PJN
ISSN 1680-5194

PAKISTAN JOURNAL OF NUTRITION

ANSInet
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorpjn@gmail.com

Pakistan Journal of Nutrition 1 (4): 169-173, 2002

Study on Pork Characteristics of Chinese Wuzhishan Mini-Pig

Jun She Sun and Fei Lu*
Food Science College of China Agricultural University (East Campus)
*No. 398 China Agricultural University (East Campus), No.17 Qing Hua East Road
Beijing, P. R. China.
E-mail: lufeilufei611@yahoo.com

Abstract: This research was conducted to evaluate the meat traits of Wuzhishan mini-pigs (WZSP). Young Xiang-pigs (XPs) and adult Beijing Black-pigs (BPs) were used as the control group of young and adult WZSPs respectively. Studies included evaluation of carcass properties, meat sensory character, edible quality and processing performance. The studies show the WZSP is of thin skin, low back-fat, high lean percentage and meat productivity. The results of meat quality analysis indicate the WZSP pork is of fresh meat color, good elasticity, less marbling, rich amino acid especially pre-flavor amino acid and low intra-muscular fat. Meanwhile, WZSP pork presents benign processing performance of low loose water percentage, low drip loss, and eminent bounding water capability.

Key Words: Wuzhishan mini-pig (WZSP), carcass property, sensory characteristics, edible quality, processing performance

Introduction

Wuzhishan mini-pig (WZSP) is a special pig in China. The WZSP initially lived in isolated tropical areas in Hainan Province, an island in southern China and was inbred for a long time. In the 1980s Chinese scientists investigated animal species around the country and found that the WZSP was on the edge of extinction. Therefore, it was designated as one of the preserved species owning to its rareness in the world in 1985. The experts in the Institute of Animal Science of CAAS (Chinese Academy of Agriculture Science) brought the last three pigs (two sires and one sow) to Beijing and began breeding them there. Since then, the study on WZSP has been an important national project. Through more than a decade of efforts, much progress has been made. For example, the inbreeding of WZSP has reached fifteen generations and the inbreeding coefficient is more than 0.956.

The process of species preservation is implemented in the steps of investigation, evaluation, protection and usage. Investigation and evaluation are the precondition of usage. Usage is the assurance of protection. The usage of WZSP meat in food processing industry and customer consuming requires mass breeding and feeding. That is the best preservation of WZSP.

Now the ninth generation of WZSP has been born and the total number of pigs has reached more than 200. The most exciting thing is that the feeding of WZSP on a large scale is possible due to modern artificial insemination and advanced feeding techniques. Pork quality is very important not only to consumers but also to food industry. This makes the study of meat traits necessary. Under this background, studies on carcass properties and meat traits of WZSP were done which included meat sensory character, edible quality, and processing performance. In the experiments, three young Xing-pigs (Xps) were used as the control group for young WZSPs because of their likeness in bodily form and rear. Three Beijing Black-pigs (BPs), the most common meat pig, were also used as the control group for adult WZSPs.

Pork is an important nutrition resource in human's daily life. Therefore it is significant not only for customers but also for food industry to evaluate pork traits. The research will be helpful to further meat development and utilization of the WZSP.

Materials and Methods

Animals: Six WZSPs were obtained from a research breeding farm of the Institute of Animal Science under Chinese Academy of Agriculture Science. Three of the pigs were two months and the others were six months. Three BPs of six months were also obtained from the farm. Three XPs were provided by Tai Ping High Tech Agriculture Company (Huhehaote, P. R. China), these were young of two months.

Before being slaughtered the pigs were transported from the research station to the abattoir and left in the lariage for approximately 2 hours. The animals were stunned with CO_2 and exsanguinated. Thereafter the carcasses were submitted to standard slaughter procedures and cut according to the routines described by Yuming and Ming (1994).

Carcass property analysis: Carcass property analysis was performed according to Regulation for Performance Testing Techniques of Lean-type Breeding Pigs in China Standard (National Standard Bureau of People Republic of China, 1999). The attributes of the analysis includes dressing percentage, thickness of back fat and skin, ham proportion, eye muscle area, percentage of lean meat, back fat, skin and bone, and meat productivity. After slaughtered, the head, ears, and feet of pig are cut off, then split it into two half and weigh it. The proportion of the weight of carcass to total gross weight is the rate of slaughter. Measure the thickness of back fat and skin between the sixth and seventh rib with vernier caliper. The proportion of the weight of ham vertically chopped off between the last two lumbers to the weight of carcass is the percent of ham and lip. Cutting off form the joint of lumber and thoracic vertebra, picturing with transparent paper of sulphuric acid then according to the formula: height to width to 0.7, the eye area is counted. The proportion of the weight of thin meat to the total weight of thin meat plus fat and bone is the rate of thin carcass meat. According to the rate of thin carcass meat, thickness of back fat and the content of intra-muscular fat, meat productivity evaluation can be taken.

Sensory analysis: The sensory characteristics of pork mainly include meat color, meat marbling and meat elasticity. Meat color and meat marbling were determined as described by Runsheng (1987). If the score is 1, the meat color and marbling were the worst while 5 is the best. Samples for meat color measurement were taken from Longissimus dorsi muscle between lumbars. Samples for marbling determination were taken from Longissimus dorsi muscle between the last two ribs. Meat elasticity was classified to three levels, good, normal and poor, according to the reflection of hand pressing.

Edible quality analysis: In edible quality analysis, the contents of moisture, ash, crude protein and intra-muscular lipid were determined as described in Food Analysis (Wuxi Light Industry College, 1990). To better investigate the nutrition of WSZP pork, the compositions of meat amino acids and fatty acids were also analyzed. All samples for edible qualities were taken from the Longissimus dorsi muscle between 4^{th} and 7^{th} lumbars and stored in refrigerator at -18 °C until analysis.

Amino acid analysis: Samples for amino acids analysis were grounded by a meat chopper and dried in an oven. The 50 mg of dry ground pork was hydrolyzed for 24 hours with 20 ml 6.0 N hydrochloric acid at room temperature. Supernatant liquid was filtered by 0.45μm filter paper and diluted to 100 ml by distilled water. Amino acid profile was analyzed by an automatic amino acid analyzer (Shimadzu 835-50 type, Japan), equipped with a flame ionization detector (FID). The amount and concentration of liquid hydrolysis for analysis were 50 microlitres and 3 nmol respectively. Separation was carried out on a chromatogram column (2.6 mm×150 mm) with 53 °C and 80-90 kilograms per square centimeter pressure. The type of ion exchanging column was 2619[#]. The total analysis recycling time was 70 min. The buffer exchanging was divided into five steps at a flow rate of 0.225 ml min^{-1}. The pressures of ninhydrin and nitrogen gas were 15-35 kilograms and 0.28 kilograms per square centimeter respectively. The flow rate of ninhydrin was 0.3 ml min^{-1}. Individual amino acid peaks were identified by comparing their retention times with the standards. Results are expressed as percentage of amino acids.

Fatty acid analysis: Total intra-muscular lipids were extracted and quantified according to the standard method (National Standard Bureau, 1999). The pre-treatment of samples for fatty acid composition analysis needs three steps: extraction, saponification and methoxy-esterify.

Extraction of lipid: After adding 10ml of tri-chloromethane/methanol (2:1) solution to 2g minced meat, the mixture was homogenized for 10 minutes. Then the supernatant liquid was filtered with a 0.45μm filter paper. The 2 ml-distilled water was added to the filtrate and mixed. The resulting mixture was placed for 30 minutes without shaking. In order to get pure lipid, 1ml of liquid from the under layer was taken into a cuvette and the appropriate nitrogen gas was poured into it.

Lipid saponification: To prepare for lipid saponification, 5ml 0.5N NaOH/formaldehyde was added to the lipid and the mixture was heated to reflux for 5 minutes.

Fatty acid trans-esterification: Fatty acid methyl esters (FAMEs) were prepared by acidic-trans-esterification in presence of BF_3 /formaldehyde solution.

Before further analysis, 3 ml n-hexane was added into the FAMEs and the reflexing was carried out for 1 minute. After adding suitable saturated NaCl solution, the mixture stood still for ten minutes. 1 ml liquid from the upper-layer was taken to a tube by a transfer pipette. Thereafter, the suitable anhydrous sodium sulfate was put into the tube to dehydrate the FAMEs.

The dehydrated FAMEs were analyzed by gas chromatography using a Shimadzu GZ-9A gas chromatography (Shimadzu, Japan) equipped with a flame ionization detector (FID). Separation was carried out on a Silar7CP chromatogram column (3.1mm×3mm) at 205 °C. Injector and detector temperatures were 230 °C. Carrier gas was nitrogen at a flow rate of 1.8 ml/min. Individual FAME peaks were identified by comparing their retention times with standards. Results can be expressed as percentage of selected fatty acids.

Process performance analysis: Performing analysis was carried out using the method of Measurement of Pork Quality (Runsheng, 1987).

Determination of pH_1 was carried within 45 minutes after slaughter on the third rib muscle and determination for ultimate pH (pH_u) was performed on muscle stored for 24 hours at 1-5 °C. Dipping the electrode of pH determination instrument (pHS-25 type, Shang Hai) directly into the measuring portion, the presented digit was pH value.

Sample for measurement of water holding capacity was taken from the Longissimus dorsi muscle between the 1st and 2nd lumbars. It was made to slides of 1.0 cm thickness and 5.0 cm^2, then was put between two piece of gauzes with eighteen layers of filters padded up and down. A piece of hard plastic backing was put outside the filters. After a press of uniform velocity to 35 kg and maintaining for 5 min, the sample was weighted immediately. The calculate format was as following:

$$\text{Water holding capacity } \% = (W_1\text{-}W_2) / W_1$$

where W_1 is the weight of meat sample before pressed, and W_2 is the weight of pressed meat sample.

Samples for drip loss determination were taken from the third lumbar. It was cut transversely from the longest muscle of back into slides with 2 cm thickness, then repaired to cube of 5 cm to 3 cm to 2 cm and weighed (W_1). Hook the end of sample with wires and let muscle fiber vertically, then put it into food plastic pack and let sample keep off the wall of pack, tie the pack and put it in icebox under 4 °C for 72 hours, then weigh it at 24, 48 and 72 hours respectively (W_2). The equation for calculating percent drip loss is as follows:

$$\text{Drip loss } \% = (W_1\text{-}W_2) / W_1 * 100\%$$

where W_1 is the weight of meat sample before hooking, and W_2 is the weight of meat sample after hooking.

Sample for cooked meat percentage was taken from the middle of largest waist muscle. After wipe off the attaching fat and film, the sample was put into boiler and heated with water to boiling for half an hour. The meat was hooked for 15 min in cool place and weighed. The equation for calculating percent cooked meat is as follows:

$$\text{cooked meat percentage} = (W_1\text{-}W_2) / W_1 * 100\ \%$$

where W_1 is the weight of sample before being boiled, and W_2 is the weight of boiled sample.

Statistical analysis: Data were analyzed using the marked test as described in Probability and Application of Statistics (Zhou, 1988). The difference of twin data sets can be calculated based on the formula of $d_i = x_i - y_i$ (suppose that they all come from a normal distribution sample population N (μ, d)), and the expectation and variance of the samples (d_1, d_2...d_n) are represented as d and s^2 respectively. Then T test is performed. The significance level is 0.05. If the t value is within the range of rejection threshold, then the twin data sets are significantly different and otherwise are not.

Results and Discussion

Carcass property : According to the data shown in Table 1, the dressing percentage of WZSP was significantly lower ($P<0.05$) than that of the control group. Because dressing percentage is closely related to weight (Yuming and Ming,1994) and the slaughter weight of WZSP was the lightest, the conclusion of low dressing percentage of WZSP could not be reached.

Ham percentage is increasing according to monthly age growing (Yuming and Ming, 1994). Compared to the same age pigs of

Table 1: Results of carcass properties (Average n=3)

Variation	Young WZSP	Adult WZSP	Young XP	Adult BP
Slaughter weight (kg)	10.40±0.40	46.00±1.90	5.60±0.20	90.00±1.90
Dressing percentage %	56.00±1.17	67.27±1.67	69.60±0.70	70.31±1.53
Skin thickness (cm)	0.17±0.01	0.28±0.01	0.21±0.01	0.38±0.03
Back fat thickness (cm)	0.28±0.01	0.92±0.03	1.56±0.07	2.04±0.03
Ham percentage %	21.43±0.35	27.71±0.21	26.31±0.05	32.00±0.47
Eye muscle area (cm2)	9.56±0.17	34.28±0.27	6.36±0.16	28.20±1.27
Lean meat percentage		62.16±1.14		58.82±1.44

Table 2: Results of sensory character (n=3)

Variation	Young WZSP	Adult WZSP	Young XP	Adult BP
Meat color				
fresh meat	2.60±0.12	2.86±0.14	3.27±0.13	2.92±0.11
cool meat	2.74±1.21	2.95±1.27	3.30±1.24	2.96±1.19
Elasticity				
fresh meat	better	better	good	common
cool meat	better	better	good	common
Marbling				
cool meat	2.10±0.09	2.46±0.12	3.50±0.10	3.33±0.14

other kinds, the ham of WZSP was less plump. Its percentage was significantly lower ($P<0.05$), 21.34% of young WZSPs and 27.71% of adults, compared with 26.31 and 32.00% respectively of the control group.

Generally, thickness of skin, back fat and area of eye muscle increase with the growth of animal weight (Yuming and Ming, 1994). Young WZSPs were heavier than young XP, but their thickness of skin and back fat were thinner than those of XP and the differences were obvious ($P<0.05$). The larger the eye muscle area is, the higher the lean meat percentage. The average weight of adult WZSPs (46 kg) was much lower than that of adult Bps (90 kg). However, the average eye muscle area (34.28 cm^2) was greatly higher than that of BP (28.20 cm^2), which displayed thick back muscle characteristic of WZSP. The eye muscle area of young pigs can not be determined because of their small size.

The lean meat percentage of adult WZSP (62.16%) was notably higher than that of the control group (58.82%) ($P<0.05$) and higher than that of the standard lean meat type pig (60%). In the meantime, according to the standard assessment of pork productivity of lean meat type pigs, the WZSP received very high score (124), much more than 90 (the basic score of the first class of lean meat pig). Therefore it can be concluded that the WZSP is an excellent lean meat type pig.

Sensory analysis : Meat sensory attributes are key factors affecting consumption, especially fresh raw pork. The attributes mainly include meat color, meat marbling and meat elasticity. The values of the meat sensory attributes were obtained as shown in Table 2.

Table 2 showed that the score of meat color of WZSP was between 2.60 to 2.95. It was lower than that of the control group (3.27-3.30 for XP, 2.92-2.96 for BP), as well as the average score of China local pigs (3.22), but slightly higher than or almost the same as that of some world famous kinds of pig, such as the average 2.25 for Changbai pig, 2.63 for Landerisi pig. Therefore the meat color is normal.

The score of meat marbling of WZSP (2.46) was obviously different ($P<0.05$) from that of the control group in the experiment, 2.10 and 2.46 for young and adult WZSP respectively, while 3.50 and 3.33 for young XP and adult BP respectively. The results displayed that the WZSP meat deposits less intra-muscular fat.

All samples were cut from healthy bodies, therefore they did well in elasticity, especially the meat of WZSP. Although the WZSP was bred in Beijing, far from its homeland. It was fed by up-to-date methods. The meat still looked better. This could be related to its small body and special pork traits originated in long term free range rearing.

Edible quality analysis:

Routine components analysis: Results in Table 3 showed that there was little difference between pigs in the control group and the WZSP of the same age in terms of water, ash and crude protein contents, but the intra-muscular fat of WSZP was extremely low.

It was found that the intra-muscular fat content of WZSP was almost the lowest among Chinese local pigs, except Zhejiang Zhongbai pig (Table 4, Guanghong, 1999).

Fat is an important caloric source. For the same amount of meat, the caloric provided by meat from WZSP was lower than that from XP and BP by 82.5 and 32.5% respectively. Therefore the pork from WZSP is one of the best sources of low-caloric meat.

Amino acid analysis: Meat is the most important source of protein for humans. The nutrition value of protein is determined by the composition and content of its amino acid, especially the composition and content of the essential amino acid.

As far as the same age pigs were concerned, the total amount of amino acid in 100 mg dry meat from WZSP was obviously higher than that from the control pigs, 76.79 and 72.352% for young WZSP and XP respectively, 78.521 and 67.093% for adult WZSP and BP respectively. It was shown that there was rich amino acid in WZSP meat (Table 5).

From the data in Table 5, two conclusions were drawn. Firstly, to young pigs, the contents of Methionine, Isoleucine, Lysine and Threonine in WZSP meat were significantly higher, the content of Valine showed no obvious difference, but the content of Phenylalanine and Leucine in the meat of WZSP were lower. According to the recommendation for the ideal mode of the essential amino acid by World Health Organization, the nutrition values of amino acid in two meats were of no obvious difference. Secondly, compared to BP, the essential amino acid contents of WZSP meat were higher except Met.. This indicated that WZSP pork had better nutrition value than that of BP.

Fatty acid analysis: Results obtained from fatty acid

Table 3: Results of routine nutrition components determination(n=3)

Variation	Water %	Ash%	Crude protein%	Crude muscle fat%
Young WZSP	78.87±0.71	1.04±0.06	19.85±0.09	0.24±0.04
Adult WZSP	75.40±0.86	1.26±0.05	20.70±0.50	2.26±0.03
Young XP	77.41±0.95	1.05±0.02	19.87±0.77	1.37±0.05
Adult BP	73.73±1.44	1.00±0.04	20.21±0.25	3.35±0.17

Table 4: Intra-muscular fat percentage of some local pigs in China

Variation	Jinhua Pig	Wujin Pig	Ming Pig	Liangguang Xiaohua Pig	Zhejiang Zhongbai Pig	BP	WZSP
Intra-muscular fat %	3.70	3.08	5.22	8.27	1.95	5.45	2.26

Table 5: Results of amino acid determination (mg/100mg dry meat)

Variation	Young WZSP	Adult WZSP	Young XP	Adult BP
Aspartic acid	7.301	7.588	6.712	6.491
Threonine	3.227	3.413	2.929	2.878
Serine *	2.541	2.681	2.112	2.331
Glutamic acid *	12.834	13.242	11.056	11.099
Glycine *	3.375	3.585	3.311	3.124
Alanine *	4.501	4.678	4.338	3.953
Cystine	0.993	0.855	1.717	0.818
Valine	4.299	4.525	4.123	3.791
Methionine	1.560	0.742	1.348	1.163
Isoleucine *	3.700	3.837	3.335	3.163
Leucine *	6.000	6.215	6.873	5.276
Tyrosine	3.251	3.025	2.888	2.620
Phenylalanine	2.833	2.856	3.055	2.435
Lysine	6.662	7.037	5.808	5.934
NH_3	1.823	2.113	1.576	1.640
Histidine	3.667	3.381	2.706	2.977
Arginine	5.963	6.191	5.682	5.262
Tryptophan				
Proline *	2.267	2.557	2.783	2.138
Total AA	76.797	78.521	72.352	67.093
Total pre-AA*	35.218	36.795	33.808	31.084

*: pre-flavor amino acid, Total pre-AA *: Total important pre-flavor amino acid

determination were listed in Table 6. Compared to the control groups, we found that the content of polyunsaturated fatty acids and total unsaturated fatty acids in WZSP meat was lower, while the content of the saturated fatty acids was higher. Compared to XP, the content of 18:2 was significantly lower and the content of 18:1 was considerably higher, but there was no obvious difference in total unsaturated fatty acids. The content of 18:0 was higher while there was no large difference between the content of 16:0 and 14:0, but the total saturated fatty acids were higher. Compared to BP, the content of 18:2, 18:1 and total unsaturated fatty acids were all lower and the content of 18:0, 16:0, 14:0 and total saturated fatty acids were higher. Therefore, we came to the conclusion that the fatty acids composition in WZSP meat was not as expected.

With the rise of living standards, the occurrence of modern culture diseases is increasing. When people eat meat or meat related food products, they are afraid of ingesting the inner high calories and cholesterol. As mentioned before, the meat of WZSP was low in intra-muscular fat. After calculating the quantity of total intra-muscular fat in every 100 g pork, it was found that the quantity from young WZSP meat was much lower than that of the control group, and there was no significant difference between quantity of meat from adult WZSP and BP. Thereby it could be concluded that the WZSP meat was low in cholesterol and calories.

Table 6: Results of fatty acid determination(n=3)

Fatty acid	Young WZSP	Adult WZSP	Young XP	Adult BP
18:3 (n-3)			1.29	2.11
18:2 (n-6)	13.75	13.79	18.33	25.61
18:1 (n-9)	39.00	40.39	36.60	42.34
18:0	10.64	13.91	11.93	9.16
16:0	26.31	24.75	24.68	15.82
14:0	1.93	1.46	1.36	0.79
12:0	0.08	0.07	0.07	0.04
Total SFA	38.96	40.19	38.04	25.81
Total MUFA	39.00	40.39	36.60	42.34
Total PUFA	13.75	13.79	19.62	27.72

SFA: saturated fatty acid MNFA: mono-unsaturated fatty acid PUFA: poly-unsaturated fatty acid

Analysis of flavor related factors: Some amino acids, including Ser., Glu., Gly., Ile., Leu., Phe. and Pro. are the necessary pre-flavor amino acid of meat smell (especially Glu). They are directly associated with the flavor of meat (Guobing, 1994).

Compared to XP (Table 7), the contents of Leu. and Pro. in WZSP meats were lower, the contents of Gly. and Ala. were almost the same, and the contents of Ser., Ile. and Glu. were higher. On the whole, the total amount of important pre-flavor amino acids in WZSP pork was higher than that in XP. Compared to BP, the amounts of all pre-flavor amino acids were higher. These components contributed much to the unique meat flavor of WZSP pork which led to the prediction of dense taste and smell after proper processing.

Fat oxidation is the main way to produce flavors. Different derivations of fat oxidation result in different flavors. According to related research, 90% of aroma substance is from lipid reaction, especially when considering that saturated fatty acids are highly correlated to unique flavor. The higher the content of polyunsaturated fatty acids is, the lower the assessment values of tenderness, juiciness, aroma and acceptable extent are. Otherwise, the higher the contents of saturated and mono-unsaturated fatty acids are, the higher the above assessment value is.

The content of 18:2 in meat from WZSP was significantly lower, while the contents of 18:1 and saturated fatty acids were notably higher compared to that from the same age XP. The amounts of 18:2, 18:1 and total unsaturated fatty acid were considerably lower and total saturated fatty acid content was noticeably higher compared to that from BP in the same age. In addition, the mini-type body of WZSP has short muscle fibers which makes meat tender. This resulted in the special flavor and highly acceptable sensory characteristics after the meat was cooked.

Process performance analysis: Process performances mean that whether the meat can be further processed. These properties

Table 7: Comparison between important pre-flavor amino- acids (n=3)

Variation	Ser	Giu	Gly	Ileu	Leu	Ala	Pro	Total
Higher than young XP%	26.94	19.77	8.28	19.31	-9.57	7.84	-8.12	4.17
Higher than BP%	15.02	19.31	14.76	21.31	17.80	18.34	19.60	18.37

Table 8: Results of process performance determination

Items	pH_1	PH_u	loose water%		cooked meat%		drip loss %		
			4h	24h	braise	cook	24h	48h	72h
Adult WZSP	6.70	5.76	2.37	14.50	55.40	54.06	1.15	1.57	2.06

include water-holding capacity, emulsification, ability of producing gelatin, cooking loss, cooking color etc (Ruitong, 2000). Among these properties pH value, water-holding capacity, cooked meat percentage, and drip-loss are important, especially to meat juiciness and the loss during cold-storage, transportation, thawing and cutting. Usually, cooked-meat percentage is used to measure cooking-loss.

Data in Table 8 show the following:

First, the change of pH value in the meat from WZSP had no remarkable difference from that of BP, which showed the similar biochemistry-physiology procedure especially the accumulation of lactic-acid in the postmortem.

Second, the drip-loss level of the meat from WZSP was significantly lower than that from BP, while the loose-water had no obvious difference. This indicated that the WZSP meat has better water-hold capacity , which would have significant economic benefit especially in the circulation of raw meat.

In the end, though the meat of WZSP had relatively better water-holding capacity, the cooked-meat percentage of WZSP was lower than that of BP and other local kinds of pig, its lower intra-muscular fat content might be the main factor.

Conclusions: Although the dressing percentage of WZSP was somewhat lower and the ham was less full, the thin skin, thin back-fat, thick back-muscle and high meat productivity of WZSP showed the excellent characteristics of lean meat type of pig. Pork of healthy WZSP was of perfect meat color, meat elasticity and less marbling. Moreover, the pork had high edible qualities, such as rich in both amino acid content and composition, and low in intra-muscular fat, which was also expected. Although its fatty acid profile was not satisfying, there was less fat and calorie compared with the same amount of other types of pork. Because of the composition of amino acids and fatty acids as well as short meat fibers, the cooked meat tasted and smelled very good. In addition, the pork still had good process performance.

It is suggested that the further study on WZSP meat flavor should be carried on and the breeding of WZSP should be rapidly developed in the future.

Acknowledgements

The authors are grateful to Feng Shu Tang (Institute of Animal Science of Chinese Academy of Agriculture Science) and Guo Hong (Tai Ping High Tech Agriculture Company) for their help in supplying pigs and funding.

References

Guanghong, Z.,1999. Pork Science. Beijing: Light Industry Press, 47-62

Guobing, Z., 1994. The Theory of Food Flavor and Technology. Beijing: Beijing University Press, 73-123

National Standard Bureau of People Republic of China, 1999. China Standard. Beijing: Chinese National Standard Bureau Press, GB8467-87

Ruitong, D., 2000. The Study Headway of Meat Quality. Meat Res., 2: 11-13.

Runsheng, C.,1987. Evaluation of Pork Quality. Nanjing: The Second Conference of Pork Quality Study in China.

Wuxi Light Industry College, 1990. Food Analysis. Beijing: Light Industry Press, 56-79

Yuming, S. and L. Ming, 1994. Pork science of animals and birds. Shandong, P.R. China: Science and Technology Press, 215-245.

Zhou, S.,1988. Probability and Application of Statistics. Beijing: Higher Education Press, 200-202