# Effects of Amino Acid or Fulibao Nutritional Additives on Slaughter Performance and Pork Quality of Pigs

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**Abstract** **[Objective]** The paper was to study the effects of amino acid or Fulibao nutritional additives on slaughter performance and pork quality of pigs, and to provide a theoretical basis for improving pork quality in pig breeding industry. **[Method]** Six Landrace × Yorkshire castrated male piglets were divided into three groups. The piglets in the first group were fed with conventional diet and used as the control. The piglets in the experimental group I were fed with the conventional diet supplementing 0.1% Fulibao, and those in the experimental group II were fed with the conventional diet supplementing 0.36% compound amino acid preparation. The piglets were reared for 2 months before being slaughtered. **[Result]** The average daily gains of piglets in the experimental groups I and II were 17.7% and 6.73% higher than that in the control group, but there was no difference in feed/gain ratio among the three groups. The dressing percentages of piglets in the experimental groups I and II were 2.7% and 1.72% higher than that in the control group, and the lean meat percentages were 3.5% and 7.97% higher than that in the control group, respectively. The meat fat ratios in the two experimental groups were significantly higher than that in the control group. The intermuscular fat in the experimental group II was significantly higher than that in the control group. However, the contents of intermuscular fat and inosinic acid in the experimental group II were significantly lower than those in the control group. **[Conclusion]** Both additives can improve the average daily gain and main slaughter performance of pigs, but can not improve the inosine acid content, and the compound amino acid preparation can not improve the intermuscular fat content.

**Keywords** Slaughter performance; Pork quality; Nutritional additives; Production performance

Since 2015, China's annual pork output has reached the maximum of 86.25 million t, with an average annual output of 85 million t, accounting for more than 60% of the country's total output of livestock and poultry meat, and China has become the world's largest pork producer and consumer[1]. At present, the growth rate and lean percentage of pigs in China have been greatly improved. Pork has met the market demand quantitatively, but low quality and flavor of pork has become a hot spot of serious concern in the current society[2]. It is worth investigating whether some methods can be explored to make pigs not only maintain high growth rate and lean percentage, but also produce pork with good taste, so as to meet people's demand in quantity and quality. Dietary composition and nutrient level are direct factors affecting pork quality, and the intramuscular fat synthesis of pork can be promoted by adjusting dietary amino acids and other nutrient levels[3]. Therefore, we made a preliminary exploration.

## 1 Materials and Methods

**1.1 Experimental animals and experimental design** Six Landrace×Yorkshire castrated male piglets with similar body weight were selected at one month post weaning, and divided into three groups, with two piglets in each group. The piglets were weighed after feeding the conventional diet for a month, and slight adjustments were made according to the body weight. The experiment was officially started when the average body weight of piglets in the three groups was very similar. The conventional diet was composed of 67% corn, 13% soybean meal, 10% extruded soybean, 2% fish meal, 4% wheat bran and 4% premix. The nutritional levels were 13.56 MJ/kg digestible energy (calculated value), 16.24% crude protein, 5.51% crude fat, 2.72% crude fiber, 0.73% calcium and 0.41% phosphorus. The piglets in the first group were fed with conventional diet as the control; the piglets in the experimental group I were fed with the conventional diet supplementing 0.1% Fulibao (a kind of additive mainly containing soybean phospholipid produced by Nanning Nongwei Feed Additives Co., Ltd.) and those in the experimental group II were fed with the conventional diet supplementing 0.36% compound amino acid preparation (mainly containing L-glutamyl nitrogen, glycine and L-aspartate). The experimental piglets were fed twice a day (08:30 and 16:30), and experimental diets and water were available *ad libitum*.

The trial was conducted in the test base of animal nutrition laboratory of Animal Husbandry Research Institute of Guangxi Zhuang Autonomous Region, and

Received: 2022–06–23 Accepted: 2022–09–05
Supported by Guangxi Agricultural Section Self-financing Project (Z2022117).
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lasted for 2 months.

**1.2 Measurement indexes** At the beginning and end of the trial, the fasting piglets were weighed before morning feeding and the average daily gain was calculated accordingly. Daily feed intake was recorded and feed/gain ratio was calculated during the trial.

At the end of the trial, one piglet was slaughtered in each group and the left half carcass was taken to determine dressing percentage, lean meat percentage, meat fat ratio, *etc*. At the same time, the longissimus dorsi (musculi oculi) was taken to determine the contents of dry matter, protein, fat[4], amino acid, inosinic acid, *etc*. Slaughter determination was carried out according to the procedures reported by Guo Zhengfang[5].

## 2 Results and Analysis

**2.1 Effects on feed intake and growth performance** The effects of different additives on feed intake and growth performance of experimental pigs are shown in Tab.1.

As shown in Tab.1, Fulibao or compound amino acid preparation as dietary supplement increased the feed intake and average daily gain of experimental pigs to varying degrees, especially the supplementation of Fulibao led to better effects. The feed intake and average daily gain of experimental pigs in the experimental group I were 19.21% and 17.71% higher than that in the control group, respectively. The feed intake and average daily gain of experimental pigs in the experimental group II were 7.03% and 6.73% higher than that in the control group, respectively. But there was no significant difference in feed/gain ratio among the three groups.

**2.2 Effects of different additives on slaughter performance of experimental pigs** The effects of different additives on the main slaughter performance of experimental pigs are shown in Tab.2.

As shown in Tab.2, the main slaughter performances of pigs in the experimental groups I and II were significantly improved, and the dressing percentages in the two experimental groups were 2.7% and 1.72% higher than that in the control group, respectively. The lean meat percentages in the two experimental groups were 3.5% and 7.97% higher than that in the control group, and the meat fat ratios in the two experimental groups were 18.67% and 40.05% higher than that in the control group, respectively.

**2.3 Effects of different additives on pork quality** The musculi oculi samples were collected from each slaughtering pig to determine flavor precursors of pork (Tab.3).

As shown in Tab.3, there were no significant differences in dry matter and crude protein of musculi oculi among the three groups. The intermuscular fat in the experimental group I was 34.57% higher than that in the control group, but that in the experimental group II was 29.08% lower than that in the control group. The inosinic acid contents in the two experimental groups were lower than that in the control group, especially the inosinic acid content in the experimental group II was 30.86% lower than that in the control group. However, the total flavor amino acid contents of musculi oculi in the two experimental groups were 1.45% and 1.19% higher than that in control group, while the ammonia contents in the two experimental groups were 46.43% and 44.05% lower than that in the control group, respectively.

## 3 Discussion

Our research results demonstrated that the feed intake of growing pigs can

**Tab.1 Effects of different additives on feed intake and growth performance of experimental pigs**

| Item | Control group | Experimental group I | Experimental group II |
|---|---|---|---|
| Average body weight before the trial//kg/head | 46.4 | 46.0 | 45.5 |
| Average body weight at the end of the trial//kg/head | 96.1 | 104.5 | 98.6 |
| Average daily gain//kg/ head | 802 | 944 | 856 |
| Average feed consumption//kg/head | 156.2 | 186.2 | 167.2 |
| Daily feed intake//kg/ head | 2.519 | 3.003 | 2.696 |
| Feed/gain ratio | 3.14 | 3.18 | 3.15 |

**Tab.2 Effects of different additives on slaughter performance of experimental pigs**

| Item | Control group | Experimental group I | Experimental group II |
|---|---|---|---|
| Live weight before slaughter//kg | 92.6 | 106.2 | 96.6 |
| Carcass weight//kg | 72.0 | 84.8 | 76.4 |
| Dressing percentage//% | 77.75 | 79.85 | 79.09 |
| Lean weight//kg | 46.88 | 57.17 | 53.71 |
| Lean meat percentage//% | 65.11 | 67.42 | 70.30 |
| Fat weight//kg | 11.51 | 11.84 | 9.42 |
| Meat fat ratio | 4.07 | 4.83 | 5.70 |

**Tab.3 Effects of different additives on the content of flavor precursors in pork**

| Item | Control group | Experimental group I | Experimental group II |
|---|---|---|---|
| Dry matter content of musculi oculi//% | 28.31 | 26.94 | 27.67 |
| Crude protein content of musculi oculi//% | 23.90 | 23.14 | 23.24 |
| Crude fat content of musculi oculi//% | 1.747 | 2.351 | 1.239 |
| Inosinic acid content of musculi oculi//mg/100 g | 337 | 295 | 233 |
| Flavor amino acid content of musculi oculi//% | | | |
| Aspartic acid | 1.91 | 2.04 | 2.03 |
| Serine | 0.75 | 0.70 | 0.69 |
| Glutamic acid | 3.08 | 3.08 | 3.11 |
| Glycine | 0.83 | 0.80 | 0.82 |
| Proline | 0.66 | 0.77 | 0.74 |
| Alanine | 1.15 | 1.13 | 1.20 |
| Valine | 0.99 | 0.97 | 1.01 |
| Leucine | 1.64 | 1.68 | 1.64 |
| Isoleucine | 0.99 | 1.06 | 1.01 |
| Lysine | 1.86 | 1.86 | 1.84 |
| Arginine | 1.33 | 1.32 | 1.28 |
| Total flavor amino acid | 15.19 | 15.41 | 15.37 |
| Ammonia | 0.84 | 0.45 | 0.47 |

Note: The inosinic acid and amino acid content of musculi oculi was determined by Guangxi Analysis Test Research Center.

be increased by supplementing Fulibao or compound amino acid preparation in the conventional diet, thus increasing the average daily gain of pigs. Similar feed conversion results of pigs in the three groups showed that the average daily gain of pigs in the two groups was improved by increasing feed intake rather than by improving feed conversion efficiency. The main slaughter performance of pigs could be significantly affected by supplementing Fulibao or compound amino acid preparation in the diet. The dressing percentages in the two experimental groups were increased; the lean meat percentage was increased more significantly, which was increased by 7.97% in the experimental group II compared with the control group; the meat fat ratio in the experimental group II was 40.05% higher than that in the control group. Therefore, supplementing compound amino acid preparation in the diet could increase the total protein synthesis, thereby increasing lean meat percentage (or lean meat mass), reducing body fat, and increasing meat fat ratio. It was further proved that dietary supplementation of compound amino acid preparation could improve the protein synthesis of growing pigs. Because the crossbred offspring produced by Landrace and Yorkshire are lean pigs and their lean meat percentage is already very high, one phenomenon we should concern about is that supplementing compound amino acid preparation in their diet can also significantly improve their lean meat percentage.

Many studies have shown that the level of pork quality is closely related to the content of its flavor precursors[6–8]. There are no less than 1 000 kinds of substances that affect the flavor of pork, with complex and changeable compositions, and even non-volatile precursors are not few[9–10]. Intermuscular fat, inosinic acid and flavor amino acid examined in this study are only three of the non-volatile precursors. The intermuscular fat contents of the pigs supplemented with Fulibao were significantly higher than that in the control group, and the total flavor amino acid contents were slightly higher, but the inosinic acid contents were lower than the control group; the flavor amino acid contents of the pigs supplemented with compound amino acid preparation were slightly higher than that in the control group, but the difference was no significant, while the contents of intermuscular fat and inosinic acid were significantly lower than that in the control group. The low content of intermuscular fat may be due to the fact that dietary nutrients can be mainly used for protein synthesis in the body by supplementing compound amino acid preparation. Therefore, the lean meat percentage and meat fat ratio of experimental pigs were higher, but body fat formation was lower, so intermuscular fat content was low correspondingly. As for its low inosinic acid content, no such research has been reported in China before. L-glutamine, glycine and L-asparaginic acid are the main amino acids required in the process of inosinic acid metabolism, but the content of inosinic acid is still low, and the reason is really unknown and needs further research.

As there are many precursors that

affect the taste of pork, only three were measured here. If only the content of these three precursors is used to determine the level of pork quality, it is obviously unreasonable. Therefore, in addition to the determination of more precursor content, physical properties such as meat color, tenderness, water-holding capacity, marbling, *etc*. should also be determined in the future, and the evaluation will be more reasonable combined with the result of human taste test on pork.

## 4 Conclusions

Dietary supplementation of Fulibao could increase feed intake, average daily gain, main slaughter performance and intermuscular fat content of pigs.

Dietary supplementation of compound amino acid preparation could increase feed intake and average daily gain of pigs, and also significantly increase the dressing percentage, lean meat percentage and meat fat ratio, but could not increase the content of intermuscular fat and inosinic acid.

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