HEALTH AND PRODUCTIVITY EFFECT OF NATURAL ZEOLITE, A FEED ADDITIVE, ON NURSERY PIGS

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INTRODUCTION

Intensive pig production, with the slatted floor technology, results in the rising of a large amount of liquid manure, source of harmful gasses emission, among which ammonia is the most dominant. Because it endangers the health of animals in farm facilities and pollutes environment itself, there is ever increasing attempt to reduce the ammonia emission by using various food or slurry additives such as natural zeolites. They are hydrated aluminosilicates of micro-porous structure with the active substance of clinoptilolite and have a large capacity of ion exchange and binding of ammonium ions (NH_4^+). In this experiment the effect of the commercial product, the feed additive, natural zeolite with 55% clinoptilolite content, on the health and productivity results of nursery pigs was assessed.

EXPERIMENTAL

The study was conducted at the Dubravica pig-breeding farm in Hrvatsko Zagorje. Measurements were taken in nursery units during winter period. Animals were housed in 14 boxes with partially slatted floor, each with 30 animals on an average, in standard keeping conditions for about 50 days. The commercial product “Pigozen”, feed additive, natural zeolite with 7% maximum moisture content and clinoptilolite of 55%, was added to the feed mix of the experimental group, in the amount of 2% by weight. The microclimatic parameters were weekly determined (n=7). Air temperature (^oC), relative humidity (%) and air flow rate (ms^{-1}) were detected by use of TESTO device (Testo Inc., Germany). NH_3 concentration was determined by a Dräger - Acuro gas detector pump with detector tubes (Dräger, Darmstad, Germany). Untreated samples of pig slurry, from the channel under the slatted floor, were also weekly sampled (n=7). Standard physicochemical parameters for wastewater quality assessment were analyzed on an HACH DREL/4000 chemistry/apparatus module. The following parameters were analyzed: dry matter (%), inorganic matter (%), pH, biochemical oxygen demand, BOD_5 (mgO_2/L) and ammonium, nitrite and nitrate ions (mgN/L). Production figures were determined by measuring the individual input and output weight of animals.

RESULTS AND DISCUSSION

Table 1. Arithmetic mean of microclimate parameters in control and experimental nursery unit

Parameter	Control unit	Experimental unit
Temperature (^oC)	24,6	24,2
Relative humidity (%)	70,1	66,2
Air flow rate (ms^{-1})	0,09	0,08
Ammonia NH_3 (ppm)	4,04	2,68
Reduction of NH_3 in comparison with control (%)		33,67

Microclimate conditions, which among others include the concentration of noxious gasses in animal facilities, have a large influence on the health and productivity of pigs. In this experiment the effect of "Pigozen" feed additive resulted in a decreased air ammonia concentration, by 34% on an average, in the experimental nursery unit compared to the control (Table 1), which could be attributed to the effect of clinoptilolite.

Table 2. Arithmetic mean of physicochemical parameters determined in the slurry from control and experimental nursery unit

Parameter	Control unit	Experimental unit
pH	7,1	7,0
Dry matter (%)	7,1	8,1
Inorganic part of dry matter (%)	24,1	25,8
Biochemical oxygen demand, BOD_5 (mgO_2/L)	6764	6280

Table 3. Arithmetic mean of nitrogen compounds determined in the slurry from control and experimental nursery unit

Parameter	Control unit	Experimental unit
Ammonium NH_4^+-N (mg/L)	1880	1378
Reduction of NH_4^+-N in comparison with control (%)		26,7
Nitrite NO_2^--N (mg/L)	6,4	5,6
Reduction of NO_2^--N in comparison with control (%)		12,2
Nitrate NO_3^--N (mg/L)	2385	1771
Reduction of NO_3^--N in comparison with control (%)		25,8

The feed additive did reduce the concentration of nitrogen compounds. In particular, the concentration of ammonium ions in the slurry was reduced by 27% of an average (Table 3).

Table 4. Overview of productivity indicators

Indicator	Control unit	Experimental unit
Mean piglets' weight at the beginning (kg)	7,40	7,35
Mean piglets' weight at the end (kg)	27,76	28,39

CONCLUSION

It can be concluded that in this study the commercial preparation „Pigozen", did not completely achieve the expected results. Namely, the air ammonia concentration in nurseries in relation to fattening units is generally relatively lower, thus recorded reduction of ammonia concentration is not that significant for the health of piglets, and ultimately for their production properties. This results do not exclude the good properties and possibilities of future applications, but confirms the attitude of many researchers that it is necessary to introduce standardization in obtaining, processing and modification of zeolites for certain purposes, thereby of zeolites, the feed as well as manure additives.

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