

Effects of Fermented Feed from Ground Source on Meat Quality of Finishing Pigs



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Abstract

The efficient utilization of feed resources has become important for development of the feed industry at present, and the fermented feed from ground source came into being. It has many advantages, such as low cost, high resource utilization, combination of planting and breeding, environment protection and pollution reduction. In this article, the characteristics of fermented feed and the effect of its application on meat quality of finishing pigs are reviewed.

Introduction

With the development of social economy, the pig industry developed rapidly. But at the same time, the environmental pollution and food safety problems brought by pig industry are becoming more and more serious. The concept of the meat quality is also extended to health and safety, nutrition, flavor quality. The price of high quality pork in United States, Canada, Japan and other developed countries is higher several times or even dozens of times than ordinary pork. This is a huge boost to research and improve the quality of meat. The flavor of pork is an important development direction of the pig industry in the future. The fermented feed has many advantages, such as good palatability, high digestibility, no antibiotics, improving the immunity of animal, has no hormone and drug residues. In addition, some ground feeds were used as fermentation materials can reduce environmental pollution.

The characteristics of ground source feed

The ground source feed refers to the local resources which could be processed as feed forage. It has its distinctive nutritional value but high cost of circulation, because it is limited to a certain area of origin and not suitable for long distance transportation. Drying or other treatment measures will cause their nutritive value lost and cost increased.

The characteristics of fermented feed using ground source

Biological fermentation feed had natural fermentation flavor and good phago stimulating effect, it also significantly improved

the palatability of pig feed [1]. The microbial fermentation feeds contained a lot of beneficial bacteria and animal digestive enzymes, helping the balance of intestinal flora and better digestion of nutrients [2-4]. The fermented feed also contained rich lactic acid, the average pH value of the fermented feed was about 4.5, and it was benefit for protecting gastrointestinal function, inhibiting harmful bacteria growth [5] and reducing the antibiotics usage [6]. The microbial fermentation feeds had lower level of mycotoxins and anti-nutritional factors and other harmful substances, reducing the damage to the animal [7]. The Functional nutritional factors were more abundant and it could improve the meat quality. In addition, it also reduced the waste odor emissions (NH₃ and H₂S) and protected the environment [8], having a wide application prospect (Joris et al, 2015).

The microbial strains applied in fermented feed

At present, microbial strains applied in fermented feed mainly includes *Bacillus*, *Lactobacillus*, *Saccharomyces* sp., *Streptococcus faecalis*, and *Aspergillus* (such as *Aspergillus niger*, *Aspergillus oryzae*). *Bacillus subtilis* can produce bacitracin, polymyxin, nystatin, gramicidin and other active substances, these substances have obvious inhibitory effect on the pathogenic condition of bacteria or endogenous infection pathogens. They also secrete digestive enzymes to stimulate good digestion and absorption of nutrients, such as proteases, lipases and amylases. Lactic acid bacteria are the earliest and most widely used probiotics. They are a group of bacteria that can produce a large amount of lactic acid in the process of carbohydrate fermentation.

They can produce lactic acid to regulate intestinal flora balance and produce bacteriocin to inhibit the growth of *Salmonella*, *Shigella*, *Pseudomonas aeruginosa* and *Escherichia coli* and other harmful bacteria. Yeast generally refers to various single celled fungi fermentation of sugars. Protein, amino acids, vitamin B, fat, sugar, enzymes and other nutrients are rich in yeast. It can secrete a variety of animal digestive enzymes required (amylase, protease, cellulase, hemicellulase etc.) and promote phytase production, improving the utilization of monogastric phosphate by animals. *Streptococcus faecalis* and *Aspergillus* also are used in fermented feed to produce many prebiotics. As the beneficial microorganisms mentioned above have different advantages and requirement. Several kind microorganisms are often combined together for fermentation in production [9].

The changes of the components before and after fermentation

The composition of fermented feed changed a lot. Chen et al. [10] found that the content of crude protein in the sample after fermentation increased from 50.6% to 54.1%, the soybean peptide, lactic acid, free amino acid increased from 2.4% to 38.8%, 1.8% to 29.5%, 0.7% to 4.7%, 5.57mg/kg to 92.65mg/g respectively. SDS-PAGE electrophoresis analysis showed that the fermented soybean antigen has been completely decomposed, large protein molecules has been degraded into small molecular peptides below 10KD, the main anti nutritional factors degradation rate reached more than 90%. Shi et al. [3] reported that fermented corn and soybean meal had a greater concentration of CP and total P compared with the unfermented feed, whereas the contents of β -conglycinin, glycinin, phytate P, raffinose, stachyose, and NDF in FMF declined by 77.6, 86.7, 41.2, 47.2, 36.6, and 38.9%, respectively. The content of trichloroacetic acid-soluble protein, small peptides and free amino acids, increased more than 3 times after fermentation than before. Scanning electron microscopy revealed that irregular shapes and a lot of porous structures were observed in the SBM of FMF, the cell wall of corn in FMF was destroyed, and the number of starch granules was decreased after 2-stage fermentation. Sholly et al. [11] showed that fermentation of cereal before feeding altered the dietary composition and influenced flow and composition of polysaccharides and other macronutrients at the ileum and in feces to a larger extent for barley than wheat. In addition, many probiotic breeding produce a variety of digestive enzymes, such as protease, amylase and lipase, protease, pectinase, cellulase, glucanase, phytase (Xu and Chen, 2008).

Effect of fermented feed on meat quality of finishing pigs

Fermented feed could effectively improve the meat quality of fattening pigs, the pH value, redness, muscle tenderness increased and the water loss decreased at 45min postmortem, the intramuscular fat content also increased [12-14]. Intramuscular fat is an important evaluation indexes of meat quality, with the increase of the content of intramuscular fat, muscle is easier to separate and chew, meat tenderness and flavor was improved

[15]. The fermented feed can reduce the shear force of the muscle, improve meat tenderness, and increase the content of intramuscular fat. Shen et al. [16] fed biological fermentation feed to Lulai pig, and the result showed that the water holding capacity and pH value of pork, lean meat rate were significantly higher than the control group. Fermented feed can improve the meat quality, which might relate with the higher content of flavor amino acids and small peptides in feed. Zhang et al. [17] found that the pork quality is more safe by adding 20% fermented feed in diets, the expenses also was reduced. Chen et al. [18] fermented cottonseed meal as the main protein source of fattening pigs diet significantly increased the end of weight and average daily gain compared with conventional feed. The income from each pig increased 78.72 yuan, the gross profit increased by 33.98%. The shear force and drip loss of the pork was significantly reduced, while the content of amino acids in pork was increased. Lu et al. (2014) showed that adding microbial fermented corn straw feed can meet the requirement of finishing pigs, and when the appropriate supplementation dosage was 20%-30%, it reduced the diarrhea rate and the mortality of pigs, and reduced the farming costs, Hu et al. [19] reported that state fermented feed can improve the production performance of finishing pig, enhance immunity and improve the meat quality of finishing pigs. Xu et al. [20] found that supplemented 5% and 10% fermented biogas residue increased the content of several flavor-promoting amino acids, and improve meat quality of pigs. Hu et al (2015) showed that pigs fed with 20% fermented feed without antibiotic for 154 days increased the average daily feed intake by 5.86%, average daily gain by 10.89% and decreased the feed conversion ratio by 4.38%. The meat quality of pigs fed fermented feed was improved, the intramuscular fat was increased by 28%, the post slaughter pH45min value and red value of pork was significantly higher, while the value of slaughtered pork drip loss and shear force was lower than the control. Zhang et al. [21] reported that the average daily gain of pigs fed with 5% or 10% fermented mulberry leaf was not significantly differ from the control. But the backfat thickness and cholesterol content in muscle were significantly decreased, while the intramuscular fat increased in pigs fed mulberry leaf powder. The activity of SOD in muscle increased and the MDA content decreased significantly in muscle. Lin et al. [22] reported that supplementation of 4% microbial fermentation feeds to pig diets for feeding 106 days, the slaughter performance, meat quality and content of amino acid were better than the control, its slaughter rate increased by 1.53%, the carcass weight increased by 2.75% and the backfat thickness decreased 0.02cm. In addition, the pork meat had higher color score, better tenderness and flavor. Although fermented feed has good efficacy and is widely used in production, there are still some problems need to be attended, such as mildew pollution, the stability of feed effect, The complex sources of fermentation bacteria, antagonistic problem. With the continuous development of technology and the solution of these problems, fermented feed will be more widely used and more significant.

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