Effects of Effective Microorganisms (EM) on Reduction of Odour from Animal and Poultry Dung

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Introduction

Animal and poultry dung cannot be used to their full potential due to their foul smell which is considered environmental pollution. This pollution is greater in the cities where large scale animal farms are found. This paper analyzes the effects of using EM in three different ways to deodorize the foul smell of dung and clean the environment.

At present there are about 2.3 billion chicken reared intensively in China. The output of the chicken dung is 84 million tonnes. If we add the animal and poultry dung (pig, cattle, duck and goose) the total dung amount maybe at least dozens of billion tonnes, which form a major source of pollution in the China. During the spring and autumn, a strong foul smell is present around the rearing homes and farms. The population of flies also cause problems to human activity. Many methods have been proposed to solve the environmental pollution of the animal rearing industry. These include the marsh gas method, high temperature dried method and heat spray methods, which either consume a lot of energy, need great investment or has long treatment period. However all these methods do not reduce the foul smell and thus are not widely spread in many rearing farms.

In recent years, the Baijing Agricultural University has cooperated with the International Research Development Center of Japan to introduce EM to deodorize the foul smell of animal dung. The primary results with the example of a chicken farm, is reported in this paper.

Materials and Methods

EM can be given to the chicken either through the feed, through drinking water or through both feed and drinking water. In this experiment all the three methods of supplying EM to the chicken were tested, with a control treatment for each test (Table 1). Test were carried out to determine the ammonia concentration in the air, the types of amino acids in the feed, production and an economic analysis.

Table 1. Treatments Used to Test EM on Chicken

Treatment		No. of chicken	Type of chicken
1	EM in drinking water + nomal feed	400	Broiler (Ruman)
2	EM in feed + nomal drinking water	500	Layers (Dika)
3	EM in feed + EM in drinking water	50	Layers (AA)

Note: Each treatment has a control of similar breed and number, but given normal feed and drinking water.

Results and Discussion

Ammonia Concentration

The ammonia concentrations in the poultry house are given in Table 2. The results clearly show that when EM was fed to the chicken, the ammonia concentration was less. The highest reduction in ammonia concentration was from treatment 3 where EM was given both in the feed and drinking water, followed by EM treatment in the feed, and lastly EM treatment in drinking water.

Table 2. Ammonia Concentration in Poultry House

Treatment		Sampling times	Ammonia concentration (ppm)		
			Control	EM treat	Difference (%)
1	Water	3	8.95	5.18	-42.12
2	Feed	6	16.13	7.38	-57.25
3	Water + feed	3	87.60	26.50	-69.70

The main elements of the foul in the rearing farm are ammonia, hydrogen sulfide, mercaptan and methylmercaptan. Due to the greater concentration of ammonia in the animal yard, it may not only influence the normal growth of the animals and poultry and cause some diseases. Therefore, the amount of ammonia is an important index of the environment of the rearing farm. From the above mentioned results, cautious application of EM to both feed and drinking water had obvious effects of reducing the ammonia concentration in the chicken house.

Amino acid concentration

The composition and concentration of amino acid in the feed before and after EM treatment are shown in Table 3.

Table 3. Amino Acid Concentration in The Feed Before and After EM Treatments

Amino acid	After treatment (%)	Before treatment (%)	Ratio
Aspartate	2.94	2.48	1.19
Theornine	1.25	1.05	1.19
Serin	1.88	1.63	1.15
Glutamate	6.17	3.6	1.71
Glycine	1.74	1.39	1.25
Alanine	1.71	1.37	1.25
Cystine	0.45	0.42	1.07
Valine	1.17	1.01	1.16
Methionine	0.63	0.43	1.24
lsoleucine	0.97	0.78	1.24
Leucine	2.16	1.81	1.19
Tyrosine	0.93	0.85	1.09
Phenyalanine	1.38	1.16	1.19
Lysine	1.02	1.84	1.21
Histidine	0.72	0.57	1.26
Arginine	1.89	1.68	1.13
Proline	3.96	3.16	1.25
Trytophan	-	-	-
NH_3	0.77	0.50	1.54
Total	30.97	24.28	1.28

These results showed that the concentration of amino acids in EM fermented feed were 28% more than that in the original. It clearly indicated that EM improved the transformation of the nutrients of the foodstuff that resulted in the increase of uptake rate and utilization coefficient of nitrogen by the poultry. At the same time, propagation of EM in the intestines also check the growth of putrifying bacteria.

Due to the action of EM, the utilization coefficient and the transfer rate of the nitrogenous compounds in the foodstuff were increased. It improved the growth of poultry an increased egg production and the length of laying period. The egg production of some chicken were increased by 13%. For broilers, the rate of weight gain was faster, with better quality meat and efficiency of feed utilization. The ratio of feed to meat production was reduced by 10.24 % and the economic benefit was raised by 18.41% (Table 4). The result shows that use of EM technology to deodorize the foul smell of animal dung need less investment and yet the return is higher.

Table 4. The Economic Benefit of EM Feed to Broilers (Yuan)

Items	Control	EM treated
Expenses:		
Chick	100	100
Feed	227.73	207.74
EM	0.00	10.00
Total	327.73	317.74
Income:		
Sale of chicken	415.01	427.00
Profit:	92.27	109.26
Relative effect (%)	100.00	118.41
Feed to meat ratio	2.26	2.05

Discussion and Conclusion

These results show that the use of EM in the poultry feed and drinking water effectively deodorize the foul smell of the animal dung, improve the environment, and at the same time also improve the growth of animal and raise the disease resistance of the animal body. It also improve the feed conversion rate which resulted, economic and social benefits. Therefore, EM has multiple functions with with excellent character. The multiple functions of EM is closely related to the actions of the dominant species in EM, such as photosynthetic bacteria, saccharomycete, lactic acid bacteria and Actinomyces.

The reasons for the control of foul odour may be due to:

1. EM microbes have rather strong nitrogen fixing ability.
2. EM contains beneficial microbes which enter into the animal intestines with feed and drinking water and then exclude the putrifying bacteria group in the intestines so as to check the activity of the intestinal colibacillus and transfer the protein into ammonia and ammonium.
3. The EM in the intestines may be able to reduce the ammonia in the dung and blood.

The above mentioned three combined actions of EM may transfer the protein in the feed into effective nutrients so as to raise the feed utilization rate and check putrification which causes foul smell. This action of EM may be concluded as the function of "anti-oxidation".

To feed the animal with EM is to utilize the microbes to build and recover the microecological balance in the animal body. It avoids the use of antibiotics that destroy the microecological balance of the animal body so as to reduce the phylactic power. Therefore, the use of EM as the feed additive result in the animal being healthy with high quality products. It is an easy way to produce green agriculture and healthy animal products with multiple benefit. Therefore, as far as the whole world and human being are concerned, it is a good news and also a strong challenge to chemical fertilizers and pesticides.

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