



ASSESSMENT OF AIR QUALITY FOR MEAT QUAILS DURING INITIAL LIFE CYCLE UNDER DIFFERENT THERMAL ENVIRONMENTS

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Background

The theme 'air quality' in rearing meat quail is still widely discussed in tropical and subtropical countries, such as Brazil, due to the lack of a database that relates productivity, thermal environment and air quality. The presence or absence of certain gases in the environment allows one to evaluate if the desired air exchange rate is being met for each specific age as a means to ensure productive performance. Another aspect related to the importance of monitoring air quality in the environment of birds comes from compliance with laws related to environmental management needed to reduce the emission of harmful gases into the atmosphere, reducing air pollution that leads to deterioration of environmental conditions on the planet.

Objective

- To monitor the levels of CO₂ and NH₃ present in the air of quails raised in climatic chambers under 5 different environmental temperature levels, during the initial cycle of life (1-21 days of age).

Material & Methods

- The experiment was conducted in 5 climatic chambers (figure 1 a), located in the experimental area of the Research Centre in Animal Environment and Agroindustrial Systems (AMBIAGRO), which belongs to the Sector of Rural Constructions and Animal Environment, Department of Agricultural Engineering, Federal University of Viçosa, Minas Gerais State, Brazil.
- In conducting this research, 900 quails (*Coturnix coturnix coturnix*) of both sexes, at day 1 of life, were used.
- Studies show that the thermal requirements of poultry change according to their growth. Based on this premise, we defined five different temperature zones in the first three weeks of life of quails (five treatments). One of these zones was taken as the range of thermal comfort proposed by Albino and Neme (1998), as the other two levels of cold stress (moderate and severe) and two levels of heat stress (moderate and severe). In Table one can see the different temperatures adopted to each environment.
- We calculated the index of Black Globe Temperature and Humidity (BGTH), for each thermal environment, based on the equation of Buffington et al. (1981).
- Air quality was assessed by monitoring gaseous concentrations (figure 1b) of CO₂ and NH₃ in all chambers every morning at 8.00.



1 (a)



1 (b)

FIGURE 1. Inside view of one of the chambers (a) and CO₂ sensor (b).

Results

TABLE 1 - Mean and standard deviations of the values of air temperature (T_{air}, °C), relative humidity (RH, %) and Black Globe Temperature and Humidity Index (BGTH) for each treatment condition assessed during the first three weeks of age of quails

Treatments	T _{air} (°C)	RH (%)	BGTH
1 – 7 days			
Severe Cold Stress	30,1 ± 0,6	56,9 ± 5,1	79,3 ± 0,6
Moderate Cold Stress	33,0 ± 0,8	56,9 ± 4,8	83,3 ± 0,7
Thermo Neutrality	36 ± 0,6	55,5 ± 4,6	87,1 ± 0,4
Moderate Heat Stress	39,1 ± 0,6	55,8 ± 6,3	91,4 ± 0,6
Severe Heat Stress	41,9 ± 0,8	56,5 ± 5,8	95,4 ± 0,6
8 – 14 days			
Severe Cold Stress	27,4 ± 0,4	58,4 ± 4,9	75,8 ± 0,4
Moderate Cold Stress	30,2 ± 0,9	59,9 ± 6,1	79,9 ± 0,6
Thermo Neutrality	33,3 ± 0,7	55,2 ± 4,5	83,4 ± 0,4
Moderate Heat Stress	35,8 ± 1,3	54,8 ± 3,0	86,7 ± 0,7
Severe Heat Stress	39,1 ± 0,6	55,1 ± 5,4	91,2 ± 1,0
15 – 21 days			
Severe Cold Stress	23,8 ± 0,8	58,5 ± 5,9	70,8 ± 0,5
Moderate Cold Stress	26,8 ± 0,7	59,7 ± 6,9	75,2 ± 0,6
Thermo Neutrality	30,0 ± 0,9	58,0 ± 5,9	79,4 ± 0,5
Moderate Heat Stress	32,9 ± 0,7	57,9 ± 4,7	83,3 ± 0,7
Severe Heat Stress	35,8 ± 0,5	59,1 ± 4,4	87,6 ± 0,8

TABLE 2 - Mean and standard deviations of carbon dioxide concentrations (CO₂, ppm), measured at 8:00 AM, during the the first three weeks of age of quails

Treatments	CO ₂ (ppm)		
	1 - 7 days	8 - 14 days	15 - 21 days
Severe Cold Stress (SCS)	915 ± 176*	1235 ± 316	1578 ± 184
Moderate Cold Stress (MCS)	844 ± 65*	1005 ± 43	1542 ± 96
Thermo Neutrality (TNT)	1001 ± 63	1104 ± 163	1374 ± 116
Moderate Heat Stress (MHS)	1138 ± 180*	1488 ± 118	1730 ± 318
Severe Heat Stress (SHS)	991 ± 150*	1335 ± 276	1322 ± 101

*Mean statistically differs from the control treatment (TNT) at 5% probability by Dunnett's test.

- In general, the monitored concentrations of CO₂ remained below the recommended safe ceiling of 3,000. Also, no presence of NH₃ was detected during the first 3 weeks of age of quails in any of the chambers. These results are due to the efficient management of air flow rate (4 ACH) and daily removal of manure trays.

Conclusions

- Temperatures taken at the initial stage of life of quails, did not affect the ambient air quality in relation to CO₂ and NH₃ gases;
- The concentrations of NH₃ were zero ppm, ie, did not affect the air quality;
- CO₂ concentrations for the first week of rearing, although significant, is not harmful to the presented values quail;
- The concentrations of CO₂ to the second and third week breeding values did not show harmful to the birds, or remained within acceptable air quality, both in the morning and in the afternoon.

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