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## Environmental Emissions from Broiler Houses in Bursa, Turkey

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### Abstract

This paper is a case study conducted in Bursa, northwest of Turkey and describes the pollutant gases such as ammonia ( $\text{NH}_3$ ), hydrogen sulphide ( $\text{H}_2\text{S}$ ), methane ( $\text{CH}_4$ ), carbon dioxide ( $\text{CO}_2$ ) concentrations and emissions measured in winter and summer seasons from three broiler houses. In this study, pollutant gas concentrations, temperature, relative humidity and airflow rate were continuously recorded for four sequential days. The average daily mean (ADM) house concentrations of pollutant gases in winter and summer seasons were measured as 31.77 and 4.78 ppm for  $\text{NH}_3$ , 19.75 and 21.32 ppb for  $\text{H}_2\text{S}$ , 2.56 and 15.68 ppm for  $\text{CH}_4$ , 2495 and 895 ppm for  $\text{CO}_2$ , respectively. The average daily emissions of  $\text{NH}_3$ ,  $\text{H}_2\text{S}$ ,  $\text{CH}_4$ , and  $\text{CO}_2$  were 442, 279, 15.88  $\text{g h}^{-1}$  and 82.71  $\text{kg h}^{-1}$  in winter season for all three houses while average daily emissions of  $\text{NH}_3$ ,  $\text{H}_2\text{S}$ ,  $\text{CH}_4$ , and  $\text{CO}_2$  were 169  $\text{g h}^{-1}$ , 604  $\text{mg h}^{-1}$ , 557  $\text{g h}^{-1}$  and 221  $\text{kg h}^{-1}$  in summer season from all three houses, respectively. Emission models for all pollutant gases monitored were also developed. There was a clear diurnal pattern among pollutant gas concentrations rather than emissions at the end of the study.

The average emission rates calculated per bird were 20  $\text{mg NH}_3 \text{ d}^{-1} \text{ bird}^{-1}$ , 29  $\mu\text{g H}_2\text{S d}^{-1} \text{ bird}^{-1}$ , 19  $\text{mg CH}_4 \text{ d}^{-1} \text{ bird}^{-1}$ , 10  $\text{g CO}_2 \text{ d}^{-1} \text{ bird}^{-1}$  and thereby lower than the emission rates obtained in similar studies in the USA. However, our results were comparable with the concentrations and emissions calculated in European studies as house design, ventilation system and bird diet applied in Turkish broiler farms are very similar to those employed in European countries.

Consequently, the concentrations and emissions for some pollutant gases were higher than optimum thresholds for birds and workers. Especially,  $\text{NH}_3$  concentration in the broiler houses was a main problem for indoor air quality. Mitigation techniques such as diet formulation, biofilters and wet-dry scrubbers were recommended to reduce  $\text{NH}_3$  concentrations in the broiler housing. In future studies, we will search which mitigation techniques are most appropriate for Bursa region.

**Keywords:** Ammonia , broiler!housing, confined animal feeding operations, environmental emissions