# AIR POLLUTION WITH SULFUR COMPOUNDS IN RABBIT HOUSE AND FOX FARM

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## SUMMARY

The air analysis for a sulphur compounds content was performed in the rabbit house (4,55 livestock unit (UL) and in the fox farm (2 UL).The air samples were collected to the Tedlar bags at the height of the animal cages. The research showed the presence of 14 sulphur compounds in the air of both farms. A higher concentration of sulphur compounds was recorded in the rabbit farm where carbon disulphide at the level of 622,63 μg/m$^3$ prevailed significantly. In the fox farm, however, the highest values were noted for phenols (118,43 μg/m$^3$) and indoles (21,03 μg/m$^3$). Deficiency of such compounds like, carbonyl sulphide, carbon disulphide and methylpropyl sulphide may point to some differences in the metabolism of herbivorous and carnivorous animals or different microclimatic conditions.

**Keywords:** rabbit, polar fox, air pollution, sulphur compounds

## INTRODUCTION

Atmospheric air is a mixture of gases and its composition in the breeding objects clearly undergoes some changes closely connected with a species of animals maintained, their nutrition, management system etc. Volatile organic pollutants are released to the air directly by the animals or indirectly from the accumulated organic matter. To preserve a typical flavour of the air in the livestock buildings is an alternative for measurable economical profits as well as a necessity to conform to the domestic and the EU requirements [1, 3, 7, 8].

The objective of the present work was monitoring and identification of sulphur compounds emitted to the air in the polar fox farm and rabbit house (the objects of different management systems).

## METHODS

The air examination was carried out in the polar fox farm and rabbit house situated in the southern part of Poland. Throughout the research period, in the rabbit house about 650 animals as the basic herd were housed (4,55 LU), while at the fox farm – 50 fox vixens as the basic herd [2 LU].

In the warren the animals were kept in the one-story cages produced according to Ferm-Stal system. In the breeding pavilion, a natural ventilation and mechanical exhaust is used.

At the fox farm, the animals are caged in the pavilion system. In both objects the faeces were removed every day and heaped up outdoors to be used for the agrotechnical practices.

The air for examination was collected twice to the Tedlar bags at the height of animals' cages (ca 130 cm) in the fox farm and rabbit house. The obtained samples were analysed chromatographically using the permeate models and appropriate analytical software [2]. At the same time the following basic microclimatic parameters were measured: temperature, moisture, air movement [5].The obtained data were analyzed statistically and compared in the Tables.

## RESULTS AND DISCUSSION

A significant factor for the animal maintenance proves to be their state of equilibrium with the internal environment they stay at. Homeostasis constitutes a vital condition for the organism functioning as well as productive benefits for their breeders. Therefore, monitoring the quality of each breeding environment factor is of primary importance, particularly the sulphur compounds regarded as noxious odours, odorforming and hazardous [4,6,9].

The chromatographic analysis of the air from the rabbit house and fox farm exhibited the presence of 14 sulphur compounds (Tab.1). In the rabbit house, three higher levels of sulphur compounds were determined. Carbon disulphide prevailed significantly as it reached a level of 622,63 $\mu g/m^3$, while among the mercaptans the highest concentrations were detected for methyl mercaptan (99,85 $\mu g/m^3$) and ethyl (95,47 $\mu g/m^3$). This high concentration of the sulphur compounds pollutants in the rabbit house air is extremely hazardous in the case of poor ventilation and low oxygen supply. Then some opiate-like by-effects may occur. The rates of these compounds emission have been exceeded in both, rabbit house and fox farm.

Absence of such compounds like carbonyl sulphide, carbon disulfide and methylpropyl sulphide at the fox farm may arise from a different composition of feedstuff supplied to the animals that is differences in metabolism of herbivores and carnivores. In the fox farms, the released volatile organic compounds undergo the direct transformations under the presence of light and other gaseous admixtures. Their spread is closely connected with the local climatic conditions.

In both farms, the permissible upper limits for phenol and indol (MPL – 2,5 $\mu g/m^3$) [10] were surpassed. The presence of identified pollutants in the air at the studied objects may have a negative influence on the health status of animals kept there. A direct or indirect mode of these substances penetration into organism means their getting into the circulation system and in turn, dissimilation all over body. As a consequence, they are accumulated in the tissues, disturb the organs and systems functioning that result in the animal performance decrease.

The air quality monitoring went along with the assessment of microclimatic parameters that showed noticeable differences between them, i.e., temperature, moisture and air movement (Tab.2). The air temperature in the fox farm appeared to be lower as compared to the rabbit house and averaged 13,2$^{o}$C and 18,8$^{o}$C, respectively. Relative moisture value was higher in the fox farm – mean 75%, while in the rabbit house – 66%. An air movement rate in the fox farm reached 2,60 m/s and 0,15 m/s in the rabbit house. The obtained values were found within the minimum limits of the zoohygienic standards for the animals maintained in the livestock buildings (0,10–0,30 m/s).

## CONCLUSION

The pollutants released in the rabbit house differed quantitatively and qualitatively compared to the fox farm which confirms the differences in these species metabolism. However, very high levels of volatile organic pollutants determined in the rabbit house imply the poor ventilation system and that may decrease the animal performance quality.

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**Table 1.** Mean levels of sulphur compounds subject in farm of rabbit and foxes (μg/m$^3$)

| Gaseous compounds | Animal maintenance section | |
|---|---|---|
| | Rabbit | Foxes |
| | $\bar{x}$ ±SD | $\bar{x}$ ±SD |
| hydrogen sulphide | 9,73±6,32 | 1,53±1,73 |
| sulphur dioxide | 8,3±2,14 | 2,52±1,49 |
| carbonyl sulphide | 46,72±25,12 | n.d. |
| methyl mercaptan | 99,85±31,60 | 0,05±0,09 |
| Ethyl mercaptan | 95,47±43,10 | 0,07±0,11 |
| carbon disulphide | 622,63±112,4 | n.d. |
| isopropyl mercaptan | 45,25±13,8 | 0,10±0,19 |
| methyl ethyl sulphide | 3,92±0,98 | 1,48±2,13 |
| diethyl sulphide | 0,50±0,23 | 0,67±0,60 |
| methylpropyl sulphide | 0,22±0,10 | n.d. |
| dipropyl sulphide | 1,06±0,84 | 1,69±1,81 |
| phenol | 4,80±1,15 | 18,43±18,2 |
| indole | 35,60±22,5 | 21,03±15,6 |
| metyl sulphide | n.d. | 5,15±6,05 |

Notes: $\bar{x}$ – arithmetic mean; SD – standard deviatian; n.d. – not detected

**Table 2.** Mean values of microclimatic parameters at rabbit and fox farm

| Animal maintenance section | Air temperature ($^o$C) | Relative moisture (%) | Air movement (m/s) |
|---|---|---|---|
| Rabbits | 18,8 | 66 | 0,15 |
| Foxes | 13,2 | 75 | 2,60 |