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Effect of Effective Microbial Technology on the Benefit Cost Ratio of different Housing Systems of Pigs in Aizawl, Mizoram

Menalsh Laishram[1], Pragati Hazarika[2], A. Losa Rose[3], Prasanta Saikia[4], Rameswar Panda[5], Girin Kalita[6] and Sasmita Panda[7]

[1]Department of Livestock Production Management, College of Veterinary Sciences and Animal Husbandry, Central Agricultural University, Selesih, Aizawl-796014, Mizoram
[2]Department of Livestock Production Management, College of Veterinary Sciences and Animal Husbandry, Central Agricultural University, Selesih, Aizawl-796014, Mizoram
[3]Division of Veterinary Microbiology, Indian Veterinary Research Institute, Bareily, UP.
[4]Department of Livestock Production Management, College of Veterinary Sciences and Animal Husbandry, Central Agricultural University, Selesih, Aizawl-796014, Mizoram
[5]Department of Livestock Production Management, West Bengal University of Animal and Fishery Sciences, Kolkata-700037 WB
[6]Department of Livestock Production Management, College of Veterinary Sciences and Animal Husbandry, Central Agricultural University, Selesih, Aizawl-796014, Mizoram
[7]Department of Livestock Production Management, West Bengal University of Animal and Fishery Sciences, Kolkata-700037 WB
E-mail: [1]menalsh08vets@gmail.com, [2]pragati.h@rediffmail.com, [3]losavets@gmail.com, [4]powalmoni@gmail.com, [5]rameswar.panda8@gmail.com, [6]gkgirin@gmail.com, [7]smileysas555@gmail.com

Abstract—*The study was carried out in the Instructional Livestock Farm Complex of College of Veterinary Science & Animal Husbandry, Central Agricultural University, Selesih, Aizawl, Mizoram, India during November-March, 2015. A total of 24 Large White Yorkshire pigs of 2-3 months age were randomly grouped into three treatment (T_1, T_2, & T_3, respectively).In each group there were eight pigs of four replicates. Animals in T_1 were kept in deep litter housing system and fed with fermented feeds. Animals of T_2 were kept in deep litter housing system and fed with conventional concentrate ration and Animals of the T_3 groups were under conventional housing along with conventional concentrate feeding system. Feeds and litter materials were fermented with Lactobacillus acidophilus which is one of the organism of the Effective Microbial (EM) Technology. The data on BCR (Benefit Cost Ratio) as a measurement of economic parameter was compared between the treatment groups. BCR was found to be 1.42 ±0.13, 1.45 ±0.24 and 1.36 ± 0.21 for T_1, T_2 and T_3 respectively which was obtained as a non-significant. Thus, the BCR of different systems of housing on the economic was found to be contributory factor for viability of pig farming.*

Keywords*: Large White Yorkshire, Effective Microbial Technology, Lactobacillus acidophilus, BCR.*

1. INTRODUCTION

The total pig population of India is estimated to be 10.29 million [1]. In NER, there are about 3.9 million pigs which are 38.41% of India's total pig population [1]. In Mizoram, livestock and poultry population are 3, 28,177 and 15, 69,991 with the growth rates of 14.1 and 11.02 % for livestock and poultry, respectively [2]. Among the livestock population, pig population (73.35%) constitutes the largest group followed by cattle (9.62%). Among the available animal protein, pork is very popular among the people in the state. In tribal-dominated society of NER, all the people irrespective of caste, creed and economic strata, consume pork without any restrictions. Pig keeping is the part and parcel of tribal community in Mizoram. Out of the total meat production, pork accounts for 51.91% followed by beef (32.75%). However, despite all these positive indicators, the region produces only 70,000 metric tonnes of pork thereby leaving a deficiency of around 5 – 10 thousand metric tonnes due to increase in human population, urbanization and change in food habits of people (Bujarbaruah, 2006). Recent investigation has found that successful use of EM (Effective Microbial) reduced stress factors in animals, enhanced immunity and fecundity and lowered the requirements of regular medicines and increased the quality and shelf life of pork products ([3]). The use of EM in animal husbandry, a unique microbial technology was first developed by Dr. Teruo Higa of Japan in the year 1980. There were reports of successful use of EM in poultry and pig farming in many countries ([4]). Scientists from different parts

of the world reported that upon the use of EM technology there were greater physiological activity in animals and better feed conversion efficiencies ([5] & [4]). EM contained many naturally occurring beneficial microorganisms, which are both oxybiotic and anaerobic in nature. After ingestion through the medium of feedstuffs, these microbes multiplied rapidly and they not only checked the growth of other pathogenic microbes but also formed the normal microbiota within the host body system to produce main vitamins for the host, provided nutrients and prevented attack of the pathogens [6]. The present study was carried out by converging above cited aspects- use of EM technology and Deep litter housing system to develop a location specific suitable Technology for enhancing pig production. The first intervention provided a low cost and comfortable deep litter housing system for pigs which was to be economical compared to intensive pig housing system. The second one was to enhance pig production through use of beneficial bacteria through feed and environment.

2. MATERIALS AND METHODS

Location and Duration of Study

The study was carried out in the Instructional Livestock Farm Complex of College of Veterinary Science & Animal Husbandry, Central Agricultural University, Selesih, Aizawl, Mizoram, India.

Climatic Pattern of the Place

The altitude ranges from 21 metre at Tlabung to 2,175 m at Phawngpui (Blue Mountain). Aizawl has a mild, sub-tropical climate due to its location and elevation. Temperature ranges from 10^0C to 36^0C and the annual rainfall ranges from 2,000 mm to 2,500 mm per annum.

Animal Selection and Treatment Allocation

A total of 24 Large White Yorkshire pigs of 2-3 months age were randomly selected from the stock maintained at Instructional Livestock Farming Complex, College of Veterinary Sciences & AH, Selesih, Mizoram. The animals were put into three treatment groups (T_1, T_2, & T_3, respectively) with eight pigs per group .In each group there were four replicates with two pigs.

Treatment 1 (T_1):

Animals in T_1 were kept in deep litter housing system where the deep litter being fermented with *Lactobacillus acidophilus* prior to the introduction of the animals and laid hours before introduction of the animals. All the 8 piglets were weaned at the 56th days of age and were given enthalmentics (Endoban® @ 10 g/kg body weight) and then repeated every 3 months during the study. They were given conventional concentrate ration fermented with *Lactobacillus acidophilus.*

Treatment 2 (T_2):

Animals of T_2 were kept in deep litter housing system where the deep litter being fermented with *Lactobacillus acidophilus* prior to the introduction of the animals and laid hours before introduction of the animals. All the 8 piglets were weaned at the 56th days and were given enthalmentics (Endoban® @ 10 g/kg body weight) and then repeated every 3 months during the study. They were given conventional concentrate ration.

Treatment 3 (T_3) control:

Animals of the T_3 groups were kept in conventional housing system and were given enthalmentics (Endoban® @ 10 g/kg body weight) like the rest of the groups which was repeated for every 3 months during the study and were given conventional concentrate feeds.

Table 1: Experimental Design

Group	Housing	Feeding	No. of Animals	Age
T_1	Deep litter+ LAB Spray on bedding material	Fermented with L. acidophilus	2 X4	2-3 M
T_2	Deep litter+ LAB Spray on bedding material	Conventional con. Feed	2 X4	2-3 M
T_3	Conventional house	Conventional con. Feed	2 X4	2-3 M

Preparation of Fermented Feed

Fermentation of feed was carried out *in vivo* in a temperature controlled by poly house. Fermentation of feed will be done with a widely used beneficial lactic acid bacteria, i.e. *Lactobacillus acidophilus* (ATCC 314) standard culture. Initially the organism was cultured for 18 h at 37°C in Man-Rogosa-Sharpe (MRS) broth prior to use for fermentation. Direct microbial count (DMC) was performed to know the numbers of organisms present in the culture. The live culture will be mixed with required amount of clean water in an aluminum container. Compound feed was then mixed with this diluted inoculums (~10^7CFU/gm) and covered with lid. Then the feed mixture was allowed to ferment for 48 h at 37°C with relative humidity of 30-40%. Manual stirring of the mixture will be done at 6 h interval. A sweat-sore smell and decrease of pH level (4.5-5.5) was an indication of fermentation of feed mixture and offered this fermented feed to the experimental pigs of Groups throughout the study. The fermentation technique will be followed as described by [7].

Production Economy

The cost per quintal of conventional and fermented feed was calculated on the basis of prevailing market price of different feed ingredient. Economics of the study included capital investment, fixed cost, variable cost, total cost, gross return, net return, profit per pig and cost of per kg pork production. Purchase of animal and sale price of pork was as per

University approved rate. The depreciation cost on housing and equipment was followed as described by [8]

Statistical Analysis:

The data was statistically analyzed by using design of CRD and RBD with interaction in SPSS 7.3 (2013) as per [9].

3. RESULTS AND DISCUSSION

Table 4.23 represents the comparative economics of production of three treatment groups. All parameters were comparable between three treatment groups. However, the variable cost/pig was highest in T_3, followed by T_2 and T_1. The total cost/pig was Rs. 5374.00, 5529.54 and 6338.56 in T_1, T_2 and T_3, respectively. The average gross income was highest in T_3, followed by T_2 and T_1. But average net income/pig was highest in T_2, followed by T_3 and T_1. Average income per pig was highest in T_2 (Rs.72.83) followed by T_3 (Rs. 59.38) and lowest in T_1 (Rs.54.99). Benefit cost ratio was least in control group (T_3) followed by T_1 and T_2.

Level of significance-NS= non significant

Based on the analysis of the economic aspects of the three production group, it was concluded that the average income per kg of pork production was higher in deep litter housing system (T_2) than the other two groups (T_1 and T_3). Because of that, BCR was higher in both deep litter groups (T_1 and T_2) compared to T_3 (Control). This might be due to the low construction costs for deep litter pig sty compared to the conventional housing system, which made deep litter housing system as cheaper [9], [10], [11]. The variable cost of raising pigs in T_1 and T_2 were also less because cleaning were not required daily in T_1 and T_2. Therefore, requirement of man-days in T_1 and T_2 were comparatively less than T_3. Reduction of recurring cost on medicines was also less in T_1 and T_2 compared to T_3. Overall, there was marginal increase in the profit of T_1 and T_2 than T_3.

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Parameters	T_1	T_2	T_3	OVERALL	F-value
Av. fixed cost/pig (Rs.)	2719.500 ±193.23	2617.13 ±554.98	2727.37 ±553.64	2688.00 ±243.91	0.017 NS
Av. Variable cost/pig (Rs.)	2654.50 ±1.099	2912.41 ±16.04	3611.18 ±372.46	3059.36 ±165.78	5.288 NS
Av. Total cost/pig (Rs.)	5374.00 ±192.56	5529.54 ±559.17	6338.56 ±840.79	5747.37 ±335.14	0.761 NS
Av. gross income/pig (Rs.)	7650.00 ±805.21	8104.25 ±1800.93	8118.50 ±7.37	7957.58 ±598.42	0.055 NS
Av. net income/pig (Rs.)	2276.00 ±680.71	3632.67 ±1356.91	2409.36 ±783.24	2723.01 ±514.94	0.617 NS
Av. cost/kg of pork production (Rs.)	145.00 ±14.77	152.35 ±28.38	156.13 ±20.65	151.62 ±11.57	0.66 NS
Av. income/kg of pork production (Rs.)	54.99 ±14.77	72.83 ±18.52	59.38 ±19.27	61.65 ±9.11	0.288 NS
Benefit Cost Ratio (BCR)	1.42 ±0.13	1.45 ±0.24	1.36 ±0.21	1.41 ±0.10	0.048 NS

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