

# Concentrations and emissions of ammonia and odour in the breeding of the muscovy duck ,using natural ventilation

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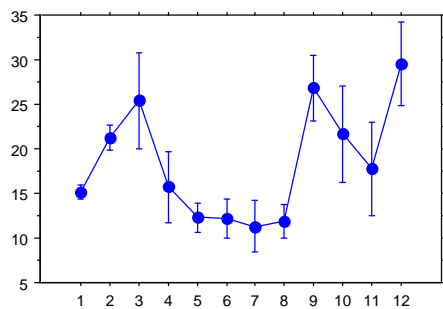
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Many neighbourhood conflicts arise as the result of odour emissions from livestock buildings. The most offensive poultry houses are those containing ducks. This study aimed to characterize the concentrations and emissions of gases such as ammonia and hydrogen sulphide and the odour emissions from the indoor rearing of muscovy ducks.

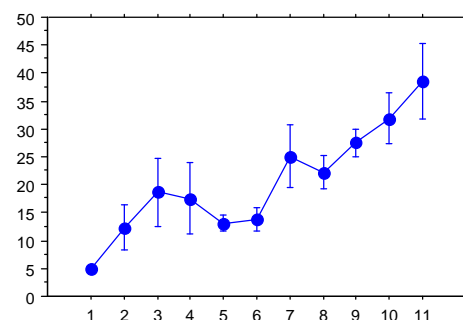
Measurements were made in two duck buildings with natural ventilation Louisiana type from March 2000 until December 2001. NH<sub>3</sub> and H<sub>2</sub>S concentrations were measured each week with Gastec tubes. Odour concentrations were measured with olfactometry (Certech, Belgium) on sample bags taken at 4, 8, and 12 weeks of age (Lubac et al, 2001). The air flow rate was calculated with the difference between outside and inside temperature, the difference between outside and inside relative humidity and with the heat production of the ducks - which depends of their number and weight (Robin et al, 2002).

The average NH<sub>3</sub> concentration (on 101 samplings) measured in the middle of the building was  $17,3 \pm 1,1$  mg/m<sup>3</sup> air (or 24,4 ppm). The emission of NH<sub>3</sub> increased from 5 to  $41.0 \pm 7.4$  mg NH<sub>3</sub>/h.duck with an average of  $21.5 \pm 1.8$  mg of NH<sub>3</sub>/h.duck (equivalent of 37g of nitrogen /duck). The emission of NH<sub>3</sub> from the building was significantly related with the air flow rate, the age of the ducks and the weight of all ducks on site (Figures 1 and 2).

**Figure 1** NH<sub>3</sub> concentration (mg/m<sup>3</sup> air)  
fonction ducks'age in weeks (n=101 - ± ES)



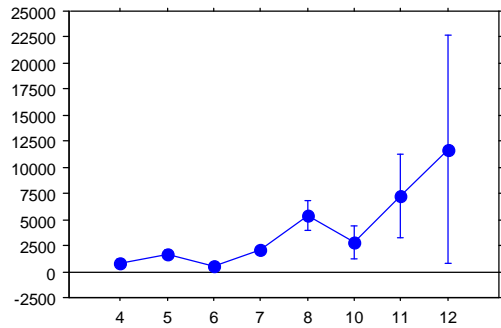
**Figure 2** NH<sub>3</sub> emission (mg/duck.h)  
fonction ducks'age in weeks (n=101 - ± ES)



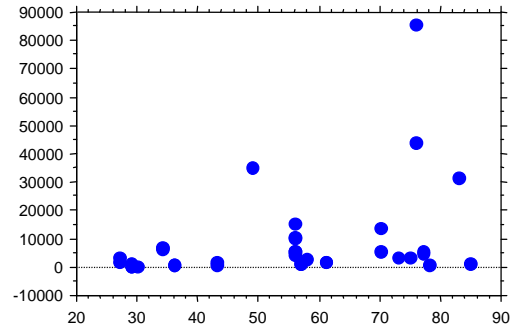
The average concentration of H<sub>2</sub>S was  $516 \pm 638$  µg/m<sup>3</sup>. The emission of H<sub>2</sub>S increased from 0 to  $1.41 \pm 0.36$  mg/h.duck with an average of 0.67 mg/h.duck. It was significantly related to the air temperature and relative humidity inside and outside the building. However, no seasonal effect on the average emission was highlighted.

The average odour concentration (on 26 samplings) was 4 050 OU/m<sup>3</sup> and the odour emission was  $59.3.10^6 \pm 15.3.10^6$  OU/h (so 11 388 ± 3749 OU/duck.h.). The latter was significantly related to the odour concentration, the air flow rate, the NH<sub>3</sub> and H<sub>2</sub>S emissions (Figures 3 and 4).

**Figure 3 Odours concentration (OU)**  
fonction ducks'age in weeks (n=26 - ± ES)

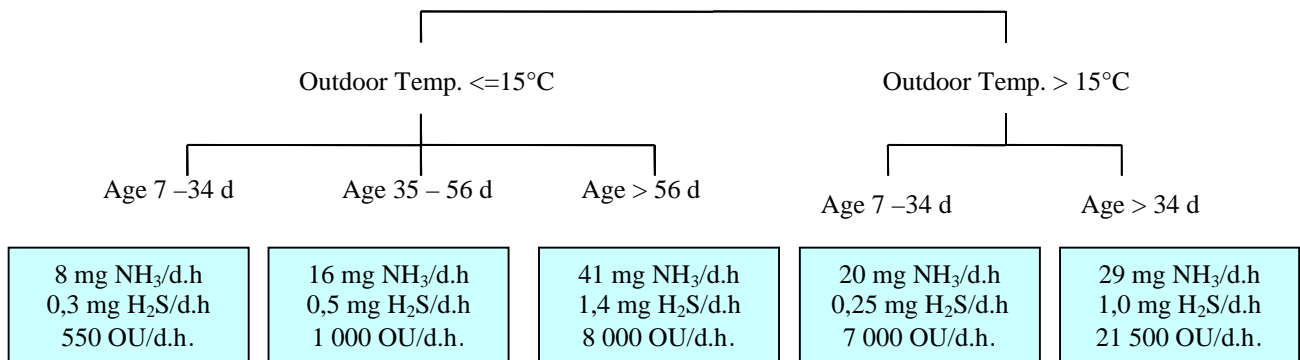


**Figure 4 Odours emission (OU/duck.h)**  
fonction ducks'age in days (n=26)



Five classes were identified after ascendant hierarchical classification (Figure 5). The peak emissions of NH<sub>3</sub> and H<sub>2</sub>S were measured during a rather cold period at the end of the lives of the ducks. The peak odour emissions were measured during a warm period as NH<sub>3</sub> concentrations were low. The highest NH<sub>3</sub> emissions compared to the lowest emissions was multiplied by 5.3, the highest H<sub>2</sub>S emissions per duck by 5.6 and the highest odour emissions by 38.

**Figure 5. NH<sub>3</sub> emissions (mg/duck.hour), H<sub>2</sub>S emissions (mg/duck.hour), and odours emissions (OU/duck.hour) fonction outdoor temperature (in Celsius degrees) and ducks'age (in days)**



This study gives first references of the NH<sub>3</sub> and odour emissions from duck buildings that can be used as an order of magnitude for emission inventories.

## References

- LUBAC S., AUBERT C. (2001) Etude des taux d'ammoniac d'hydrogène sulfuré et niveaux d'odeurs des bâtiments d'élevage de canards de Barbarie et conséquences du raclage des fientes. *Sciences et Techniques Avicoles*, **37** : 5-9.
- ROBIN P., AMAND G., PERRIN P., AUBERT C., FRANCK Y., LUBAC S., FERREN J.C. (2002) Productions de chaleur et calcul du débit d'air d'un élevage intensif de canards sur caillebotis ou sur litière. *Sciences et Techniques Avicoles*, **38** : 19-29.

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