being of +5.24% (19 g).

Between 180-280 days of age, the average daily gain was the same, the difference being of 27 g in favour of group E2.

Statistical differences between groups are significant throughout the rearing and fattening.

Table 3 Average daily gain during the period growing – fattening

Specification	Average daily gain (30-90 days) (kg/day)		Average daily gain (90-180 days) (kg/day)		Average daily gain (180-280 days) (kg/day)	
	E1	E2	E1	E2	E1	E2
Average	0.338	0.323	0.362	0.381	0.385	0.407
V%	11.54	12.21	13.12	13.35	14.54	13.81
Fisher Test	s		s		s	

Analyzing the values presented in table 3 could be considered that they it fits to the data presented in the literature on Mangalica breeds [5, 8, 13, 14].

According to the experimental plan, feeding experimental groups was based on the age pigs, the level of compound feed energy and protein administered according to specific nutritional requirements of pigs. In table 4 are shown the quantities of fodder consumed by the two groups of pigs and feed conversion rate achieved during growth and fattening.

Table 4 Food consumption and feed conversion rate to Mangalica breed

Specification	Mangalica Breed					
	Period 30-90 days		Period 90-180 days		Period 180-280 days	
	E1	E2	E1	E2	E1	E2
Food consumption *(kg / capita/ day)*	57.4	56.6	130.4	132.5	182	187.3
Average weight gain *(kg)*	20.29	19.43	32.66	34.3	38.5	40.7
Feed conversion rate *(kg)*	2.82	2.91	3.99	3.86	4.72	4.60
Fisher Test	s.		s.		s.	

Throughout the experimental period the pigs in group E1 showed the lowest feed consumed (369.8 kg) compared to group E2 that had a consumption of 377.4 kg feed, so about 2% higher.

The feed conversion rate are different values between groups according to the experimental period. In the first experimental period, the feed conversion rate was 2.82 kg for group E1 versus 2.91 kg for E2 group. In the second and third period in group E1 consumption was 3.99 kg and 4.72 kg and in group E2 consumption was 3.86 kg and 4.6 kg.

Between groups were recorded statistically significant differences for all analyzed indicators (feed consumption, weight gain, feed conversion rate). Regarding homogeneity studied character, values calculated for V% were medium. Data obtained by both batches are in accordance with the literature [5, 8, 12, 13, 15].

Pigs mortality

At lot of Mangalica breed studied, no mortality was recorded throughout the experiment, which shows very good resistance to organic breed.

During the experiment has been some diseases, the main causes being diarrhea and respiratory syndrome.

CONCLUSIONS

After the investigations we can draw the following conclusions.

Microclimate significantly affect the Mangalica breed productions.

Values on body weight, achieved by both pigs groups indicate a difference between the group E1 (98.3 kg) and group E2 (101,2 kg) meaning around 2.9%. Results concerning the average daily gain also indicate, for all experimental period, better performances in group E2 (0.377 kg) versus the group E1 (0.365 kg), issuing a difference of around 12 g (3.5%). The feed conversion ratio, for the last experimental period, reached 4.72 kg in group E1 and 4.60 kg in group E2.

Production characteristics demonstrate the potential of Mangalica breed to harness intensive growth conditions, but remain inferior to breeds improved.

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