Evaluation of Local Chicken Slaughter Operation, Carcas and Product Characteristics in Yogyakarta

Wahyu Supartono[1], Sri Raharjo[1] and Sofyan Iskandar[2]
[1]Faculty of Agricultural Technology – Gadjah Mada University – Yogyakarta
[2]Research Center for Animal Production - Bogor

ABSTRACT

Indonesian local chicken has some advantages in compared with broiler chicken. Local chicken can live freely and sometimes serves as "saving" for family in villages. The local chicken is used as raw material for some traditional foods. This research focused on chemical and microbiological properties on local chicken carcasses and also their finished products, such as satay or fried chicken.

Results of this research showed, that local chicken carcasses has more protein content than broiler carcasses, and has also lower calorie and fat content. But their fat and calorie became higher, after their fresh local chicken carcasses were prepared, spiced and fried or grilled ready-to-eat foods. All of fresh local chicken carcasses, which were taken and collected from local slaughtering houses, were contaminated by pathogenic microbes, such as Escherichia coli, Salmonella sp and Staphylococcus sp. But after processing of the fresh carcasses, the number of the pathogenic microbes decreased drastically, so food poisoning or out break of consumers was rarely occurred.

The results of evaluation on gender and socio-economic factors suggested, that local slaughtering house operations were feasible with no possibility to expand their activities. More investment to buy an electrical machine (Feather-Pluckier) was very useful for raising their productivity, capacity and ease in preparing carcasses. The women workers had three job description (owner, main worker and an assistant) in this slaughtering process, and they did not have difficulties to do their job and their loan actually was used to help their own economic family.

Key words: Local Children, slaughter operation, microbiological characteristic

INTRODUCTION

Fried chicken and chicken satay are one of the most popular item served in restaurants and other food service establishments. Fried chicken and satay consumers prefer local fowl meat instead of broiler meat of foreign origin. This in part is due to its superior texture and flavor. Although an accurate data on poultry meat consumption is not available, it is reasonable to say that family member most widely and frequently consumes chicken. Therefore, it raises concern on its food safety. Although there is a national standard on broiler carcasses or broiler meat, but up to this time no national standard for local chicken carcasses is available. This could lead to customer's complaints and raises concern on its quality aspects.

Local chicken carcasses are mostly processed by small businesses or traditional poultry slaughter houses. Large-scale slaughterhouses operating sophisticated mechanical equipments and implementing quality as well as safety management are excluded from this study. This local chicken are raised in small farm and grain fed or they are free living and fed with food leftover. Both type of local chicken, however, are marketed as the same commodity without distinguishing the way they were raised. Therefore, it is urgent to establish a generic standard for local chicken fowl carcasses. These local chickens are usually processed into carcasses without inspection by poultry meat inspector. The carcasses are distributed using open container (unpacked) and handled at ambient temperature during temperature and display in traditional markets.

Based on these conditions this research was conducted for evaluating the local chicken carcasses from their traditional slaughtering houses to their ready to eat chicken products. The chemical and microbiological properties of carcasses were evaluated. The evaluation was aimed to determine critical process steps that should be avoided due to consumers out-break or complaints. The results of this evaluation were very important as an input for all persons who handled local chicken carcasses.

Other aspects in this research were SEAGA or Socio-Economic And Gender Analysis for the traditional slaughtering houses in Yogyakarta. This study should cover the role of the slaughtering houses for their worker households and role of the women workers in the activities of preparing carcasses.

MATERIALS AND METHODS

Samples of this research were fresh local chicken carcasses were obtained from traditional slaughtering houses in Yogyakarta, and used as raw materials for satay, fried chicken or other products. The samples were cut, prepared as carcasses and stored in cooled package before they were transported to laboratories. Before the analysis was conducted, all samples were kept in the freezer to protect them from microbiological contamination. The feasibility study was also conducted in same location where the samples of carcasses were taken. This part was field study and was helped by using questionnaire and depth interview with owners and workers.

The methods for analyzing chemical aspects were: water content was determined by drying oven, ash content by muffle oven, protein content by micro Kjeldahl, fat content by Soxhlet, sugar content by spectrophotometer and pH value by pH meter. To identify the pathogenic microbes in the carcasses, the microbiological tests for *Escherichia coli, Salmonella* sp and *Staphylococcus* sp were implemented. Calorie of the carcasses was determined by Bomb-Calorimeter.

Conducting the feasibility study and socio-economic aspect, some methods were used namely; Net Present value (NPV), Internal Rate of Return (IRR), Pay back Period (PBP), Break Even Point (BEP), Margin of Safety (M/S) and Benefit Cost Ratio (BCR). The gender analysis was surveyed by followed activities in traditional slaughtering houses specially the women.

RESULTS AND DISCUSSION

Local chicken has good economical value in rural areas. It can be used as savings or part of special menu in traditional events. In past time local chicken was usually used as "tax" for the kingdom, where the society lived in. Population of local chicken in Indonesia was 222.89 million in 1993 and increased for 5.01%, so in 1997 its population became 270.76 million (Anonym, 1999; Rasa, 1992).

Comparing nutritional value of chicken, Vollmer et.al. (1995) stated in table 1 the nutritional value of broiler chicken. Table 2 showed the result of chemical value of fresh local chicken carcass and its chicken products.

Table 1. **Nutritional value of broiler chicken in 100 g edible part.**

Type and Part	Protein [g]	Fat [g]	Calorie [kcal]
Chicken for barbeque	15	4	107
Breast	16	1	79
Leg	15	2	90
Chicken for Soup	20	13	810

Source : Vollmer et.al, 1995

Table 2. **Nutritional value of fresh local chicken carcass and products**

	FrCh	FCh	RFChA	FChA	RFChB	FChB	RSt	St
Water (%)	77.41	47.37	79.33	52.84	57.60	56.42	62.25	51.75
Ash (%)	0.82	2.37	1.48	4.64	1.51	2.28	0.86	1.64
Protein (%)	21.63	32.60	16.29	32.55	26.92	27.70	17.46	21.66
Fat (%)	1.35	8.39	1.91	9.62	7.92	17.47	25.72	17.72
Sugar (%)	0.021	1.935	0.019	0.188	1.43	0.976	0.021	3.52
pH*	5.71	5.64	5.32	6.39	5.64	6.53	5.40	5.93

- pH value expressed its value (not in percentage)
- All results were based on 5 replicates and standard deviation was approximately 3-10% of the results
- **FrCh** : Fresh Chicken Carcasses; **FCh** : Fried Chicken; **RFChA** : Raw Fried Chicken prepared with javanese traditional art and not so dry and crispy; **FchA**:Fried Chicken; **RGChB**: Raw Fried Chicken prepared with other traditional art, dry and crispy; **RSt**: Raw Satay; **St**: Satay ready to be consumed

In compared between Table 1 and Table 2, the local chicken has advantages in higher protein content for

4-5% and lower fat content. But during preparation of fried chicken or satay, the carcasses were added with some spices to achieve special aroma and flavor in the finished products. The special spices varied from every kind of fried chicken, but they contained usually spices (onion, ginger, pepper, etc), sugar, salt, edible acid in certain composition. These spices could give the consumers special taste too, and the consumers could prefer in certain kind of fried chicken.

The addition of spices contributed to better flavor and taste and also longer storage time in some chicken products. This process increased the calorie value of fresh chicken carcasses. Beside the spices, frying process could increase the calorie value respectively. In the frying process for fried chicken the edible oils like palm oil was utilized, and after this process the fried chicken had 7-10% of fat content that depended on art and length of the frying. The increase of fat content caused the increase of calorie value. In grilling process in satay, the fat content decreased, because during the process some of fat were burnt.

The frying process could cause the increase of protein content. The frying of chicken was a complex process and intended to generate flavor and remove the moisture, in which the high temperature of edible oil played important roles. The edible oils contained protein, fat, carotenoid and others. So during the process the protein from oils could be transferred into the fried chicken. The increase of protein could be supported by the decrease of the moisture content.

Microbiological evaluation of fresh carcasses and some chicken products was focused on hygiene and safety of products for the consumers. The evaluation was based on only in three pathogenic microbes, *Escherichia coli*, *Salmonella* sp and *Staphylococcus* sp. The choose of these three microbes was based on the reality, that they were very common in contamination of poultry products. Presence of *E. coli* indicated the lack of hygiene, because *E. coli* lives in the intestinal system of chicken and goes out with feces. *E. coli* can cause diarhe. *Salmonella* sp can be founded in poultry meat, because of cross contamination and cross infection *Salmonella* could reach the human gastrointestinal system. It caused diarrhea, headache, out break, etc. *Staphylococcus* sp usually is founded in human mucus membrane in nose, breath system, skin and hair. People who suffered influenza can spread *Staphylococcus* through their cough. But in the chicken *Staphylococcus* can live in nose, skin and feather, so if the preparation of carcasses was bad, the cross contamination could be occurred in the human body. The contamination of *Staphylococcus* in human body caused out breaks, shock, etc.

Table 3. **Result of microbiological determination**

Products	*E. coli*[a] *FNCC 0091*	*Staphylococcus sp*[b] *FNCC 0048*	*Salmonella sp*[c] *FNCC 0050*
Fresh Carcass	++	-	+
Spiced Fresh Carcass	+	++	+
Fried Chicken	-	-	-
RFChA	+	-	+
FChA	-	-	+
RFChB	+	+	-
FChB	-	+	+
RSt	++	+++	+
St	-	+	+

Based on the microbiological evaluation in the chicken carcasses and their finished products, it could be summarized that their material handling in the slaughtering houses were conducted badly, so the cross contamination could occur. The presence of *E. coli* suggested that the carcass did not meet the hygienic requirement or standard. Carcasses was also contaminated by *Staphylococcus* sp and *Salmonella* sp (Table 3). These three pathogens could cause food borne illnesses.

Living environment of local chickens was not clean or hygiene, because they lived freely and looked after their own feed in rice field, garden, garbage deposit or in households. They were surrounded by unhealthy conditions, for example land, water and feed could be contaminated by pathogenic microbes. These microbes could live in a gastrointestinal system in the chickens, but they did not give negative effects to the healthy of the chickens. After cutting process and during preparation of the carcasses, the microbes were deliberated into the slaughtering places and they were potential microbiological hazards to contaminate the carcasses.

Based on the field research and depth interview to the local slaughtering houses, which was evaluated in feasibility, financial and gender aspects. The results of feasibility and financial aspects were depicted in Table 4.

Table 4. **Feasibility and financial study on local slaughtering houses**

Criteria	Aryani*	Tulus*	Margono*	Ngatijan*	Karti*
NPV [Rp]	96,196,401	210,003,825	123,040,924	45,519,713	17,111,376
IRR [%]	110.35	138.25	135.80	104.50	297.75
PBP [year]	0.88	0.71	0.71	0.93	0.33
BEP [unit]	45,367	104,371	53,025	19,100	866
BEP [Rp]	17,148,600	31,419,423	17,286,300	12,453,200	609,383
M/S Ratio	0.49	0.55	0.58	0.24	0.88
BCR	1.2517	1.5085	1.5711	1.0869	3.7271

* : owner of slaughtering operation
NPV: Net Present Value; **IRR**: Internal Rate of Return; **PBP**: Pay Back Period; **BEP**: Break Even Point; **M/S**: Margin of Safety Ratio; **BCR**: Benefit Cost Ratio.

The results showed, all of the local slaughtering houses were financially feasible to be developed or expanded. But this condition was not a guarantee, that they could invest a new equipment to ease their process. Beside these results some aspects due to the local slaughtering houses could be pointed out:

Understanding level of consumer for carcass quality

Some owner of slaughtering houses understood good manufacturing practices of preparing carcass. But the consumers wanted the preparation should be cheaper, faster and they ignored the quality of carcass. This phenomena depicted, the improving of carcass quality had to be started from the consumers level. They should know the proper quality and safety of the carcass they consumed.

Status of slaughtering houses

Most of them rented only small space in the markets, so they had a restriction to expand the work place. In Terban market Government Agency for Poultry had developed the slaughtering houses, but their design was not supported process efficiency and the space was too narrow, so the worker could not do their job optimally.

Worker

The workers did their job daily and amount of them was limited. They worked fast and ignored the hygienic aspects or they did not obey Good Manufacturing Practices as long as the consumers did not complain them because of the quality or safety of local chicken carcasses.

The gender analysis was conducted and it was founded five women who involved in these activities (Table 5).

Table 5. **Result of Gender Analysis on Slaughtering Operation**

Name	Status in slaughtering houses	Job description
Aryani	Owner and worker	Organizing the clean carcasses
Raminem	Assisstant of main worker	Cleaning the intestine
Paerah	Main worker	All process except cutting
Pariman	Assistant for main worker	Cleaning the feathers
Karti	Owner and worker	All Process steps

The description of status in the slaughtering houses could be divided into three categories:

Owner and worker

There were two types in this category, namely; a. owner and worker who worked with semi mechanical equipment and was helped by 1-2 other workers to prepare the chicken into the finished carcass; b. owner and worker, who worked alone without any help of equipment or other worker.

Main worker

As main worker, the women had the same job as the men with exception in cutting the chicken that was always executed by the men.

Assistant for main worker

They were responsible in one part of the carcass preparation process especially in the critical step that had more contact with the dirt and contamination, such as cleaning the intestine or plucking the feathers.

All the women involved in the preparation of carcasses had no difficulties to adapt and do their jobs, because they already worked in the same job before and some of the slaughtering houses were operated traditionally (manual). Rewards for the women were equal with what they did during the day or they worked. If the order increased, they received extra salary too, although they had already fixed salary monthly. But the women salary was 2/3 of the men worker respectively, because they did not do some jobs, which were suitable for the men.

CONCLUSIONS

Based on the results of the study, it can be concluded: The local chicken carcasses had ones higher protein content, lower calorie and fat content compared with broiler. Although there were some contaminations of pathogens in the fresh carcass, the frying process could reduce or remove them. Local chicken slaughtering operations were economically feasible to be expanded. The women played important roles in the slaughtering operation as either owner or main worker.

ACKNOWLEDGEMENT

The authors thanked to the Agricultural Research Management Project (ARMP) II 1999/2000 which gave financial support for conducting this research.

REFERENCES

American Meat Institute Foundation. 1994. HACCP: The Hazards Analysis and Critical Control Points in the Meat and Poultry Industry.

Anonym. 1999. Invests Agrobisnis Komoditas Unggulan – Peternakan. Penerbit Kanisius Yogyakarta bekerjasama dengan Badan Agribisnis Departemen Pertanian.

Charlebois, R; R. Trudel and S. Messier. 1991. Surface Contamination of Beef Carcasses by Fecal Coliforms. J. Food Protection 54: 950-956.

Lilliard, H.S. 1990. The Impact of Commercial Processing Procedures on the Bacterial Contaminatuion and Cross-Contamination of broiler Carcasses. J. Food Protection 53: 202-204.

Priyatno, M.A. 1999. Mendirikan Usaha Pemotongan Ayam. Edisi II. PT. Penebar Swadaya. Jakarta.

Rasyaf, M. 1991. Pengelolaan Usaha Peternakan Ayam Kampung. PT. Kanisius. Yogyakarta

United States Department of Agriculture. 1997. Guidebook for the Preparation of HACCP Plan.

Vollmer, G; G. Josst; D. Schenker; W. Sturm; N. Vreden. 1995. Lebensmittelfuehrer. Thieme Verlag. Stuttgart.