Functional biological feed by microbial fermentation: A way to improve nutrition value of feed

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Abstract

Antibiotics are used in swine production for long periods, resulting in drug-resistant strains emergence and environmental pollution, also posing health hazards for both animals and humans. Microbial fermented feed maybe a good choice to reduce antibiotics. The aim of this study was to investigate the nutrition value of functional biological feed and its effect on production performance of lactating sows. The corn-soybean meal-bran mixed feed was fermented with lactic acid bacteria and *Saccharomyces cerevisiae* combined with multiple enzymes, at 30℃ for 96 h (water: feed ratio of 2:5). A total of 20 lactating sows were randomly divided into 2 treatments, with 10 replicates per treatment and 1 sow per replicate. Sows in control group were fed the basal diet (with antibiotic), and sows in experimental group were fed the experiment diet which contained 20% fermented feed (without antibiotic) and 80% basal diet. The experiment lasted for 30 days. The results showed that: 1) Lactic acid bacteria DBN01 could efficiently synthesize acid. Lactic acid bacterium DBN01 and *Saccharomyces cerevisiae* SC01 could obviously inhibit the growth of pathogen. 2) After fermentation for 96 h, the pH of the mixed feed decreased from 6.40 to 4.29, the total acid content rose from 0.42% to 2.82%, and the acid-soluble protein content (dry matter) increased from 2.07% to 4.88%. The SDS-PAGE analysis indicated that some macromolecular peptides were degraded into small molecular peptides. More abundant metabolites were observed in the functional biological feed after fermentation determined via HPLC. 3) Compared to control group, the average daily gain of weaned piglets and feed intake of lactating sows in experimental group were improved by 1.63% and 3.68%, respectively. In addition, the mortality of weaned piglets in experimental group was reduced by 75.43%. In conclusion, functional biological feed has a positive effect on the nutrition value of feed and production performance of lactating sows, with a promising potential in reducing antibiotics in swine production.

Introduction

- Antibiotics are used widely in animal husbandry. Due to the abuse of antibiotics in China, it results in drug-resistant strains emergence, drug residues in animal products and environments, and also poses health hazards for both animals and humans.
- Most of medicated feeding additives will be forbidden to be used in feed in China in 2020. To achieve this goal, various technologies and methods are needed and combined, including livestock feeding environment, feeding mode, feeding facilities, antibiotic substitution technology and so on.
- Microbial fermented feed can be a highly promising approach owing to its multiple advantages, such as enhancing the palatability, nutrition value and digestibility of feed; improving animal immunity and intestinal health; preventing animal diseases; maintaining healthy breeding environment.
- Microbial fermented feed mainly takes advantage of beneficial microbe(s) fermentation to obtain safe and high-quality biological feed.
- Beneficial microbial strains and fermentation process are crucial to microbial fermentation feed.

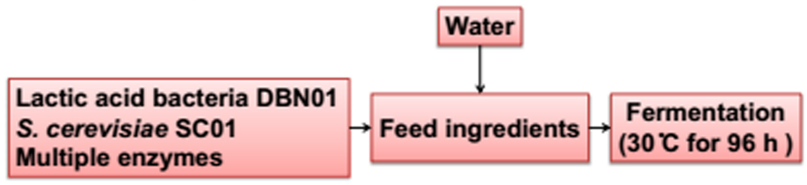
Objectives

To investigate the nutrition value of functional biological feed.

To assess the effect of biological feed on production performance of lactating sows.

Method

- Fermentation process



- Fermentation quality determination

  Moisture, crude protein, acid-soluble protein, acids, pH

- Production performance of sows

  Average daily gain, feed intake, mortality

Results

Table 1. Fermentation quality of the functional biological feed.

Item	Moisture (%)	Crude protein (%)	acid-soluble protein (%)	Acids (%)	pH
0 h	38.36	20.94	2.07	0.42	6.40
96 h	39.10	21.78	4.83	2.82	4.29

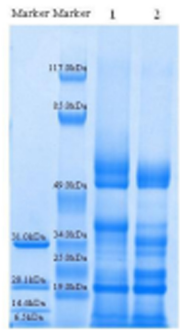


Figure 1. The SDS-PAGE analysis of peptide in the biological feed.
1, Before fermentation;
2, After fermentation.

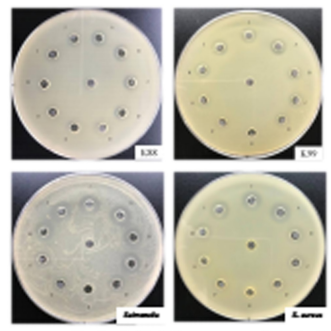
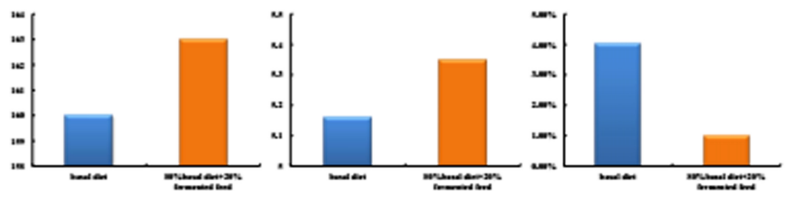


Figure 2. Inhibition against the growth of pathogen.



Average daily gain of weaned piglets (g/d) Feed intake of lactating sows (kg/d) Mortality of weaned piglets

Figure 3. Effect of the biological feed on production performance of lactating sows.

Conclusion

- Lactic acid bacteria DBN01 and *Saccharomyces cerevisiae* SC01 could obviously inhibit the growth of pathogen.
- After fermentation, the total acid content and acid-soluble protein content (dry matter) increased. And the feed contains more small molecular peptides.
- The functional biological feed has a positive effect on the nutrition value of feed and production performance of lactating sows, with a promising potential in reducing antibiotics in swine production.