鹿大農場研報（Bull. Exp. Farm Fac. Agr. Kagoshima Univ.）24：23～27（1999）

Utilization of Fermentation Floor for the Feeder Cattle Using Indigenous Microorganisms

Koichi YANAGITA, Shigemaru ITOH,
Toshimi UCHIMURA and Yoshihiro MATSUYAMA

(Received for Publication October 10, 1998)

Introduction

Generally, in order to maintain housed cattle in good condition, fattening floor is indispensable and to improve meat production, betterment of floor condition will also have to be needed. As for the fattening cattle floor, sawdust and bark are used. However, because of certain declines in the forestry industry, the securing of sawdust and bark is troublesome. Furthermore, as mucking out the fattening floor of housing cattle requires a heavy work, it is of high labor cost unless manure is not used effectively and the entire process of management is not arranged.

In this study, using indigenous microorganisms (IMO)[4~11], which is used in the biodegradations of oil, chemical materials and heavy organic waste contaminants, preliminary experiment was conducted to make fattening management of the housing cattle without mucking out the cattle floor.

Material and Methods

The experiment was done in the experimental fattening cattle house (24 paddocks, 1 paddock 49㎡, 6-8 heads/1 paddock) at Iriki livestock Farm, Kagoshima University. There was no need to muck out the housing floor as the fertilizer continued to accumulate by itself. The cattle floor at the time of the experiment remained in this condition, without being mucked out for 7 months. The IMO used for the management of the cattle floor was collected from the surface soil of the rotten broadleaf tree woods. To culture IMO, it was mixed with fish amino acid (FAA)[4], fermented plant juice (FPJ)[4] and distilled alcohol by-product, and was adjusted to 60% moisture with the rice bran. The adjusted rice bran was buried at a depth of 3㎝ in the rotten broadleaf tree woods and bacterial plexus was taken 1 week later. The bacterial plexus was mixed with the same quantity of molasses and kept as the IMO ancestor. The IMO ancestor increased for management of the cattle floor by being allowed to ferment with the fowl dung (50%) and rice bran (50%), and 500㎏ of increased IMO was sprayed on 24 paddocks (49㎡/1 paddock). FAA[4], FPJ[4], marine plant juice (MPJ)[4] and extracted

Shirasu solution (ESS) were mixed respectively, with a ration of 1 liter to 500 liters of water. This solution was then sprayed on the cattle fattening floor surface with the power spray. After that, it was blended with the floor surface by the rotary and the floor was flatted. The blending was done at one month intervals for seven months.

In order to maintain housed cattle in good condition, investigation were made to observe cattle density in the paddock, ammonia gas concentration (measured 5 points/paddock with GASTEC No.3) 2cm above cattle floor and eating behavior of cattle (average number of eating heads/one hour intervals from 8 a.m. to 18 p.m.) during the same day.

Results and Discussion

The ammonia gas concentration (ppm) on the surface of the cattle fattening floor till 12 days after IMO processing is given in Table 1. By processing floor surface, the ammonia gas concentration could be suppressed within 3 ppm. The difference of ammonia gas concentration on the floor surface among the number of cattle in the paddock is shown in Figure 1.

Table 1. Changes in the ammonia gas concentration on the surface of the cattle fattening floor after IMO processing management

Days after IMO processing management	No. of measured paddocks	Concentration of ammonia gas (ppm)
0	24	2.57±1.45
7	24	2.14±0.99
12	24	2.78±1.51

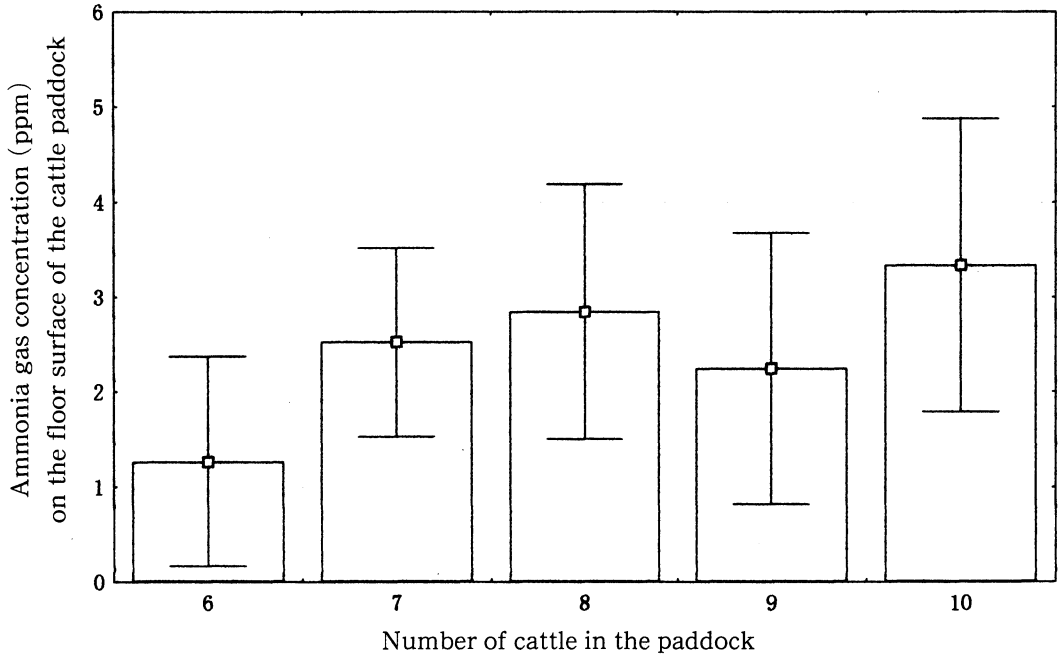

Fig. 1. Differences of ammonia gas concentrations on the floor surface.

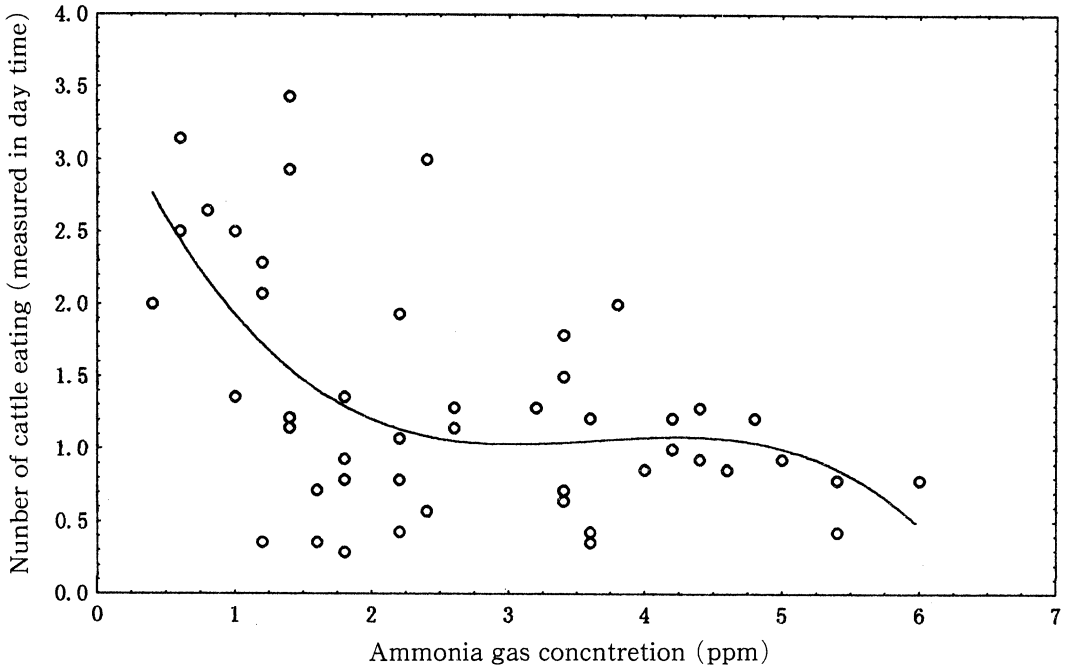

Fig. 2. Relation between ammonia gas concentration and number of cattle eating.

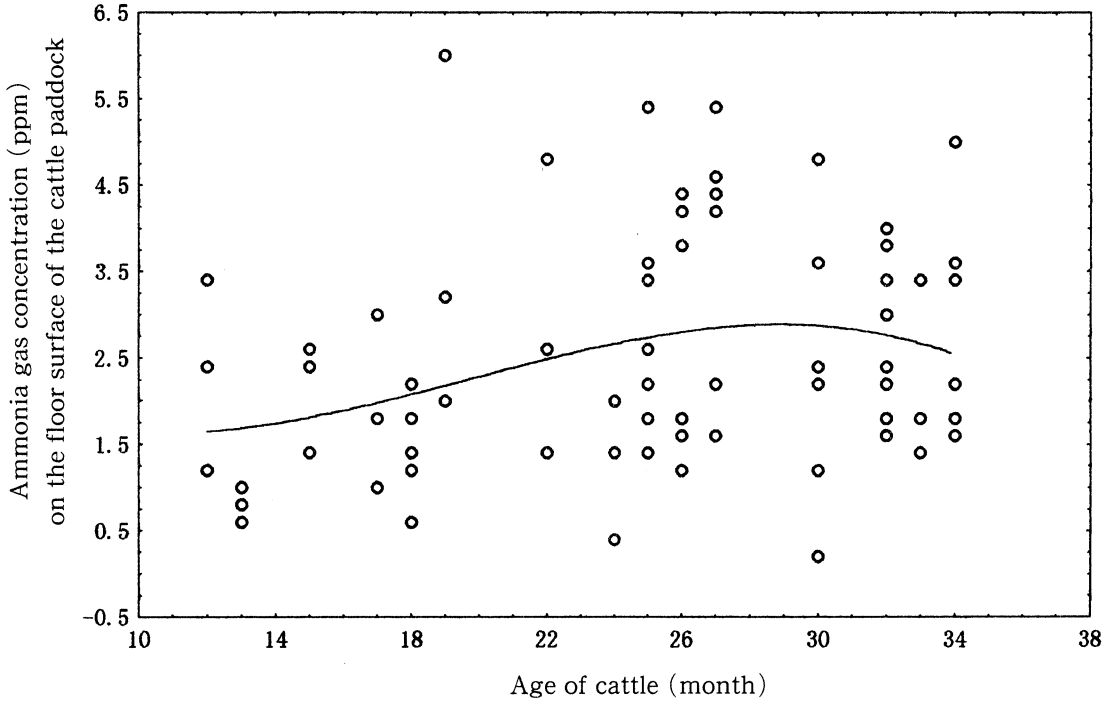

Fig. 3. Relation between age and ammonia gas concentration on the floor.

Ammonia gas concentration was low when six cattle were in the paddock and increased with advancing number of cattle. Therefore, it is thought that the number of cattle in the paddock was the important factor in the ammonia levels coming from the cattle floor. The relation between ammonia gas concentration of the paddock floor surface and average number of eating cattle is shown in Figure 2. As the numbers of eating cattle decreased, the

ammonia gas concentration increased. The relation between ammonia gas concentration of the paddock floor surface and age of the feeding cattle is shown in Figure 3. The results in Figures 2 and 3 suggest that as the younger ages of feeding cattle is more, the ammonia gas concentration is lower, and eating cattle/paddock increased when ammonia gas is low. Irrespective of the condition of the floor surface, adhesion of the filth to the cattle body was not admitted as evidence. Thus, further research will be needed to examine the relations among cattle floor processing, cattle floor moisture and cattle productivity.

References

1) Bradley, P. M., Chapelle, F. H., Landmeyer, J. E. and Schumacher, J. G.: Microbial transformation of nitroaromatics in surface soils and aquifer materials. *Applied and Environmental Microbiology*, **60**(**6**), 2170-2175 (1994)
2) Corseuil, H. X. and Alvarez, P. J. J.: Natural bioremediation perspective for BTX-contaminated groundwater in Brazil: Effect of ethanol. *Water Science and Technology*, **34**(**7-8**), 311-318 (1996)
3) Ginn, J. S., Sims, R. C. and Murarka, I. P.: Evaluation of biological treatability of soil contaminated with manufactured gas plant waste. *Hazardous Waste and Hazardous Materials*, **12**(**3**), 221-232 (1995)
4) Han, K. C. and Atushi,: K. Korean natural farming. Korean Natural Farming Association Publisher, (1997)
5) Ishaque, M., Bisaillon, J. G., Beaudet, R. and Sylvestre, M.: Degradation of phenolic compounds by microorganisms indigenous to swine waste. *Agric. Wastes*, **13**(**3**), 229-235 (1985)
6) Margesin, R. and Schinner, F: Efficiency of indigenous and inoculated cold-adapted soil microorganisms for biodegradation of diesel oil in Alpine soils. *Applied and Environmental Microbiology*, **63**(**7**), 2660-2664 (1997)
7) Mueller, J. G., Middaugh, D. H., Lant, S. E. and Chapman, P. J.: Biodegradation of creosote and pentachlorophenol in contaminated groundwater: Chemical and biological assessment. *American Society for Microbiology*, **57**(**5**), 1277-1285 (1991)
8) Ostrofsky, E. B., Traina, S. J. and Tuovinen O. H.: Variation in atrazine mineralization rate in relation to agriculture management practice. *Journal of Environmental Quality*, **26**(**3**), 647-657 (1997)
9) Xie, Y., Bewtra, J. K., Biswas, N. and Franklin, M.: Biodegradation of lubricating oils in aquatic environments. *Water Quality Research Journal of Cabnada*, **30**(**1**), 101-109 (1995)
10) Xie, Y., Bewtra, J. K., Biswas, N. and Franklin, M., Nishino, S., F., Spain, J. P. and Pettigrew, C. A.: Biodegradation of chlorobenzene by indigenous bacteria. *Environmental Toxicology and Chemistory*, **13**(**6**), 871-877 (1994)
11) Zhou, E. and Crawford, R. L.: Effects of oxygen, nitrogen and temperature on gasoline biodegradation in soil. *Biodegradation*, **6**(**2**), 127-140 (1995)

Summary

This experiment was performed on the possibility of fermentation in the cattle feeder floor using indigenous microorganisms. The experiment was done in the experimental fattening cattle house (24 paddocks, 1 paddock 49m², 6-8 heads/1 paddock) at Iriki livestock farm. The cow floor was kept without mucking out for 7 months. Indigenous microorganisms (IMO) were used for the management of the cattle floor. Maintenance of the density of feeding cattle in the paddock, ammonia gas concentration and behavior of cattle were investigated.

The results obtained were as follows:

1) Without mucking out the cattle floor for 7 months, ammonia gas concentration in the floor managed with indigenous microorganisms was kept within 3 ppm.
2) Main factor causing the increase in the ammonia gas concentration of the paddock floor surface was the number in the paddock and the age of cattle.
3) As the number of eating cattle increased, ammonia gas concentration of the floor surface remained low.