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Indoor Air Quality in Loose Dairy Housing in Spring and the Effects of Gas Emission on Environmental Pollution

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Abstract

Indoor air quality is one of the important factors for human being and animals in livestock which must be taken consideration with fastidiously. Manure contains many organic compounds that may be decomposed at different climatic condition. Mineralisation period may be affected by environmental conditions. This study has been carried out to determine climatic parameters (temperature, relative humidity *etc.*) harmful gases (NH_3, CH_4, H_2S) occurring in barn and O_2 have been measured in loose dairy houses in spring season (1-14 March) of 2008 in Konya-Turkey where little data is currently available on this subject. The air quality parameters have been collected by using data logger and multi-gas monitor during 14 days for a Dairy Cattle Company. In this study, hydrogen sulphide values are nearly detectable level or less then this value. Because, H_2S is most dangerous gas livestock buildings, than NH_3 fallows. CH_4 was not measurable level. Oxygen level was not critical level for livestock buildings and sometimes changed about 1%. In this study, climatic parameters (temperature, relative humidity) harmful gases (NH_3, CH_4, H_2S) occurring in barn and O_2 have been measured in loose dairy houses in experimental days. The effects of harmful gases occurring in barns on animal health and air quality of environment have been endeavoured to determine. However we tried to investigate effect of air quality parameters for animal housings and human that work in barn, and environment pollution.

Keywords: *Air quality, ammonia, loose housing, environmental pollution, livestock building, hydrogen sulphide*

1. Introduction

Agriculture is a major source of gaseous emissions contributing to air pollution and climate change. This sector represented 96% of the total French ammonia (NH_3) emissions, 78% of the nitrous oxide (N_2O) emissions and 70% of the methane (CH4) emissions in 2004 [1,2]. Atmospheric ammonia emissions are responsible for several adverse effects on natural habitats in Europe [3, 4]. Other than acidification effects in soils, soil water, groundwater and surface waters via dry deposition and wet precipitation [5], ammonia emissions can react with nitrates and sulphates in the atmosphere to produce smog [6]. Livestock production is deemed to be the greatest contributor of anthropogenic ammonia emissions in Europe and Canada [7, 8]. However, very few field measurements have been done in Turkey. Several large-scale studies measuring ammonia emission rates from dairy livestock buildings have been conducted in the other country (Europe and in the United States of America), where climate, ventilation method or livestock management practices usually differ from those in Turkey. For instance, dairy animals in Europe usually graze outside during the summer and manure is often stored underneath slotted floors. Livestock production and manure management practices such as milking schedules [9], diet composition [10], water consumption [10], ventilation flow rates, air temperatures [9], type of manure handling systems [11], scraping methods and frequency [10], and type of litter used [12], [10] affect environmental and manure physicochemical characteristics involved in ammonia volatilisation. Livestock animals typically use less than 30% of the nitrogen they ingest, which leaves 50–80% to be excreted in urine and 20–30% in feces. Urea is the source of 97% of all nitrogen contained in urine [13]. Transformation of urea into ammonium ions is dictated by ureic activity, where urease enzymes contained in feces can readily decompose the urea in urine. Therefore, limiting contact between feces and urine should limit ammonia emission rates. Furthermore, ureic activity increases exponentially with increasing temperature. Ureic activity is also negligible at temperatures below 10 °C [10]. This can occur rapidly during short-term manure storage in dairy buildings, with complete conversion of urea into ammonium within a few hours. The following environmental and manure physico-chemical parameters affect ammonia

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