EFFECT OF *YUCCA SCHIDIGERA* EXTRACT, A FEED ADDITIVE, TO REDUCE AIR POLLUTANTS IN PIG FATTENING UNITS

Marija Vučemilo, Alenka Tofant, Suzana Hađina, Davorin Barač
Faculty of Veterinary Medicine University of Zagreb, Department of Animal Hygiene, Environment and Ethology, Zagreb, Croatia

Introduction

Intensive pig breeding facilities are associated with high levels of air pollutants that may have adverse effects on both animal and human health. Hygienic standards of air quality in pig housing are determined by physicochemical microclimate parameters and air microorganism content. The emission of ammonia and malodor from stock breeding facilities that exert unfavorable effects both within and beyond the facilities are generated during the process of manure degradation and animal metabolism. Additives are defined as agents added to feed or manure in order to reduce the emission of ammonia and malodor, and characterized by specific properties to improve both microclimate and liquid manure quality. The effect of a commercial food additive based on the *Yucca schidigera* palm extract in reducing air pollutants in pig fattening units was investigated.

Material and Methods

The fattening units – the study was conducted at the Dubravica pig–breeding farm. During the 3 month study period there were about 450 fattening pigs. The fatteners were housed in boxes on a partially slatted floor, and feed and water *ad libitum*. The additive De-Odorase was mixed into the diet of the treated pigs in the amount of 112 g per 1.000 kg feed mix. The microclimate measurements were performed by use of standard methods and Testo instruments. Air samplers were taken with SAS 100^{TM}. Nutrition agar for mesophilic bacteria and Sabouraud maltosis agar for isolation of fungi were used.

Results

Table 1. Arithmetic mean of air pollutant levels in control and treated units

Parameters	Control unit	Treated unit	Reduction (%)
Ammonia (ppm)	14.5	10.2	29.7
Carbon dioxide (ppm)	3000	1500	50.0
Mesophilic bacteria (CFU/m^3)	4,80x10^4	3,20 x10^4	33.4
Fungi (CFU/m^3)	5,26 x10^4	3,72 x10^4	29.3

Table 2. Arithmetic mean of microclimate parameters in control and treated units

Parameters	Control unit	Treated unit
Temperature (°C)	16.9	17.2
Relative humidity (%)	77	73
Air velocity (m/s)	0.13	0.12

Discussion

The emission of ammonia associated with animal keeping and housing conditions originates from degradation of organic nitrogen compounds in feces and urea hydrolysis in urine. Fecal protein nitrogen mineralization occurs by the action of proteolytic bacteria and deaminases, whereas urinary urea undergoes hydrolysis by urease enzymes. The rate of conversion to gaseous ammonia and carbon dioxide depends on air temperature and pH. The process is retarded by low air temperature and low pH. As urea hydrolysis is a considerably faster process than nitrogen mineralization, urine is the major source of ammonia emission (Andersson, 1994). The microbiologic state of animal housing is reflected in the air microflora that mostly originates from animals (~80%), manure, and attending personnel (Methling *et al.*, 1981). Agents prepared from the *Yucca schidigera* palm extract have been used as additives to reduce adverse manure emissions, especially ammonia (McCrory and Hobbs, 2001). Studies performed to date report on different rates of ammonia reduction (Amon *et al.,* 1994). The agents appear to more efficiently reduce the level of ammonia emission in animal housing when used as feed additives, whereas by far greater amounts are required when added to manure. In the present study, the addition of De Odorase to feed resulted in 30% reduction of ammonia air concentration in a pig fattening unit, which is consistent with literature reports. Also, the concentration of other air pollutants such as carbon dioxide, bacteria and fungi was decreased.

Conclusion

The addition of De Odorase to animal feed resulted in about 30% reduction in the ammonia and carbon dioxide concentrations and air microorganism count in the pig fattening unit. Standards for assessment and evaluation of additive efficiency including environmental requirements should be adopted in the near future.

References

Amon, M., M. Dobeic, T. H. Misselbrook, B.F. Pain, V.R. Phillips, R. W. Sneath (1994): A farme scale study on the use of De-Odorase for reducing odour and ammonia emissions from intensive fattening piggeries. Bioresource Technol. 48, 163-169.

Andersson, M. (1994): Performance of additives in reducing ammonia emissions from cow slurry. Swedish Univ. Of Agric. Sci. Dep. Of Agric. Biosyst. And Technol. Rep. No. 93. JBL Publ. Sweden.

Methling, W., G. Mehlhorn, K. Beer, W. Erwerth, K. Förster (1981): Quantität und Qualität der mikrobiellen Kontamination der Luft in Schweinezuchtställen. Mh. Vet. Med. 36, 732-739.

McCrory, D. F., P. J. Hobbs (2001): Additives to reduce ammonia and odor emissions from livestock wastes. J Environ. Qual. 30, 345-355.