

## A Study on the Effect of *Abelmoschus Manihot Jinhua* kui Extract on Odor Reduction

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### Abstract

*With the commercialization and full-timeization of the livestock industry, civil complaints continue to increase, and the livestock industry is facing a crisis due to social problems such as odor caused by livestock manure, soil pollution, water pollution, and environmental pollution. In order to increase productivity in livestock farms, the amount of livestock manure generated is increasing due to excessive use of protein feed and high-density breeding environment, and complaints such as odor and water pollution due to management problems are increasing rapidly. Livestock odor has emerged as a serious social problem, and due to growing complaints, conflicts between the Ministry of Agriculture and Forestry and the Ministry of Environment are even causing the livestock industry to lower its status. There is an urgent need for solutions to identify problems in the livestock industry and improve policies. This study aims to develop a " *Abelmoschus Manihot Jinhua* kui " brand that can improve the intestinal environment of livestock, reduce odors caused by livestock excrement, and improve the productivity of livestock farms in order to improve the increasingly serious odor problem in livestock sites. For Jeju livestock farms, which place more importance on the environment by securing tourists, eco-friendly feed additives were applied to the experiment, the results were derived, and the focus was on solving fundamental problems of odor generation through the development and packaging of feed additive brands. We aim to fundamentally solve the odor problem of domestic livestock farms, secure eco-friendly livestock farms, and contribute to reducing livestock odors and increasing productivity through research results that reduce ammonia levels in each livestock farm.*

**Keywords:** Odor reduction, Eliminate odor, Biodegradation, Eco-friendly, Feed additive

### 1. Introduction

Livestock odor has a serious impact on the health of livestock and humans, and there is a lot of interest in reducing it [1]. In particular, odors generated by livestock farms decrease the productivity of livestock, affect human health, and cause complaints due to odors in surrounding areas. In the past, when the supply of livestock products was insufficient, environmental pollution problems such as odor, water pollution, and soil pollution caused by livestock manure were not highlighted as social problems. However, as urbanization progresses, odors and environmental pollution caused by livestock manure are emerging as social issues [2]. It is thought that microorganisms will play the most important role in both the occurrence and reduction of odors [3]. In addition, about 60% of farmers use microbial feed as a way to reduce odors in a survey of livestock farms [4]. This study aims to develop a feed additive that helps livestock reduce odor through experimental results by

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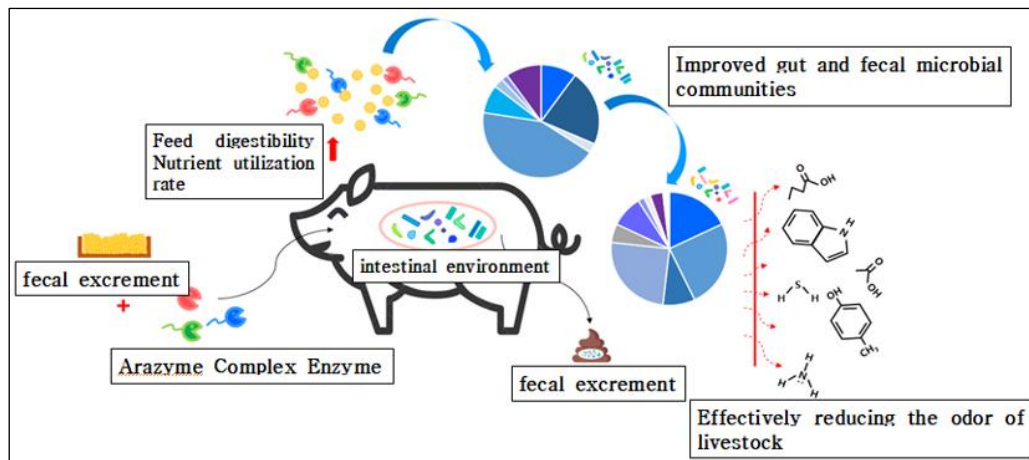
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developing the plant "Abelmoschus manihot Jinhuakui" as a feed additive for eco-friendly livestock. Through prior research on feed additives that reduce livestock odors and increase productivity, we will derive directions for domestic livestock environment policies and case studies on odor reduction facilities, and improve the livestock environment in Korea by suggesting ways to improve livestock farms, focusing on odor and water pollution, which are the biggest problems of environmental pollution.

## 2. Research direction

To reduce the odor of livestock, technology to reduce the amount of odor generated in the shed through dust removal or masking in the shed, and technology to reduce odor discharged to the outside of the shed using windshields, bio curtains, and wet scrubbers are mainly used. Another way is to fundamentally improve the animal's intestinal environment through feed additives to change the state of excrement discharged. As shown in Figure 1 is a conceptual diagram of the development of formulations optimized by combining several enzymes based on natural proteases of the Korea Biotechnology Research Team published in the environmental journal Science of the Total Environment (IF 10.753). In a three-year field application test of pig farms in Jeollanam-do, the concentration of ammonia and hydrogen sulfide, the main components of the odor, was reduced by up to 63%. In addition, the average shipment time was shortened by 10 days and the meat quality grade was improved due to the improved types and density of beneficial microorganisms in the pig intestine



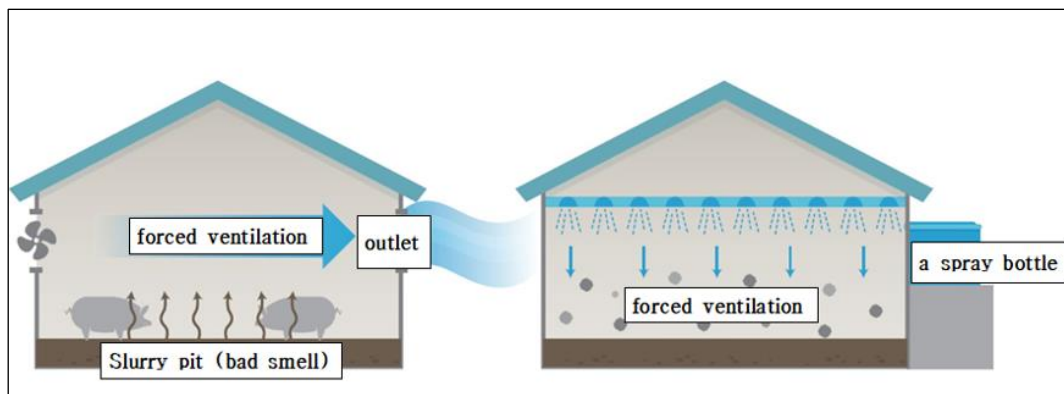
**Figure 1. Conceptual diagram of livestock odor reduction and productivity improvement of complex enzymes < Source: Korea biotechnology research institute >**

The research direction is to reduce odors to solve the fundamental odor problem of livestock farms and reduce the occurrence of complaints related to livestock manure. It also aims to reduce the smell of livestock manure and manage eco-friendly livestock. The purpose of this study is to present improvement measures to solve the odor problem, which is the biggest problem of livestock environmental pollution in Korea, by examining and comparing cases of livestock odor that have been promoted so far. The odor problem directly affects not only environmental pollution but also the quality of life of the accreditation and can cause disputes. It is important to accurately identify the cause of the odor, find a problem-solving method and apply it to the site. We would like to find out how to use physical ventilation, how to reduce odor using chemical drugs, and how to use biofilter facilities using microorganisms and suggest ways to develop feed additives.

## 3. Background of Odor Reduction

### 3.1. Use of physical ventilation

If a simple forced exhaust fan is used in a pig house with a bad odor due to humidity, temperature, dust, etc., as shown on the left, the odor may spread further to the outside. As shown in Figure 2, on the right a large amount of odor can be reduced by managing fog spray facilities and ventilation facilities.



**Figure 2. Use of physical ventilation < Source: Livestock environmental management agency >**

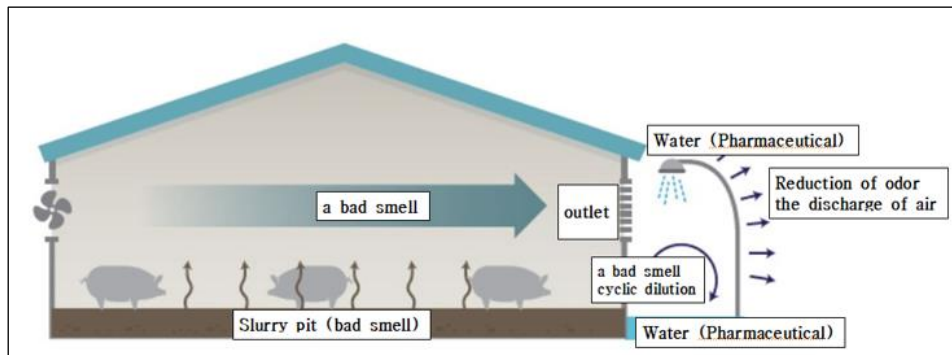
Most odors in the pig house combine with dust to cause malodor complaints and diseases by adsorbing them to the respiratory tract of livestock. As shown in Figure 3, the fog spray facility used as a solution can control some of the dust and odors in the pig house, but it should be considered to install it inside unconditionally because it can affect the respiratory tract of pigs.



**Figure 3. Pig farm fog spray facility < Source: Livestock environmental management agency >**

### 3.2. Chemical Odor Reduction Method

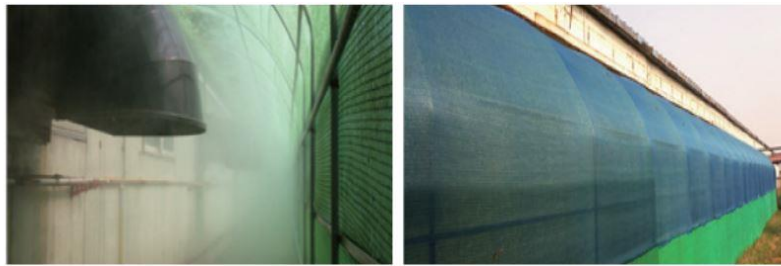
As shown in Figure 4, installing a bio curtain and using the chemical properties of odor-generating substances to perform fog spray that mixes water, chlorine dioxide, ozone water, OH laticals, other microorganisms, and masking agents inside by neutralizing and diluting them can be expected to prevent the spread of odor and dust to the outside, and the price is cheaper than other odor-reducing facilities.



**Figure 4. Drug-based odor reduction inside the bio-curtain**

< Source: Livestock environmental management agency >

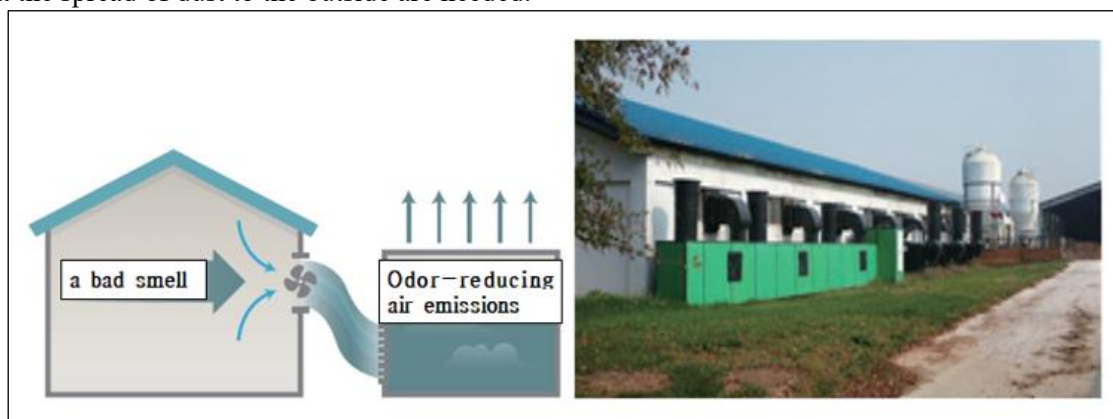
If the concentration of odor coming out of the exhaust port is high, As shown in Figure 5 even if the odor reduction rate through the bio curtain is high, the residual emission concentration may be high, so it is important to reduce the odor inside the shed. (For example, if you want to reduce ammonia (NH<sub>3</sub>) 100 ppm by 90%, you can feel 10 ppm emission-odor, and if you reduce 3 ppm by 50%, it is difficult to feel 1.5 ppm emission-odor.)



**Figure 5. Bio-curtain installation**

< Source: Livestock environmental management agency >

There are various types of microorganisms that grow in carriers such as sawdust, wood chips, and hard-boiled compost, and these numerous types of microorganisms reduce odors by oxidizing and decomposing various types of odor-causing substances generated in the shed. As shown in Figure 6 among the factors that spread the odor in the shed to the outside, the odor combined with dust accounts for a large part, so measures to prevent the spread of dust to the outside are needed.



**Figure 6. Biofilter facility using microorganisms outside pig house**

< Source: Livestock environmental management agency >

## 4. Background of Odor Reduction

### 4.1. Use of physical ventilation

*Abelmoschus Manihot* Jinhuakui has beautiful petals and is very rich in collagen and estrogen, so it is widely used for medicinal purposes in recent years. As shown in Figure 7, *Abelmoschus Manihot* Jinhuakui is effective in improving digestive functions, such as strengthening the digestive system and facilitating bowel movements. Since it is a beneficial agricultural crop as a feed additive and has the function of a deodorant, it was used as an experimental material and results were derived. When agricultural products, creativity, and imagination are combined, diverse forms of processed goods (food, medicine, health food, and household items) and tourism experience service goods can be developed [5].



**Figure 7. *Abelmoschus Manihot* Jinhuakui**

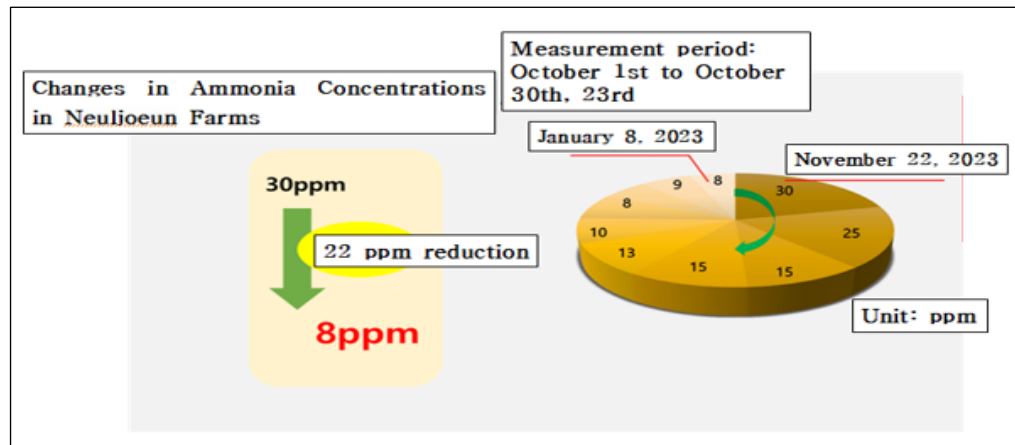
Neuljoeun farms have been raising pigs in Jeju clean areas for two generations since 1997. They slaughter pigs themselves and put them on consumers' tables. As shown in Figure 8, pigs here are highly immune and high-quality because they grow up eating charcoal powder and clean water. Charcoal promotes metabolism, eliminates harmful bacteria in the intestine, antibacterial and detoxifies, and strengthens immunity. In order to reduce the odor of farms located in Jeju and improve the environment, ammonia measurement tests were conducted on Neuljoeun farms. As a condition, a feed additive mixed with 2% gold coins was used as a test farm feed. Ammonia levels were recorded after a month's feeding by adding a *Abelmoschus manihot* Jinhuakui additive to the feed.



**Figure 8. Neuljoeun Farm**

As shown in Figure 9 after the introduction, Analysis of the administration of the *Abelmoschus manihot* Jinhuakui additive in the lean pig house showed that ammonia levels in the pig house were reduced from 30 ppm on November 22, 2023 to 25 ppm on November 29, 15 ppm on December 6, 15 ppm on December 3, 13

ppm on December 20, 10 ppm on December 27, 10 ppm on December 30, 10 ppm on December 30, 2024, 8 ppm on January 3, 9 ppm on January 5, and 8 ppm on January 8. Smell was reduced in pig manure and gas generation was significantly reduced even within slurry bits.



**Figure 9. Changes in ammonia concentration**

## 5. Conclusions

As a result of the experiment of Neuljooun Farm, feed additives using *Abelmoschus manihot* Jinhuakui have the effect of lowering the ammonia concentration and temperature. Through this, the following benefits were found. First, the concentration of ammonia is lowered to reduce odor in the farm. Second, it is possible to reduce the problem of odor that spreads to the outside and reduce the stress caused by life by reducing the odor felt by workers or livestock inside. Third, the temperature inside the farm can be reduced, thereby reducing the thermal stress felt by livestock in their lives. Fourth, it is possible to reduce the risk of livestock intake falling in a hot environment. Afterwards, we want to increase the accuracy of the experiment by comparing various farm experiments, and we hope that the results of this study will help reduce livestock odors.

## Acknowledgement

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