Chemical Quality of Fresh New Zealand White Rabbit Meat in Batu, Indonesia

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Abstract. Batu was one of the cities in the province of East Java, Indonesia that one of the leading tourist cities in Indonesia. Rabbit satay was one of the Batu city famous foods. Many tourists visited Batu City to consume it. Rabbits were obtained from rabbit breeders in the Batu city. The environment and the pattern of rearing rabbits had an impact on the quality of the meat and specific characteristic of the meat production. This study aimed to determine the chemical quality of the fresh New Zealand White (NZW) rabbit meat in the Batu City using the proximate analysis. This Research used 9 males of NZW rabbits, each of them was taken 100gr of loin flesh for proximate analysis. Rabbits were kept intensively. The results showed that fresh NZW Rabbit Meat had a carbohydrate content was 0.43%, Protein content was 19.99%, Moisture was 75.84%, Ash content was 1.43% and Energy gross was 110.47 Kcal/100g.

1. Introduction

Batu is one of cities in the East Java Province, Indonesia. It located at the high altitude of 700-2.000 meter above sea level (masl) with average temperature around 11-19°C. Batu City is known as one of a tourism city in Indonesia because its natural beauty. The surrounding region around Batu City has been known as mountainous areas with cool air that is comfortable for holiday. The total area of Batu City is about 202.30 km² and most of Batu's topographical conditions are dominated with highland areas, and located on the slopes of two large mountains, Arjuno-Welirang and Butak-Kawi Panderman. The soil is contained a lot of minerals from volcanic eruptions so that it has a high fertility rate.

Rabbit satay is one of the famous foods in Batu City. The high demand of rabbit satay by tourists could increase the consumption of rabbit meat in Batu City. The quality of rabbit meat, such as a high protein with low fat and cholesterol content, makes it healthier meat for consumption. The rabbit meat was produced by local breeders from Batu City. The local breeders usually bred New Zealand White (NZW) rabbit.

The New Zealand White rabbit is meat-producing type because of it sturdy and compact meat. The New Zealand White rabbit was known as commercial meat producer. It had fast growth rate, good carcass quality, high fertility and good maternity [1]. The first mating age was 8-9 month with average litter size was 8-9 kits and weaned was 37 days. The NZW rabbit had pregnancy time was 30 days, calving interval was 27 days [2]. The breeder use pattern of rearing rabbits in Batu City generally an intensively pattern, which the rabbits were kept inside the cage and given forage originating from the remnants of agricultural products. The temperature of Batu City is around 11-19°C and the amount of forage is sufficient for the needs of rabbits causes rabbit livestock in Batu can develop rapidly.

Nowadays, several factors can be used to determine the quality of fresh meat are its nutritional content meat and safety meat. Some factors that affect the quality of rabbit meat were environmental...
factors, rearing technique, feeding effects, preslaughter conditions, stunning conditions, genetics, age, body weight, feed, cooling conditions and the technology used after cutting [3]. Based on the condition of Batu City and rearing technique of Batu rabbits’ breeders, it has an impact on the quality of rabbit meat production, so this article will discuss the quality of the meat in terms of the chemical quality of fresh NZW rabbit meat of in Batu City, Indonesia and the results of this research can be used as one of the bases in the development of processing animal products from rabbit meat.

2. Materials and Methods

2.1. Collection and Preparation Sample
This research used meat from 9 tails of Male NZW Rabbit of “Adi Jaya” Batu Breeder Group. This research was on August, 2019. The rabbits were rearing intensively that kept inside cage and fed the forage and complete feed twice a day. Water was supplied ad-libidum in the respective water (automatic Niple) kept inside the cage. This research was carried out under cold condition having ambient temperature range from 11°C (minimum) to 19°C (Maximum). The rabbits were slaughtered manually according to Islamic procedure and aged 3-4 months, then deskinneed and eviscerated on spot, then taken 100gr fresh meat on the loin flesh of each rabbit tail, kept separately in polyethylene bags and transported with a minimum of delay to the laboratory of Meat, Faculty of Animal Science, Brawijaya University.

2.2. Chemical Analysis
Chemical analysis used in this research was a proximate analysis, consisting of analysis of proteins, fats, water and ash. The all of methods of proximate analysis used in this study are according to the procedure of Association of Analytical Communities [4]. The Carbohydrate content was analysis using calculations: 100 - (protein + fat + ash content) [5]. Gross energy was analysis using calculation: Gross energy (Kcal/100g) = (protein% x 4) + (fat% x 9) + (carbohydrate% x 4) [6].

3. Results
Based on the results of the research on the chemical quality of the New Zealand White rabbit meat in Batu were obtained the following data on Table 1.

Table 1. Proximate Composition of Fresh NZW Rabbit meat, Batu Indonesia.

| Composition   | Value         |
|---------------|---------------|
| Gross Energy  | 110.47 Kcal/100g |
| Carbohydrate  | 0.43 %        |
| Protein       | 19.99 %       |
| Fat           | 2.31 %        |
| Moisture      | 75.84 %       |
| Ash           | 1.43 %        |

The carbohydrate content of Fresh NZW Rabbit meat, Batu was 0.43%. The carbohydrate content in rabbit meat was relatively low when compared to carbohydrate content in red meat. This research results show that it was higher when compared with the results of the carbohydrate levels in the fore quarter and hind quarter rabbit meat was 0.33% [7]. Gross Energy calculation result for NZW rabbit meat was 110.47 Kcal/100g. Based on Food and Agriculture Organization (FAO) the gross energy content of rabbit meat was around 120 Kcal/100g [8], so the result of the study was compared with the FAO standard, the research results was lower than the standard. The gross energy content of local rabbit meat and Rex rabbits that reared in Bogor (one of city in Indonesia) was 136.0-171.6 Kcal/g. The Male rabbit behaviour had a greater eating behaviour than females’ rabbits, so it would further affect the energy content of the meat [17]. Genetic differences affect the energy content of rabbit meat. The main energy value was more closely related to protein content than fat content, while carbohydrate content can be neglected [9].
Proximate analysis measured crude protein levels were actually not only protein fractions but also all nitrogen-containing compounds. The protein content was one of the most important indicators in food. High-quality food ingredients had high protein content. The protein content of rabbit meat, when compared with the meat of other species was quite high. The protein content of rabbit meat from this research was 19.99%, it was higher than protein content of the fore quarter's rabbit meat was 18.6% and lower than the protein content of the hindquarters at 20.59% [10] and it was higher when compared with the protein content of local rabbit meat in Bogor Indonesia was 18.36-18.78% [17]. Rabbit meat protein content of NZW was 18.63-18.86% [11]. The protein content of rabbit meat increased with increasing age of the rabbit [11] and has no significant effect on diet and genotype [9] and sex [12].

The fat content of fresh rabbit meat of NZW Batu City was 2.31%, the result showed that rabbit meat was classified as low-fat meat. Fat content of rabbit meat of NZW in Batu City was lower when compared with the results of 8.8% in the forelegs rabbit meat and 3.4% in the hind legs rabbit meat [9], higher when compared with the results of the hind quarters’s rabbit was 1.78% [7]. The value of fat content was 1.69-1.81 for Belgian Giant rabbits [13]. The NZW fat content in the Longissimus Dorsi muscle section was 5.82% [11]. Fat content of meat was influenced by breed, age, species, muscle location and feed [18]. The meat fat content of Rex rabbits that reared in Bogor Indonesia was 2.20 - 5.01%, and local rabbits was 0.89-1.34%. The meat fat content of Rex rabbits was higher because it was one of the fur producing rabbits whose behaviour was tame, so that the energy consumed was more deposited in fat than for activity. In other hand Rex rabbit was subtropical rabbits, so the meat fat content was higher than local rabbits whose live in tropical environments. It was one of the effect of the environment [17]. The fat content will increase with increasing age of rabbits. Cutting types, diets, and class/family show significant differences in fat content in rabbit meat [11], while sex and genotype did not have a significant effect on rabbit meat fat content [9, 14].

The moisture level in rabbit meat of NZW from this research was 75.84%. It was lower than the results of the Longissimus Dorsi muscle was 76.19% [14], and higher when compared to the results of the study of lion muscle of NZW rabbit meat showed a value of 74.1% [15]. The moisture of rabbit meat was ranged from 63.6-75.93% both female and male rabbits [13]. Water availability was greatly influenced the endurance of the meat as food, especially in the context of microbiological damage. The water measured by the direct heating method in testing the moisture content was water that evaporates because its boiling point was exceeded and lost during heating (±105°C) included both surface water and water on the inside of the meat. The type of breed and the interaction between type of breed and gender significantly was significant effect on Rex rabbit meat and Bogor-local rabbit meat. The average moisture of Rex female rabbits was 70.57±2.51 was smaller than the average moisture of male and female local rabbits locally was 73-75% [17]. The moisture of fresh meat was more influenced by the level of dehydration of livestock before slaughtered [19]. The condition of livestock at the time of slaughtering could cause the differences in the chemical composition of meat produced. Carcass weight was a reflection of the condition of livestock. The carcass weight was influenced by interactions between breed and feed which showed that the efficient utilization of energy, protein and possibly mineral feed was relatively different among breed and feed treatments, but it was not always reflected in differences in the chemical composition of meat. The relationship between moisture and fat content had a significant negative correlation with meat fat content and moisture [20]. The moisture content of Rex rabbits had the smaller water content and higher fat content than local rabbit, while the local rabbit meat had higher moisture and the smaller fat content [17]. The moisture level of the rabbit meat would decrease significantly with increasing age of rabbit and did not have a significant effect on rabbit meat species and sex [9].

The ash content of fresh NZW rabbit meat in Batu was 1.43%. The ash content of fresh NZW rabbit meat in Batu was higher when compared with the results of the four quarters’s rabbit meat was 1.21% and hind quarters’s rabbit meat was 1.17% [7], while lower when compared the ash content of male rabbit meat was 2.27% [16]. The results of NZW rabbit meat was 1.15% ash content in the rabbit Longissimus muscles [11], and the rabbit loin meat of NZW 1.35% [15]. The ash content of Rex rabbit meat and Bogor-Local rabbit meat was not influenced by the type of breed, gender and interaction between the them. The average ash content for all rabbits was 1.06 - 1.19%. This difference can be
influenced by the mineral content of feed [17]. The meat ash content of New Zealand, Californian, Chinchilla and Rex rabbits had 4.44, 4.52, 4.43 and 4.49% [21]. Age, class/family, sex, diet or carcass section did not show a significant effect on ash content in rabbit meat [9, 15], whereas an increasing in age significantly affects the ash content in rabbit meat of Soviet Chinchilla [11].

4. Conclusion
In summary the results of this research was fresh meat of New Zealand Rabbit in Batu city, Indonesia had a chemical quality that were almost the same as the meat chemical qualities of the rabbit was kept in other countries. Based on the chemical qualities of the fresh NZW rabbit meat in Batu, it could be concluded that the fresh rabbit meat is healthier over that other meats and can be recommended for consumption as functional food with the high protein content (19.99%) and low fat content (2.31%). The results of this research are preliminary research for make the new product as the development of livestock products processing from rabbit meat.

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