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Odorless Probiotic Chicken of Eco-Smart Poultry Coop

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ABSTRACT

The smell of chicken waste has become a serious problem in Malaysia. Flies and an unpleasant odor from poultry coop plague the locals. To decrease the disagreeable odor of chicken manure, the approach used in this study is charcoal as an adsorption method to adsorb an ammonia gas. The sawdust is used as a drying agent for the chicken waste to ensure it produces no smell, and it also contains EM (Effective Microorganisms) as a decomposition mechanism for the bacteria in the chicken waste. The research result obtained positive results based on the number of flies, the odor examined through human surveys, the difference between probiotic and normal chicken waste, and the difference in fat content identified in probiotic chicken. It has been demonstrated by studies that while using wood dust and charcoal can aid in eliminating the odor of chicken droppings, processing chicken droppings with an EM solution is crucial before the droppings start to smell bad. Implementing an automatic system to manage chicken feed and drink is a recommended approach to ensure the project's success. This will ensure that the chickens obtain the proper amount of food and drink at the time specified. Given that chickens are highly susceptible to extreme heat or cold, the following recommendation is to monitor the cage's temperature and humidity levels. The ammonia odor associated with poultry farming affects not only the environment but also people. People who live close to the area where chickens are raised will feel uncomfortable because of this issue. The probiotic approach is the problem-solving strategy, according to the research. The chickens' digestive tract will be aided using EM solution as a drink and meal, resulting in less offensive chicken faeces.

1. Introduction

The poultry industry has grown rapidly since the Second World War and the volume of poultry products continues to increase [1]. The Food and Agriculture Organization of the United Nations reported that about 23 billion broiler chickens were produced worldwide in 2016 [1-3]. Therefore, broiler chickens are raised in high stocking densities and new strains are genetically selected for very fast growth. However, fast growth selection has side effects such as limited disease resistance, poor skeletal integrity and heart failure. In addition, intensive rearing of broiler chicken has raised a

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particular issue with the disease. Diseases are now considered by many to be the most important obstacle for the poultry sector itself and public health [4-6]. So those steps to improve and modernize the production of this industry need to continue to be explored *via* increasing the opportunities of this industry in addition to encourage and help the use of the latest technology to achieve these goals. The high production of chicken depends on the environment, the breeding process and the active operations [7-9]. The smart process involves many stages, e.g., management, feeding/planting, quality assurance, environment control and performance and reliability as stated in [10]. In Malaysia, the agriculture sector such as chicken poultry has been increasing by the year. In 2021, Malaysians has consumed an estimated 49.7 kg of poultry meat per person. This put Malaysia amongst the top global consumers of poultry meat worldwide.

Broilers are typically raised on litter-covered floors. Litter serves numerous purposes, including providing good thermal insulation, collecting spilled liquid and excrement to keep pens dry, and distributing and covering excrement to avoid contact between broilers and excrement [10]. As a vital protective medium, litter must be very absorbent but also lightweight, affordable, non-toxic and reusable. The price and availability of litter materials vary by area. Wood shavings and sawdust are the most regularly utilized litter materials, however rice hulls, peanut hulls, sand, wheat straw and soybean straw have been used on several occasions [10-12]. Sawdust has a higher water absorption capacity and is more popular than other litter materials. A study in Bangladesh on the effect of litter materials on broiler performance discovered that sawdust was the best litter for broiler growth, followed by rice husk, sugarcane bagasse and wheat straw [10].

The use of in-feed antibiotics led to improved feed conversion efficiency and reduced pathological load associated with poultry production. The greatest problem with antibiotics for poultry as well as for humans is antibiotic-resistant bacteria [13-15]. This has made controlling disease hard in broiler chickens because many antibiotics previously used in poultry production now fail to treat many disease cases. Probiotic feed is a formulation of probiotic nutrition produced by the process of fermentation and isolation naturally using 100 % chemical-free ingredient products that are replaced with various microorganisms found in food processing [13]. Probiotic feed can also help in the digestive system of livestock and helps ecology in the digestive system for the better [14]. Directly, it can help the growth of domestic animals' in a healthy condition and also prevents the attack of diseases and dangerous bacteria. Probiotic feed is suitable for all ruminant livestock, aquaculture and poultry farming types [15].

The smell that comes from the chicken coop is from the odor of the chicken waste. The smell of chicken waste is because of the ammonia and moisture. The characteristic of ammonia is colorless and bring about a pungent smell. Nowadays, chicken waste has become a serious issue in Malaysia. Most businessmen and farmers use traditional poultry farming methods. Traditional poultry farms lack proper and effective management to maintain the health and growth of chicks.

This study presented a plan for probiotic chicken product starting from ammonia-free (smell) poultry to probiotic food processing where everything is produced using technology without the use of chemicals, antibiotics, vaccines, hormones and others. This paper focus more on the development aspect of eco smart poultry coop (odorless) prototype research and expose breeders and farmers to new technology. The odorless poultry prototype can attract the interest of new breeders entering the field. Probiotic feed is a formulation of probiotic nutrition produced by the process of fermentation and isolation naturally using 100 % chemical-free ingredients with effective microorganism (EM). Chemical-based nutritional products can be replaced with various microorganisms found in food processing.

2. Methodology

2.1 Material and Design of Odorless Probiotic Chicken of Eco-Smart Poultry Coop

Figure 1 shows the isometric view of odorless probiotic chicken of Eco-Smart. Figure 2 illustrates the orthographic view of odorless probiotic chicken of Eco-Smart poultry coop.

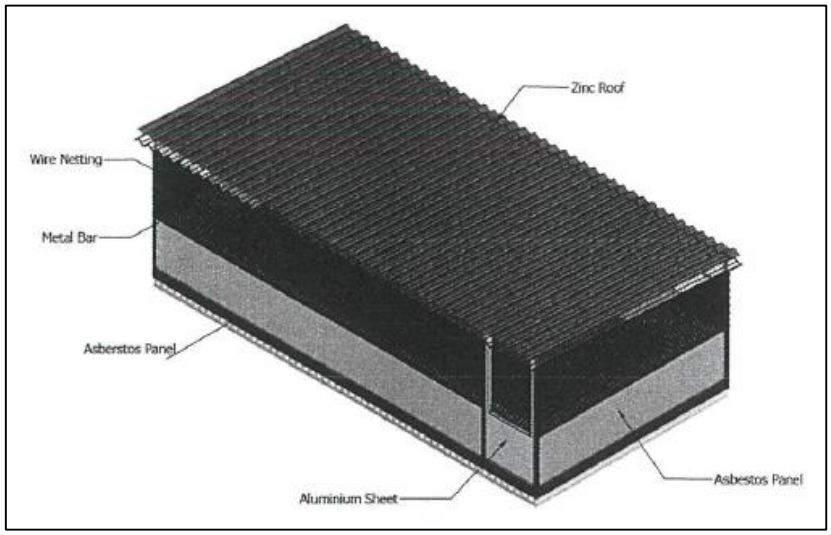

Fig. 1. Isometric view of odorless probiotic chicken of Eco-Smart poultry coop

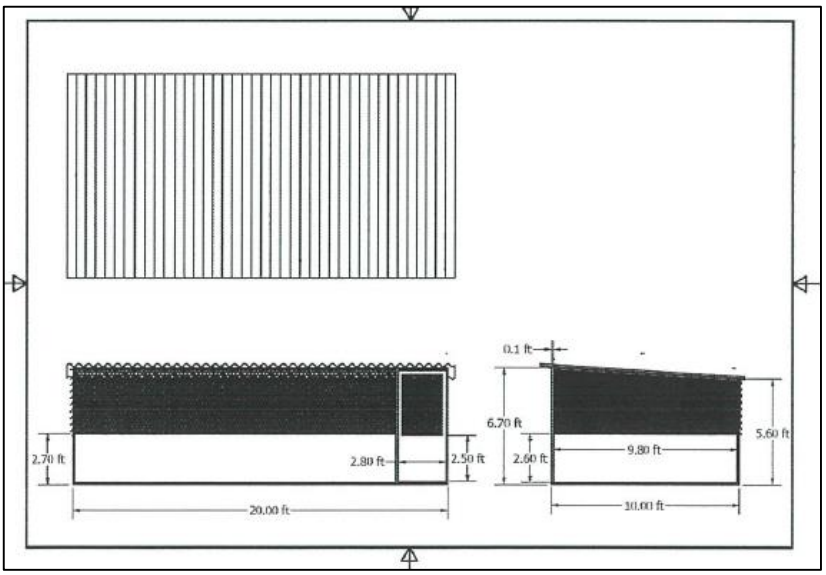

Fig. 2. Orthographic view of odorless probiotic chicken of Eco-Smart poultry coop

2.2 Material and Method Preparation for the Floor of Odorless Probiotic Chicken of Eco-Smart Poultry Coop

The probiotic method can prevent odor in chicken poultry coop. In the probiotic method, charcoal and sawdust were used in the process. The function of charcoal and sawdust is to absorb the moisture contained in the cage to prevent the cage from smelling [8]. In addition, the use of EM solution also helps in the deodorization process. All the materials were easy to find in the market for an odorless floor of the probiotic chicken poultry coop as shown in Figure 3.

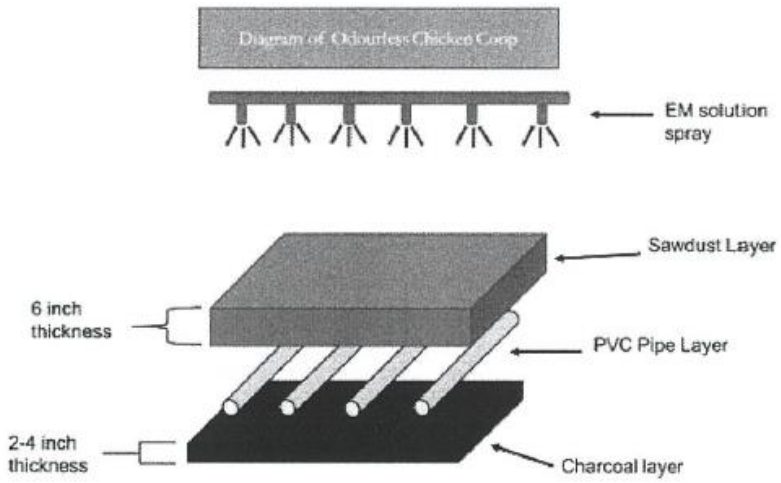

Fig. 3. Design of floor odorless probiotic chicken poultry coop

2.3 Preparation of Effective Microorganisms (EM)

To prepare EM in feed (100 ml of EM solution), 100 ml molasses and 10 liters of water were combined with 100 kg of feed (mesh feed). Molasses were dissolved in water to create a molasses solution, which was then mixed with EM before being sprayed on the feed and thoroughly mixed. These processes were used to prepare EM in solid form. To ferment and utilize the mixed feed, it was finally sealed in an airtight black plastic bag and left for 8 days.

3. Results

3.1 Effectiveness of EM Solution Against the Flies of Chicken Poultry Coop

Table 1 shows the result of the number of flies taken 7 days before harvesting the chicken. This is because the chicken will emit the maximum scent during this period. Data on the quantity of flies was collected in the morning and after the rain. A strong smell of chicken faeces rose into the air in the morning and after rain, attracting the attention of flies to the coop. Figure 4 shows the flies that have been trapped. On the first day, there were many flies in this coop because there was no spraying of the EM solution on the coop's floor, and on the second day, the process of spraying EM solution using as much as (2 litres) started. Then, between days 3 to 6, the EM solution began to affect the chicken floor and chicken waste, gradually reducing the number of flies in the coop.

Table 1
The effectiveness of EM solution against the smell of chicken coop toward flies

Day	Flies rate (morning)	Flies rate after rain
1	Many	Many
2	Many	Many
3	Less much	Many
4	Less much	Less Much
5	Less	Less much
6	Less	Less
7	Almost none	Almost none

Fig. 4. Flies trap Day 1

Finally, on day 7, there were almost no flies found in the coop or on the chicken faeces, indicating that the EM solution played an important role in the process of reducing the smell of chicken faeces, which was assisted by drying agents such as charcoal and wood dust to support the process.

3.2 Effectiveness of EM Solution Against the Smell of Chicken Poultry Coop

The effectiveness of the EM as a solution against the smell of chicken coop test configuration for this experiment is shown in Table 2. The aim was to prove that this chicken coop does not smell. Therefore, the method used to collect data was using the human survey method. Six people have been called to undergo the survey. The survey were asked to smell the chicken coop according to the set distance of 5 meters, 10 meters, 15 meters and 20 meters (Figure 5). The survey have been asked to answer and complete the project form that has been prepared. From the table, it can be observed that each of the 6 volunteers marked no odor smell emitted by the coop within a set distance. Therefore, this result can prove that probiotics chicken coop does not emit a bad smell and it is proven that the EM solution can help remove the smell of chicken waste.

Table 2
Effectiveness of EM solution against the smell of chicken coop

Person/ Distance from the coop (m)	5	10	15	20
1	X	X	X	X
2	X	X	X	X
3	X	X	X	X
4	X	X	X	X
5	X	X	X	X
6	X	X	X	X
7	X	X	X	X

Table 3 shows the difference between probiotics chicken and normal chicken wastes focussing on related odor, physical and mortality parameters. Chicken probiotics used organic food sources such as corn kernels, soybeans and palm dregs. All those ingredients were processed with EM solution to make probiotic food. In addition, probiotic chickens also used EM solution as a drink to facilitate the chicken's digestive system while normal chickens only use tap water. As seen, the probiotic waste emitted lesser smell compared to the normal chickens' waste. This was due to the effectiveness of the EM solution which was very helpful in the chicken's digestive system. This was also due to the 'good' bacteria in the chicken. In addition, the physical waste of probiotics chicken waste was dry due to the effectiveness of the drying system from wood dust and charcoal used in the manufacture of coop sites compared to normal chicken waste which is wet and smelly. Therefore, it was proven that the EM solution and the drying system from the coop site can affect the properties of chicken waste.

Table 3
The parameter of probiotic chicken waste versus regular chicken waste and mortality of chicken in 45 days

Parameter	Probiotic waste	Regular waste
Odor	Less odor	Odor
Physical	Dry	Wet
Mortality	7 (45 day)	15 (45 days)

Table 4 shows the effect of EM solution and probiotics food on chicken meat. As can be observed that the probiotic chicken meat is lighter than normal chicken (Figure 6), this is because of the lack of fat content found in probiotic chicken compared to normal chicken meat that can be found in the market. However, probiotic chicken meat will be chewy than normal chicken because the percentage of chicken muscle is higher than the percentage of fat (Figure 6). Therefore, the EM solution can influence chicken meat, making it healthier and better quality for human consumption.

Fig. 5. Collecting odor data (human survey)

Fig. 6. Meat of probiotic chicken

Table 4
The effectiveness of EM solution on the properties of chicken meat

Chicken (whole leg)/Chicken Type	Probiotic chicken	Regular chicken
Chicken weight (g)	180	250
Chicken texture	Chewy	Soft
Fat content	Less fat	More fat

4. Conclusions

Probiotics can be added to poultry feed to reduce the risk of gastrointestinal illnesses. Recognizing the impact of probiotics on avian gut bacteria balance, growth and immunity is crucial for practical applications. It is critical to reduce the frequency of illness in poultry through natural measures to have a strong immune system that will aid in the increase of chicken production levels. The probiotic technique can indeed stop stinking in chicken coops, which brings broilers to the next point. To keep the cage from stinking, charcoal and sawdust were used to absorb the moisture present in the probiotic technique. Additionally, the deodorization process was aided by applying an EM solution. Charcoal, wood dust and EM solutions are just a few of the items that are readily available in the market. The probiotic approach is the problem-solving strategy, according to the research. The chickens' digestive tract was aided using EM solution as a drink and meal, resulting in less offensive chicken faeces. The ammonia odor associated with poultry farming affects not only the environment but also people. People who live close to the area where chickens are raised will feel uncomfortable because of this issue. Understanding probiotics, their mechanism of action and their

widespread application in chicken health and productivity can lead to further advancements in poultry health and productivity in the coming years.

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